

# **z/OS V2.5 IBM Education Assistant**

Solution Name: Enhance RMF Master concept for CF data gathering (RFE)

Solution Element: RMF



# Agenda

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- Trademarks
- Objectives
- Overview
- Usage & Invocation
- Interactions & Dependencies
- Upgrade & Coexistence Considerations
- Installation & Configuration
- Summary
- Appendix

# Trademarks

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- See url <http://www.ibm.com/legal/copytrade.shtml> for a list of trademarks.
- Additional Trademarks:
  - None


# Objectives

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- In sysplex environments with many Coupling Facility (CF) structures and larger distances between sysplex systems and CFs, RMF data collection of CF hardware statistics causes a higher system overhead.
- Observed by customers and addressed by RFE 124161 with title “RMF CF statistics gathering only once per sysplex”
- This session explains the purpose/usage of the enhanced RMF Master concept for CF data gathering.

# Background Information: CF HW Data Collection

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- Coupling Facility HW statistics obtained from CF microcode by use of synchronous requests.
- Consists of structure control information (like min/max/current allocated structure size) or resource consumption data (like CF processor time used for structure)
- CF HW statistics are independent from sysplex system collecting the data  
 Need to be collected on only one sysplex system
- Today, RMF collects CF HW data on multiple sysplex systems:
  - For SMF 74-4, on each system collecting SMF 74-4 records
  - For Monitor III CF activity reporting, on each system running with Monitor III CFDETAIL data gathering option.

# Overview

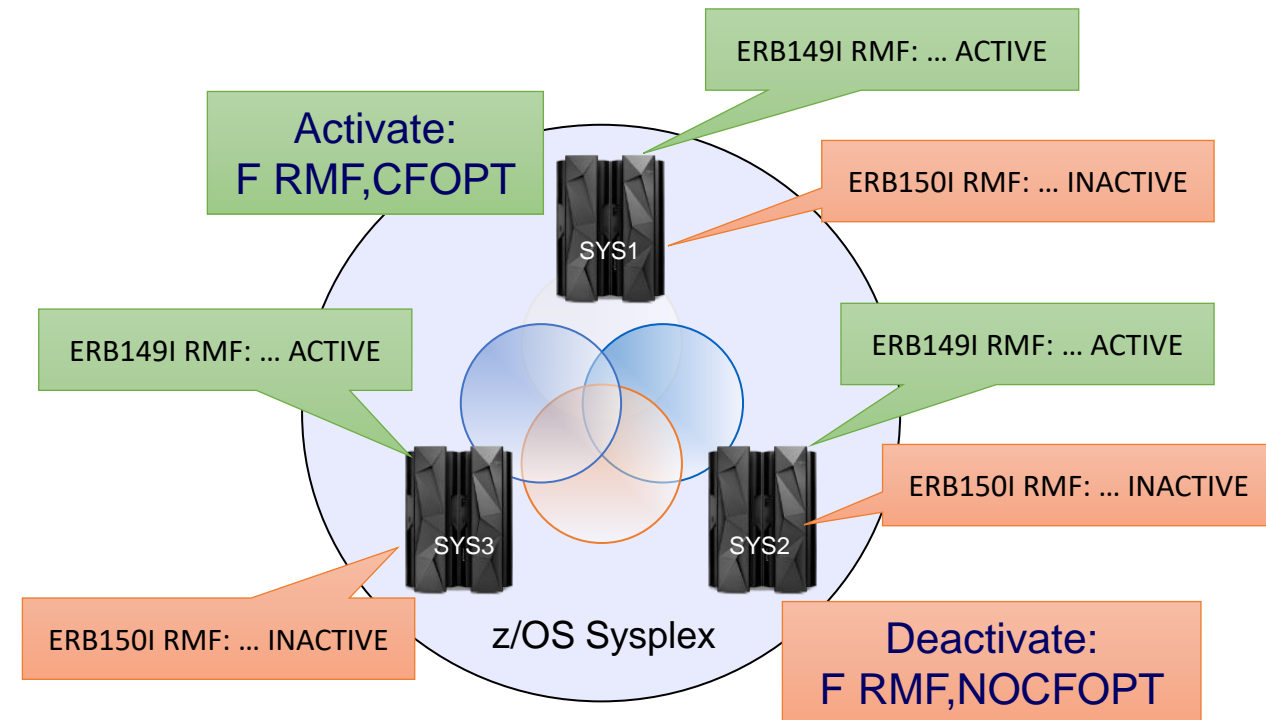
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- Who (Audience)
  - z/OS System Programmers
- What (Solution)
  - z/OS System Programmer can switch on an optimized gathering of Coupling Facility Hardware (CF HW) statistics. In optimization mode, CF HW data is only collected on one system in the sysplex.
  - If optimized data collection of CF HW statistics is active, the z/OS System Programmer can select the optimal sysplex system for RMF CF HW data collection of a specific CF.
- Wow (Benefit / Value, Need Addressed)
  - Reduce the system overhead and contention caused by the RMF CF HW data collection in sysplex environments with many CF structures and a larger distance between sysplex systems and their coupling facilities.

# Usage & Invocation: CFOPT Session Control Option

- New RMF control session option CFOPT can be used to switch on the optimized CF HW data collection. In optimization mode, CF HW statistics will be collected on the RMF master system only.
- Only one RMF master system within the sysplex, determined according to following rules:
  1. Monitor III Gatherer active
  2. Highest RMF Release
  3. SMF Buffer active
  4. Monitor III MASTER option specified
- Following possibilities to specify CFOPT option:
  1. Start command: `START RMF,,CFOPT`
  2. Modify command: `MODIFY RMF,CFOPT`
  3. Procedure parm:

```
//RMF      PROC  
//IEFPROC  EXEC PGM=ERBMFMFC,REGION=256M,TIME=1440,  
//          PARM='CFOPT'
```

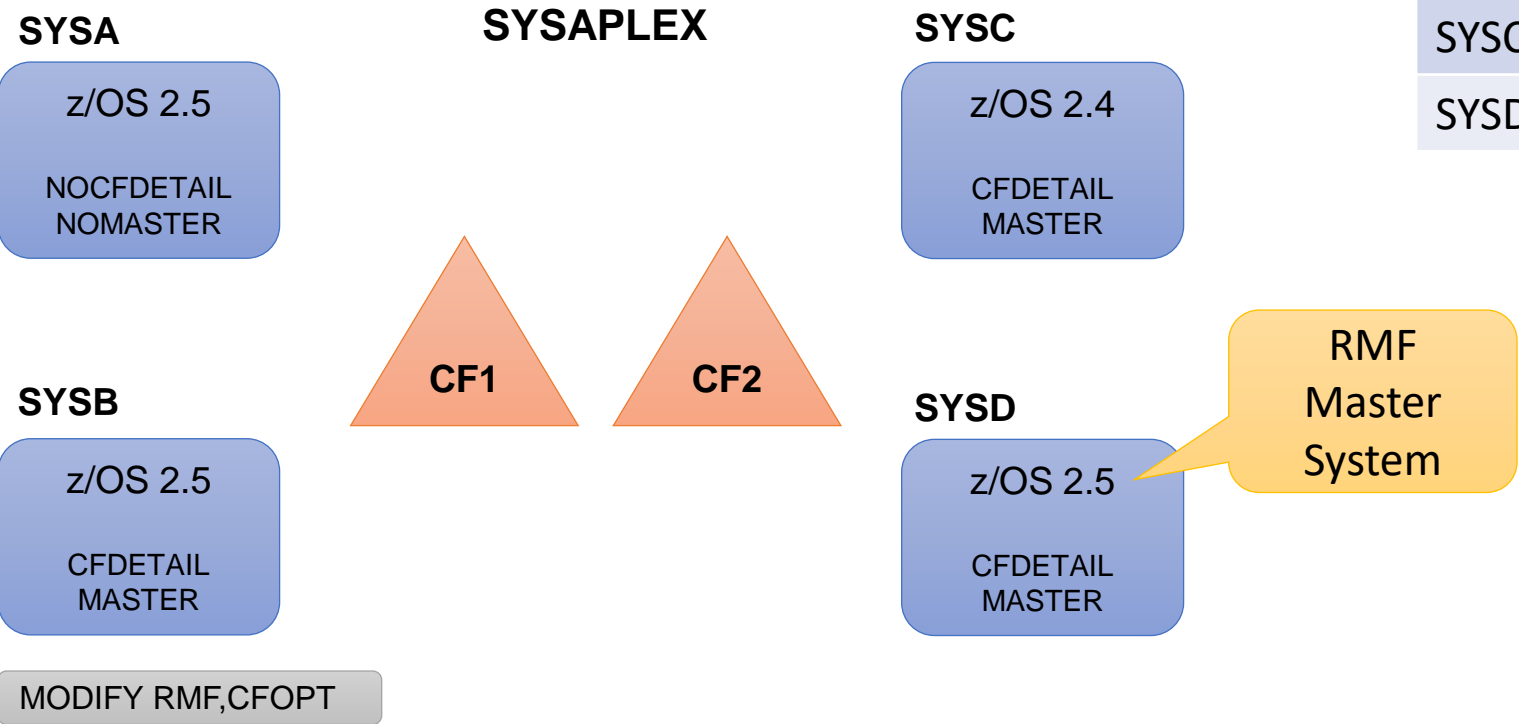


- ❑ The CFOPT option can be specified on any system of the sysplex
- ❑ It is recognized on all z/OS 2.5 sysplex systems where RMF is active
- ❑ Modify command: 'MODIFY RMF,NOCFOPT' will switch off optimized CF data gathering.

# Usage & Invocation: Optimized CF HW Data Gathering

**Example:**

Sysplex setup with optimized CF HW data collection



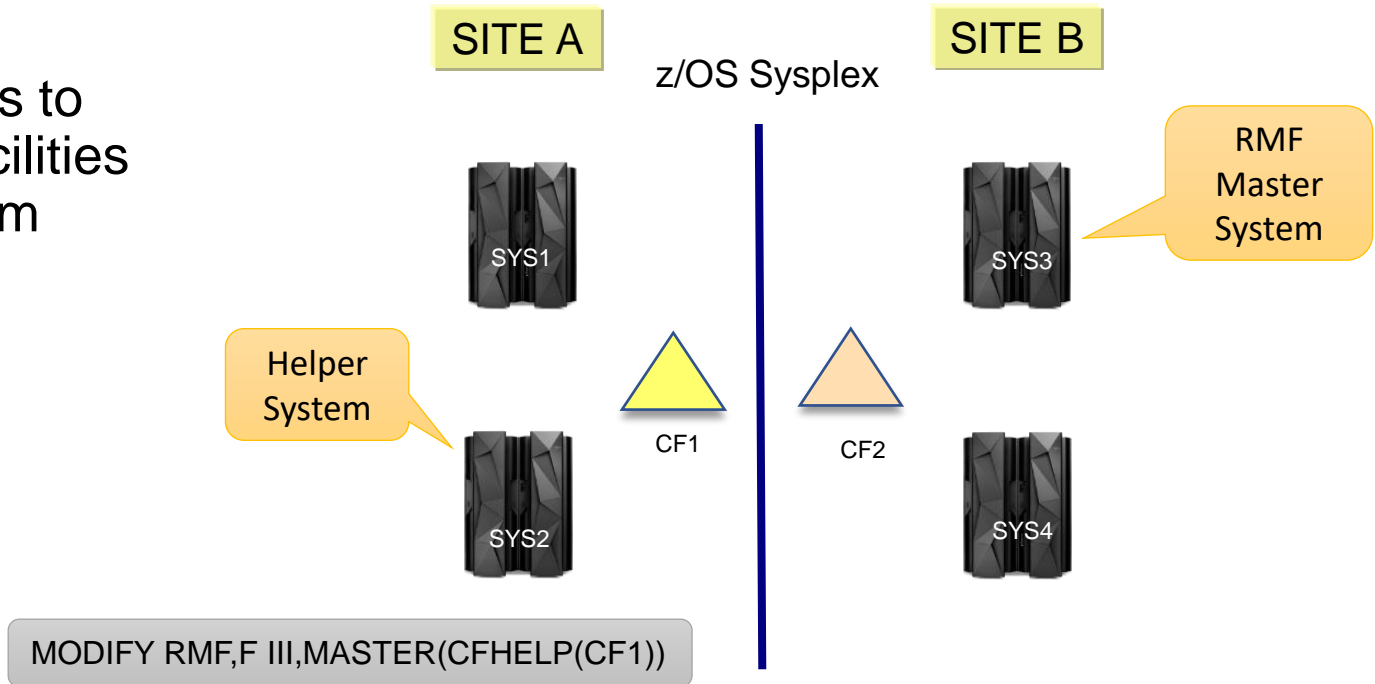
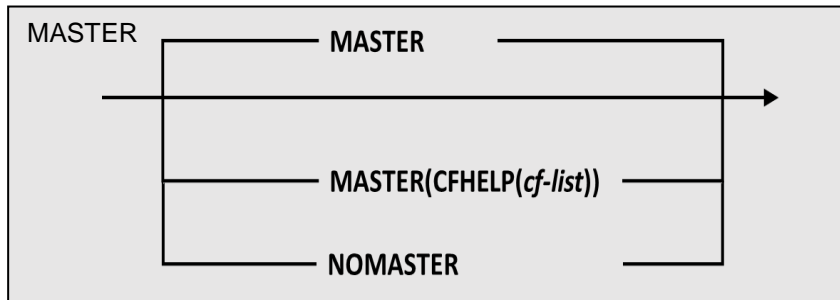
	CFI3 Data Collection	SMF 74-4 Data Collection
SYSA	✗	✗
SYSB	✗	✗
SYSC	✓	✓
SYSD	✓	✓

✗ NO CF HW DATA  
✓ CF HW DATA



# Usage & Invocation: Monitor III CFHELP Suboption

- If optimized CF HW data gathering is active, new Monitor III data gatherer suboption can be used to select helper system for CF HW data collection of specific CF
- New MASTER CFHELP suboption allows to specify the names of up to 8 coupling facilities on a system that can act as helper system for CF HW data collection.



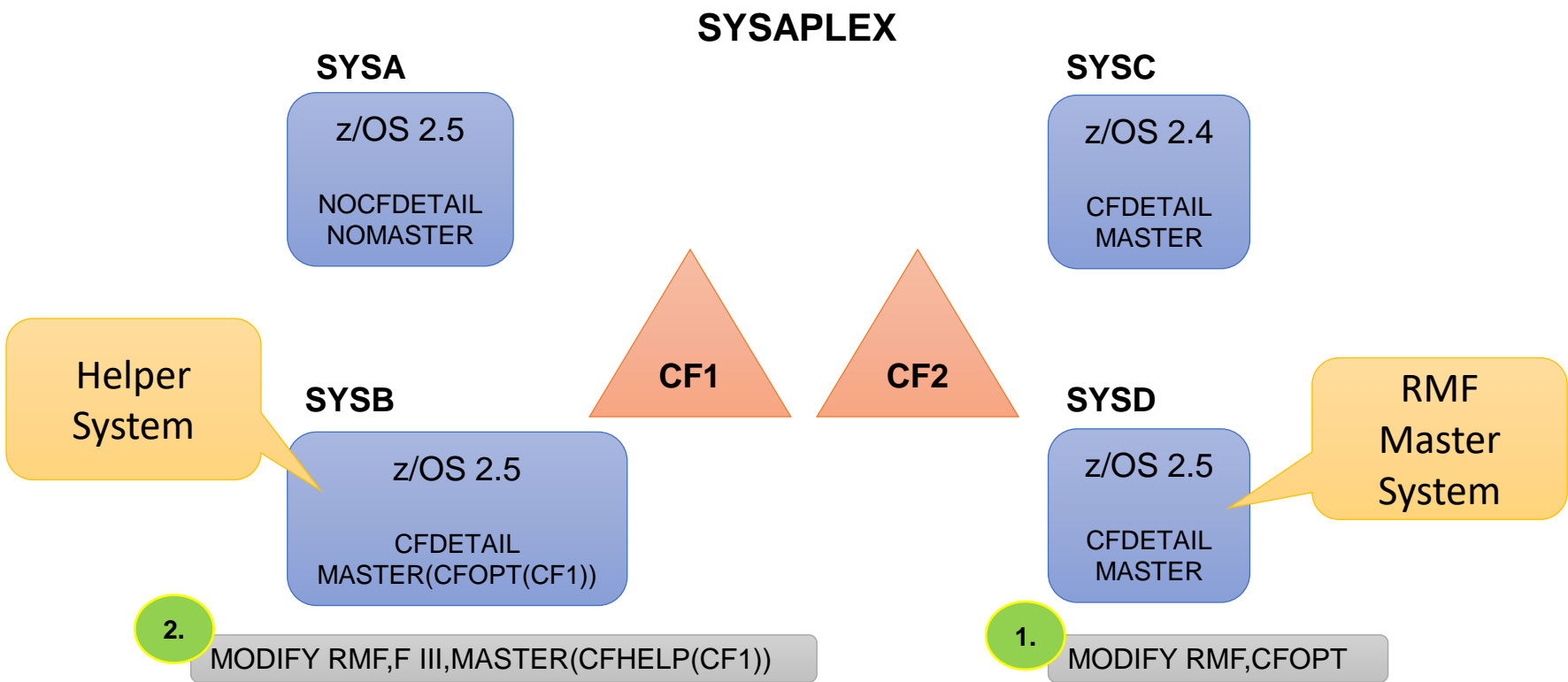
- Helper system collects CF HW statistics for the specified CF only if system is running the highest z/OS release in the sysplex
- As soon as there is a helper system collecting the CF HW statistics for a specific CF, CF HW statistics for that CF will no longer be collected by RMF master system.

# Usage & Invocation: Optimized CF HW Data Gathering with Helper System

## Example:

Sysplex setup with optimized CF HW data collection and helper system

✗ NO CF HW DATA  
✓ CF HW DATA



CFIG3 Data Collection

	CF1	CF2
SYSA	✗	✗
SYSB	✓	✗
SYSC	✓	✓
SYSD	✗	✓

SMF 74-4 Data Collection

	CF1	CF2
SYSA	✗	✗
SYSB	✓	✗
SYSC	✓	✓
SYSD	✗	✓

# Usage & Invocation: SMF record type 74.4 (1)

- SMF 74 subtype 4 **Local Coupling Facility Data Section:**

New flag in field R744FFLG indicates, if CF HW statistic data are **NOT** available in the SMF 74 subtype 4 record.

Offsets	Name	Length	Format	Description								
...												
16 10	R744FFLG	1	binary	<div>Status Flags</div> <table><tr><td>Bit</td><td>Meaning when set</td></tr><tr><td>...</td><td></td></tr><tr><td>5</td><td>No CF HW statistics available since optimized CF HW data gathering was active.</td></tr><tr><td>6-7</td><td>Reserved.</td></tr></table>	Bit	Meaning when set	...		5	No CF HW statistics available since optimized CF HW data gathering was active.	6-7	Reserved.
Bit	Meaning when set											
...												
5	No CF HW statistics available since optimized CF HW data gathering was active.											
6-7	Reserved.											

- The following SMF 74 subtype 4 data sections are only available, if the SMF 74 subtype 4 record was created by a sysplex system which collected CF HW statistic data, meaning bit 5 of status flag R744FFLG is **NOT** set:
  - Connectivity Data Section
  - Structure Data Section
  - Cache Data Section
  - Storage Class Memory Data Section
  - Asynchronous CF Duplexing Data Section
- SMF triplet fields SMF744XN, SMF744QN, SMF744CN, SMF744MN, and SMF744AN are all set to zero if the SMF record was created by a system that did not collect CF HW statistics (bit 5 of R744FFLG is turned on).

# Usage & Invocation: SMF record type 74.4 (2)

## Request Data Section

Offsets	Name	Length	Format	Description																		
25 19	R744SFLG	1	binary	<div>Status Flags</div> <table><tr><th>Bit</th><th>Meaning when set</th></tr><tr><td>0</td><td>Structure was connected to the system at the end of the interval.</td></tr><tr><td>1</td><td>Structure became active during the interval.</td></tr><tr><td>2</td><td>Structure is capable to participate in asynchronous duplexing. (Valid if bit 5 of R744FFLG is NOT set.)</td></tr><tr><td>3</td><td>Structure is in the duplexing active state. (Valid if bit 5 of R744FFLG is NOT set.)</td></tr><tr><td>4</td><td>Structure is primary instance of an asynchronously duplexed structure. (Valid if bit 5 of R744FFLG is NOT set.)</td></tr><tr><td>5</td><td>Structure is secondary instance of an asynchronously duplexed structure. (Valid if bit 5 of R744FFLG is NOT set.)</td></tr><tr><td>6</td><td>Structure is encrypted. (Valid if bit 5 of R744FFLG is NOT set.)</td></tr><tr><td>7</td><td>Reserved.</td></tr></table>	Bit	Meaning when set	0	Structure was connected to the system at the end of the interval.	1	Structure became active during the interval.	2	Structure is capable to participate in asynchronous duplexing. (Valid if bit 5 of R744FFLG is NOT set.)	3	Structure is in the duplexing active state. (Valid if bit 5 of R744FFLG is NOT set.)	4	Structure is primary instance of an asynchronously duplexed structure. (Valid if bit 5 of R744FFLG is NOT set.)	5	Structure is secondary instance of an asynchronously duplexed structure. (Valid if bit 5 of R744FFLG is NOT set.)	6	Structure is encrypted. (Valid if bit 5 of R744FFLG is NOT set.)	7	Reserved.
Bit	Meaning when set																					
0	Structure was connected to the system at the end of the interval.																					
1	Structure became active during the interval.																					
2	Structure is capable to participate in asynchronous duplexing. (Valid if bit 5 of R744FFLG is NOT set.)																					
3	Structure is in the duplexing active state. (Valid if bit 5 of R744FFLG is NOT set.)																					
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5	Structure is secondary instance of an asynchronously duplexed structure. (Valid if bit 5 of R744FFLG is NOT set.)																					
6	Structure is encrypted. (Valid if bit 5 of R744FFLG is NOT set.)																					
7	Reserved.																					
26 1A	*	1		Reserved.																		
27 1B	R744SLEC	1	binary	Lock structure only: lock table entry characteristic. (Valid if bit 5 of R744FFLG is NOT set.)																		

# Usage & Invocation: SMF record type 74.4 (3)

## Request Data Section

Offsets	Name	Length	Format	Description
28 1C	R744SLEL	4	binary	List structure: limit on number of list entries. The estimated maximum number of list entries that may reside in storage class memory is not included.  Lock structure: limit on number of data elements. (Valid if bit 5 of R744FFLG is NOT set.)
32 20	R744SLEM	4	binary	List structure: current number of list entries in use. The number of list entries that currently reside in storage class memory is not included.  Lock structure: current number of data elements in use (Valid if bit 5 of R744FFLG is NOT set.)
36 24	R744SLTL	4	binary	Lock structure only: limit on number of lock table entries. (Valid if bit 5 of R744FFLG is NOT set.)
40 28	R744SLTM	4	binary	Lock structure only: Current number of lock table entries in use. (Valid if bit 5 of R744FFLG is NOT set.)
236 EC	R744SSIZ	4	binary	Allocated size of structure (units = 4K byte blocks). (Valid if bit 5 of R744FFLG is NOT set.)
240 F0	R744SMAS	4	binary	Maximum structure size. (Valid if bit 5 of R744FFLG is NOT set.)
244 F4	R744SMIS	4	binary	Minimum structure size. (Valid if bit 5 of R744FFLG is NOT set.)
248 F8	R744SDEC	4	binary	Cache structure only: Total directory entry count. (Valid if bit 5 of R744FFLG is NOT set.)

# Usage & Invocation: SMF record type 74.4 (4)

## Request Data Section

Offsets	Name	Length	Format	Description
252 FC	R744SDEL	4	binary	Cache structure only: Total data element count. (Valid if bit 5 of R744FFLG is NOT set.)
256 100	R744SNLH	4	binary	List structure only: Number of list headers. (Valid if bit 5 of R744FFLG is NOT set.)
260 104	R744SMAE	4	binary	List structure only: maximum number of elements. The estimated maximum number of list elements that may reside in storage class memory is not included. (Valid if bit 5 of R744FFLG is NOT set.)
264 108	R744SCUE	4	binary	List structure only: current number of elements in use. The number of list elements that currently reside in storage class memory is not included. (Valid if bit 5 of R744FFLG is NOT set.)
...				
368 170	R744SETM	8	I_float	Structure execution time (microseconds). Valid if R744FLVL > 14. (Valid if bit 5 of R744FFLG is NOT set.)
...				
424 1A8	R744SQCH	1	binary	Asynchronous duplex operation queue characteristic. The number of queue entries is the product of: $4096 * 2^{**} R744SQCH$ (Valid if bit 5 of R744FFLG is NOT set.)

# Interactions & Dependencies

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- Software Dependencies
  - None.
- Hardware Dependencies
  - None.
- Exploiters
  - None.

# Upgrade & Coexistence Considerations

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- None.



# Installation & Configuration

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- This support is included in the GA shipment of the z/OS V2R5 Data Gatherer (HRG77D0) deliverable.

# Summary

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- Enhanced RMF Master concept for CF data gathering provides new functionality that allows to reduce system overhead and contention caused by the RMF CF data collection:
  - RMF provides a new data gatherer option that allows to switch on an optimized gathering of Coupling Facility hardware (CF HW) statistics. In optimization mode, CF HW statistics will be collected on the RMF master system only.
  - If optimized data collection of CF HW statistics is active, a new Monitor III data gatherer suboption can be used to select a helper system to collect the CF HW statistics for a specified CF.

# Appendix

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- Documentation

- z/OS Data Gatherer User's Guide, SC27-4934
- z/OS Data Gatherer Programmer's Guide, GC27-4935
- z/OS RMF Messages and Codes, SC34-2666
- MVS System Management Facilities (SMF), SA38-0667
- Latest version of PDF files can be downloaded from:  
<http://www.ibm.com/systems/z/os/zos/bkserv/>

- Website

- <https://github.com/IBM/IBM-Z-zOS/tree/master/zOS-RMF>  
with product information, newsletters, presentations, ...