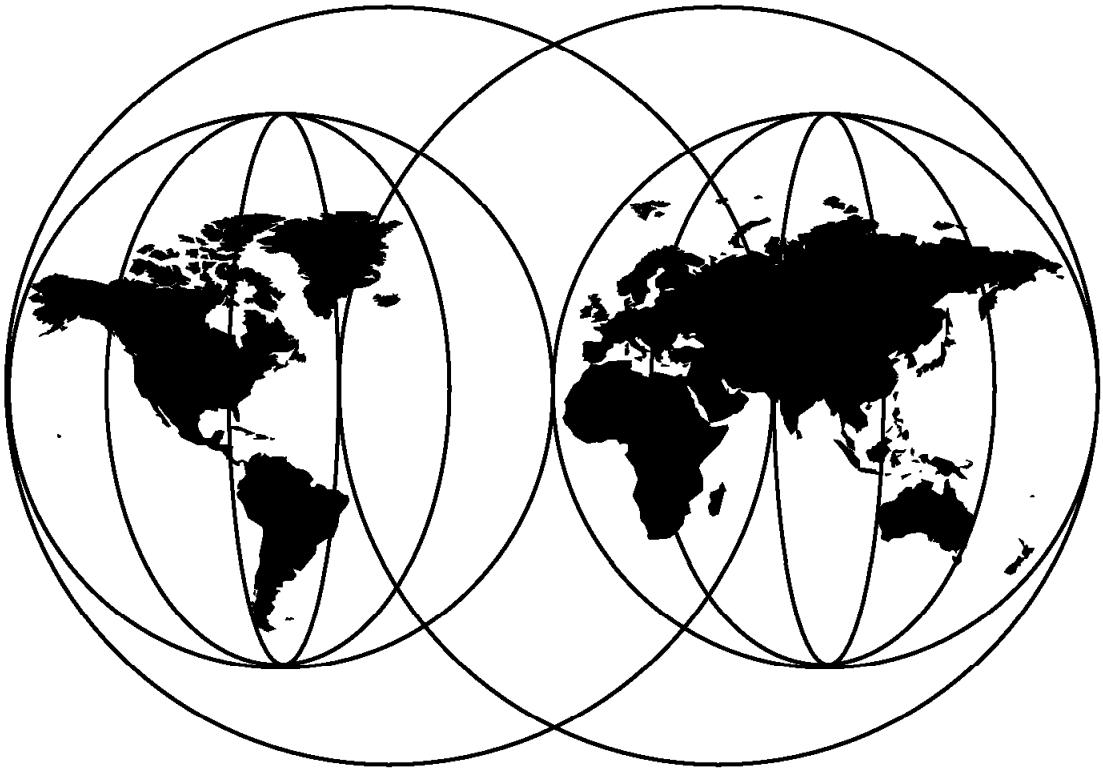
Parallel Sysplex Coupling Facility Online Monitor Installation and User′s Guide

Dave Clitherow Franco Meroni Alan Soldini



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May 1998

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix C, “Special Notices” on page 63.

First Edition (May 1998)

This edition applies to the initial release of a Coupling Facility monitor, known as CFMON, for use in Parallel Sysplex performance monitoring.

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Preface

The coupling facility monitor (CFMON) provides online realtime performance information relating to coupling facilities (CFs) and the structures within them. This information can be used to assist performance and capacity management of CF resources, just as the information from RMF and other monitors is used for traditional processor resources.

CFMON offers a variety of reports through ISPF panels for CF performance evaluation, either sysplex-wide or for a single OS/390 or MVS image. The reports can be used to perform online realtime performance monitoring as well as capacity planning and administrative tasks.

CFMON also helps in the analysis of bottlenecks or problems in the CF area, that can result in performance degradations in a Parallel Sysplex.

CFMON also makes it possible to see the results of tuning actions immediately.

This redbook describes how to install and use CFMON, including comprehensive examples of the information provided by the tool.

The Team That Wrote This Redbook

This redbook was produced by a team of specialists from around the world working at the International Technical Support Organization Poughkeepsie Center.

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Chapter 1. Introduction

This chapter briefly introduces Parallel Sysplex and coupling facility (CF) functions. In addition, it presents the coupling facility monitor (CFMON) objectives and briefly describes how CFMON works.

Support and Limitations

The monitor is distributed on “as-is” basis.

See 2.8, “Restrictions” on page 18 for the tool limits.

1.1 Parallel Sysplex Functions

Parallel Sysplex consists of a set of OS/390 or MVS systems communicating and cooperating with each other through multi-system hardware components and software services. New coupling technology facilitates system-level functions in support of data sharing, distributing work and balancing system resources within the sysplex by providing hardware assistance for buffer coherency, locking and caching of data. Coupling technology extends the concept of the sysplex to up to 32 systems, while allowing all systems to share data.

For more information about Parallel Sysplex, there are many useful publications. A good place to start is *OS/390 Parallel Sysplex Overview: Introducing Data Sharing and Parallelism in a Sysplex*.

1.2 What is a Coupling Facility?

Coupling facilities (CFs) provide a common memory for the Parallel Sysplex that is dynamically partitioned into lock, cache and list structures. These structures are typically used to hold status information required for inter-system coherency and provide a serialization mechanism for multiple systems. In addition, the cache structures can be used as buffers for storing shared data with multi-system read/write access.

A CF consists of the Coupling Facility Control Code (CFCC) running in one of the following environments:

- An LPAR on an IBM 9674
- An LPAR on any IBM 9021 711-based and IBM 9672 models

Prior to Parallel Sysplex, capacity planning and tuning generally consisted of sizing and controlling the usage of three resources:

- Processors
- Processor storage
- I/O

Parallel Sysplex introduces another element to be sized and controlled, the CF.

Sizing a CF involves estimating the number of processors and the amount of storage needed on the CF. It also includes estimating the number of CF links that will be needed.

Tuning the CF is performed to ensure that sufficient quantities of the various resources needed by exploiters of the coupling technology have been allocated. Observation of the storage allocated and utilized by structures, the response times and request rates, and the processor utilization, is required both to determine bottlenecks and to balance storage, and the number of processors, and the number of CF links to optimally use the coupling technology.

For additional information about capacity planning refer to:

- *OS/390 MVS Parallel Sysplex Capacity Planning*
- *OS/390 MVS Parallel Sysplex Configuration, Volume 1: Overview*
- *OS/390 MVS Parallel Sysplex Configuration, Volume 2: Cookbook*
- *OS/390 MVS Parallel Sysplex Configuration, Volume 3: Connectivity*

1.2.1 Coupling Facility Requests

A critical component of Parallel Sysplex performance is the response time of CF requests. This section takes a closer look into what a CF request is, how it is processed and what can impact the processing.

In principle, a CF request is initiated by OS/390 (the XES component), transferred to the CF if there is a free CF link, and processed by a CF CP. When the CF request has been processed, data and other information is sent back to OS/390 via the CF link.

Figure 1 shows one CEC with two logical partitions running OS/390. The CEC is connected to the CF via two CF links. The CF has one CP.

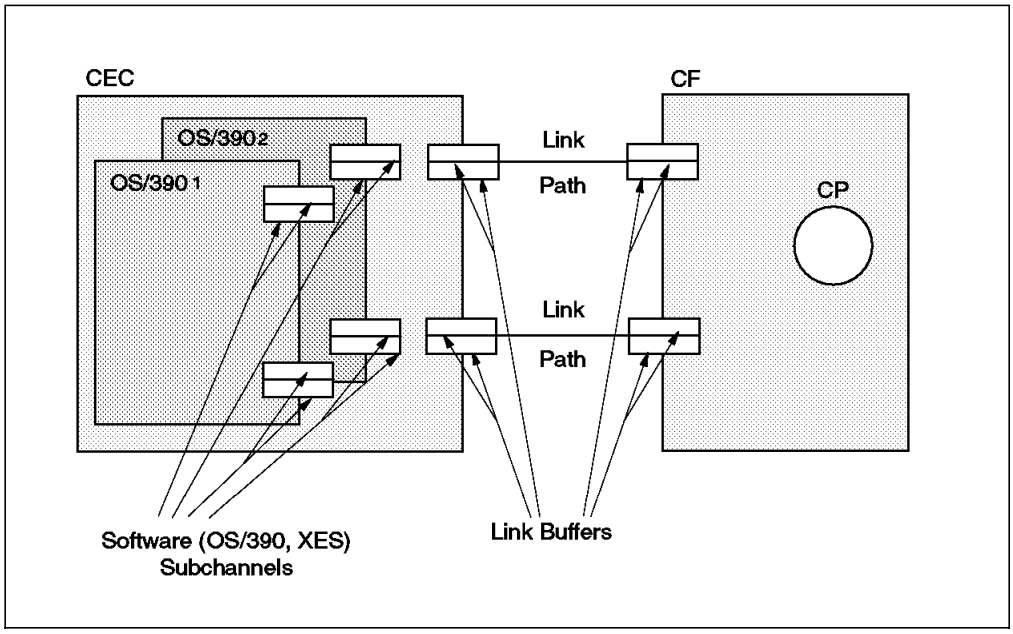

Figure 1. Some of the Components Participating in a CF Request

Explanations related to the components in Figure 1 are as follows:

Link/Path Links connect the CEC and the CF. There are two links in this figure. The term *path* is also used and is equivalent to a link.

Link Buffer The link buffer acts as a buffer for the CF requests. There are two buffers per link.

Software Subchannel The software subchannel acts as a buffer for the CF requests on OS/390. There are two buffers per link in each OS/390. There is a one-to-one mapping to the link buffer. If you are sharing CF links using EMIF, there will be two software subchannels in each OS/390 image, but still only two buffers per link.

Buffers in CF The buffers in the CF are used to hold the CF request on the CF side. There are two buffers per link, as on the CEC side.

1.2.1.1 CF Request Delays

Before describing the actions involved in processing the CF request, we list different delay reasons for the CF requests. OS/390 places the request in a subchannel to initiate its transfer to the CF. The subchannel may be unable to accept the request for the following reasons:

- Software subchannel busy

  All software subchannels in this OS/390 are busy waiting for one or more of the following:

  - An available link buffer (EMIF contention)
  - Data transfer in the link to complete
  - A CF processing the request

- Link buffer busy

  At least one software subchannel is free, but the corresponding link buffer is busy (EMIF contention), because it is waiting for the following:

  - Data transfer in the link to complete
  - A CF to complete the request

1.2.1.2 CF Request Processing

The different types of CF requests are processed and delays handled as follows:

1. If the CF request cannot be started in OS/390 because all its subchannels or link buffers are busy, then the following actions are taken as shown in Figure 2 on page 4, depending on the request:

   - A synchronous immediate request (for example, a lock-type request) “spins” on the CEC CP until a subchannel becomes available if:

     - The software subchannel is busy **1**.
     - The link buffer is busy **2**.

     In this case the request is delayed. This is shown in CFMON as a SYNC delayed request with an average delay time. In addition, the subchannel busy and path busy counters are incremented respectively. For an example, see Figure 17 on page 29 references **9** and **10**.

   - A synchronous request (non-immediate) is:

     - Changed to asynchronous and queued in OS/390 if the software subchannel is busy **3**.

       This is shown in CFMON as a changed request, an ASYNC queued request and an average queue time. The subchannel busy counter is also incremented. For an example, see Figure 17 on page 29 references **9** and **10**.

– Restarted as an asynchronous request and queued in OS/390 if the link buffer is busy **4**.

This increments the path busy counter shown in CFMON. For an example, see Figure 17 on page 29 references **9** and **12**.

- An asynchronous request is queued in OS/390 if:
  – The software subchannel is busy **5**.

  This is shown in CFMON as an ASYNC queued request with an average queue time. For an example, see Figure 17 on page 29 references **9** and **10**.

  – The link buffer is busy; the request is started again as a new request (redriven) **6**.

  This increments the path busy counter shown in CFMON. For an example, see Figure 17 on page 29 references **9** and **12**.

The queued request in OS/390 is redriven when a subchannel or buffer becomes available.

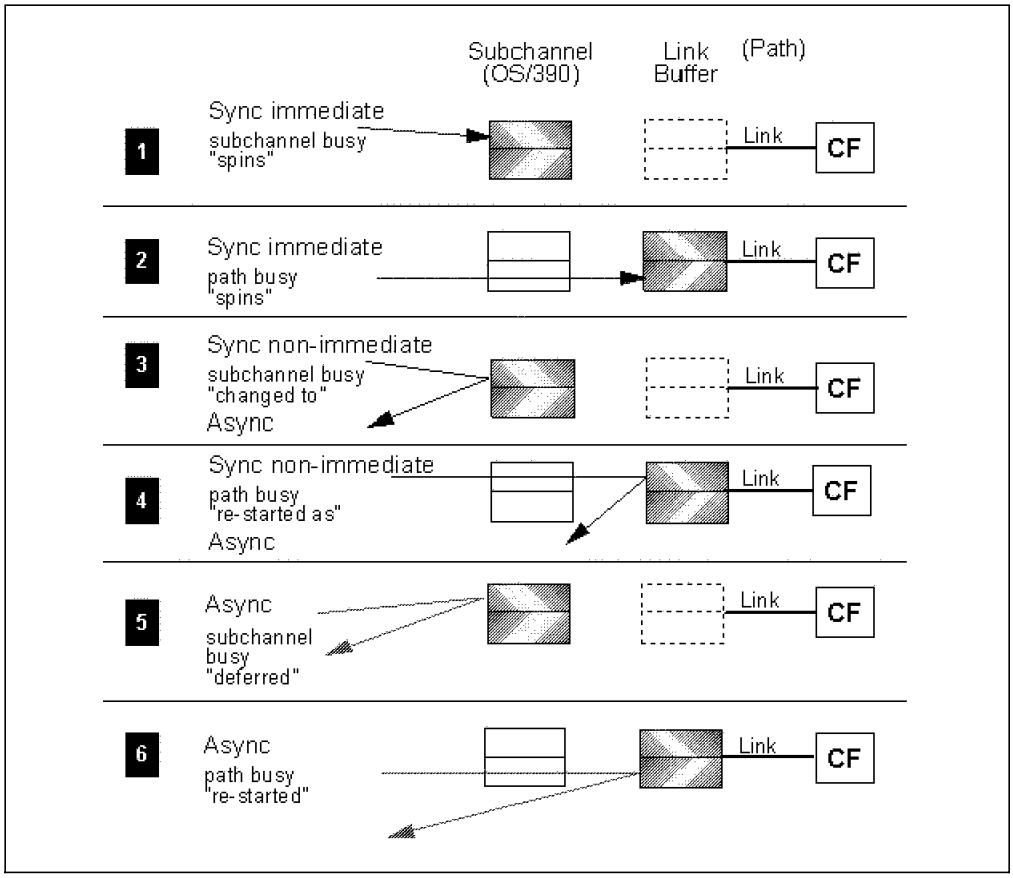

Figure 2. CF Requests and Delay Types

2. When one of the subchannels or buffers is free, the request is started (by XES or by PR/SM) and the commands and/or data are transferred to the CF as soon as the link is free. There are two subchannels (and link buffers) per link, so the link may be busy transferring data on the other link buffer. Data transfer does not need a free CP in the CF. The request is queued in the CF if the CF does not have an available CP. This subchannel (and buffer) stays

reserved for this request until it is completed. However, the link is released when the request arrives at the CF.

3. The CF processes the request as soon as it has a free CP.
4. When the CF has processed the request, the response is sent back to OS/390 as soon as the link is free. There are two subchannels (and link buffers) per link, so the link may be busy transferring data on the other buffer. As the subchannel (and buffer) has been reserved for this request, the request uses the same link as before.

1.2.2 CF Times, Delays and Queues

For the actions of the CF requests in 1.2.1.2, "CF Request Processing" on page 3 for points 1 to 4, the delays and processing are as follows:

1. Wait for the CF or the link.

   If the subchannels (buffers) of the CF links are busy, either the request is put on a queue and redriven, or it "spins" on the CEC CP, depending on the type of request.

2. Send a request through the link.

   The transfer time for a lock request (approximately 250 bytes) is only a few microseconds (µs). For a 4KB page on a 50MB/s link, the transfer time is about 80 µs, and about 40 µs for on a 100MB/s link.

3. The CF processes the request.

   The service time is a function of the CF CP speed and the type of request. Its average is observed to be less than 100 µs (if mostly lock-type requests) or more than 200 µs (if mostly DB2 cache-type requests) on an R5-based CF.

4. Send the response back through the link.

   There is no queueing or waiting for a subchannel (buffer), but there may be some wait time for the link.

   The transfer time for a lock request (approximately 250 bytes) is only a few microseconds. For a 4KB page on a 50MB/s link, the transfer time is about 80 µs, and about 40 µs on a 100MB/s link.

What does the monitor show?

CFMON reports the queue time (point 1), the SYNC or ASYNC service time (the time between points 2 and 4), and the response time (the sum of these), as displayed in the ISPF application. See Figure 38 on page 50 for an example.

1.2.3 What Information Does RMF Provide?

CF capacity planning and tuning is also assisted by RMF data and reports that allow the observation of resource consumption for the structures in the CF.

RMF reports sysplex-wide on the CF, and the report is based on the RMF SMF record type 74 subtype 4. These records are collected by the RMF Monitor III Data Gatherer (RMFGAT), and in order to combine the data from all systems, you must synchronize the data collection intervals on all systems.

The reports are generated by the RMF Postprocessor and can be created from SMF data residing in SMF data sets and from SMF data residing in the RMF

Sysplex Data Buffer. RMF writes SMF records at user-specified intervals (typically 15 minutes), and for most resources the RMF Postprocessor provides the ability to combine a number of such records in a single report. Thus, a set of one-hour reports could be generated from multiple 15-minute interval records. This capability is referred to as *duration interval reporting*.

However, at the time of writing, RMF does not have an online realtime CF monitor and does not support duration interval reporting for the CF.

IBM has announced that RMF in OS/390 V2.6 will have Monitor III support for CF online reporting and RMF Postprocessor will have support for CF duration interval reporting. This support will be retrofitted to OS/390 V2 R4 and OS/390 V2 R5.

CFMON is intended to provide online realtime CF monitoring only until this support is provided by RMF. In view of this, CFMON has an expiration date set to December 31, 2000. After that date, the monitor will no longer work.

This expiration date will give enough time to Parallel Sysplex users to migrate from MVS V5 and OS/390 V1 to the most current OS/390 versions.

1.3 Objectives of CFMON

CFMON offers a variety of reports through ISPF panels for CF performance evaluation, either sysplex-wide or for a single OS/390 or MVS image. The reports can be used to perform online realtime performance monitoring as well as capacity planning and administrative tasks.

CFMON also helps in the analysis of bottlenecks or problems in the CF area, that can result in performance degradations in a Parallel Sysplex.

CFMON online reporting allows you to have all relevant data at a glance with your chosen granularity, making it easy to determine for example:

- Which structure can be moved to another CF
- Which links are overloaded
- Which CF processors are over-utilized

CFMON also makes it possible to see the results of tuning actions immediately.

CFMON has threshold values for CF resources utilization that will turn the value *red* on the screen when thresholds are reached. These threshold values can be easily customized and changed if necessary. The initial values set for these values when CFMON is installed represent values that we have found useful in our own studies. They should *not* be interpreted as recommendations for “happy values.” For more information about how to change these threshold values, see 2.3, “Monitor customization” on page 10.

For additional information about CF performance evaluation refer to *S/390 MVS Parallel Sysplex Performance* and *OS/390 MVS Parallel Sysplex Capacity Planning*.

1.4 How CFMON Works

CFMON uses the OS/390 services IXCQUERY and IXLMG to obtain information for CF utilization. The CF utilization statistics are collected every *cycle* (default value 10 seconds) and are organized in a *data space*. CF activities are then evaluated for the *last cycle* and for the *interval* and presented through the ISPF application.

The following terms are used throughout this book

Cycle	Monitor sampling time in seconds.
Last cycle	Most recently completed sampling cycle.
Interval	Time elapsed since the monitor was started or re-initialized.
SYNC	A synchronous CF request.
ASYNC	An asynchronous CF request.
Service time	The time spent processing a request. This includes CF CPU time and link transfer time.
Queue time	The time spent queuing, waiting for a resource to become free to process the request.
Delay time	The time a request was delayed waiting for a resource to become free to process the request.
Response time	Service time + queue time.

The cycle time can be dynamically changed with an MVS MODIFY command. For additional information about CFMON supported commands see 2.6, “Monitor Control” on page 14.

The data inside the data space are organized in binary tree structures as follows:

- One structure for the CFs
- One structure for the subchannels′ ISC links
- One structure for the CFs′ defined and allocated structures
- One structure for the CF connections

These structures are logically interconnected to allow the merging of information and the evaluation of statistics for CFs and their subchannels.

Because of CFMON′s internal organization, CF and system utilization statistics presented by the ISPF application are updated to the *last cycle - 1*, while CF structures and connection utilization statistics are updated to the *last cycle*.

The information provided by OS/390 system services is related only to the image in which the monitor is running. This information should suffice for administrative purposes, but it does not provide a sysplex-wide picture, which is necessary for performance and capacity evaluation.

To have a complete picture of the behavior of a CF in a sysplex, the monitor must be started in all OS/390 images that have connections with the CFs. One (or more, if desired) monitor(s) must be modified as MASTER (see 2.6, “Monitor Control” on page 14) to allow all other monitors to send their own subchannel and connection utilization statistics to the MASTER monitor(s).

To allow this communication, CFMON uses an XCF group whose name is CFXCFMON, and all monitors become members by joining the group. Data are sent across the sysplex with OS/390 XCF system services. This provides a sysplex-wide view for the CFs utilization, from a single point.

The following terms are used throughout this book:

MASTER Monitor status that allows the monitor to receive utilization statistics from the other monitors running in a Parallel Sysplex.

SLAVE Default monitor status at start time. In this status, CFMON only provides a single-system view of the CFs and their structures.

Figure 3 shows the relationship between MASTER and SLAVE monitors. All monitors use the IXLMG and IXCQUERY macros to obtain information from the coupling environment. The monitors in SLAVE mode use the IXCMSGO service to send their own system's information to the monitor (or monitors) in MASTER mode. The MASTER monitor(s) use the IXCMSGI service to read the information. The sysplex-wide information is then aggregated by the MASTER and presented to the user through the ISPF application.

The ISPF application can also be used to present data from a monitor running in SLAVE mode, but as this data represents only a single-system view, it is of limited value.

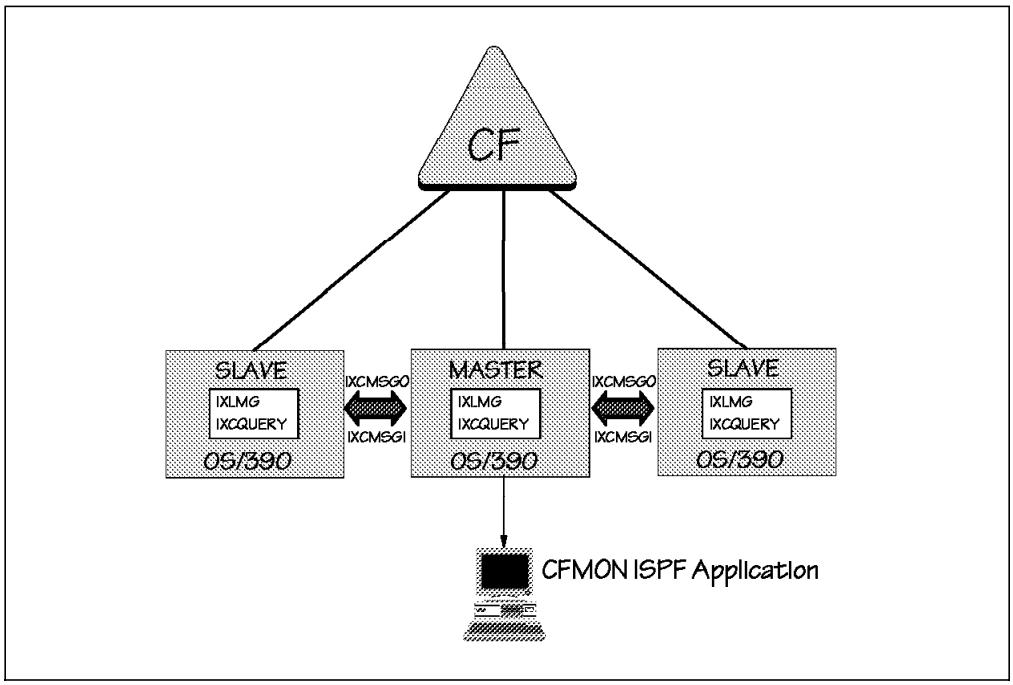

Figure 3. CF Monitor MASTER and SLAVE Relationship

The CFMON executable code must reside in an authorized library. The monitor does not require the installation of code into SYS1.NUCLEUS, therefore CFMON can be dynamically installed and activated.

For additional information about OS/390 sysplex system services refer to:

- *MVS Programming - Sysplex Services Guide*
- *MVS Programming - Sysplex Services Reference*

Chapter 2. Installation and Operation

This chapter describes where to obtain the code for CFMON, how to install the code onto your MVS or OS/390 system, how to run the monitor and how to control the monitor via operator commands.

2.1 Where To Get the Code

The code can be obtained from the following IBM FTP site:

`ftp://www.redbooks.ibm.com/redbooks/sg245153`

If you have any problems in downloading the code, contact your IBM representative for assistance, or e-mail the ITSO at `redbook@vnet.ibm.com`.

2.2 Installation

The monitor is distributed as a single, self-extracting ZIP file which, when downloaded and executed, explodes into two files:

- CFLOAD.BIN, which contains modules that are to be loaded in an authorized library.
- CFISPF.BIN, which contains elements of the ISPF interactive application and the JCL needed to start the monitor.

These files must be uploaded to an MVS or OS/390 system and their contents loaded into appropriate libraries.

The installation steps are:

1. Upload the two binary files to temporary sequential data sets on your MVS or OS/390 system. Be sure to upload them without ASCII or CRLF options and specify fixed-length 80-byte records.
2. Use the RECEIVE INDSN(/) command for each temporary data set and specify at the prompt the installation-defined partition data set name, for example (DA('CFMON.V1R1M0.LOADLIB')).
   - As shown in Table 1, the reloaded partitioned data sets have the following characteristics (the data set names shown are examples):

Table 1. CFMON Data Set Attributes

Data set name	RECFM	BLKSIZE	LRECL	BLOCKS
CFMON.V1R1M0.LOADLIB	U	6144	--	200
CFMON.V1R1M0.ISPF	FB	6160	80	200

   - The data set CFMON.V1R1M0.LOADLIB will contain the following modules:
     - CFXCFCON
     - CFXCFDSP
     - CFXCFMON - this is the only module that must be authorized AC(1)
     - CFXCFSPF
     - CFXCFTCF

- CFXCFTOT

- The data set CFMON.V1R1M0.ISPF will contain the following members
  - CFMON (main CLIST)
  - CFXCPROF (ISPF profile)
  - CFXCCMDS (application command table)
  - CFLHxxxx (help and tutorial)
  - CFLPxxxx (ISPF panels)
  - CFMONJCL (JCL to execute)
  - CFPRT (print CLIST)

3. Copy the modules of data set CFMON.V1R1M0.LOADLIB to an authorized library, or authorize this library.
4. Copy the members CFMON and CFPRT from data set CFMON.V1R1M0.ISPF into a user SYSPROC library.

   Tailor these members (following the notes inside them) as follows:

   - Edit the member CFMON.
   - The customization required is indicated by the comment CHGx. Find the string CHG and change the data set names to conform to your installation's specifications.
   - The CFPRT CLIST allocates a data set to hold print images of data displayed. As shown in Table 2, by default, this data set has the following characteristics:

   Table 2. CFMON Print Data Set Attributes

Data set name	RECFM	BLKSIZE	LRECL	CYLS	UNIT
userid.CFMON.LIST	FBA	6156	81	(2,1)	SYSDA

   If necessary, modify the specification identified by the comment CHG to ensure that this data set conforms to your installation's specifications.
5. Copy the member CFMONJCL from data set CFMON.V1R1M0.ISPF into your procedure or JCL library.
6. Customize the JCL to start the monitor (see 2.4, "Monitor Execution" on page 11).
7. Copy into the ISPF profile the member CFXCPROF from the CFMON.V1R1M0.ISPF data set. It is recommended you copy CFXCPROF into your ISPF profile data set whenever the monitor is reinstalled.

2.3 Monitor customization

The first time the ISPF application is executed, select the **Settings** option from the menu bar and set the monitor thresholds exception values appropriate to your installation, or use the provided default values.

Figure 4 on page 11 shows the threshold values setting panel.

```
            CFMON threshold exception values setting

              screen color value          pink       red

Type over red fields and press enter to update

CF storage utilization threshold. . . .:  50    %
CF cpu utilization thresholds . . . . .:  40    %    60    %

CF SYNC  requests  delayed threshold. .:             5     %
CF ASYNC requests  queued  threshold. .:             25    %
CF requests queued no-sch  threshold. .:             25    %
CF SYNC  requests changed  threshold. .:             10    %
CF links PATH busy threshold  . . . . .:             10    %
STR ASYNC requests queued  thresholds .:  20    %    30    %
STR ASYNC requests queued  no-sch . . .:  20    %    30    %
STR SYNC  requests changed thresholds .:  5     %    10    %

CACHE STR DIRECTORY RECLAIMS highlight :             Y
```

Figure 4. Monitor Threshold Values

If a threshold has a low and a high value for the resource utilization, for example CF CPU, the first value turns the color on the screen to pink and the second value to red.

Note: A red value in the CF storage utilization field has a specfic meaning. When the value is red, it is indicating that this CF has insufficient space to contain all the structures currently allocated in *both* CFs.

2.4 Monitor Execution

To start the monitor, no IPL is required if an authorized library is available. It can be started either by running a procedure or by submitting a job. The dispatching priority or service class should guarantee the collecting cycle of ten seconds. The job should be considered never-ending; TIME=1440 or TIME=NOLIMIT is suggested.

```
//*
//*  PROCEDURE TO START THE MONITOR
//*
//*  STEPLIB = AUTHORIZED LIBRARY  (CFMON.V1R1M0.LOADLIB)
//*
//RUNCF    PROC
//IEFPROC  EXEC PGM=CFXCFMON,PARM='CYCLE=10',TIME=NOLIMIT
//STEPLIB  DD   DSNAME=CFMON.V1R1M0.LOADLIB,DISP=SHR
//SYSUDUMP DD SYSOUT=A
```

Figure 5. JCL to Run the Monitor

The PARM= field specifies how often, in seconds, the monitor will wake up and collect data. The value of *cycle* can vary between 5 and 300 (seconds). Depending on how busy the systems are and the dispatching priority or the service class the monitor is running in, the real cycle time may differ from that specified.

For example, in a highly utilized environment, a ten-second cycle time may not be met by CFMON even with high dispatching priority or using the SYSSTC service class. Nevertheless the data shown by CFMON are valid.

For coupling facility monitoring to be effective, the monitor must be running in all sysplex system images. Therefore it is suggested you start the monitor as a procedure so that it can be started on all system images with a single MVS command:

```
RO *ALL,S stcname
```

Similarly, it can be re-initialized or stopped with one MVS command:

```
RO *ALL,F stcname,I         (to re-initialize)

RO *ALL,F stcname,STOP      (to stop)
```

When CFMON is started, it has SLAVE status by default. To have MASTER status in the system where the ISPF application is used, the following MVS command is required; see also 2.6, “Monitor Control” on page 14.

```
F stcname,MASTER
```

It is recommended that all the monitors have the same cycle time.

2.5 Resources Used

CFMON does not use common virtual storage below 16M.

The CPU utilization has been measured at between 1 and 1.5 % of one CP at 10 seconds monitor cycle time.

CFMON CPU utilization should be evaluated according to the following formula:

$$CPU_{\text{util}}\% \;=\; \frac{CPU_{\text{time (secs)}}}{(interval_{\text{secs}} \times number_{\text{CPs}})} \times 100$$

In a sysplex, the monitor on each system sends data relating to the connections and subchannels on the system to the monitor(s) with MASTER status. This communication is via XCF, using IXCMSGO and IXCMSGI system services. One message is sent for each connection and subchannel element. This information is sent every cycle, and the XCF message length is 320 bytes.

Assume a Parallel Sysplex with the configuration valuses shown in Table 3 and Table 4 on page 13:

Table 3. Sysplex Configuration Values

Number of systems	8
Number of CFs	2
Number of CF links per system per CF	2
Number of active structures	50
Number of CFMON MASTER monitors	1
Number of CFMON SLAVE monitors	7
Cycle time seconds	10

Table 4. System Specific Configuration Values	
Number of connections per system per structure	1
Number of subchannels per system	8
Number of connections per system	50

The XCF sysplex message rate is calculated as:

$$XCF_{\text{message rate}} = \frac{(C + S) \times V \times M)}{T}$$

where:

C = number of connections per system

S = number of subchannels per system

V = number of monitors in SLAVE mode

M = number of monitors in MASTER mode

T = cycle time in seconds

For this configuration, the XCF sysplex message rate is:

$$XCF_{\text{message rate}} = \frac{(50 + 8) \times 7 \times 1}{10} = 40.6 \text{ messages per second}$$

For the same configuration, if every CFMON is in MASTER status, the XCF sysplex message rate would be:

$$XCF_{\text{message rate}} = \frac{(50 + 8) \times 8 \times 8}{10} = 371.2 \text{ messages per second}$$

We therefore recommend that you only run one monitor in MASTER status in order to minimize the XCF message traffic generated by the monitor.

Data space utilization depends on the number of CFs, structures and connections. The data space size is hardcoded at 5MB.

The data space storage is mainly used to maintain data relating to the subchannels and connections present in the configuration. Two elements inside the data space are used to describe each subchannel and each connection.

As shown in Table 5, the number and size of the elements used for each type of monitored component are:

Table 5. Data Space Elements		
Component	**Number of Elements**	**Element Size (Bytes)**
CF	1	400
Structure	1	240
Subchannel	2	240
Connection	2	320

Assuming the Parallel Sysplex configuration in the previous example, the data space virtual storage used by a MASTER monitor is:

$$\sum CF_{\text{elements}} + Structure_{\text{elements}} + Subchannel_{\text{elements}} + Connection_{\text{elements}}$$

where:

$$CF_{\text{elements}} = \#_{\text{CFs}} \times \#_{\text{elements}} \times length_{\text{element}}$$
$$= 2 \times 1 \times 400 = 0.8\text{KB}$$

$$Structure_{\text{elements}} = \#_{\text{structures}} \times \#_{\text{elements}} \times length_{\text{element}}$$
$$= 50 \times 1 \times 240 = 12.0\text{KB}$$

$$Subchannel_{\text{elements}} = \#_{\text{systems}} \times \#_{\text{subchannels}} \times \#_{\text{elements}} \times length_{\text{element}}$$
$$= 8 \times 8 \times 2 \times 240 = 30.7\text{KB}$$

$$Connection_{\text{elements}} = \#_{\text{systems}} \times \#_{\text{connections}} \times \#_{\text{elements}} \times length_{\text{element}}$$
$$= 8 \times 50 \times 2 \times 320 = 256.0\text{KB}$$

Note: # represents “number of”

In this example, the data space usage can be calculated to be:

$$Data\_space_{\text{size}} = 0.8 + 12.0 + 30.7 + 256.0 = 299.5\text{KB}$$

The hardcoded data space size of 5MB is sufficient for a Parallel Sysplex configuration of 32 systems, four CFs, two links per CF per system, 200 active structures, and one connection per system per structure.

2.6 Monitor Control

The monitor supports the MVS MODIFY command.

```
F stcname,option
```

The MODIFY command supports the following options:

- List the CFs on the operator console and SYSLOG (option C).
- List the STRUCTURES on the operator console and SYSLOG (option S).
- Re-initialize the data space (option I).
- Switch the monitor status from SLAVE to MASTER and vice versa.
- Change the monitor cycle time. The cycle time can range from 10 to 300 seconds, with a default value of 10 seconds. We recommend that all monitors have the same cycle time.
- Stop the monitor (option STOP).

To stop the monitor the MVS `P stcname` command can be used, as well as the MODIFY command with the option STOP.

Figure 6 on page 15 shows the options supported.

```
      F  STCNAME,C                    DISPLAY THE CFs

      F  STCNAME,S                    DISPLAY THE STRUCTUREs

      F  STCNAME,I                    RE-INITIALIZE THE DATA SPACE

      F  STCNAME,MASTER               SWITCH TO MASTER

      F  STCNAME,SLAVE                SWITCH TO SLAVE

      F  STCNAME,CYCLE=xx             CHANGE CYCLE TIME (10 - 300)

      F  STCNAME,STOP                 STOP THE MONITOR

      P  STCNAME                      STOP THE MONITOR

      C  STCNAME                      CANCEL THE MONITOR
```

Figure 6. CFMON Modify Command Options

The MODIFY command option C lists the coupling facilities, the allocated structures and the connected systems. Figure 7 shows sample output for option C.

```
F RUNCF,C

-----------COUPLING FACILITY-----------------
CFO1
-----------ALLOCATED STRUCTURES--------------
DSNHGHG_GBP32K
DSNHGHG_GBP3
LOG_DFHSHUNT_PO1
DSNDSGC_GBPO
DSNDSGA_SCA
DSNDSGA_LOCK1
IEFAUTOS
-----------CONNECTED SYSTEMS-----------------
SC67
SC62
SC50
SC48
SC43
  //
-----------COUPLING FACILITY-----------------
CFO2
-----------ALLOCATED STRUCTURES--------------
ISTMNPS
LOG_DFHLOG_PO1
IGWLOCKOO
DSNDSGC_SCA
DSNDSGC_LOCK1
SYSTEM_OPERLOG
-----------CONNECTED SYSTEMS-----------------
SC67
SC62
SC50
SC48
SC43
  //
```

Figure 7. Modify option C Output Example

The MODIFY command option S lists the defined structures and, for the allocated structures, the connections. Figure 8 on page 16 shows sample output for option S.

```
F RUNCF,S

-----------STRUCTURE ------------------------
ISGLOCK
-----------CONNECTORS ----------------------
ISGLOCK#SC04
ISGLOCK#SC66
ISGLOCK#SC67
ISGLOCK#SC62
ISGLOCK#SC50
   //
-----------STRUCTURE ------------------------
ISTGENERIC
-----------CONNECTORS ----------------------
USIBMSC_SC66M
USIBMSC_SC04M
USIBMSC_SC67M
USIBMSC_SC43M
USIBMSC_SC50M
   //
-----------STRUCTURE ------------------------
IXC_DEFAULT_1
-----------CONNECTORS ----------------------
SIGPATH_0F000E14
SIGPATH_0E000E08
SIGPATH_0D000E1D
SIGPATH_0C000E1E
SIGPATH_0B000DFE
   //
```

Figure 8. Modify option S Output Example

The MODIFY command option I can be used to reinitialize the data space without stopping and restarting the monitor(s).

2.7 Messages - Abends - Return Codes

Figure 9 lists the messages issued by CFMON on the system operator console.

```
- CFXCF01 -  NAME/TOKEN PAIR PROBLEM

              monitor abends U1000 RC=12

- CFXCF02 -  CREATE/JOIN XCF PROBLEM

              monitor terminates

- CFXCF03 -  CFXCFCON NOT AVAILABLE
          -  CFXCFDSP NOT AVAILABLE
          -  CFXCFTCF NOT AVAILABLE
          -  CFXCFTOT NOT AVAILABLE

              monitor continues

- CFXCF04 -  INVALID REQUEST

              invalid modify request

- CFXCF05 -  PARM INVALID

              invalid parm in the exec dd statement

- CFXCF06 -  ALREADY ACTIVE

              monitor started twice

- CFXCF07 -  OK

              modify command accepted
```

Figure 9. Monitor Messages

The following messages are issued on the system operator console when CFMON is running with OS/390 V2 R6, or if CFMON is used after its expiration date of 12/31/2000:

```
- CFXCF08  - RMF MONITOR III OF OS/390 V2 R6 SUPPORTS THE
             CF ONLINE DISPLAY

- CFXCF99  - STOP FOR EXPIRATION DATE. SINCE RMF V 2.6, MONITOR III
             SUPPORTS THE COUPLING FACILITY ONLINE DISPLAY
```

The following message is issued by the ISPF application when CFMON is running with OS/390 V2 R6:

```
     RMF Monitor III in OS/390 V2 R6 supports CF ONLINE DISPLAY
     Please use RMF for online CF monitoring where possible
```

The abend issued by the monitor is shown in Figure 10.

```
- ABEND U1000

            RC=8    STOP/MODIFY PROBLEM

            RC=12   NAME/TOKEN PAIR PROBLEM
```

Figure 10. Monitor Abend Code

2.8 Restrictions

CFMON has some restrictions:

- The monitor has only been tested from MVS V5 R2 up to OS/390 V2 R5.
- The ISPF application has only been tested with ISPF V4 R2.
- For a sysplex-wide view, the monitor must be started in all system images.
- The CF activity (selection **1** and **1.F**) and the systems′ activity (selection **1.S**) present data for *cycle - 1*, while all the other displays present data for the current *cycle*. This is described more fully in 1.4, “How CFMON Works” on page 7.
- When the monitor status is MASTER, the sysplex-wide data does not exactly map to the same cycle for all system images; there may be a difference ranging from zero to the cycle time value.
- At monitor startup, when the monitor status is changed from SLAVE to MASTER or vice versa, or when the monitor cycle time is modified, two or three cycles are required to update the information contained in the data space and in the main menu panel.

  For example, if the monitor cycle time is set or changed to 300 seconds, it requires up to 15 minutes to have data updated for the first time.
- If a monitor is switched from MASTER back to SLAVE, the data for other monitored systems is *not* cleared. Residual data will be displayed, but will not be updated.
- The monitor supports up to 16 connected systems in option **1** command **T**, and up to four coupling facilities in option **1.F**.
- The specified cycle time may not be met in a highly utilized Parallel Sysplex.
- If CFMON is left running continuously, the capacity of its counters will be exceeded, leading to values being displayed as *negative numbers*. For example, if a CF receives an average of 2,000 requests per second, this field will wrap around after approximately 12 days. If this should occur, either disregard the field in question, or use the MVS MODIFY command to reinitialize the dataspace (see 2.6, “Monitor Control” on page 14).
- The interval reported in the panels is the elapsed time since the monitor started on the system where the ISPF application is running.

2.9 Diagnostic Information

The main program is protected with an ESTAE that deletes the terminating member from the XCF group CFXCFMON if the monitor terminates abnormally.

If CFMON abends, a software logrec record is written for diagnostic information.

If the ISPF application abends, the abend code is displayed on the panel and a dump is taken if a SYSUDUMP DD JCL statement is present in the logon procedure.

Chapter 3. ISPF Application and Reference

Note

CFMON has only been tested with ISPF V4.2. It may not work with a previous ISPF release.

As stated in 1.4, “How CFMON Works” on page 7, CFMON saves the information collected in a data space and, if the monitor status is MASTER, the monitor collects sysplex-wide CF utilization statistics. The data space content can be displayed with an ISPF application that presents the following logical views:

- CF summary
  - Allocated structures
  - Connections
  - Subchannels
  - Systems
- Defined structures
- Allocated structures
- Connections

The overall flow through the ISPF application is illustrated in Figure 11 on page 22. Different logical views of the information will be desirable depending on circumstances.

For example, if it is suspected that a particular CF structure is causing a performance problem, then the allocated structures view would be the obvious starting point. If a particular system appears to be performing worse than other systems in the sysplex, perhaps connections would be a more appropriate view. For general monitoring of the Parallel Sysplex, you will probably view the information at the CF level.

Whichever view you start with, you can select individual items for more detailed analysis, until you get down to the level of the connection between a specific system and a specific CF structure.

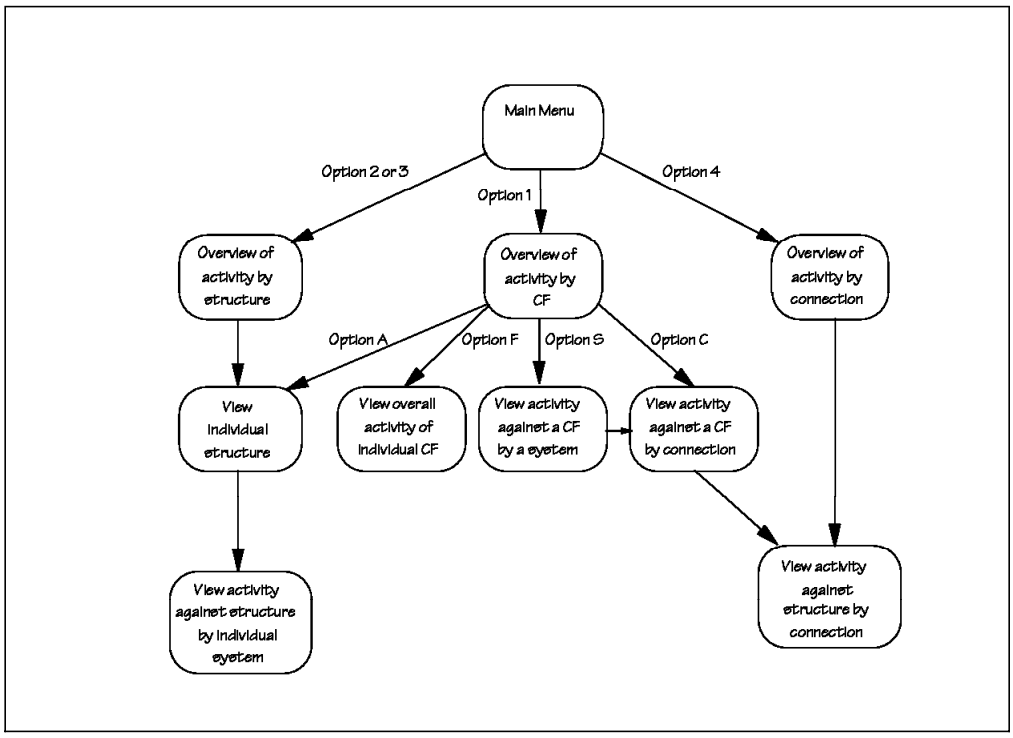

Figure 11. Overall Flow of ISPF Application

In the following sections we explain how to use CFMON, but for the explanation of each field presented in the panels, refer to the online help. Help panels and a tutorial are available on each panel. Where appropriate, PF keys are also provided on the panels to sort the information presented in a variety of sequences.

The sample panels in this book were produced on the Parallel Sysplex that we run in the ITSO. This Parallel Sysplex runs no production work, and is not tuned for performance. It is here for us to use in the various projects we run to produce redbooks like this, so it is sometimes stressed, so that we can study its behavior in different circumstances. It includes up to fifteen OS/390 images, eight of which are in LPARs on a single 9672-R75. Therefore, you should not interpret any of the numbers presented in the samples that follow as representative of what we would expect to see in a real production Parallel Sysplex. Our aim here is to illustrate CFMON - for advice on Parallel Sysplex tuning and capacity, refer to *OS/390 MVS Parallel Sysplex Capacity Planning* and *S/390 MVS Parallel Sysplex Performance*.

3.1.1 ISPF Help Panels

The help panels use the *point and shoot* methodology; they display an example of the screen and, to get the field level help information, you have to tab to the highlighted field you are interested in, and hit PF1 again.

Figure 12 on page 23 shows a help panel example. **A** indicates the highlighted fields, which appear white on the screen.

```
              - Coupling Facilities Display -   Extended Help

 To get help for a highlighted field, tab to it and press  Help.
A Command ==>
       1 - Coupling Facilities
       2 - Defined Structures
       3 - Allocated Structures
       4 - Connections
 ------------------------------------------------------------------------
  Current time        97.353   14:53     A Elapsed   secs     72575
  Monitor start time  97.352   18:43     A CPU time  secs     562
  Monitor cycle time  12   secs          A Monitor   status   MASTER
                                         A Monitored Systems  2

A SYSPLEX ID          OS390PSO            A HRDW name          S68
A SYSID               PSO1                A LPAR name          F1
A SYSTEM              SP6.0.2             A CPU  model         9672
A CFs                 2                   A Structures         16
```

Figure 12. Help Panel Example

3.1.2 ISPF Tutorial

The *tutorial* can be invoked from any panel via the action bar, and as is shown in Figure 13, you can directly go to the topic you are interested in, or page through all the topics.

```
CFLH0000 ------------------------------------------------------------------
Command ===>
                      +---------------------------+
                      |     CF online monitor     |
                      +---------------------------+

  The CF online monitor presents Coupling Facility activity from systems in
  a Parallel Sysplex. The CF online monitor offers a variety of reports for
  Coupling Facility performance evaluation either sysplex-wide or for a
  single System. The reports can be used for online performance
  monitoring as well as capacity planning and administrative tasks.

  The following topics are presented in sequence, by pressing enter to
  page forward, or may be selected by number/letter.

  Detailed information on the data presented in the ISPF panels is not
  provided in the tutorial, but via the online help for each panel.

      W - Monitor Description
      X - Monitor Commands
      Y - Monitor Messages
      Z - Disclaimers

      1 - Coupling Facilities  -----+-->  A - CF Allocated Structures
      2 - Defined Structures   --+  +-->  C - CF Connections
      3 - Allocated Structures --+  +-->  F - CF Activity
      4 - Connections   -------+ |  +-->  S - CF Systems Activity
            | +----->  D - Structure  Activity
            +------->  E - Connection Activity
```

Figure 13. Tutorial Entry Panel

Throughout the ISPF application, each panel indicates, if appropriate, which command is supported on the command line and which selection, other than **S**, is supported at table row level. Therefore we do not describe all the possible combinations.

The ISPF application is invoked with the CFMON CLIST provided with the package. To start the application, either issue the CFMON command from ISPF/PDF Option 6 (Command), or use the TSO CFMON command from the command line of any ISPF panel.

In the following examples, it is assumed that the monitor status is MASTER. The main difference, if the monitor status is SLAVE, is that only the data for the system where the ISPF application is running are valid.

Note: Some panels have in the upper right corner a red field containing the word "MASTER." This is an *input field*, which allows you to over-type a system name, in which case the panel information will be limited to the indicated system. If the system name is incorrect or the monitor is not active in the selected system, no data will be displayed and no error message will be issued.

To avoid any confusion, we remind you that the following terms are frequently used throughout this chapter:

Cycle	Monitor sampling time in seconds.
Last cycle	Most recently completed sampling cycle.
Interval	Time elapsed since the monitor was started or re-initialized.
SYNC	A synchronous CF request.
ASYNC	An asynchronous CF request.
Service time	The time spent processing a request. This includes CF CPU time and link transfer time.
Queue time	The time spent queuing, waiting for a resource to become free to process the request.
Response time	Service time + queue time.
Delay time	The time a request was delayed waiting for a resource to become free to process the request.
Average q-t	Total delay time divided by the number of requests experiencing delay.
Amortized q-t	Total delay time divided by the total number of external requests (those that experienced delay and those that did not).

Note: The terms *queued* and *delayed* are often interchangeable.

Response Time

In CFMON response time is calculated by adding the amortized queue time to the service time.

However, at very low SYNC request rates, it is possible that the number of SYNC immediate requests delayed, as reported to CFMON by IXLMG, can exceed the total number of external requests.

This is because system internal requests, which are not included in the number of external requests, *are* included in the count of requests delayed if they encounter contention. In this case, the use of amortized queue time yields unrealistically high results for SYNC response time, often greater than 100%.

As a result of this, when the reported number of SYNC requests delayed is greater than 20% of the reported total SYNC requests, CFMON adds *average* delay time to service time to calculate response time, rather than using *amortized* queue time.

When the number of requests delayed exceeds the total requests, CFMON reports the percentage of requests delayed as 99.

3.2 ISPF Application Print Facility

Pressing PF4 from any panel in the ISPF application causes a logical image of that panel to be written to the print data set for later analysis. By default, this data set is named *sysuid*.CFMON.LIST. If this data set does not exist, it is automatically allocated by CFMON the first time you press PF4.

If CFMON finds an existing data set with this name, the current logical screen data is appended to this existing data set. CFMON does not include the command line, nor static information from the panel, in the print image. However, it does write the entire content of the scrollable area of the panel, no matter how many lines this includes. Contrast this with ISPF′s print facility, which records only what is actually displayed on the screen.

Examples of CF print output are provided in Appendix B, “CFMON Print Output Samples” on page 59.

Note: CFMON′s print facility does not support printing of the help or tutorial panels. We assume that, if you want a hardcopy of any of panels, you would want an exact copy of the physical screen, so the print facility of ISPF would meet your needs.

3.3 ISPF Application Main Menu

Figure 14 on page 26 shows the Main Menu displayed when you start the CFMON application.

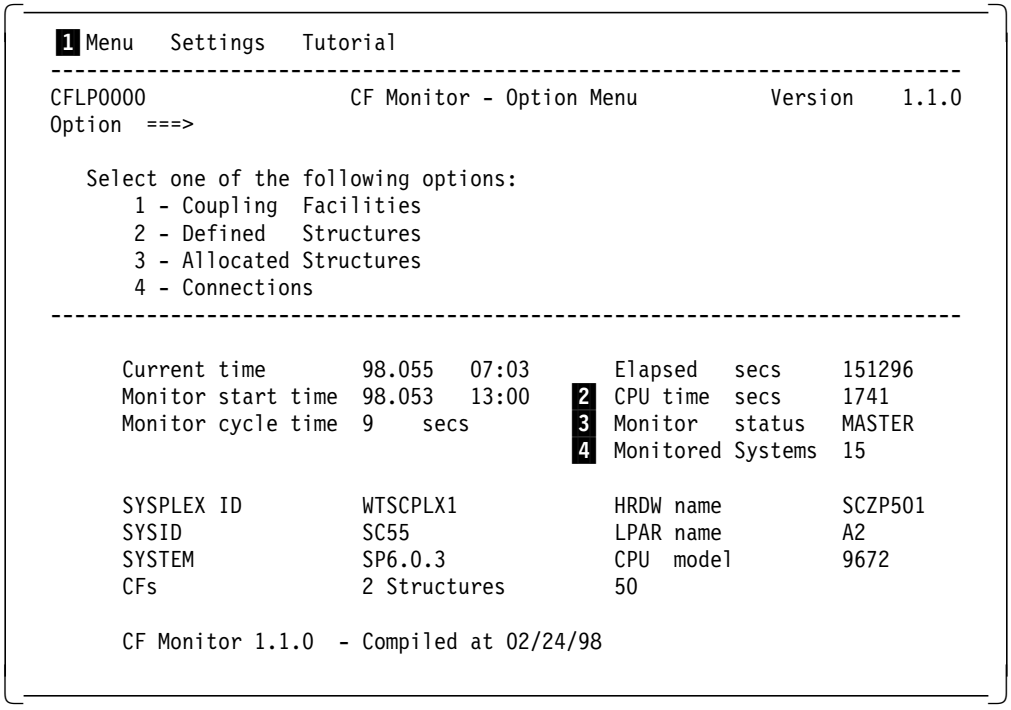

Figure 14. CFMON Main Menu

In the menu panel and in all other panels, the menu bar **1** has pulldown windows for Menu, Settings and Tutorial.

The menu panel displays general information including:

2 Monitor CPU time, represents the number of seconds of one CP used by the monitor in the interval. Therefore the monitor CPU utilization is:

$$CPU_{util}\% = \frac{CPU_{time\ (secs)}}{(interval_{secs} \times number_{CPs})} \times 100$$

3 Monitor status, MASTER or SLAVE.
4 Number of systems in which the monitor is running.

3.4 CF Summary (Option 1)

Option **1** starts the CF logical view and Figure 15 on page 27 shows the panel displayed. The logical views for Option 1, and selection 1.S for SYNC and ASYNC requests, display the interval average *response time*. Selections 1.C and 1.S.S display, for SYNC requests, the interval average *service time* and, for ASYNC requests, the interval average *response time*.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLPO011  CF Monitor - Coupling Facilities Activity Summary    Row 1 to 2 of 2
                                                                    num-sys 15
Command ===>                                                  System A MASTER

                         CFRM policy  CFRM18     Activated at: 98.006 20:10:08
                                                 Updated   at: 98.006 20:09:20
Enter T on command line to display connected Systems
Select A for Allocated Structures  C for Connections
       F for CF activity           S for Systems activity

<----- last cycle  10  sec    --------   interval 005:28:46  secs 19726    --->
                     <---------- sync ----------> <---------- async ---------->

          bsy max stg  total req  interval  dly chg total req  interval  que nsc
            1    2          3           4   5          6           7   8
  CFname  %  bsy  %             avg         %  %             avg         %  %
- ------- ------ --- b--m--k--- -r/t- -rate -- -- b--m--k--- -r/t- -rate -- --
_ CF01     5 10   34       4542   260     0 99  0    9985635  3857   202 44 35
_ CF02     6 55   53     997993   139    51  1  0   10068758  2703   189 42 33
```

Figure 15. CFs Activity Summary (Option 1)

The CF activity summary panel gives at a glance an overall picture of the CF's behavior including:

1 CF CPU utilization during the last cycle (bsy %) and the highest CF CPU busy percentage seen by the monitors in the sysplex during any cycle in the interval (max bsy).

2 CF storage utilization percentage.

3 The total number of SYNC requests and the average response time for these (in microseconds) for the interval.

Note: If System **A** is MASTER, these and the following values relate to the entire sysplex; if System is a system name, they relate only to that system.

Note: See the note on page 25 for details of response time calculation.

4 Percentage of all SYNC immediate requests that have been delayed, that is, requests that *spin* waiting for access to the CF. This value can be greater than 100 at very low SYNC request rates. If this is the case, it is displayed here as 99.

5 Percentage of all SYNC requests that have been changed to ASYNC in the interval.

6 The total number of ASYNC requests and the average response time for these (in microseconds) for the interval.

Note: See the note on page 25 for details of response time calculation.

7 Percentage of all ASYNC requests in the interval that have been queued.

8 Percentage of all ASYNC requests in the interval that have been delayed because no subchannel was available.

3.4.1 CF Connected Systems (Option 1.T)

You can see the systems connected to the CFs and the node descriptors for the CFs by entering the **T** command on the panel command line. Figure 16 shows the panel that is displayed.

```
   Menu   Settings   Tutorial
  ------------------------------------------------------------------------------
CFLP0010               CF Monitor - Coupling Facilities       Row 1 to 2 of 2
Command ===>
SYSID MASTER          CFRM policy  CFRM18     Activated at: 98.006 20:10:08
                                              Updated   at: 98.006 20:09:20
Select A for Allocated Structures C for Connections
       F for CF activity          S for Systems activity
 ---    --------  --------- --------------------------- --------- ------- -bsy-
 Sel    CFname     Status        Node  Descriptor       Partition  CPCID    %
        Connected Systems

  _     CF01      OPERATING 9672.E03.IBM.02000000040104     1         0      5
        SC67     SC66     SC54     SC42     SC50     SC48     SC04    SC62
        SC61     SC49     SC43     SC53     SC55     SC52     SC47
  _     CF02      OPERATING 9672.E03.IBM.02000000040104     1         1      5
        SC67     SC66     SC54     SC42     SC50     SC48     SC04    SC62
        SC61     SC49     SC43     SC53     SC55     SC52     SC47
```

Figure 16. CFs - Connected Systems (Option 1.T)

From either CF summary display, you can select a CF for further analysis by selecting one of the following options:

A Allocated Structures
C Connections
F CF activity
S Systems activity

3.4.2 CF Activity Summary (Option 1.F)

For more detailed information about the utilization of a particular CF, you can select a CF with **F**, in which case the panel shown in Figure 17 on page 29 is displayed.

```
   Menu   Settings   Tutorial
 ------------------------------------------------------------------------------
 CFLP0500                Coupling Facility Activity          Row 1 to 11 of 60
                                                                  num-sys 15
 Command ===> C                                          System A MASTER
                1                2          3
 CFname CF01     Busy %  6 ( 12 ) CP 6  Used space K: 154112    30 % CF  lvl. 4
<----- last cycle  10  sec    --------   interval 005:28:46  secs   19726    -->
      4                   5                    6
 Total req   9990 K  cycle rate  633     interval rate  202
                                  7                          8
 Sync        4542    % 0      avg srv-t(mic) 156       amortized q-t  2323
 Async       9985 K  % 99     avg srv-t(mic) 1231      amortized q-t  2626
 --- delayed requests -------- queue/delay time ---------------------------------
     9                            10
 Sync-dlay 13262     % 99     avg dly-t(mic) 104       <-- sync  req %
 Sync-chng 0         % 0                               <-- included in   async
 Asyn-qued 3529   K  % 43     avg que-t(mic) 6005      <-- async req %
 Qued-nsch 2840   K  % 35                               <-- async req %
================================================================================
Enter C on command line to see CHPID information
sysid    dev n status   total req  rate  path busy   %   pim pam  subchannels
-------- ----- -------- b--m--k--- ----- b--m--k--- ---  --- --- -gen use max-
            11                          12                      13
SC04     FFFA  NOT-USED          0     0          0   0   C0  C0    4   2   2
SC04     FFFB  NOT-USED          0     0          0   0   C0  C0    4   2   2
SC04     FFFE  OPER         321573    20      16326   5   C0  C0    4   2   2
SC04     FFFF  OPER         339580    27      27086   8   C0  C0    4   2   2
SC42     FFEE  OPER         188253     8      24051  13   C0  C0    4   4   4
SC42     FFEF  OPER         203742    19      31697  16   C0  C0    4   4   4
SC42     FFFA  OPER         221579    13      39645  18   C0  C0    4   4   4
SC42     FFFB  OPER         284434    20      52606  18   C0  C0    4   4   4
SC43     FFEE  OPER         175424     4      25157  14   C0  C0    4   4   4
                                                          14 chpids
SC43     FFEF  OPER         200247    14      32113  16   08 A4 FF FF FF FF FF
SC43     FFFA  OPER         193679    19      34837  18   08 A4 FF FF FF FF FF
```

Figure 17. CF Activity Summary (Option 1.F)

The CF activity panel details the CF utilization and behavior showing:

1 The CF CPU utilization during the last cycle (busy %) and, in parentheses, the highest CF CPU busy percentage seen by the monitors in all cycles in the interval (12 in the example).

2 The number of CPs in the CF.

3 The CF storage utilization, expressed both in kilobytes and as a percentage of the available storage. This is followed by the CFCC microcode level.

Note: The colors used to highlight the storage utilization field have specific meanings:

- Pink indicates that the storage allocated exceeds the threshold set in the CFMON Settings.
- Red indicates that this CF does not have sufficient storage to hold all the structures currently allocated in the Parallel Sysplex (both CFs).

4 The total requests (SYNC plus ASYNC) since the monitor started or was re-initialized.

Note: If System **A** is MASTER, the values in the top section of this display relate to the entire sysplex; if System is a system name, they relate only to that system.

5 The request rate per second (SYNC plus ASYNC) for the *last cycle-1*.

6 The request rate per second (SYNC plus ASYNC) for the interval.

7 For SYNC and ASYNC requests respectively: the number of requests, the percentage of the total requests that this number represents, and the average service time in microseconds during the interval.

8 The average queue time in microseconds for SYNC and ASYNC requests respectively, evaluated using total interval requests count (amortized).

9 Counts and percentages of requests delayed (SYNC requests) or queued (ASYNC requests) during the interval. Percentage of all SYNC immediate requests that have been delayed can be greater than 100 at very low SYNC request rates. If this is the case, it is displayed here as 99.

10 The average delay time for SYNC and average queue time for ASYNC evaluated using delayed and queued interval requests count. This time is not included in the service time.

11 The device number and status for each subchannel.

12 For each subchannel, the count of requests during the interval, the request rate per second for the last cycle, the number of times a request found a path busy condition, and this number expressed as a percentage of total requests.

Note: If System **A** is MASTER, these fields are valid for all systems. If System is a system name, only fields for that system are valid; fields for other systems will contain either 0, or residual values if this instance of CF previously had MASTER status.

13 The path installed mask and path available mask followed by the number of subchannels generated, in use and maximum number.

The command **C** changes the PIM, PAM and subchannels fields to show *CHPID* information instead **14**.

3.4.3 Systems Activity Summary (Option 1.S)

Instead of the CF view just described, you could enter **S** against a CF in the CF activity summary, and view the utilization of this CF by each connected system. Figure 18 on page 31 shows the panel that is displayed.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0400                Systems  Activity  Summary          Row 1 to 15 of 15
                                                                  num-sys 15
Command ===>                                                 System A MASTER

Enter S to select a System for Connections
                  1                  2
CFname CF01     Busy %  5 ( 10 ) CP 6  Used space K: 154112    30 % CF lvl. 4
<----- last cycle  15  sec    --------   interval 042:02:01  secs 151321   --->
                     <---------- sync ----------> <---------- async ---------->
              3         4                5  6     7                   8   9
           total req  total req  interval  dly chg total req  interval  que nsc
  system     9990972       4580  avg      0  %  %    9986392  avg    495  %  %
- ------- b--m--k--- b--m--k--- -r/t- -rate -- -- b--m--k--- -r/t- -rate -- --
_ SC04        680517         37   339      0 99  2     680480  4195    29 46 43
_ SC42        235207         36   256      0 99  0     235171  3803    36 45 34
_ SC43        643337         35   280      0 99  2     643302  4243    30 46 33
_ SC47        271620         43   329      0 99  2     271577  2229    37 47 43
_ SC48        202806       3630   269      0 54  0     199176  2342    36 46 43
_ SC49        645224         35   334      0 99  0     645189  3852    30 43 32
_ SC50        188389         35   277      0 99  0     188354  3026    36 38 34
_ SC52        590917         38   280      0 99  0     590879  4180    29 40 33
_ SC53        226687         36   247      0 99  0     226651  3026    36 37 33
_ SC54        251095         35   264      0 99  0     251060  3935    37 45 33
_ SC55        401993         35   247      0 99  0     401958  3904    39 45 34
_ SC61        667210         91   268      0 99  0     667119  4168    30 48 33
_ SC62        784830        419   249      0 99  0     784411  4314    31 48 32
_ SC66        100891         39   270      0 99  0     100852  3310    29 40 33
_ SC67        960238          0     0      0 25  0     960213  1217     0 48 33
```

Figure 18. Systems Activity Summary (Option 1.S)

The systems activity summary breaks down the CF-level numbers given previously, to show the behavior of each system connected to the CF:

1 The CF CPU utilization during the last cycle (bsy %) and highest CF CPU busy percentage seen by the monitors (max bsy) in any cycle - this is the same as shown on the CF activity panel.

2 CF storage utilization percentage - again, this is the same as shown on the CF activity panel.

3 The total requests in the interval (SYNC plus ASYNC).

Note: If System **A** is MASTER, all fields in this table are valid for all systems. If System is a system name, only fields for that system are valid; fields for other systems will contain either 0, or residual values if this instance of CF previously had MASTER status.

4 The total SYNC requests and the average response time for these requests in microseconds.

Note: See the note on page 25 for details of response time calculation.

5 Percentage of SYNC immediate requests delayed; that is, requests that *spin* waiting for access to the CF. This value can be greater than 100 at very low SYNC request rates. If this is the case, it is displayed here as 99.

6 Percentage of SYNC requests changed to ASYNC.

7 The total ASYNC requests since the monitor started and the average interval response time (in microseconds).

Note: See the note on page 25 for details of response time calculation.

8 Percentage of ASYNC requests in the interval that have been queued.

9 Percentage of ASYNC requests in the interval that have been queued because no subchannel was available.

3.4.3.1 System Connections Display (Option 1.S.S)

If you then select a system, the numbers are further broken down to show the activity on each connection between that system and the CF. Figure 19 shows the panel displayed when you select **S**. Refer to 3.4.4, “CF Connections Activity (Option 1.C)” on page 33 for additional information on the fields displayed.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLPO25Y                  Connections Display                Row 1 to 5 of 5
Command ===>                                                 num-sys 15
  Interval start 98.055 13:15 end  98.055 15:42:12 CF CFO1     System SCO4____
  Interval length   OO2:26:56 secs            8816 <- last cycle  10 secs ->
  Enter V structure-name on command line to view a structure, R to reset
  Enter C on command line to see connection name and stats for the last cycle
  CF busy% 5      type              stat total req <- sync interval async -> cf
  structure name   ‘ cf-name sysid    ‘     298728     1   avg      0   avg  lv
- ---------------- - ---------------- - b--m--k--- -rate  -s/t- -rate  -r/t- --
_ IXC_DEFAULT_2    L CFO2    SCO4     A     278089     0      0     0   2530  1
_ DSNHGHG_LOCK1    K CFO2    SCO4     A      17610     1    162     0      0  2
_ DSNHGHG_GBPO     C CFO2    SCO4     A       2863     0    160     0      0  2
_ IEFAUTOS         S CFO2    SCO4     A        160     0      0     0      0  0
_ SYSTEM_LOGREC    L CFO2    SCO4     A          6     0      0     0      0  1
```

Figure 19. System Connections (Option 1.S.S)

3.4.3.2 Connection Activity Display (Option 1.S.S.S)

If you further select a system connection, the activity of the selected connection is displayed. Figure 20 on page 33 shows the panel displayed when you select a list structure. Refer to 3.6.2, “List Connection Activity (Option 4.S)” on page 48 for additional information on the fields.

```
  Menu   Settings   Tutorial
--------------------------------------------------------------------------------
CFLP0253                 Connection Activity
Command ===>
  Cycle time 11  secs       Interval start 98.055 13:15 end 98.055 15:55:08
--------------------------------------------------------------------------------
  Structure IXC_DEFAULT_1          Type LIST            CF CF02
--------------------------------------------------------------------------------

   Sysid  SC04      Asid  0006     Jobname   XCFAS      Status ACTIVE

 <---------  last cycle  --------> <--- Interval 002:39:58  secs 9598     --->
                                   Total req 300691
 SYNC s-t(MIC) 0        Rate 0     SYNC  req 0          % 0    Avg s-t 0
ASYNC s-t(MIC) 0        Rate 0     ASYNC req 300691     % 0    Avg s-t 1386
                           ------------------------------------------------
                                                         amortized q-t 2467
                           Async   queued    115668     % 38   Avg q-t 6415
                           Sync    changed   0          % 0   <-incl in ASYNC
                           Delayed no-sch    106328     % 35
```

Figure 20. List Connection Activity (Option 1.S.S.S)

3.4.4 CF Connections Activity (Option 1.C)

For an overall view of a CF's connection activity, you can use selection **1** from the menu and then **C**. Figure 21 on page 34 shows the panel that is displayed. This panel is the same as that shown in Figure 19 on page 32, except that here all connections from all systems to the CF are displayed (assuming the monitor is in MASTER status).

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP025Y                  Connections Display              Row 1 to 15 of 47
Command ===>                                                 num-sys 15
  Interval start 98.055 13:15 end  98.055 17:01:08 CF CF01     System A MASTER
  Interval length   003:45:53 secs           13553 <- last cycle  10 secs ->
  Enter V structure-name on command line to view a structure, R to reset
  Enter C on command line to see connection name and stats for the last cycle
  CF busy% 5      type              stat total req <- sync interval async -> cf
  structure name   ‘ cf-name sysid    ‘    6607687     3          488        lv
                                     1     2          3 avg      4  avg   5
- ---------------- - ---------------- - b--m--k--- -rate  -s/t- -rate  -r/t- --
_ IXC_DEFAULT_2    L CF02    SC55     A     523015     0      0    33   1257  1
_ IXC_DEFAULT_2    L CF02    SC47     A     515828     0      0    72   1719  1
_ IXC_DEFAULT_2    L CF02    SC42     A     500182     0      0     0      0  1
_ IXC_DEFAULT_2    L CF02    SC53     A     488708     0      0    63   1222  1
_ IEFAUTOS         S CF02    SC48     A        159     0      0     0      0  0
_ LOG_DFHSHUNT_P01 L CF02    SC54     A         56     0      0     0      0  1
_ IEFAUTOS         S CF02    SC50     A         54     0      0     0      0  0
_ IEFAUTOS         S CF02    SC62     A         53     0      0     0      0  0
_ IEFAUTOS         S CF02    SC61     A         52     0      0     0      0  0
_ IEFAUTOS         S CF02    SC43     A         45     0      0     0      0  0
_ IEFAUTOS         S CF02    SC49     A         30     0      0     0      0  0
_ IEFAUTOS         S CF02    SC67     A         28     0      0     0      0  0
_ IEFAUTOS         S CF02    SC66     A         26     0      0     0      0  0
_ SYSTEM_LOGREC    L CF02    SC52     A         22     0      0     0      0  1
_ DSNHGHG_LOCK1    K CF02    SC04     A      27078     3    151     0      0  2
```

Figure 21. CF Connections Activity (Option 1.C)

The CF connections activity panel provides information for each connection:

1 The connection status:
A Active connection
F Failed-persistent connection
2 The total requests (SYNC plus ASYNC) on this connection since the monitor started.

Note: If System **A** is MASTER, all fields in this table are valid for all systems. If System is a system name, only fields for that system are valid; fields for other systems will contain either 0, or residual values if this instance of CF previously had MASTER status.
3 The SYNC requests per second and the service time for these requests in microseconds for the last cycle. Service time does not include any queue time.
4 The ASYNC requests per second and the response time for these requests in microseconds for the last cycle. Response time includes the queue time.
5 The CFCC microcode level requested by the connector.

The command **C** changes the *interval* data in **3** and **4** to the corresponding rate and service time values for the last *cycle*. The CF name and system name are also changed to show the connection name. The command **I** resets the display to show interval data as wsll as CF and system names.

The command **V** *structure-name* limits the table display to the structure connections named. The structure name search is for the characters *typed*; the full name is not required.

For example, **V ISG** displays data for all connections for the first structure found whose name starts with the string ISG.

Selecting a connection displays the *connection activity*. For additional information refer to:

- Figure 35 on page 47 for a lock connection
- Figure 36 on page 48 for a list connection
- Figure 37 on page 49 for a serialized list connection
- Figure 38 on page 50 for a cache connection.

3.4.5 CF Allocated Structures (Option 1.A)

For an overall view of the structures allocated in a CF, you can use option **A** from the CF activity summary panel. Figure 22 illustrates this.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0020           Active Structures in Coupling Facility    Row 1 to 11 of 11
Command ===>

 CFNAME CF02         CF level     4          Used space K: 266240    53 %
 Busy % 6   CP 6     Dump space K 2048       Free,Total K: 234496   500736
 Type   NON-VOLATILE CFRM policy  CFRM18     Activated at: 98.006 20:10:08
       Updated   at: 98.006 20:09:20
Enter L Structure-name on command line to locate a Structure
Enter S to select a Structure for Connections
- ---------------- ------------- b--m--k--- ----- ------- -----policy----- ---
                   1              2           3          4          5
S Structure name   Status          Total req Type   Size      Init  Size-K  RB%
_ DSNDSGC_LOCK1    ACTIVE             174554 LOCK   100096  100000  500000   10
_ DSNDSGC_SCA      ACTIVE             174408 LIST    20224   20000  300000   10
_ DSNHGHG_SCA      ACTIVE             302213 LIST    64000   64000   96000    5
_ IGWLOCK00        ACTIVE             120079 LOCK    14336   14300   28600   75
_ ISGLOCK          ACTIVE            1127953 LOCK    10240           10000    1
_ ISTGENERIC       ACTIVE            1080319 LIST     8192            8192
_ ISTMNPS          ACTIVE                 80 LIST     1024    1024    4096   30
_ IXC_DEFAULT_1    ACTIVE           63018869 LIST    16128           16128
_ JES2CKPT_1       ACTIVE                  0 LIST     4096            4096
_ LOG_DFHLOG_P01   ACTIVE              14681 LIST     9728    9728   14848    1
_ SYSTEM_OPERLOG   ACTIVE              56079 LIST    16128           16128
```

Figure 22. CF Allocated Structures (Option 1.A)

The CF allocated structures panel includes the following data:

1 The status of the structure.

2 The total requests to the structure (SYNC plus ASYNC) since the monitor started. If System **A** is MASTER, these values relate to the entire sysplex; if System is a system name, they relate only to that system.

3 The current structure size in KB.

4 The structure initial amount of space in KB to be allocated and the maximum size in KB to which the structure can be altered, as defined in the active CFRM policy.

5 The rebuild percentage specified in the active CFRM policy.

Selecting a structure displays its connections. For additional information about this panel refer to:

- Figure 25 on page 38 for a lock connection
- Figure 27 on page 40 for a list connection (including serialized list)
- Figure 30 on page 43 for a cache connection.

3.5 Defined and Allocated Structures (Options 2 and 3)

For an overall view of the structures defined in the current CFRM policy, use option **2** from the menu panel. Figure 23 shows the panel that is displayed.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0200            CF Monitor  -  Defined  Structures       Row 6 to 25 of 50
Command ===>                    1
SYSID SC55                CFRM policy  CFRM18     Activated at: 98.006 20:10:08
                                                  Updated   at: 98.006 20:09:20
Enter L Structure-name on command line to locate a Structure
Enter S to select a Structure for Connections
- ---------------- -------- ---------- b--m--k--- ------------ ----- ------ ---
                   2        3          4          5
S Structure name   CF name  Status      Total req TOD alloc.   Type  Size-K RB%
_ DSNDSGA_GBP1             NOT_ALLOC
_ DSNDSGA_LOCK1            NOT_ALLOC
_ DSNDSGA_SCA              NOT_ALLOC
_ DSNDSGB_GBP0             NOT_ALLOC
_ DSNDSGB_GBP1             NOT_ALLOC
_ DSNDSGB_LOCK1            NOT_ALLOC
_ DSNDSGB_SCA              NOT_ALLOC
_ DSNDSGC_GBP0     CF01    ALLOCATED          0 97.339 17:12 CACHE   1024  60
_ DSNDSGC_LOCK1    CF02    ALLOCATED     174554 97.329 18:36 LOCK  100096  10
_ DSNDSGC_SCA      CF02    ALLOCATED     174408 97.329 18:36 LIST   20224  10
_ DSNHGHG_GBP0     CF01    ALLOCATED      49265 97.352 22:43 CACHE   8192   5
_ DSNHGHG_GBP1             NOT_ALLOC
_ DSNHGHG_GBP2             NOT_ALLOC
_ DSNHGHG_GBP3     CF01    ALLOCATED          0 97.352 22:56 CACHE  16128   5
_ DSNHGHG_GBP32K   CF01    ALLOCATED          0 97.352 22:56 CACHE  40192   5
_ DSNHGHG_LOCK1    CF01    ALLOCATED     302666 97.329 20:19 LOCK   48128   5
_ DSNHGHG_SCA      CF02    ALLOCATED     302350 97.329 20:19 LIST   64000   5
_ FULL_STRA                NOT_ALLOC
_ HSM14_CACHE              NOT_ALLOC
_ IEFAUTOS         CF01    ALLOCATED        782 98.043 14:44 LIST     768  20
```

Figure 23. Defined Structures (Option 2)

If you select option **3** from the menu panel, only *allocated* structures are displayed, as shown in Figure 24 on page 37.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0202            CF Monitor  -  Allocated  Structures     Row 1 to 20 of 21
Command ===>                    1
SYSID SC55                CFRM policy  CFRM18     Activated at: 98.006 20:10:08
                                                   Updated   at: 98.006 20:09:20
Enter L Structure-name on command line to locate a Structure
Enter S to select a Structure for Connections
- ---------------- -------- ---------- b--m--k--- ------------ ----- ------ ---
                    2        3          4         5
S Structure name   CF name  Status      Total req TOD alloc.   Type  Size-K RB%
_ DSNDSGC_GBP0     CF01     ALLOCATED           0 97.339 17:12 CACHE   1024  60
_ DSNDSGC_LOCK1    CF02     ALLOCATED      174554 97.329 18:36 LOCK  100096  10
_ DSNDSGC_SCA      CF02     ALLOCATED      174408 97.329 18:36 LIST   20224  10
_ DSNHGHG_GBP0     CF01     ALLOCATED       49268 97.352 22:43 CACHE   8192   5
_ DSNHGHG_GBP3     CF01     ALLOCATED           0 97.352 22:56 CACHE  16128   5
_ DSNHGHG_GBP32K   CF01     ALLOCATED           0 97.352 22:56 CACHE  40192   5
_ DSNHGHG_LOCK1    CF01     ALLOCATED      302682 97.329 20:19 LOCK   48128   5
_ DSNHGHG_SCA      CF02     ALLOCATED      302366 97.329 20:19 LIST   64000   5
_ IEFAUTOS         CF01     ALLOCATED         782 98.043 14:44 LIST     768  20
_ IGWLOCK00        CF02     ALLOCATED      120079 97.329 18:36 LOCK   14336  75
_ ISGLOCK          CF02     ALLOCATED     1129569 98.054 13:49 LOCK   10240   1
_ ISTGENERIC       CF02     ALLOCATED     1080831 98.006 20:10 LIST    8192
_ ISTMNPS          CF02     ALLOCATED          80 97.329 18:22 LIST    1024  30
_ IXC_DEFAULT_1    CF02     ALLOCATED    63071306 98.043 14:41 LIST   16128
_ IXC_DEFAULT_2    CF01     ALLOCATED    62858937 98.043 14:40 LIST   16128
_ JES2CKPT_1       CF02     ALLOCATED           0 98.049 19:54 LIST    4096
_ JES2CKPT_2       CF01     ALLOCATED           0 98.049 19:53 LIST    4096
_ LOG_DFHLOG_P01   CF02     ALLOCATED       14709 98.043 20:31 LIST    9728   1
_ LOG_DFHSHUNT_P01 CF01     ALLOCATED         210 98.043 20:31 LIST    1280   1
_ SYSTEM_LOGREC    CF01     ALLOCATED        1648 98.026 20:35 LIST   16128
```

Figure 24. Allocated Structures (Option 3)

The defined structure panel lists all the structures defined within the current CFRM policy. The data presented includes:

1 The name of the current CFRM policy, the time it was updated, and the time it was activated.

2 The CF name where the structure is allocated.

3 The status of the structure:

ALLOCATED	Structure is allocated in a CF
ALTER	Structure is during alter process
CHG PENDING	Administrative policy change is pending
NOT-ALLOC	Structure is not allocated
REBUILD	Structure is during rebuild process

4 The total requests (SYNC plus ASYNC) issued.

Note: If CFMON is MASTER in the system in which the ISPF application is running, these values relate to the entire sysplex; if CFMON is SLAVE, they relate only to the system where that slave is running.

5 The TOD when the structure was allocated.

If you select an allocated structure, then the storage structure organization (lock entries, directory entries, elements, data elements), its utilization and the structure connections are shown. The following sections describe what is presented for each structure type.

If you select a structure which is not allocated or has no connection, the following ISPF message is displayed:

```
STRUCTURE HAS NO CONNECTIONS
```

3.5.1 Lock Structure Display (Option 3.S)

Figure 25 shows the panel displayed when you select a lock structure.

```
  Menu   Settings   Tutorial
--------------------------------------------------------------------------------
CFLP0220            Structure Display - SYSID  SC55          Row 1 to 15 of 15
Command ===>

Structure      ISGLOCK          CF CF02     Allocated at  98.054 13:49:21
                                [1]
Size,K 10240   Type LOCK   Entries 1048576   In use 2762      Highest 2922
                                [2]
CF   % 2           Record Elements 0         In use 0         Highest 0
Preference list CF02     [3]       CF01
Exclusion  list
Disposition     DELETE  Max connections  32    Access time  0
- ---------------- ------- ----- ---------- -------- -------- ---- -------- ---
                  [4]   [5] [6]     [7]       [8]                    [9]      [10]
                 Cont F  Cycle  Interval
S Connection name  %   %  Rate   Tot reqs  Sysname  Jobname  ASID Status   CFL
                                 b--m--k---
_ ISGLOCK#SC47     0.9 0.2     0     258210 SC47     GRS      0007 ACTIVE    0
_ ISGLOCK#SC52     5.0 1.3     0      53312 SC52     GRS      0007 ACTIVE    0
_ ISGLOCK#SC55     2.1 0.5     0      68701 SC55     GRS      0007 ACTIVE    0
_ ISGLOCK#SC53     9.4 1.8     0      24012 SC53     GRS      0007 ACTIVE    0
_ ISGLOCK#SC43    10.0 1.7     0      17745 SC43     GRS      0007 ACTIVE    0
_ ISGLOCK#SC49     0.6 0.0     2     451481 SC49     GRS      0007 ACTIVE    0
_ ISGLOCK#SC61     1.7 0.4     0     114469 SC61     GRS      0007 ACTIVE    0
_ ISGLOCK#SC62     3.2 0.6     0      64365 SC62     GRS      0007 ACTIVE    0
_ ISGLOCK#SC04    13.2 2.5     0      19295 SC04     GRS      0007 ACTIVE    0
_ ISGLOCK#SC48    12.6 3.9     0      18725 SC48     GRS      0007 ACTIVE    0
_ ISGLOCK#SC50    10.7 2.8     0      18334 SC50     GRS      0007 ACTIVE    0
_ ISGLOCK#SC42     4.5 1.0     0        203 SC42     GRS      0007 ACTIVE    0
_ ISGLOCK#SC54    11.1 2.4     0      19855 SC54     GRS      0007 ACTIVE    0
_ ISGLOCK#SC66     1.7 0.4     5        482 SC66     GRS      0007 ACTIVE    0
_ ISGLOCK#SC67     2.6 0.3     0        380 SC67     GRS      0007 ACTIVE    0
```

Figure 25. Lock Structure (Option 3.S)

The allocated lock structure display shows the overall behavior of the structure including:

1 The number of lock entries allocated in the structure, the current count of lock entries in use, and the highest value seen by the monitor during the interval for the lock entries in use count.

2 The number of record data elements allocated, the current count of record data elements in use, and the highest value for this count seen by the monitor during the interval.

3 The preference list and exclusion list as specified in the CFRM policy.

4 The percentage of external requests experiencing lock contention during the interval. This includes both real and false contention.

Note: If CFMON is MASTER in the system in which the ISPF application is running, these and the following values are valid for the entire sysplex. If CFMON is SLAVE, only data for the system where that slave is running is valid. Values for other systems will either be 0, or will contain residual data if this instance of CFMON was previously in MASTER status.

5 The percentage of external requests experiencing false contention during the interval.

6 The total request rate per second during the last cycle.

7 The total external SYNC request count for the interval.

8 The system name that made the connection.

9 The status of the connection.

10 The CFCC microcode level requested by the application.

3.5.1.1 Lock Structure Connection Activity (Option 3.S.S)

If you select a lock structure connection, the structure activity for the system that made the connection is displayed. Figure 26 shows the panel, which is similar to Figure 35 on page 47.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0224           Structure Activity from System  SC55
Command ===>

   Cycle time 10  secs       Interval start 98.053 13:00 end 98.055 07:05:57
------------------------------------------------------------------------------
Structure      ISGLOCK         CF   CF02    Allocated at  98.054 13:49:21
Size-K 10240   Type LOCK   Entries 1048576   In use 2762      Highest 2922
Record Elements 0         In use 0         Highest 0
   Disposition     DELETE   Max connections  32      Access time  0
==============================================================================

   Sysid  SC55      Asid  0007     Jobname   GRS        Status ACTIVE
<--- last cycle ---> <-------  Interval 042:04:40  secs 151480    --------->
                                                 1 External req cnt   68367
2 Req rate   0       3 Req cnt  68701                              Cont.   1425
  Srvt (MIC) 0         Avg srvt 132                                Cont.   2.1

                                                                  False    337
                                                                  False %  0.5
```

Figure 26. Lock Structure Connection Activity (Option 3.S.S)

The additional information you can find from this panel is related to the system that made the connection, and includes:

1 The external request count for the interval - that is, the requests issued by the application.

2 The request rate per second and response time (in microseconds) during the last cycle.

3 The total request count and average service time (in microseconds) for the interval. This count can be less than the external request count because XES optimizes the number of unlock requests issued to the structure.

3.5.2 Serialized List Structure Display (Option 3.S)

Figure 27 shows the panel that is displayed when you select a serialized list structure. The list structure display is the same except for the lock entries **3**, which are not used and therefore are not displayed.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0232            Structure Display - SYSID  SC55          Row 1 to 15 of 15
Command ===>
  Structure      ISTGENERIC        CF CF02    Allocated at  98.006 20:10:35

  Size,K 8192           1  Entries  44301     In use 44        Highest 45
  CF   % 1              2  Elements 883       In use 16        Highest 17
  Type Serialized LIST  3  Lock-ent 4         In use 0         Highest 0
  Preference list CF02      4      CF01
  Exclusion  list
  Disposition     DELETE  Max connections  32    Access time  1800
--- ---------------- ----------- ---------- -------- -------- ---- -------- ---
                        5          6        7                      8       9
                     ---Cycle---  Interval
Sel Connection Name  Sync  Async  Tot reqs  Sysname  Jobname  ASID Status   CFL
                                  b--m--k---
 _  USIBMSC_SC47M        0     0     364842 SC47     VTAM44   0078 ACTIVE    4
 _  USIBMSC_SC52M        0     0         32 SC52     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC53M        0     0     334941 SC53     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC55M        0     0     381294 SC55     VTAM44   004C ACTIVE    4
 _  USIBMSC_SC43M        0     0          2 SC43     VTAM44   001B ACTIVE    4
 _  USIBMSC_SC61M        0     0         22 SC61     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC49M        0     0          2 SC49     VTAM44   001D ACTIVE    4
 _  USIBMSC_SC04M        0     0          2 SC04     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC62M        0     0         20 SC62     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC48M        0     0          6 SC48     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC50M        0     0          2 SC50     VTAM44   001B ACTIVE    4
 _  USIBMSC_SC54M        0     0         36 SC54     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC42M        0     0          0 SC42     VTAM44   0061 ACTIVE    4
 _  USIBMSC_SC67M        0     0         40 SC67     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC66M        0     0          0 SC66     VTAM44   001A ACTIVE    4
```

Figure 27. Serialized List Structure (Option 3.S)

The serialized list structure display and the list structure display show the overall behavior of the structure including:

1 The number of entries allocated in the structure, the number of entires in use, and the highest number of entries in use seen by the monitor during the interval.

2 The number of data elements allocated in the structure, the number of data elements in use, and the highest number of data elements in use seen by the monitor during the interval.

3 The number of lock entries allocated in the structure, the number of lock entries in use, and the highest number of lock entries in use seen by the monitor during the interval. The lock information is only shown for a serialized list structure; it is not relevant to other types of list structures.

4 The preference and exclusion lists as defined in the CFRM policy.

5 The SYNC and ASYNC request rates per second for the last cycle.

Note: If CFMON is MASTER in the system in which the ISPF application is running, these and the counts at 6 are valid for the entire sysplex. If CFMON is SLAVE, only data for the system where that slave is running is valid. Values for other systems will either be 0, or will contain residual data if this instance of CFMON previously had MASTER status.

6 The total request count for the interval (SYNC plus ASYNC).

7 The system name that made the connection.

8 The status of the connection.

9 The CFCC microcode level requested by the application.

3.5.2.1 Serialized List Structure Connection Activity (Option 3.S.S)

If you select a serialized list structure connection, the structure activity for the system that made the connection is displayed. Figure 28 shows the panel, which is similar to Figure 37 on page 49.

```
   Menu   Settings   Tutorial
 ------------------------------------------------------------------------------
CFLP0236           Structure Activity from System  SC55
Command ===>
  Cycle time 10  secs       Interval start 98.055 13:15 end 98.056 16:33:34
------------------------------------------------------------------------------
  Structure      ISTGENERIC        CF CF02    Allocated at  98.006 20:10:35
  Size,K 8192              Entries  44301     In use 43        Highest 44
  CF   % 1                 Elements 883       In use 17        Highest 18
  Type Serialized LIST     Lock-ent 4         In use 0         Highest 0
  Disposition     DELETE   Max connections  32      Access time  1800
==============================================================================

   Sysid  SC55      Asid  004C     Jobname   VTAM44     Status ACTIVE
 <---------  last cycle  --------> <--- Interval 027:17:30  secs 98250    --->
                              1 Total req 3065    K
2 SYNC s-t(MIC) 0      Rate 0      SYNC  req 3060    K  % 99 3 Avg s-t 217
  ASYNC s-t(MIC) 0     Rate 0      ASYNC req 5178       % 0    Avg s-t 974
                           ------------------------------------------------
                                                          4 amortized q-t 2278
                          5 Async   queued    5811        % 112  Avg q-t 2030
                          6 Sync    changed   5222        % 0   <-incl in ASYNC
                          7 Delayed no-sch    5125        % 98
8 External req 3065   K    Req.  contention  0           % 0.0
```

Figure 28. Serialized List Structure Connection Activity (Option 3.S.S)

The additional information you can find from this panel is related to the system that made the connection and includes:

1 The total request count and the total for each of SYNC and ASYNC requests for the interval. The number of SYNC and ASYNC requests are also shown as percentages of the total requests.

2 The service time (in microseconds) and rate per second for SYNC and ASYNC requests in the last cycle.

3 The average service time (in microseconds) for SYNC and ASYNC requests in the interval.

4 The average queue time (in microseconds) for ASYNC requests evaluated using total interval requests count (amortized). This time is not accounted for in the service time.

5 The count and percentage of ASYNC requests that have been queued during the interval.

6 The count and percentage of SYNC requests that have been changed to ASYNC during the interval.

7 The count and percentage of ASYNC requests that have been delayed during the interval because no subchannel was available.

8 The total external requests to the structure during the interval and the count and percentage of these that experienced contention.

3.5.2.2 List Structure Connection Activity (Option 3.S.S)

The list structure activity display, shown in Figure 29, is similar to the serialized list structure activity display except for the lock entries and request contention count, which are not part of the structure. Refer to Figure 36 on page 48 for a similar display.

```
   Menu   Settings   Tutorial
 ------------------------------------------------------------------------------
CFLP0234           Structure Activity from System  SC50
Command ===>
  Cycle time 10  secs       Interval start 98.055 13:15 end 98.056 17:36:46
------------------------------------------------------------------------------
  Structure      IXC_DEFAULT_1     CF CF02    Allocated at  98.043 14:41:53
  Size,K 16128   Type LIST  Entries  3775     In use 1         Highest 63
  CF   % 3                  Elements 3767     In use 47        Highest 105
  Disposition     DELETE   Max connections  32      Access time  0
==============================================================================

   Sysid  SC50      Asid  0006     Jobname   XCFAS      Status ACTIVE
 <---------  last cycle  --------> <--- Interval 028:20:41  secs 102041   --->
                                   Total req 36390   K
 .SYNC s-t(MIC) 0       Rate 0     SYNC  req 244        % 0    Avg s-t 254
 ASYNC s-t(MIC) 1338    Rate 37    ASYNC req 36389   K  % 99   Avg s-t 1164
                           ------------------------------------------------
                                                       amortized q-t 58
                           Async   queued    13612   K  % 37   Avg q-t 155
                           Sync    changed   6          % 2   <-incl in ASYN
                           Delayed no-sch    11940   K  % 32
```

Figure 29. List Structure Connection Activity (Option 3.S.S)

3.5.3 Cache Structure Display (Option 3.S)

Figure 30 on page 43 shows the panel that is displayed when you select a cache structure.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0240           Structure Display - SYSID  SC42           Row 1 to 2 of 2
Command ===>
Structure     CICS_CACHE         CF CF02    Allocated at   97.274 18:08:32
Size,K 50176  Type CACHE 1 Dir.     11855     In use 11806     Highest 11806
CF   % 10                2 Elements 23510     In use 23477     Highest 23477
Reads    1045  3    Writes   944                        4 Dir.Reclaims 0
Castouts 0          Xi's     944                        5 El. Reclaims 0
Preference list CF02     6       CF01
Exclusion  list
Disposition     DELETE  Max connections  32    Access time  0
--- ---------------- ----------- ---------- -------- -------- ---- -------- ---
                        7           8        9                      10       11
                     ---Cycle---  Interval
Sel Connection Name  Sync  Async  Tot reqs  Sysname  Jobname  ASID Status   CFL
                                  b--m--k---
_   IXCLO01E0001       12     1      14842 SC61     SMSVSAM  000A ACTIVE    4
_   IXCLO01E0002        6     0       6252 SC62     SMSVSAM  00)A ACTIVE    4
```

Figure 30. Cache Structure (Option 3.S)

The cache structure display shows the overall behavior of the structure including:

1 The number of directory entries allocated in the structure, the number of directory entries in use, and the highest number of directory entries in use seen by monitor during the interval.

2 The number of data elements allocated in the structure, the number of data elements in use, and the highest number of data elements in use seen by monitor during the interval.

3 The counts of reads, writes, castouts and cross-invalidates for the interval.

4 The number of directory reclaims in the interval.

5 The number of element reclaims in the interval.

6 The preference and exclusion lists.

7 The SYNC and ASYNC request rate per second for the last cycle

Note: If CFMON is MASTER in the system in which the ISPF application is running, these values and that at **8** are valid for the entire sysplex; if CFMON is SLAVE, they are related only to the system where that slave is running.

8 The total request count (SYNC plus ASYNC) for the interval.

9 The system name that made the connection.

10 The status of the connection.

11 The CFCC microcode level requested by the application.

3.5.3.1 Cache Structure Connection Activity (Option 3.S.S)

If you select a cache structure connection, the structure activity for the system that made the connection is displayed. Figure 31 shows the panel, which is similar to Figure 38 on page 50.

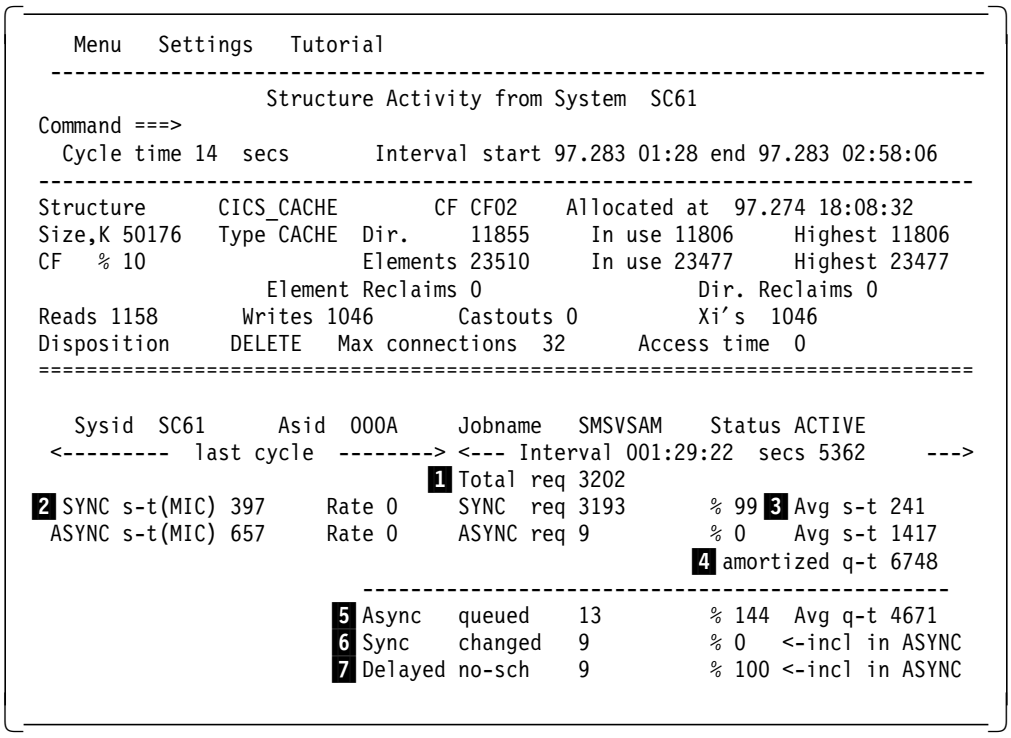

Figure 31. Cache Structure Connection Activity (Option 3.S.S)

The additional information you can find from this panel is related to the system that made the connection and includes:

1 The total request count and the total for each of SYNC and ASYNC requests for the interval. The number of SYNC and ASYNC requests are also shown as percentages of the total requests.

2 The service time (in microseconds) and rate per second for SYNC and ASYNC requests in the last cycle.

3 The average service time (in microseconds) for SYNC or ASYNC requests in the interval.

4 The average queue time (in microseconds) for ASYNC requests evaluated using total interval requests count (amortized). This time is not accounted for in the service time.

5 The count and percentage of ASYNC requests that have been queued during the interval.

6 The count and percentage of SYNC requests that have been changed to ASYNC during the interval.

7 The count and percentage of ASYNC requests that have been delayed during the interval because no subchannel was available.

3.6 Connections (Option 4)

For an overall view of the connections at sysplex level, use option **4** from the menu panel. Figure 32 shows a panel example.

```
------------------------------------------------------------------------------
CFLPO251             CF Monitor - Connections Display      Row 1 to 19 of 149
Command ===>                                                  num-sys 15
  Interval start 98.056 08:33 end  98.057 09:10:59            System A MASTER
  Interval length   024:36:49 secs          88609 <- last cycle   6 secs ->
  Enter V structure-name on command line to view a structure, R to reset
  Enter I on command line to see CF-name sysid and  stats for interval
                 type              stat total req <- sync .cycle.. async -> cf
  structure name   ‘ connection name  ‘  185287007    40          663        lv
- ---------------- - ---------------- - b--m--k--- -rate  -s/t- -rate  -s/t- lv
                                     1     2           3          4        5
_ IXC_DEFAULT_1    L SIGPATH_04000DF7 A   39883836     0       0    65   1146  1
_ IXC_DEFAULT_2    L SIGPATH_04000DF7 A   39734202     0       0    50   1268  1
_ IXC_DEFAULT_1    L SIGPATH_0B000DFE A   38839387     0       0     0      0  1
_ IXC_DEFAULT_2    L SIGPATH_0B000DFE A   38014930     0       0     0      0  1
_ IXC_DEFAULT_1    L SIGPATH_01000E0A A    5529513     0       0     0      0  1
_ IXC_DEFAULT_2    L SIGPATH_01000E0A A    5479606     0       0     0      0  1
_ IXC_DEFAULT_2    L SIGPATH_0E000E08 A    4906544     0       0     0      0  1
_ IXC_DEFAULT_1    L SIGPATH_0E000E08 A    4874938     0       0     0      0  1
_ IXC_DEFAULT_1    L SIGPATH_02000E0E A    2363304     0       0    54   1022  1
_ IXC_DEFAULT_2    L SIGPATH_02000E0E A    2339406     0       0    52   1171  1
_ ISGLOCK          K ISGLOCK#SC47     A     526190     0       0     0      0  0
_ ISTGENERIC       S USIBMSC_SC47M    A     393428     0       0     0      0  4
_ ISGLOCK          K ISGLOCK#SC67     A     282542     0       0     0      0  0
_ ISGLOCK          K ISGLOCK#SC66     A     282542     0       0     0      0  0
_ SYSTEM_OPERLOG   L IXGLOGR_SC47     A     118256     0       0     0      0  1
_ IXC_DEFAULT_2    L SIGPATH_03000E15 A     108774     0       0     0      0  1
_ IXC_DEFAULT_1    L SIGPATH_05000E16 A     107642     0       0     0      0  1
_ IXC_DEFAULT_1    L SIGPATH_03000E15 A     106805     0       0     0      0  1
_ IXC_DEFAULT_2    L SIGPATH_05000E16 A     101627     0       0     0      0  1
```

Figure 32. Syspex Connections Activity (Option 4)

The sysplex connections activity panel details behavior of each connection, including:

1 The connection status:

A Active connection
F Failed-persistent connection

2 The total SYNC and ASYNC requests since the monitor started.

Note: If CFMON is MASTER in the system in which the ISPF application is running, these values and those at **3** and **4** are valid for the entire sysplex. if CFMON is SLAVE, only values for the system where that slave is running are valid; values for other systems will either be 0, or will reflect residual information if this instance of CFMON previously had MASTER status.

3 The SYNC request rate per second and the service time (in microseconds) for the last cycle.

4 The ASYNC request rate per second and the service time (in microseconds) for the last cycle.

5 The CFCC microcode level requested by the connector.

The command **I** changes the display from request rates and service times for the *cycle* to *interval*-level information. CF names and SYSIDs are also displayed, rather than connection names. The command **C** reverses this change.

When the Connections Display panel shows *cycle* information, it shows the last cycle *service* time for both SYNC and ASYNC requests. When it shows *interval* information, it shows the interval average *service* time for SYNC requests and the interval average *response* time for ASYNC requests.

The command **V** *structure-name* limits the table display to the structure connections (the structure name search is for the *typed* characters; the full name is not required). Figure 33 shows an example where the connections view has been limited to the structure *SYSTEM_OPERLOG*.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLPO251             CF Monitor - Connections Display       Row 1 to 15 of 15
Command ===>                                                      num-sys 15
  Interval start 98.053 13:00 end  98.055 07:08:24             System A MASTER
  Interval length   042:06:58 secs          151618 <- last cycle  11 secs ->
  Enter V structure-name on command line to view a structure, R to reset
  Enter I on command line to see CF-name sysid and  stats for interval
                type              stat total req <- sync .cycle.. async -> cf
  structure name   ‘ connection name  ‘      56523     0            0        lv
- ---------------- - ---------------- - b--m--k--- -rate  -s/t- -rate  -s/t- --
                                    1     2           3           4       5
_ SYSTEM_OPERLOG   L IXGLOGR_SC61     A      13219     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC47     A      11366     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC52     A       9338     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC62     A       6063     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC49     A       3988     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC43     A       3098     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC55     A       2645     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC53     A       1434     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC54     A       1320     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC48     A       1312     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC50     A       1308     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC04     A       1303     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC67     A         84     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC42     A         26     0      0     0      0  1
_ SYSTEM_OPERLOG   L IXGLOGR_SC66     A         19     0      0     0      0  1
```

Figure 33. Structure Connections Activity (Option 4 & V=strname)

If you over-type the input field in the upper right corner of the panel (MASTER **A**) with a system name, the table display is limited to that system's connections. Figure 34 on page 47 shows an example where the connections view is for system *SC47*. In this example, we have also switched from cycle data to interval data.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0251             CF Monitor - Connections Display       Row 1 to 15 of 15
Command ===>                                                      num-sys 15
  Interval start 98.053 13:00 end  98.055 07:08:24            System A SC47__
  Interval length   042:06:58 secs          151618 <- last cycle  11 secs ->
  Enter V structure-name on command line to view a structure, R to reset
  Enter C on command line to see connection name and stats for last cycle
                 type              stat total req <- sync interval async -> cf
  structure-name   ‘ cf-name sysid    ‘   12403391     3   avg     74   avg  lv
- ---------------- - ---------------- - b--m--k--- -rate  -s/t- -rate  -s/t- --
                                     1      2          3          4      5
_ IXC_DEFAULT_1    L CF02    SC47     A    5696349     0    256    36   1198  1
_ IXC_DEFAULT_2    L CF01    SC47     A    5645172     0    263    36   1228  1
_ ISGLOCK          K CF02    SC47     A     530169     3    165     0      0  0
_ ISTGENERIC       S CF02    SC47     A     405763     0    207     2   1070  4
_ SYSTEM_OPERLOG   L CF02    SC47     A     118684     0    293     0   1264  1
_ IGWLOCK00        K CF02    SC47     A       4601     0   1825     0      0  0
_ IEFAUTOS         S CF01    SC47     A       2287     0    231     0   3024  0
_ SYSTEM_LOGREC    L CF01    SC47     A        366     0    299     0   2369  1
_ DSNDSGC_GBP0     C CF01    SC47     F          0     0      0     0      0  2
```

Figure 34. System Connections Activity (Option 4 & sysid)

3.6.1 Lock Connection Activity (Option 4.S)

If you select a system connection, the activity of the selected connection is displayed. Figure 35 shows the panel displayed when you select a connection to a lock structure. Note the similarity between this panel and Figure 26 on page 39.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CLPP0252                 Connection Activity
Command ===>
   Cycle time 11  secs       Interval start 98.056 08:33 end 98.057 10:50:58
------------------------------------------------------------------------------
  Structure ISGLOCK               Type LOCK            CF CF02
------------------------------------------------------------------------------

   Sysid  SC47      Asid  0007     Jobname   GRS        Status ACTIVE

<--- last cycle ---> <-------  Interval 026:16:42  secs 94602     --------->
                                                 1 External req cnt   542813
 2 Req rate   0    3 Req cnt  531788                        4 Cont.    2414
   Srvt (MIC) 137    Avg srvt 165                           Cont. %  0.4

                                                           5 False    570
                                                             False %  0.1
```

Figure 35. Lock Connection Activity (Option 4.S)

The additional information you can find from the panel is related to the system that made the connection and includes:

1 The external request count for the interval - the requests done by the application.

2 The request rate per second and service time (in microseconds) for the cycle

3 The total request count and average service time (in microseconds) for the connection in the interval. This count can be less than the external request count because XES optimizes the number of unlock requests issued to the structure.

4 The count and percentage of external requests on the connection that have experienced contention in the interval (this includes both real and false contention).

5 The count and percentage of external requests that have experienced false contention in the interval.

3.6.2 List Connection Activity (Option 4.S)

Figure 36 shows the panel displayed when you select a connection to a list structure. Again, note the similarity to Figure 29 on page 42.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0253                 Connection Activity
Command ===>
  Cycle time 11  secs       Interval start 98.055 13:15 end 98.055 15:55:08
------------------------------------------------------------------------------
  Structure IXC_DEFAULT_1          Type LIST            CF CF02
------------------------------------------------------------------------------

   Sysid  SC04      Asid  0006     Jobname   XCFAS      Status ACTIVE

 <---------  last cycle  --------> <--- Interval 002:39:58  secs 9598     --->
                                1 Total req 300691
 2 SYNC s-t(MIC) 0      Rate 0     SYNC  req 0          % 0  3 Avg s-t 0
  ASYNC s-t(MIC) 0      Rate 0     ASYNC req 300691     % 0    Avg s-t 1386
                           ------------------------------------------------
                                                      4 amortized q-t 2467
                         5 Async   queued    115668     % 38   Avg q-t 6415
                         6 Sync    changed   0          % 0   <-incl in ASYNC
                         7 Delayed no-sch    106328     % 35
```

Figure 36. List Connection Activity (Option 4.S)

The information you can find from this panel is related to the system that made the connection and includes:

1 The total request count and the counts of SYNC and ASYNC requests for the interval. The SYNC and ASYNC requests are also presented as percentages of the total.

2 The service time (in microseconds) and rate per second for SYNC and ASYNC requests in the last cycle.

3 The average service time (in microseconds) for SYNC and ASYNC requests in the interval.

4 The average queue time (in microseconds) for ASYNC requests evaluated using total interval requests count (amortized). This time is not accounted for in the service time.

5 The count and percentage of ASYNC requests that have been queued in the interval.

6 The count and percentage of SYNC requests that have been changed to ASYNC in the interval.

7 The count and percentage of ASYNC requests delayed in the interval because no subchannel was available.

3.6.3 Serialized List Connection Activity (Option 4.S)

Figure 37 shows the panel displayed when you select a connection to a serialized list structure. It is similar to Figure 28 on page 41.

```
   Menu   Settings   Tutorial
 ------------------------------------------------------------------------------
CFLP0254            Connection Activity
Command ===>
  Cycle time 10  secs       Interval start 98.056 08:33 end 98.057 11:03:34
------------------------------------------------------------------------------
  Structure ISTGENERIC             Type S-LIST          CF CF02        0:35
-------------------------------------------------------------------------44

   Sysid  SC47      Asid  006B     Jobname   VTAM44     Status ACTIVE

                                1 Total req 3065    K
2 SYNC s-t(MIC) 0      Rate 0      SYNC  req 3060    K  % 99 3 Avg s-t 217
 ASYNC s-t(MIC) 0      Rate 0      ASYNC req 5178       % 0    Avg s-t 974
                          ------------------------------------------------
                                                    4 amortized q-t 2278
                           5 Async   queued    5811       % 112  Avg q-t 2030
                           6 Sync    changed   5222       % 0   <-incl in ASYNC
                           7 Delayed no-sch    5125       % 98
8 External req 3065   K    Req.  contention  0          % 0.0
```

Figure 37. Serialized List Structure Connection Activity (Option 4.S)

The information you can find from this panel is related to the system that made the connection and includes:

1 The total request count and the counts of SYNC and ASYNC requests for the interval. The SYNC and ASYNC requests are also presented as percentages of the total.

2 The service time (in microseconds) and rate per second for SYNC and ASYNC requests in the last cycle.

3 The average service time (in microseconds) for SYNC or ASYNC requests in the interval.

4 The average queue time (in microseconds) for ASYNC requests evaluated using total interval requests count (amortized). This time is not accounted for in the service time.

5 The count and percentage of ASYNC requests that have been queued in the interval.

6 The count and percentage of SYNC requests that have been changed to ASYNC in the interval.

7 The count and percentage of ASYNC requests delayed in the interval because no subchannel was available.

8 The total number of external requests to the structure in the interval and the count and percentage of these that have experienced contention.

3.6.4 Cache Connection Activity (Option 4.S)

Figure 38 shows the panel displayed when you select a connection to a cache structure. It is similar to Figure 31 on page 44.

```
   Menu   Settings   Tutorial
 ------------------------------------------------------------------------------
                  Structure Activity from System  SC61
Command ===>
  Cycle time 14  secs       Interval start 97.283 01:28 end 97.283 02:58:06
------------------------------------------------------------------------------
Structure      CICS_CACHE        CF CF02    Allocated at  97.274 18:08:32
------------------------------------------------------------------------------

   Sysid  SC61      Asid  000A     Jobname   SMSVSAM    Status ACTIVE

                                1 Total req 3202
2 SYNC s-t(MIC) 397     Rate 0     SYNC  req 3193       % 99 3 Avg s-t 241
 ASYNC s-t(MIC) 657     Rate 0     ASYNC req 9          % 0    Avg s-t 1417
                                                      4 amortized q-t 6748
                          ------------------------------------------------
                         5 Async   queued    13         % 144  Avg q-t 4671
                         6 Sync    changed   9          % 0   <-incl in ASYNC
                         7 Delayed no-sch    9          % 100 <-incl in ASYNC
```

Figure 38. Cache Structure Connection Activity (Option 4.S)

The information you can find from this panel is related to the system that made the connection and includes:

1 The total request count and the counts of SYNC and ASYNC requests for the interval. The SYNC and ASYNC requests are also presented as percentages of the total.

2 The service time (in microseconds) and rate per second for SYNC and ASYNC requests in the last cycle.

3 The average service time (in microseconds) for SYNC or ASYNC requests in the interval.

4 The average queue time (in microseconds) for ASYNC requests evaluated using total interval requests count (amortized). This time is not accounted for in the service time.

5 The count and percentage of ASYNC requests that have been queued in the interval.

6 The count and percentage of SYNC requests that have been changed to ASYNC in the interval.

7 The count and percentage of ASYNC requests delayed in the interval because no subchannel was available.

Chapter 4. CFMON Utilization Examples

The overall flow through the ISPF application is illustrated in Figure 11 on page 22 with different logical views of the information. This chapter uses some CFMON panels to present a practical approach to a real situation.

4.1 CF Analysis Example

For general monitoring of CFs, the logical approach is to view the summary information at the CF level (Option 1). Figure 39 shows the information displayed.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0011  CF Monitor - Coupling Facilities Activity Summary    Row 1 to 2 of 2
                                                                 num-sys 15
Command ===>                                                   System MASTER

                          CFRM policy  CFRM18     Activated at: 98.006 20:10:08
                                                  Updated   at: 98.006 20:09:20
Enter T on command line to display connected Systems
Select A for Allocated Structures  C for Connections
       F for CF activity           S for Systems activity

<----- last cycle  10  sec    --------   interval 005:28:46  secs 19726    --->
                     <---------- sync ----------> <---------- async ---------->

          bsy max stg  total req  interval  dly chg total req  interval  que nsc
            1                                                    2         3  4
  CFname  %  bsy  %              avg         %  %              avg          %  %
- ------- ------ --- b--m--k--- -r/t- -rate -- -- b--m--k--- -r/t- -rate -- --
_ CF01     5 10   34       4542   260     0 99  0    9985635  3857   202 44 35
_ CF02     6 55   53     997993   139    51  1  0   10068758  2703   189 42 33
```

Figure 39. CF Analysis Example - CFs Activity (Option 1)

In this case, the response time for ASYNC requests **2** is 3857 microseconds for CF01 and 2703 microseconds for CF02, even though the CP utilization of both CFs is similar, and both are low (5% and 6%). Notice also that the percentage of ASYNC requests queued **3** and queued for no subchannel **4** for are similar for both CF01 and CF02.

To see if there is any significant differences in the numbers at system level, Option 1.S is used and the panel is shown by Figure 40 on page 52.

```
  Menu   Settings   Tutorial
--------------------------------------------------------------------------------
CFLP0400                Systems  Activity  Summary          Row 1 to 15 of 15
                                                                  num-sys 15
Command ===>                                                   System MASTER

Enter S to select a System for Connections

CFname CF01     Busy %  5 ( 10 ) CP 6  Used space K: 154112    30 % CF lvl. 4
<----- last cycle  15  sec    --------   interval 042:02:01  secs 151321   --->
                     <---------- sync ----------> <---------- async ---------->
                                                                5         6  7
           total req  total req  interval  dly chg total req  interval  que nsc
  system     9990972       4580  avg      0  %  %    9986392  avg    495  %  %
- ------- b--m--k--- b--m--k--- -r/t- -rate -- -- b--m--k--- -r/t- -rate -- --
_ SC04        680517         37   339     0 99  2     680480  4195    29 46 43
_ SC42        235207         36   256     0 99  0     235171  3803    36 45 34
_ SC43        643337         35   280     0 99  2     643302  4243    30 46 33
_ SC47        271620         43   329     0 99  2     271577  2229    37 47 43
_ SC48        202806       3630   269     0 54  0     199176  2342    36 46 43
_ SC49        645224         35   334     0 99  0     645189  3852    30 43 32
_ SC50        188389         35   277     0 99  0     188354  3026    36 38 34
_ SC52        590917         38   280     0 99  0     590879  4180    29 40 33
_ SC53        226687         36   247     0 99  0     226651  3026    36 37 33
_ SC54        251095         35   264     0 99  0     251060  3935    37 45 33
_ SC55        401993         35   247     0 99  0     401958  3904    39 45 34
_ SC61        667210         91   268     0 99  0     667119  4168    30 48 33
_ SC62        784830        419   249     0 99  0     784411  4314    31 48 32
_ SC66        100891         39   270     0 99  0     100852  3310    29 40 33
_ SC67        960238          0     0     0 25  0     960213  1217     0 48 33
```

Figure 40. CF Analysis Example - Systems Activity (Option 1.S)

The ASYNC average response time is high for all system images as shown by **5**. The percantages of requests queued **6** is also high, and the majority of queueing is caused by no subchannel being available **7**.

For a detailed analysis of ASYNC requests response time, the CF activity Option 1.F is used, and the panel that is displayed is shown in Figure 41 on page 53.

```
   Menu   Settings   Tutorial
 ------------------------------------------------------------------------------
 CFLP05OO                Coupling Facility Activity         Row 22 to 44 of 60
                                                                  num-sys 15
 Command ===>                                                  System MASTER

 CFname CF01     Busy %  6 ( 12 ) CP 6  Used space K: 154112    30 % CF  lvl. 4
<----- last cycle  10  sec    --------   interval 005:28:46  secs   19726    -->

 Total req   9990 K  cycle rate  633     interval rate  202
                                    8                          9
 Sync        4542    % 0      avg srv-t(mic) 156       amortized q-t  2323
 Async       9985 K  % 99     avg srv-t(mic) 1231      amortized q-t  2626
 --- delayed requests -------- queue/delay time ---------------------------------

 Sync-dlay 13262     % 99     avg dly-t(mic) 104       <-- sync  req %
 Sync-chng 0         % 0                               <-- included in   async
 Asyn-qued 3529   K  % 43     avg que-t(mic) 6005      <-- async req %
 Qued-nsch 2840   K  % 35                               <-- async req %
================================================================================
Enter C on command line to see CHPID information
sysid    dev n status   total req  rate  path busy   %   pim pam  subchannels
-------- ----- -------- b--m--k--- ----- b--m--k--- ---  --- --- -gen use max-
                                   10                 11
SC49     FFFA  OPER        1288708    15     236422  18   C0  C0    4   4   4
SC49     FFFB  OPER        1521519    18     301289  20   C0  C0    4   4   4
SC50     FFF6  OPER        1266679    14      53052   4   C0  C0    4   4   4
SC50     FFF7  OPER        1245837     9      64459   5   C0  C0    4   4   4
SC50     FFFC  OPER        1287564    23      82476   6   C0  C0    4   4   4
SC50     FFFD  OPER        1418447    10     115680   8   C0  C0    4   4   4
SC52     FFF6  OPER        1007059     9      52659   5   C0  C0    4   4   4
SC52     FFF7  OPER        1032415    14      67966   7   C0  C0    4   4   4
SC52     FFFC  OPER        1136183    16      87836   8   C0  C0    4   4   4
SC52     FFFD  OPER        1261851     9     118362   9   C0  C0    4   4   4
SC53     FFF6  OPER        1306396    10      50394   4   C0  C0    4   4   4
SC53     FFF7  OPER        1253270    12      60609   5   C0  C0    4   4   4
SC53     FFFC  OPER        1254815    14      77248   6   C0  C0    4   4   4
SC53     FFFD  OPER        1396709    22     109685   8   C0  C0    4   4   4
SC54     FFEE  OPER        1255949    25     166113  13   C0  C0    4   4   4
SC54     FFEF  OPER        1327627     9     208565  16   C0  C0    4   4   4
SC54     FFFA  OPER        1471416     7     265404  18   C0  C0    4   4   4
SC54     FFFB  OPER        1814777    21     347374  19   C0  C0    4   4   4
SC55     FFEE  OPER        1300379     8     172807  13   C0  C0    4   4   4
SC55     FFEF  OPER        1361526    16     213719  16   C0  C0    4   4   4
SC55     FFFA  OPER        1491759    14     272285  18   C0  C0    4   4   4
SC55     FFFB  OPER        1843766    28     367278  20   C0  C0    4   4   4
```

Figure 41. CF Analysis Example - CF Activity (Option 1.F)

The information indicates that the ASYNC *service* time is 1231 microseconds **8** and that amortized queue time is 2626 microseconds **9**. Two-thirds of the *response* time for ASYNC requests is taken up in a queue.

In the same panel the scrollable area shows that the path busy percentage **11** is consistently in the teens for systems SC54 and SC55 (and some other systems when we scroll the display), while it is always below 10 for the other systems. It is the high incidence of path busy conditions that causes the redrive and queueing of the ASYNC requests, which in turn leads to subchannel busy conditions.

In our example, systems SC54, SC55 and the other six systems showing high path busy percentages are in LPARs in the same CPC, while the seven systems

with low path busy percentages are divided between two other CPCs (three on one, four on the other).

The reason for CF links contention is that EMIF is being used to share CF links among OS/390 images, but it turns out that the number of physical CF links available are not enough to sustain the ASYNC request rate **10** from 8 systems in a single CPC.

4.2 Lock Structure Analysis Example

The information contained in the CF activity panel (Option 1) can also be the starting point for an overall view of SYNC requests behavior. See Figure 42.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP0011  CF Monitor - Coupling Facilities Activity Summary    Row 1 to 2 of 2
                                                                    num-sys 15
Command ===>                                                   System MASTER

                          CFRM policy  CFRM18     Activated at: 98.006 20:10:08
                                                  Updated   at: 98.006 20:09:20
Enter T on command line to display connected Systems
Select A for Allocated Structures  C for Connections
       F for CF activity           S for Systems activity

<----- last cycle  10  sec    --------   interval 005:28:46  secs 19726    --->
                     <---------- sync ----------> <---------- async ---------->

         bsy max stg  total req  interval  dly chg total req  interval  que nsc
                                    1       2
  CFname  %  bsy  %              avg         %  %             avg         %  %
- ------- ------ --- b--m--k--- -r/t- -rate -- -- b--m--k--- -r/t- -rate -- --
_ CF01     5 10   34       4542   260      0 99  0    9985635  3857   202 44 35
_ CF02     6 55   53     997993   139     51  1  0   10068758  2703   189 42 33
```

Figure 42. Lock Structure Analysis Example - CFs Activity (Option 1)

In our case, the GRS structure (ISGLOCK) is allocated in CF02. This CF has an overall SYNC request response time of 139 microseconds **1**, a request rate of 51 and 1% of SYNC immediate requests delay **2**. These numbers relate to all SYNC requests to CF02 - ISGLOCK is not the only lock structure in the CF.

To see the ISGLOCK connections behavior, Option C and the command **V ISGLOCK** is used. Figure 43 on page 55 shows the panel with monitor interval data.

```
  Menu   Settings   Tutorial
------------------------------------------------------------------------------
CFLP025Y             CF Monitor - Connections Display       Row 1 to 15 of 15
Command ===>                                                  num-sys 15
  Interval start 98.058 18:16 end  98.061 17:31:11            System MASTER__
  Interval length   071:12:55 secs          256375 <- last cycle  10 secs ->
  Enter V structure-name on command line to view a structure, R to reset
  Enter C on command line to see connection name and stats for last cycle
                 type              stat total req <- sync interval async -> cf
                                                    1
  structure-name   ‘ cf-name sysid    ‘    3179994    51   avg      0   avg  lv
- ---------------- - ---------------- - b--m--k--- -rate  -s/t- -rate  -r/t- --
_ ISGLOCK          K CF02    SC61     A    1368704     5    125      0      0  0
_ ISGLOCK          K CF02    SC47     A     479380     4    143      0      0  0
_ ISGLOCK          K CF02    SC55     A     223027    10    132      0      0  0
_ ISGLOCK          K CF02    SC42     A     209809     1    131      0      0  0
_ ISGLOCK          K CF02    SC67     A     204937     8    124      0      0  0
_ ISGLOCK          K CF02    SC62     A     179870     6    133      0      0  0
_ ISGLOCK          K CF02    SC52     A     118374     0    152      0      0  0
_ ISGLOCK          K CF02    SC48     A      73686     4    167      0      0  0
_ ISGLOCK          K CF02    SC54     A      63579     0    145      0      0  0
_ ISGLOCK          K CF02    SC53     A      61165    11    171      0      0  0
_ ISGLOCK          K CF02    SC49     A      58257     0    148      0      0  0
_ ISGLOCK          K CF02    SC43     A      56805     0    145      0      0  0
_ ISGLOCK          K CF02    SC50     A      56736     0    173      0      0  0
_ ISGLOCK          K CF02    SC66     A      19049     2    137      0      0  0
_ ISGLOCK          K CF02    SC04     A       6616     0    147      0      0  0
```

Figure 43. Lock Structure Analysis Example - Connections Activity (Option 4)

The ISGLOCK connection service time **1** is in the range of 120 - 170 microseconds, which, for a CF model C01, is acceptable. The next step is to look at how effective is the size and the utilization of the storage allocated to the ISGLOCK structure.

For this analysis we use allocated structures (Option 3), and then selection (S) on the ISGLOCK structure. Figure 44 on page 56 shows the panel.

```
  Menu   Settings   Tutorial
--------------------------------------------------------------------------------
CFLP0220            Structure Display - SYSID  SC55          Row 1 to 15 of 15
Command ===>

Structure      ISGLOCK          CF CF02     Allocated at  98.054 13:49:21
         1                          2            3                4
Size,K 10240   Type LOCK   Entries 1048576   In use 2762      Highest 2922
Preference list CF02             CF01
Exclusion  list
Disposition     DELETE  Max connections  32    Access time  0
- ---------------- ------- ----- ---------- -------- -------- ---- -------- ---
                   5   6
                  Cont F  Cycle  Interval
S Connection name   %   %  Rate   Tot reqs  Sysname  Jobname  ASID Status   CFL
                                  b--m--k---
_ ISGLOCK#SC47     0.9 0.2     4     258210 SC47     GRS      0007 ACTIVE    0
_ ISGLOCK#SC52     5.0 1.3     0      53312 SC52     GRS      0007 ACTIVE    0
_ ISGLOCK#SC55     2.1 0.5    10      68701 SC55     GRS      0007 ACTIVE    0
_ ISGLOCK#SC53     9.4 1.8    11      24012 SC53     GRS      0007 ACTIVE    0
_ ISGLOCK#SC43    10.0 1.7     0      17745 SC43     GRS      0007 ACTIVE    0
_ ISGLOCK#SC49     0.6 0.0     0     451481 SC49     GRS      0007 ACTIVE    0
_ ISGLOCK#SC61     1.7 0.4     5     114469 SC61     GRS      0007 ACTIVE    0
_ ISGLOCK#SC62     3.2 0.6     6      64365 SC62     GRS      0007 ACTIVE    0
_ ISGLOCK#SC04    13.2 2.5     0      19295 SC04     GRS      0007 ACTIVE    0
_ ISGLOCK#SC48    12.6 3.9     4      18725 SC48     GRS      0007 ACTIVE    0
_ ISGLOCK#SC50    10.7 2.8     0      18334 SC50     GRS      0007 ACTIVE    0
_ ISGLOCK#SC42     4.5 1.0     1        203 SC42     GRS      0007 ACTIVE    0
_ ISGLOCK#SC54    11.1 2.4     0      19855 SC54     GRS      0007 ACTIVE    0
_ ISGLOCK#SC66     1.7 0.4     2        482 SC66     GRS      0007 ACTIVE    0
_ ISGLOCK#SC67     2.6 0.3     8        380 SC67     GRS      0007 ACTIVE    0
```

Figure 44. Lock Structure Analysis Example - Lock Structure (Option 3.S)

For some systems (SC43, SC04, SC48, SC50, SC54) the lock contention percentage **5** is above 10%; this is application-dependent and CF tuning will not help. An RMF ENQ report could be used to identify resources with high ENQ activity, which you may be able to avoid at the application level.

However, the false contention percentage **6** for some systems (SC53, SC43, SC04, SC48, SC50, SC54) ranges between 1.5 and 3.9%. This level of false contention percentage is high (below 1% is recommended) and indicates that the space allocated to the structure may be too small. Given that our Parallel Sysplex includes fifteen systems, 10• resources may well be insufficient.

For lock structures, the entries in use count **3** and **4** can be highly misleading as they reflect only the number of entries in use at a particular *point in time*. The numbers reported by the system (2762 entries in use **3** out of over a million allocated **2**) would suggest that the allocated space is sufficient, but the false contention tells us that this is not the case.

False contention could be reduced by allocating more storage to the structure. The current allocation is 10MB **1**. Entries in ISGLOCK are 8 bytes each, and the number allocated is a power of 2, so in our case, the size of ISGLOCK should be increased to 17MB, to allow 16MB for the entries, with 1MB for additional control space in the structure.

Appendix A. Monitor Utilization Quick Reference

In summary, different logical views of CF information are possible depending on what you want to monitor. You can view the data at the CF level, the system level, or the structure level. Whichever view you start with, you can select individual items for more detailed analysis, until you get down to the level of the connection between a specific system and a specific CF structure.

A quick reference to CFMON monitor utilization hints is provided in Table 6.

Table 6 (Page 1 of 2). CFMON Utilization Hints

Scope	CFMON facility	Reference
Monitor installation		2.2, “Installation” on page 9
Monitor execution		2.4, “Monitor Execution” on page 11
Monitor control		2.6, “Monitor Control” on page 14
Monitor customization	Threshold exception values	2.3, “Monitor customization” on page 10
Sysplex-wide monitoring	F stcname,MASTER	2.6, “Monitor Control” on page 14
CF storage and CP utilization	ISPF option **1**, **1**.**F**	Figure 15 on page 27, Figure 17 on page 29
Overall CF activity: SYNC, ASYNC, queued/delayed, queue/delay/response time	ISPF option **1**, **1**.**F**	Figure 15 on page 27, Figure 17 on page 29
Subchannels activity	ISPF option **1**.**F**	Figure 17 on page 29
Overall structures storage utilization	ISPF options **1**.**A**, **3**	Figure 22 on page 35, Figure 24 on page 37
Lock structure storage utilization: lock-entries, record-elements allocated and used	ISPF options **1**.**A**.**S**, **3**.**S**	Figure 25 on page 38
Serialized List structure storage utilization: entries, elements, lock-entries allocated and used	ISPF options **1**.**A**.**S**, **3**.**S**	Figure 27 on page 40
Cache structure storage utilization: directory-entries, elements allocated and used	ISPF options **1**.**A**.**S**, **3**.**S**	Figure 30 on page 43
Sysplex connections activity	ISPF options **4**	Figure 32 on page 45
CF connections activity	ISPF options **1**.**C**	Figure 21 on page 34
One system connections activity	ISPF options **4** and over-type sysname with sysid	Figure 34 on page 47
One structure connections activity	ISPF options **4** and command **V** structure-name	Figure 33 on page 46
One structure connections activity	ISPF options **1**.**A**.**S**	Figure 27 on page 40, Figure 30 on page 43
Lock structure activity	ISPF options **3**.**S**	Figure 25 on page 38
Lock structure real and false contention	ISPF options **3**.**S**, **4**.**S**	Figure 25 on page 38, Figure 35 on page 47
Lock structure connection activity	ISPF options **3**.**S**.**S**, **4**.**S**	Figure 26 on page 39, Figure 35 on page 47
Serialized List structure activity	ISPF options **3**.**S**	Figure 27 on page 40
Serialized List structure connection activity	ISPF options **3**.**S**.**S**, **4**.**S**	Figure 28 on page 41, Figure 37 on page 49

Table 6 (Page 2 of 2). CFMON Utilization Hints		
Scope	**CFMON facility**	**Reference**
List structure connection activity	ISPF options **3**.**S**.**S**, **4**.**S**	Figure 29 on page 42, Figure 36 on page 48
Cache structure activity	ISPF options **3**.**S**	Figure 30 on page 43
Cache structure connection activity	ISPF options **3**.**S**.**S**, **4**.**S**	Figure 31 on page 44, Figure 38 on page 50

Appendix B. CFMON Print Output Samples

Printed output from CFMON is substantially the same as what is displayed on the screen. The command line is not printed, and in most cases we omit text describing which commands are available from the screen. An exception to this is the main menu, as illustrated in Figure 45.

```
--------------------------------------------------------------------------------
CFLP0000                CF Monitor - Option Menu           Version    1.1.0
  Select one of the following options:
      1 - Coupling  Facilities
      2 - Defined   Structures
      3 - Allocated Structures
      4 - Connections
--------------------------------------------------------------------------------
      Current time        98.063   13:27      Elapsed    secs    12563
      Monitor start time  98.063   09:57      CPU time   secs    122
      Monitor cycle time  10   secs           Monitor    status  MASTER
                                              Monitored  systems 15

      Sysplex id          WTSCPLX1            HRDW  name         SCZP401
      SYSID               SC52                LPAR  name         A1
      System              SP6.0.4             CPU model          9672
      CFs                 2                   Structures         50

      CF monitor 1.1.0  - Compiled at 03/04/98
********************************* End of data *********************************
```

Figure 45. Printed Main Menu

The list of defined structures illustrated in Figure 46 on page 60 would clearly require repeated scrolling to enable the standard ISPF print facility to process this many structures.

```
--------------------------------------------------------------------------------
CFLPO2OO            CF Monitor  - Defined Structures
SYSID SC52               CFRM Policy  CFRM18     Activated at: 98.006 20:10:08
                                                  Updated   at: 98.006 20:09:20
- ---------------- -------- ---------- b--m--k--- ------------ ----- ------ ---
S Structure name   CF name  Status      Total req TOD alloc    Type  Size-K RB%
_ CACHECIC                  NOT_ALLOC
_ CACHECICS                 NOT_ALLOC
_ CICS_CACHE                NOT_ALLOC
_ DFHXQLS_TSQSPQA1          NOT_ALLOC
_ DSNDSGA_GBPO              NOT_ALLOC
_ DSNDSGA_GBP1              NOT_ALLOC
_ DSNDSGA_LOCK1    CFO1     ALLOCATED           0 98.056 23:51 LOCK   16128   5
_ DSNDSGA_SCA      CFO1     ALLOCATED           0 98.056 23:51 LIST    4096   5
_ DSNDSGB_GBPO              NOT_ALLOC
_ DSNDSGB_GBP1              NOT_ALLOC
_ DSNDSGB_LOCK1             NOT_ALLOC
_ DSNDSGB_SCA               NOT_ALLOC
_ DSNDSGC_GBPO     CFO1     ALLOCATED           0 97.339 17:12 CACHE   1024  60
_ DSNDSGC_LOCK1    CFO2     ALLOCATED       25942 97.329 18:36 LOCK  100096  10
_ DSNDSGC_SCA      CFO2     ALLOCATED       25944 97.329 18:36 LIST   20224  10
_ DSNHGHG_GBPO     CFO1     ALLOCATED           0 97.352 22:43 CACHE   8192   5
_ DSNHGHG_GBP1              NOT_ALLOC
_ DSNHGHG_GBP2              NOT_ALLOC
_ DSNHGHG_GBP3     CFO1     ALLOCATED           0 97.352 22:56 CACHE  16128   5
_ DSNHGHG_GBP32K   CFO1     ALLOCATED           0 97.352 22:56 CACHE  40192   5
_ DSNHGHG_LOCK1    CFO1     ALLOCATED           0 97.329 20:19 LOCK   48128   5
_ DSNHGHG_SCA      CFO2     ALLOCATED           0 97.329 20:19 LIST   64000   5
_ FULL_STRA                 NOT_ALLOC
_ HSM14_CACHE               NOT_ALLOC
_ IEFAUTOS         CFO1     ALLOCATED        1518 98.043 14:44 LIST     768  20
_ IGWLOCKOO        CFO2     ALLOCATED      272044 97.329 18:36 LOCK   14336  75
_ IRLMT1                    NOT_ALLOC
_ IRRXCFOO_BOO1             NOT_ALLOC
_ IRRXCFOO_POO1             NOT_ALLOC
_ ISGLOCK          CFO2     ALLOCATED      283106 98.054 13:49 LOCK   10240   1
_ ISTGENERIC       CFO2     ALLOCATED       94344 98.006 20:10 LIST    8192
_ ISTMNPS          CFO2     ALLOCATED         181 97.329 18:22 LIST    1024  30
_ IXC_DEFAULT_1    CFO2     ALLOCATED     5850132 98.043 14:41 LIST   16128
_ IXC_DEFAULT_2    CFO1     ALLOCATED     5828189 98.043 14:40 LIST   16128
_ IXC_DFLT16K_1             NOT_ALLOC
_ IXC_DFLT16K_2             NOT_ALLOC
_ JES2CKPT_1       CFO2     ALLOCATED           0 98.049 19:54 LIST    4096
_ JES2CKPT_2       CFO1     ALLOCATED           0 98.049 19:53 LIST    4096
_ LOG_DFHLOG_PO1   CFO2     ALLOCATED        7490 98.057 14:10 LIST    9728   1
_ LOG_DFHSHUNT_PO1 CFO1     ALLOCATED          14 98.057 14:11 LIST    1280   1
_ LOG_USERBWFP_PO1          NOT_ALLOC
_ MVSLOGEMHQO1              NOT_ALLOC
_ MVSLOGMSGQO1              NOT_ALLOC
_ RRS_LOG1                  NOT_ALLOC
_ STREMHQOOFLW              NOT_ALLOC
_ STREMHQO1                 NOT_ALLOC
_ STRMSGQOOFLW              NOT_ALLOC
_ STRMSGQO1                 NOT_ALLOC
_ SYSTEM_LOGREC    CFO1     ALLOCATED         822 98.026 20:35 LIST   16128
_ SYSTEM_OPERLOG   CFO2     ALLOCATED       18837 98.043 14:45 LIST   16128
********************************** End of data ***********************************
```

Figure 46. Printed Defined Structures List

If we were keeping a hardcopy record of a real investigation into the behavior of the ISTGENERIC structure, our next print request might produce the output shown in Figure 47 on page 61.

```
--------------------------------------------------------------------------------
CFLP0232            Structure Display - SYSID SC52
Structure       ISTGENERIC             CF CF02     Allocated at 98.006 20:10:35
Size,K   8192                Entries  44301    In use 46       Highest 46
CF   %   1                   Elements 883      In use 19       Highest 19
Type Serialized List         Lock-ent 4        In use 0        Highest 0
Preference List CF02  CF01
Exclusion  List
Disposition DELETE         Max Connections 32      Access Time 1800
--- ---------------- ----------- ---------- -------  -------- ---- -------- ---
                    ---Cycle---  Interval
Sel Connection name  Sync  Async  Tot Reqs  Sysname  Jobname  ASID Status   CFL
                                  b--m--k---
 _  USIBMSC_SC47M        0     0      36972 SC47     VTAM44   006B ACTIVE    4
 _  USIBMSC_SC52M        0     0         14 SC52     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC53M       11     0      26399 SC53     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC54M        0     0          4 SC54     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC42M        0     0         18 SC42     VTAM44   0024 ACTIVE    4
 _  USIBMSC_SC55M        0     0      31220 SC55     VTAM44   0067 ACTIVE    4
 _  USIBMSC_SC61M        0     0          4 SC61     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC49M        0     0         79 SC49     VTAM44   001D ACTIVE    4
 _  USIBMSC_SC62M        0     0        144 SC62     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC48M        0     0         88 SC48     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC50M        0     0          4 SC50     VTAM44   001B ACTIVE    4
 _  USIBMSC_SC43M        0     0         48 SC43     VTAM44   001B ACTIVE    4
 _  USIBMSC_SC67M        0     0          6 SC67     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC04M        0     0         16 SC04     VTAM44   001A ACTIVE    4
 _  USIBMSC_SC66M        0     0          4 SC66     VTAM44   001A ACTIVE    4
******************************** End of data ********************************
```

Figure 47. Printed Structures Display - ISTGENERIC

We might follow this with a hardcopy record of the activity on each connection of the ISTGENERIC structure, with a series of outputs like that shown in Figure 48.

```
--------------------------------------------------------------------------------
CFLP0236           Structure Activity from System SC47
   Cycle Time 10  secs      Interval start 98.063 09:57   End 98.063 14:51:23
--------------------------------------------------------------------------------
Structure      ISTGENERIC       CF CF02          Allocated at 98.006 20:10:35
Size-K 8192              Entries  44301    In use 46       Highest 46
CF   %  1                Elements 883      In use 19       Highest 19
Type Serialized LIST     Lock-ent 4        In use 0        Highest 0
Disposition     DELETE   Max connections   32     Access time 1800
================================================================================

  SYSID SC47      ASID 006B     Jobname VTAM44     Status ACTIVE
<----------  Last cycle --------> <---  Interval 004:53:47   secs 17627    --->
                                   Total req    48718
 Sync/s-t(MIC)        0 Rate     0 Sync  req        4  %  0 Avg s-t      169
Async/s-t(MIC)        0 Rate     0 Async req    48714  % 99 Avg s-t     1094
                           ------------------------------------------------
                                                    Amortized q-t        5
                           Async   queued          86  %  0 Avg q-t     2832
                           Sync    changed          0  %  0<- Incl in Async
                           Delayed no-sch          84  %  0
External req 48718         Req.  contention         0  %  0.0
******************************** End of data ********************************
```

Figure 48. Printed Structure Activity from SC47

Appendix C. Special Notices

This publication in conjunction with the CFMON online monitor is intended to help systems programmers and performance specialists to more fully understand the performance characteristics of coupling facilities within a Parallel Sysplex. The information in this publication is not intended as the specification of any programming interfaces that are provided by OS/390 Version 2 Release 4. See the PUBLICATIONS section of the IBM Programming Announcement for OS/390 Version 2 Release 4 for more information about what publications are considered to be product documentation.

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Appendix D. Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this redbook.

D.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see “How to Get ITSO Redbooks” on page 67.

- *OS/390 MVS Parallel Sysplex Configuration,Volume 1: Overview*, SG24-2075
- *OS/390 MVS Parallel Sysplex Configuration,Volume 2: Cookbook*, SG24-2076
- *OS/390 MVS Parallel Sysplex Configuration,Volume 3: Connectivity*, SG24-2077
- *S/390 MVS Parallel Sysplex Performance*, SG24-4356
- *OS/390 MVS Parallel Sysplex Capacity Planning*, SG24-4680

D.2 Redbooks on CD-ROMs

Redbooks are also available on CD-ROMs. **Order a subscription** and receive updates 2-4 times a year at significant savings.

CD-ROM Title	Subscription Number	Collection Kit Number
System/390 Redbooks Collection	SBOF-7201	SK2T-2177
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Transaction Processing and Data Management Redbook	SBOF-7240	SK2T-8038
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RS/6000 Redbooks Collection (PostScript)	SBOF-7205	SK2T-8041
RS/6000 Redbooks Collection (PDF Format)	SBOF-8700	SK2T-8043
Application Development Redbooks Collection	SBOF-7290	SK2T-8037

D.3 Other Publications

These publications are also relevant as further information sources:

- *OS/390 MVS Programming - Sysplex Services Guide*, GC28-1771
- *OS/390 MVS Programming - Sysplex Services Reference*, GC28-1772
- *OS/390 Parallel Sysplex Overview: Introducing Data Sharing and Parallelism in a Sysplex*, GC28-1860

How to Get ITSO Redbooks

This section explains how both customers and IBM employees can find out about ITSO redbooks, CD-ROMs, workshops, and residencies. A form for ordering books and CD-ROMs is also provided.

This information was current at the time of publication, but is continually subject to change. The latest information may be found at http://www.redbooks.ibm.com/.

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- **PUBORDER** — to order hardcopies in United States
- **GOPHER link to the Internet** - type GOPHER.WTSCPOK.ITSO.IBM.COM
- **Tools disks**

  To get LIST3820s of redbooks, type one of the following commands:

  ```
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  TOOLS SENDTO CANVM2 TOOLS REDPRINT GET SG24xxxx PACKAGE (Canadian users only)
  ```

  To get BookManager BOOKs of redbooks, type the following command:

  ```
  TOOLCAT REDBOOKS
  ```

  To get lists of redbooks, type the following command:

  ```
  TOOLS SENDTO USDIST MKTTOOLS MKTTOOLS GET ITSOCAT TXT
  ```

  To register for information on workshops, residencies, and redbooks, type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ITSOREGI 1998
  ```

  For a list of product area specialists in the ITSO: type the following command:

  ```
  TOOLS SENDTO WTSCPOK TOOLS ZDISK GET ORGCARD PACKAGE
  ```

- **Redbooks Web Site on the World Wide Web**

  http://w3.itso.ibm.com/redbooks/

- **IBM Direct Publications Catalog on the World Wide Web**

  http://www.elink.ibmlink.ibm.com/pbl/pbl

  IBM employees may obtain LIST3820s of redbooks from this page.

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  Index # 4421 Abstracts of new redbooks
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Redpieces

For information so current it is still in the process of being written, look at "Redpieces" on the Redbooks Web Site (http://www.redbooks.ibm.com/redpieces.html). Redpieces are redbooks in progress; not all redbooks become redpieces, and sometimes just a few chapters will be published this way. The intent is to get the information out much quicker than the formal publishing process allows.

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ITSO Redbook Evaluation

Parallel Sysplex Coupling Facility Online Monitor Installation and User's Guide
SG24-5153-00

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