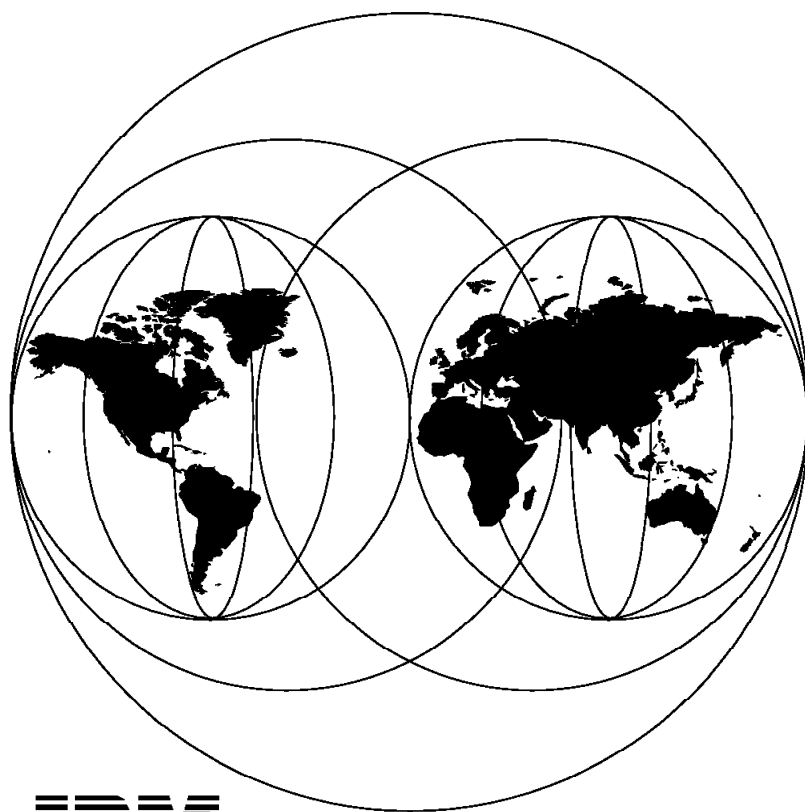


CICS and VSAM Record Level Sharing: Recovery Considerations

June 1997



IBM

**International Technical Support Organization
San Jose Center**



International Technical Support Organization

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**CICS and VSAM Record Level Sharing:
Recovery Considerations**

June 1997

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix A, "Special Notices" on page 229.

First Edition (June 1997)

This edition applies to Version 1, Release 1, of CICS Transaction Server for OS/390, Program Number 5655-147.

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Preface

This redbook will help you design and maintain your high-availability transaction processing environment. It will also help you prevent failures and perform a speedy recovery in an emergency situation. The redbook explores possible causes of failures and recovery considerations in a VSAM record level sharing (RLS) environment with CICS Transaction Server for OS/390 Version 1 Release 1 (CICS TS) and DFSMS/MVS Version 1 Release 3 running on a Parallel Sysplex. RLS is designed to allow VSAM data to be shared, with full update integrity, among many applications running in one or more MVS images in a Parallel Sysplex.

The CICS TS shared temporary storage server also uses Parallel Sysplex facilities, thus allowing sharing of CICS temporary storage. Failure and recovery considerations for this service are also covered in this redbook.

The book contains examples of and recommendations for the following major failure events:

- Loss of VSAM access
- MVS system logger failures
- CICS abnormal termination and communication failures
- Shared temporary storage server failures

You should read this book after familiarizing yourself with the planning steps required to implement CICS and VSAM RLS. The best sources of information are the product manuals and the following redbooks, which are companions to this redbook:

- *CICS and VSAM Record Level Sharing: Planning Guide*
- *CICS and VSAM Record Level Sharing: Implementation Guide*

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 San Jose Center.

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Chapter 1. Failures, Recovery, and Availability

In today's competitive environment many companies require highly available, highly reliable, computer-based systems to support their business. Systems must be available on demand, no matter what time of the day or day of the week. In this book we discuss recovery and availability considerations for a specific environment: VSAM record level sharing (RLS) with CICS Transaction Server for OS/390, Version 1 Release 1 (CICS TS) and DFSMS/MVS Version 1 Release 3 (DFSMS/MVS 1.3). This book builds on the ideas presented in *Planning for CICS Continuous Availability in an MVS/ESA Environment*.

Before discussing specific recovery and availability considerations for VSAM RLS, CICS TS, and DFSMS/MVS 1.3, let us review the obstacles that prevent us from achieving total availability and see how a Parallel Sysplex environment with CICS TS, DFSMS/MVS 1.3, and VSAM RLS overcomes some of those obstacles.

1.1 What Makes Systems Unavailable?

In this section we discuss changing your system, errors, overstressed systems, single points of availability, and restart times. Most causes of unavailability can be placed in one of these categories. We are interested in both unplanned and planned unavailability.

1.1.1 Changing Your System

Changes occur as new applications are written, existing applications are rewritten, new software is installed to introduce new features to the system, or new hardware is installed to provide increased capacity or reduce costs. Change is inevitable, but change can cause your system to be unavailable. Change can require a period of planned unavailability so that you can change the definition of part of the system, for example. It can also cause a period of unplanned unavailability if the change has an unexpected effect or introduces an error to the system.

1.1.2 Errors

Errors are usually associated with unplanned unavailability, but a noncatastrophic error may require a period of planned unavailability. Nearly all errors are caused by humans and are typically:

- Programming errors
- Operational errors (making an incorrect decision)
- Procedural errors (failing to follow a procedure correctly)

1.1.3 Overstressed Systems

Overstressed systems are more likely to fail than unstressed systems. Consider one example of stress: a CICS region that is short-on-storage (SOS). One of the first actions that CICS takes is to stop accepting new tasks in the SOS region (so incoming tasks either have to queue or be routed to other regions). Typically one or more tasks completes processing and releases storage, the SOS condition is resolved, and activities return to normal. It is, however, quite possible that all of the tasks in the system require *more* storage to complete their processing. Because the region is SOS, we cannot give the tasks this storage, and the region stalls. Tasks that would have run without a problem

cannot complete because the region is overstressed, and eventually the region or application becomes unavailable.

1.1.4 Single Point of Unavailability

A single point of unavailability is often called a *single point of failure*. This terminology reflects cases of unplanned system outages. We need to consider the planned unavailability case too. The failure of a critical component, the removing of a critical component for planned maintenance, the requirement for two processes to have exclusive access to a resource at the same time (for example, database reorganization) can cause unavailability. Typically we can avoid these causes of unavailability by duplicating system components, removing the requirement for exclusive access, or at least shortening the time for which exclusive control is required.

1.1.5 Extended Restart

The unavailability of a system worsens if it takes a long time to restart. Although extended restart is not a cause of unavailability, it is something that you must take into account when planning how to improve the availability of your system and achieve continuous availability.

1.2 How Does a Parallel Sysplex Environment Help?

A Parallel Sysplex environment enables you to build a system in which nearly every component can be either duplicated, or automatically rebuilt by MVS if it fails. The latest levels of software, used in a Parallel Sysplex environment, offer you great flexibility to make nondisruptive changes to the system.

In this section we explain how the Parallel Sysplex environment and associated software meet the challenges discussed in 1.1, “What Makes Systems Unavailable?” on page 1.

1.2.1 Managing Changes to Your System

Change is inevitable. There are two aspects to change: testing in advance to ensure that the changes you make have the effect you expect, and managing the process of implementing the change. We do not discuss testing in this book; refer to *Planning for CICS Continuous Availability in an MVS/ESA Environment* for more information.

Managing change requires good change management techniques. The most important considerations for continuous availability are:

- Using facilities such as CICS resource definition online (RDO) to make dynamic changes to the system. CICS TS introduces RDO for transient data queues and autoinstall of log stream definitions.
- Designing your system so that you can remove components to make changes without stopping the service completely. The introduction of the SMSVSAM server address space in DFSMS/MVS 1.3 for RLS mode access to VSAM data sets can eliminate the need for a CICS file-owning region (FOR). In a Parallel Sysplex environment with more than one MVS image, you can make nondisruptive changes when previously you would have had to stop the FOR to make a change.
- Always having a backout or fallback plan

1.2.2 Avoiding Errors

You can reduce programming errors, operational errors, and procedural errors by developing a maintenance strategy, performing thorough testing, having correct procedures in place, and automating procedures and operations. These concepts are discussed in detail in *Planning for CICS Continuous Availability in an MVS/ESA Environment*.

1.2.2.1 Procedures

Your procedures (for example, how to stop a CICS region) must be well documented. They should be the definitive source of operational knowledge in your organization. They should detail the *correct* way to perform a process and be based on the collective knowledge and experience in your organization. A good set of procedures can improve availability by reducing human error and giving all your operators access to the knowledge they need to do their jobs well.

If you do not have well-documented procedures for a task, you are likely to encounter errors as your operators try to perform tasks in “seat of the pants” mode.

1.2.2.2 Automation

Automating repetitive operations and procedures uses tested techniques to ensure that the same (and correct) action is taken when required, thereby reducing the possibility of unavailability caused by operator error.

Your operators issue commands and receive messages to communicate with and control operating systems, subsystems, and the network. Each of these systems, subsystems, and networks has its own command language syntax and message formats. Your operators have to keep in mind many different commands and messages. Sometimes they even have to enter a complex series of commands and replies to messages to resolve a problem or carry out a task. The more complex the sequence of commands and replies, the greater the possibility of making a mistake.

Automation helps in two ways if your operators have to recover an online application system in a production environment. First it can eliminate the operators completely or reduce the complexity of the action they have to take. To recover an online application system, operators often have to make an immediate decision on a complex problem, which increases the possibility of making a mistake. Second automation reduces delays in the detection of problems. Delays cause a reduction in the quality of service that your end users experience. Automation can help by speeding up the detection of the problem and reducing the complexity of the decisions your operators must make.

Both CICS TS and the SMSVSAM server address space support the automatic restart manager (ARM) function of MVS/ESA 5.2 and OS/390. SMSVSAM provides its own restart capability. It does not use ARM. CICSplex System Manager for MVS/ESA (CICSplex SM) is included with CICS TS. This product enhances the ability to automate responses to events occurring within CICS. See *Automating CICS/ESA Operations with CICSplex SM and NetView* for more information.

1.2.3 Removing Stress Points

One of the most important factors for achieving continuous availability is planning for the future. Such planning ensures that your system can cope with expected usage by helping you determine whether your existing I/O subsystem has enough capacity to deal with expected usage in six months' time or whether you may experience virtual storage constraint. To plan how you will change the system to remove these constraints, or stress points, you have to ask yourself these and many other questions:

- Can the hardware handle the expected increase in activity?
- Will there be enough disk space for paging, data base growth, and so on?
- What is the impact of workload increase on virtual storage requirements?
- What is the impact of workload increase on real storage requirements?

Plan for all foreseeable situations.

1.2.4 Removing Single Points of Unavailability

Unavailability can be caused by the failure of a critical component or by the requirement for two processes to have exclusive access to a resource at the same time (for example, database reorganization). In this section we explain how VSAM RLS removes an FOR as a single point of unavailability and reduces the requirement for exclusive access to VSAM data sets.

1.2.4.1 Duplication and Change Management

Say you wanted to upgrade the FOR in the system shown in Figure 1 on page 5. Because you have only a single FOR, you cannot make any changes that require stopping the FOR (for example, applying a program temporary fix (PTF) to CICS) without making the system unavailable.

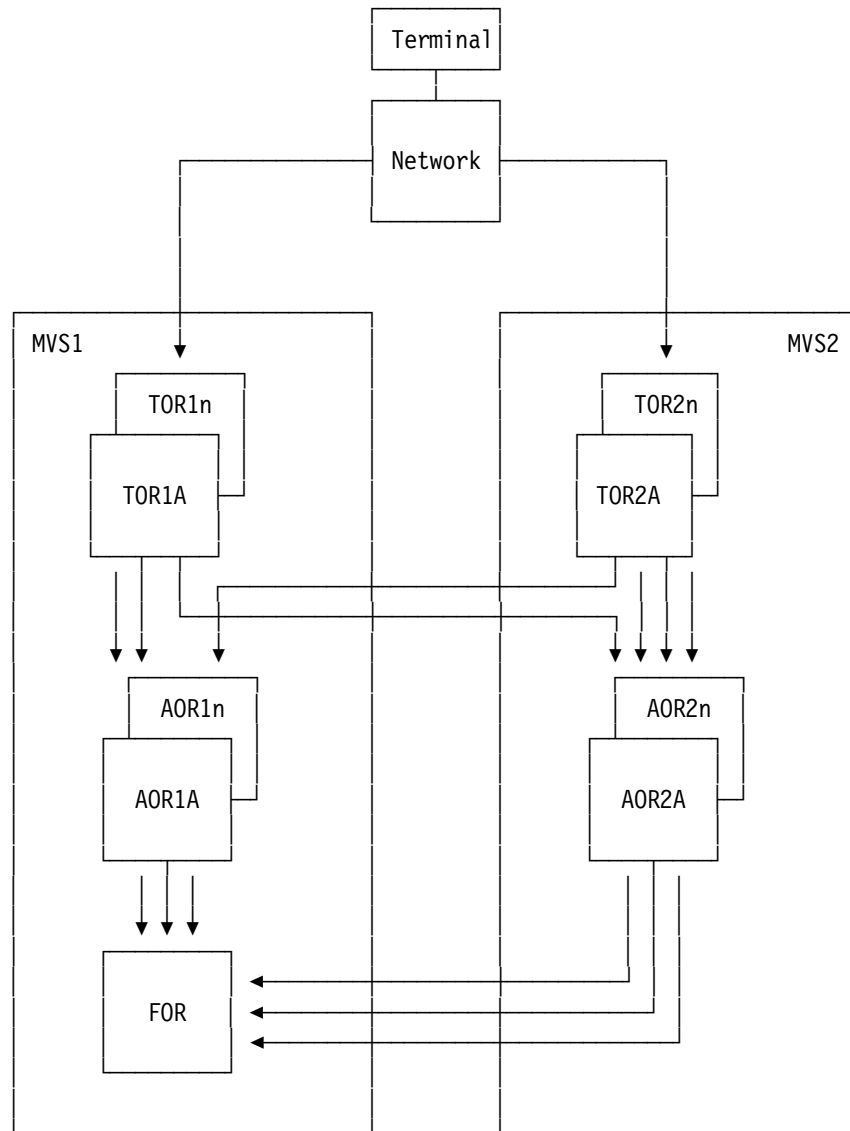


Figure 1. Parallel Sysplex with Single FOR

The Parallel Sysplex with SMSVSAM servers (Figure 2 on page 6) enables you to make changes that require stopping one SMSVSAM server without making the whole system unavailable.

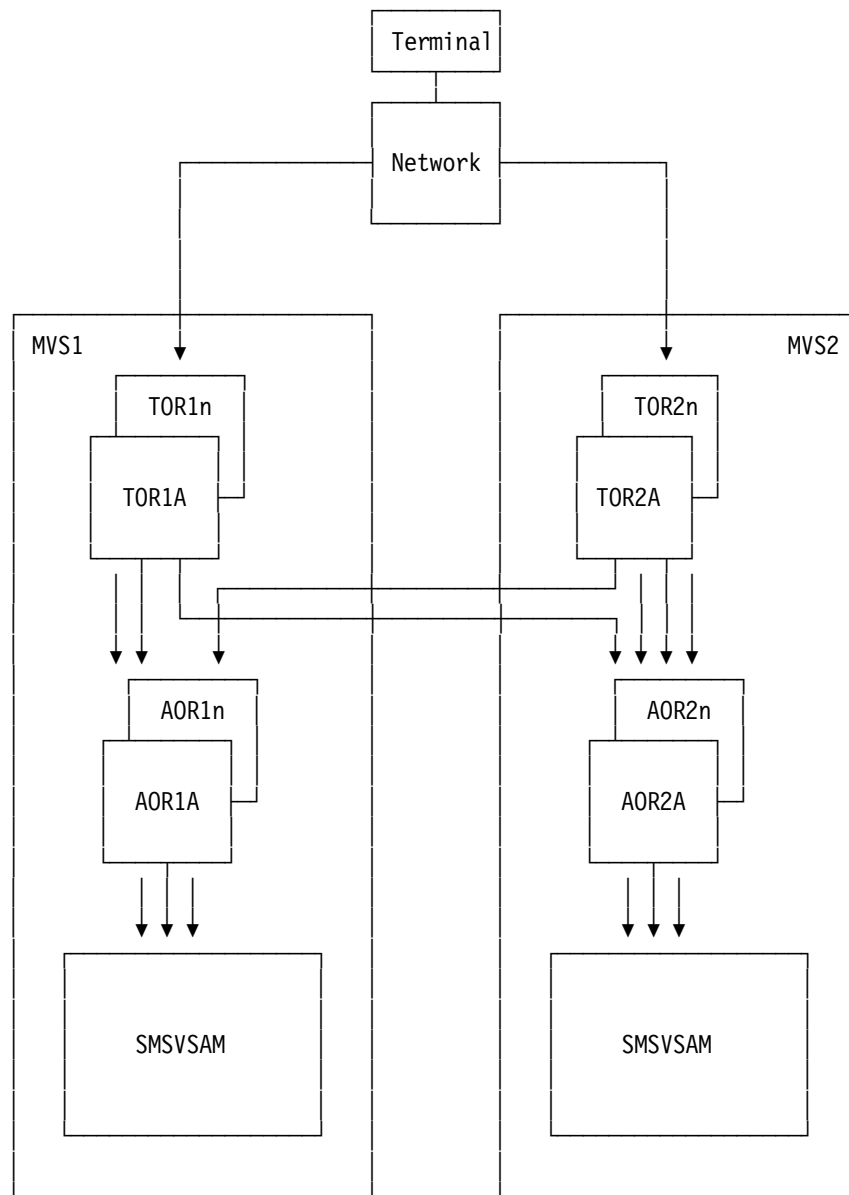


Figure 2. Parallel Sysplex with SMSVSAM Servers

1.2.4.2 Removing the Need for Exclusive Access

If any part of your system requires exclusive access to a resource, the whole system becomes unavailable if another system is using the resource.

Today the need for exclusive access usually applies to data and is often caused by the need to update a VSAM file from a batch program or reorganize a VSAM file.

Using the latest levels of software reduces the impact of this problem. For example, use DFSMS/MVS 1.2, DFSMS/MVS 1.3, or later so that you can take backup copies of VSAM files while CICS is updating them.

VSAM RLS gives batch programs read access to VSAM data sets while CICS is updating them and write access to nonrecoverable data sets. This access is better than the sharing available through SHAREOPTIONS.

1.3 How Does This Book Help?

This book covers specific aspects of implementing an RLS environment and of recovering from errors that are new to users of CICS TS, DFSMS/MVS 1.3, and VSAM RLS. Though we make an effort to document as many failure situations as possible, we cannot, obviously, cover all of them. The following list summarizes the major failure categories that we deal with in this book.

- Loss of VSAM access
 - SMSVSAM address space failure
 - Integrated Catalog Facility (ICF) catalog unavailability
 - Physical I/O error on a VSAM data set
 - Loss of sharing control data sets (SHCDSs)
- MVS system logger failure
 - Logger address space abend
 - Log stream errors
 - Coupling facility errors
 - Log data set errors
 - Staging data set errors
- CICS abnormal termination and communication failures
 - Terminal owning region (TOR) abend
 - Application owning region (AOR) abend
 - Resynchronization failure between CICS TS regions
 - Resynchronization failure between a CICS TS and a CICS/ESA region
- Shared temporary storage server failures
 - Address space failure
 - Coupling facility failure

For each error situation, we discuss its impact, the means of prevention, and the recovery actions needed to make systems available as soon as possible.

Chapter 2. System Topology for Maximum Availability

In this chapter we describe CICS and data system design features that enable you to duplicate components of your system and thus remove them as single points of unavailability. We also introduce the environment we used to develop the failure and recovery examples documented in the book.

2.1 The CICSplex

Up until the late 1970s most enterprises could run all of their data-processing operations on a single computer, and a single CICS system could be expected to handle an enterprise's entire online transaction processing (OLTP) workload. Later, as a result of fast developments in hardware and operating system technology, and even faster developments in requirements to provide high availability, high capacity transaction processing systems, the concept of a CICSplex¹ evolved (though the name CICSplex was invented much later).

A CICSplex is a connected set of CICS regions (or a complex of CICS regions). See Figure 3 on page 10. Factors that led to the evolution of the CICSplex include:

- Lack of resources, particularly virtual storage
- Security
- Application isolation
- Performance
- Operational requirements (separate test and production, differing availability times)
- Integrity (isolate rogue applications).

CICS regions in a CICSplex are classified according to their main function, even though each is a full-function CICS system:

- TORs are used to manage terminal sessions. A TOR routes transactions initiated from terminals to another region for execution. This function is known as transaction routing. When transaction routing was first implemented in CICS, you had to define to which region the TOR should route a particular transaction by including a SYSID option in the transaction definition in the TOR. Once the transaction was defined to the TOR, all instances of that transaction would be routed to a particular region for processing, which makes the system inflexible (for example, if the region you want to route to is not available, the TOR cannot dynamically select an alternative region).² CICS/ESA Version 3 introduced a new form of transaction routing—dynamic transaction routing (see 2.2, “Dynamic Transaction Routing” on page 10). Dynamic transaction routing uses a program (the dynamic transaction routing program) to decide to which region

¹ We use CICSplex, with a lowercase p, when referring to a complex of CICS regions. We use CICSPLex, with an uppercase P, when referring to the product CICSplex SM.

² It is possible to use a CICS global user exit, such as DFHZATDX, to control routing by changing the transaction identifier (transid) of the incoming transaction before it is attached in the TOR. This allows some flexibility.

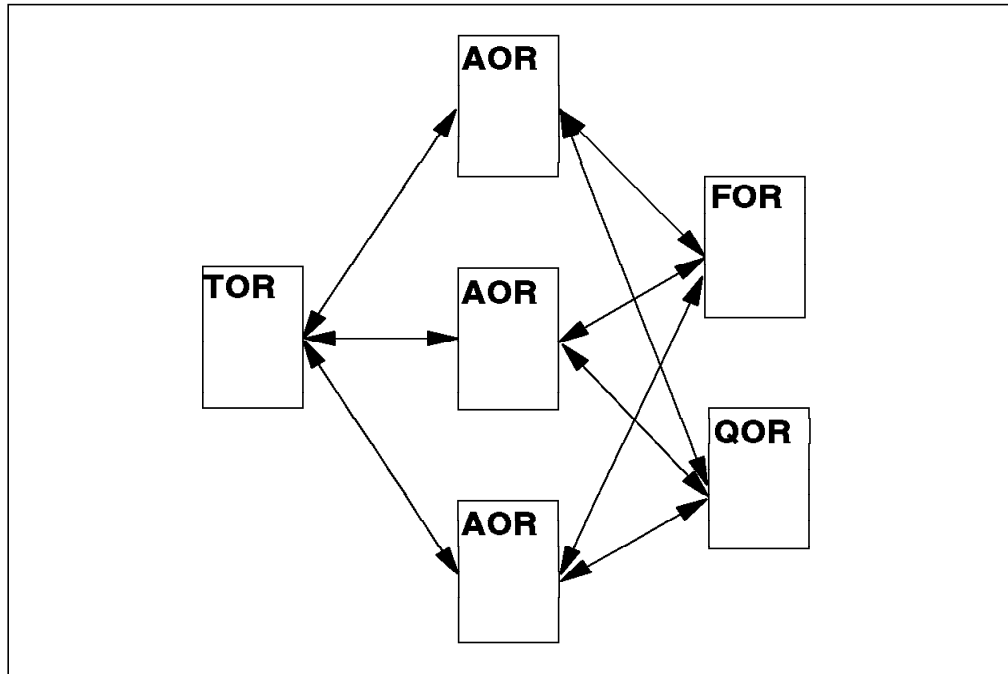


Figure 3. Example of a CICSplex

a particular transaction should be routed. The previous method of fixed definitions (now called *static transaction routing*) can still be used.

- AORs are used to process transactions and route the results back to the originating TOR. If the transaction running in the AOR needs to access remote data (that is, data located in yet another region), CICS sends a request from the AOR processing the transaction to the region that owns the resource (file, transient data queue, or temporary storage queue) in which the data is located. This function is known as *function shipping*.
- FORs are used to manage VSAM files, basic direct access method (BDAM) files, and CICS data tables. The FOR processes read, update, and delete requests for data records that have been function shipped to the FOR from an AOR and returns the results to the originating AOR. FORs can also manage access to local DL/I databases, in which case the more general term *data-owning region* (DOR) is often used instead of FOR.
- Printer-owning regions (PORs), queue-owning regions (QORs), and resource-owning regions (RORs) are dedicated owner regions. Multiple AORs can therefore share access to external resources, usually through function shipping.

2.2 Dynamic Transaction Routing

CICS transaction routing is an intercommunication facility that allows terminals or logical units connected to one CICS region to initiate, and communicate with, transactions in another CICS region. Thus you can distribute terminals and transactions around your CICS systems and still have the ability to run any transaction with any terminal.

When you define transactions to CICS, you define them as local or remote. Local transactions always execute in the TOR, that is, in the CICS region to which the terminal initiating the transaction is directly logged on. Remote

transactions are routed to other CICS regions connected to the TOR by multiregion operation (MRO) links or to other systems that are connected by intersystem communication (ISC) links. If the remote system is another CICS region, it is referred to as an AOR.

CICS supports two forms of transaction routing for remote transactions:

- *Static transaction routing*, where the transaction is predefined with the name of the remote CICS region to which it is to be routed for execution.
- *Dynamic transaction routing*, where one of the attributes on the transaction resource definition specifies DYNAMIC(YES), indicating that the transaction is to be routed dynamically. Alternatively, if the transaction is not defined, CICS/ESA assumes that it is to be dynamically routed. The name of the remote destination is determined by a user-written dynamic transaction routing program at the time the transaction is invoked from a user's terminal.

CICS/ESA Dynamic Transaction Routing in a CICSplex contains detailed information on this subject.

Using dynamic transaction routing across a CICSplex rather than static routing is fundamental to building a continuously available CICS system.

2.2.1 High Availability

Dynamic transaction routing can help you provide high availability by enabling you to clone AORs. With multiple AORs available to choose from, the dynamic transaction routing program can bypass any failed or "sick" AOR. Faster restart is possible for smaller AORs, and fewer end users are affected by any single failure. All these factors contribute to:

- Reducing the number of user transaction failures
- Reducing the end-user outage time
- Reducing the incidence of "sympathy sickness" between CICS regions

2.2.2 Continuous Operations

Dynamic transaction routing helps you achieve continuous availability by enabling you to:

- Quiesce an AOR and direct transactions to alternate AORs
- Remove an AOR once it has been quiesced
- Stop and restart an AOR to apply service changes to the AOR when no transactions are active
- Add an AOR clone and notify the dynamic transaction routing program that a new target AOR is available

Dynamic transaction routing enables you to add and remove AORs, and apply changes to AORs, in a way that is quite transparent to end users. The kinds of changes you might want to make to an AOR, while still maintaining service to end users, include introducing modified CICS/ESA tables, applying service to CICS/ESA, or applying service to application code.

2.2.3 CICSplex SM

Implementing a CICSplex with dynamic transaction routing allows the CICS system to grow, but is not without its problems. For example, in a CICSplex you have to consider:

- Effective use of resources
- Multiple operation points
- Increased difficulty in keeping track of what is happening

CICSplex SM, introduced by IBM when CICS/ESA 4.1 was announced, resolves these problems and provides a dynamic transaction routing program. CICSplex SM is a component of CICS TS.

CICSplex SM is a systems management tool for CICSplex environments. It provides several functions that contribute to increased availability:

- Workload management
- Availability monitoring
- Support for the ARM

For more information about CICSplex SM, read *CICSplex System Manager for MVS/ESA, Concepts and Planning*.

2.2.4 Roll Your Own

You can code your own dynamic routing program, trading off customization against cost. If you code your own program, you should get exactly what you want, at a higher cost. The logic involved is very complex. You may also need to update the code when you move to a new release of CICS/ESA or MVS/ESA.

2.3 Data Sharing

Data sharing is the concept that applications running in different CICS regions, IMS processing regions, or even as batch jobs can share access to data no matter on which MVS image in a sysplex they happen to be running. To fully implement data sharing in a CICS/ESA workload management environment you have to implement the prerequisites shown in Table 1 on page 13.

| <i>Table 1. CICS/ESA N-Way Data Sharing Prerequisites</i> | | | |
|--|-------------------------|-----|------|
| | Data Environment | | |
| | IMS DBCTL | DB2 | VSAM |
| MVS/ESA 5.1 | X | X | |
| MVS/ESA 5.2 | O | O | X |
| OS/390 | O | O | O |
| Coupling facility | X | X | X |
| CICS/ESA 4.1 | O* | O* | |
| CICS TS | O* | O* | X |
| IMS DB 5.1 | X | | |
| IRLM 2.1 | X | X | |
| DB2 4.1 | | X | |
| DFSMS/MVS 1.3 | | | X |
| Note: X=required; O=optional; O*=optional—provides full exploitation of the MVS workload manager. | | | |

Ideally, all CICS/ESA AORs should be able to access all of the data needed to run any transaction. If you have only one MVS system image, you should find it easy to achieve this access. If you have two or more MVS system images in your sysplex, you may have to implement specific levels of database or access method software to enable all AORs to access the same data at the same time, no matter in which MVS system the AOR is running.

By implementing data sharing between online and batch applications, you can eliminate the need for many of the scheduled outages that would otherwise be required to accommodate batch processing requirements. With IMS/ESA and database control (DBCTL) subsystems, you can use batch message-processing programs (BMPs) to achieve sharing between batch and online without the need for full data sharing.

Database systems such as DB2 and IMS/ESA provide data sharing with integrity. DFSMS/MVS 1.3, in conjunction with CICS TS, provides similar facilities for VSAM data sets.

2.3.1 DB2

IBM DATABASE 2 Version 4 Release 1 provides full data sharing support for DB2 databases in a Parallel Sysplex. IBM DATABASE 2 Version 4 Release 1 and the IMS Resource Lock Manager (IRLM) Version 2 Release 1 use the cross-system coupling facility (XCF) lock structures to hold information about locks on the database and the XCF signaling facility to invalidate database pages held in the storage of any other DB2 subsystems sharing access to a database when a row is updated. If you do not have DB2 Version 4 installed, and your CICSplex spans more than one MVS image, you need to use the workload separation facilities of CICSplex SM to ensure that transactions are routed to AORs that can access the appropriate DB2 databases.

2.3.2 IMS/ESA

CICS TS supports only the IMS DBCTL interface to IMS databases. CICS/ESA 4.1 and earlier releases of CICS/ESA support both the DBCTL and local DL/I interfaces.

2.3.2.1 DBCTL

DBCTL in IMS/ESA Version 5 Release 1 Database Manager (IMS/ESA DB) provides n-way data sharing support at the block level within a sysplex. The DBCTL subsystems in multiple MVS images can share access to the databases at the same time. IMS/ESA DB 5.1 and IRLM 2.1 use XCF lock structures to hold information about locks on the database and the XCF signaling facility to invalidate database blocks held in the storage of any other IMS/ESA DB 5.1 subsystems sharing access to a database when a segment is updated. The other IMS/ESA DB systems would then refresh their copy of the segment from disk when they next need to access it. IMS/ESA DB 5.1 does not support the local DL/I interface from CICS.

DBCTL in IMS/ESA DB 4.1 provides two-way data sharing support at the block level within a sysplex. The DBCTL subsystems in two MVS images can share access to the databases at the same time. The IRLMs of the two MVS systems communicate using VTAM to invalidate database blocks held in the storage of the other IMS/ESA DB 4.1 subsystem sharing access to a database when a segment is updated. The other IMS/ESA DB system would then refresh its copy of the segment from disk when it next needs to access the segment.

2.3.2.2 Local DL/I

You can implement sharing of IMS databases between multiple AORs in a single MVS image by using a single data-owning region (DOR). The DOR controls access to the databases, and transactions in the AORs access the databases by function shipping their DL/I requests to the DOR. The DOR uses the local DL/I interface to access IMS databases. Therefore it must run CICS/ESA 4.1 or an earlier release of CICS (CICS TS does not support the local DL/I interface) to access IMS/ESA DB 4.1 or an earlier release of IMS/ESA DB (IMS/ESA DB 5.1 does not support the local DL/I interface). You can extend this support to allow sharing of IMS databases between multiple AORs over two MVS images, using the block level sharing facilities of IMS Database Recovery Control (DBRC). You must implement the recovery control level of DBRC before you can use block-level data sharing. Using block-level sharing has significant implications for the CICS user. For example, all batch jobs that update the databases *must* produce a log; dealing with all of these logs increases the complexity of operations.

Use DBCTL, not local DL/I

We strongly recommend that you use the DBCTL interface rather than try to implement block-level sharing with local DL/I.

DBCTL provides a release-independent interface between CICS and IMS/ESA DB. If you implement DBCTL, you avoid the requirement to regenerate CICS or IMS every time a new release of one or the other is installed.

Note: CICS/ESA 4.1 and IMS/ESA 4.1 are the last releases of these products that support local DL/I.

2.3.2.3 Batch Processing

With IMS/ESA, you can have concurrent access of databases from BMPs and from CICS/ESA applications. Separate subsystem address spaces for CICS and the IMS database manager and multiple DL/I thread task control blocks (TCBs) provide isolation and enable multiprocessor utilization. This is independent of data sharing and is a good solution if all of your workload executes on a single MVS/ESA image.

2.3.3 VSAM

Multiple CICS/ESA applications in a CICSplex can share VSAM data sets with integrity by using function shipping to a single FOR (see 2.1, “The CICSplex” on page 9). This approach has limitations. It does not solve the problem of sharing data sets between CICS/ESA and batch, and the FOR is a single point of unavailability. Other CICS applications outside the Parallel Sysplex (perhaps in CICS for AIX or CICS for OS/2 regions) can also use the FOR by function shipping over ISC links. Typically the network delays are such that only comparatively low rates of access are supportable over ISC links.

DFSMS/MVS 1.3 provides RLS for VSAM files. CICS TS allows CICS users to exploit the function. RLS is designed to allow VSAM data to be shared, with full update integrity, among many applications running in many CICS regions in one or more MVS system images in a Parallel Sysplex.

RLS also improves data sharing among multiple CICS TS regions and between CICS TS and batch. Batch jobs can read and update, concurrently with CICS/ESA, nonrecoverable data sets that are opened by CICS/ESA in RLS mode. Batch jobs can read but not update, concurrently with CICS/ESA, recoverable data sets that are opened by CICS/ESA in RLS mode.

2.4 Topology of Our System

Figure 4 on page 16 shows the environment we used to test various failures. Note that we did not use DB2 or IMS/ESA DB in our system.

We implemented a Parallel Sysplex of two MVS images (SC42 and SC52), with two coupling facilities. We ran a CICS TOR and two AORs in each MVS image. The TORs have SYSIDs of PTA1 and PTA2. For all CICS regions, the APPLID is the SYSID prefixed by SCSC (so the APPLID for PTA1 is SCSCPTA1). Figure 4 on page 16 shows only the SYSIDs of the regions. The two TORs also shared a generic APPLID of CICSTOR. In each MVS image, one AOR ran CICS/ESA 4.1 and one ran CICS TS. This setup enabled us to investigate a mixed-level environment. Because the CICS/ESA 4.1 AORs (PAA2 and PAA3) cannot access VSAM data sets in RLS mode, we provided an FOR (PFA1) running CICS TS in MVS SC42 to allow the applications in PAA2 and PAA3 to access RLS mode data sets. We implemented DFSMS/MVS 1.3 and started an SMSVSAM server address space in each MVS image.

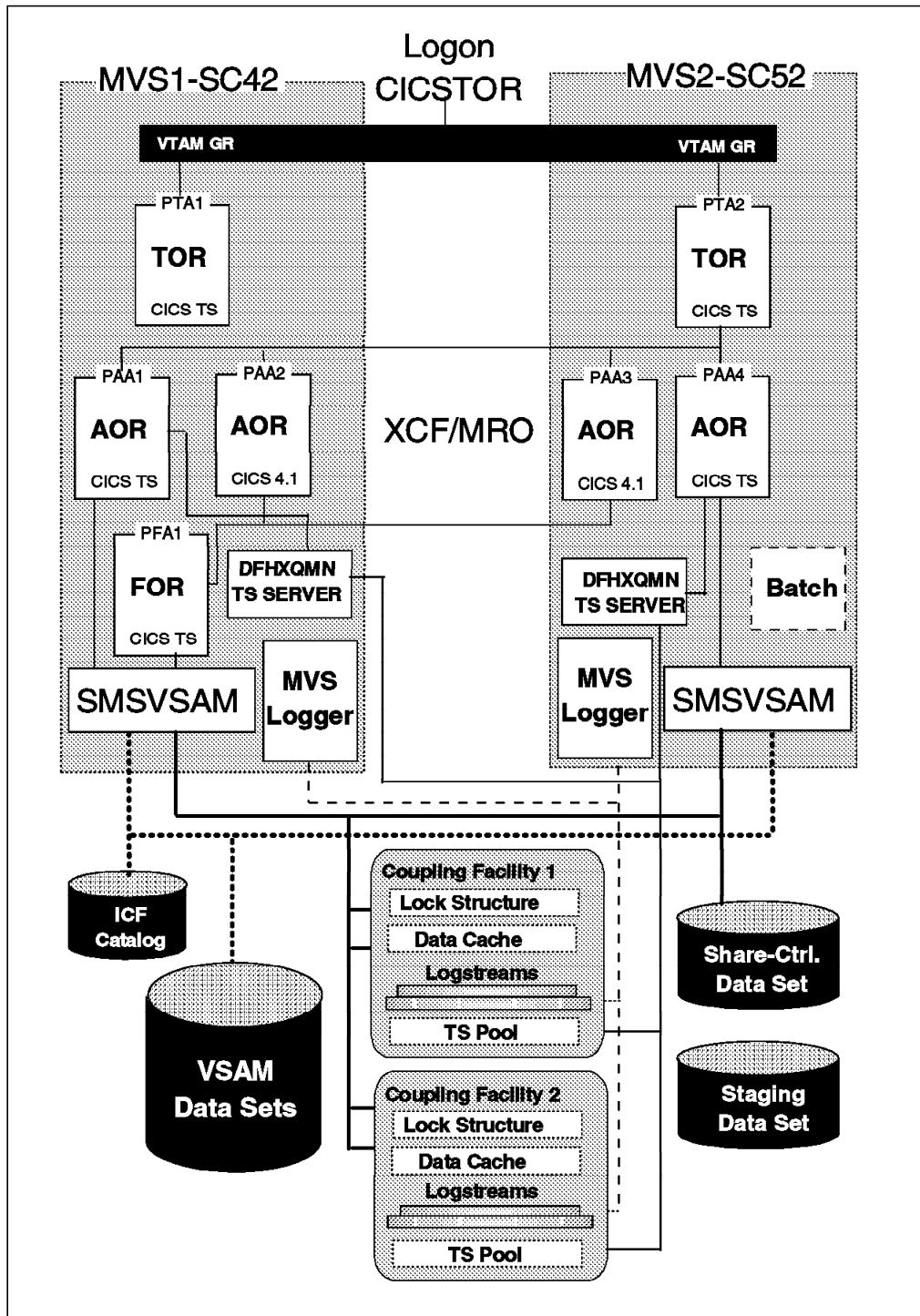


Figure 4. Testing Environment for This Book

Chapter 3. Loss of VSAM Access

In this chapter we investigate the following failures, which are most likely to cause a loss of access to VSAM RLS files:

- SMSVSAM Server failure
- Integrated Catalog Facility failure
- Physical I/O error on a VSAM data set
- SHCDS failure

The effect of these failures depends on how far the inflight transactions have progressed.

3.1 SMSVSAM Server Failure

The SMSVSAM server runs in its own address space and handles all VSAM requests made in RLS mode. If this address space fails, it can be restarted automatically up to six times, assuming RLSINIT=YES is specified in the IGDSMSxx member that the host MVS image uses. The most likely reason for an SMSVSAM server failure is loss of connectivity to the coupling facility.

3.1.1 Impact

The SMSVSAM address space fails if it cannot rebuild a coupling facility lock structure, if it loses connectivity to the coupling facility lock structure, or if the coupling facility lock structure fails. The SMSVSAM address space also fails when it loses the last active SHCDS and has no spare available.

When the SMSVSAM address space fails, any I/O against a VSAM data set open in RLS mode or any attempt to open a VSAM data set in RLS mode receives an error indicating that the SMSVSAM is unavailable. CICS detects that SMSVSAM address space is unavailable when one of the transactions attempts an RLS access. When this event occurs, CICS issues message *DFHFC0153, The previous instance of the SMSVSAM server has failed. File control RLS access is being closed down.* The effect that this has varies, depending on where individual tasks are in their life cycle.

A typical transaction accesses several records in VSAM data sets and then performs either an implicit or explicit syncpoint. Statistically, a task is most likely to discover the failure of the SMSVSAM address space when it next attempts to read from or write to an RLS mode VSAM data set. It is less likely that a task discovers that SMSVSAM has failed when it tries to syncpoint and release its locks in the VSAM data set.

3.1.1.1 Failure before Read or Write Access

If a task attempts to read from or write to an RLS mode VSAM data set after SMSVSAM has failed, CICS abends it. While processing the abend, CICS tries to back out any uncommitted updates. This can involve backing out updates to data in RLS mode VSAM data sets. Any attempt to back out such changes will fail because SMSVSAM is not available, causing CICS to shunt the unit of work

(UOW). CICS automatically unshunts the UOW and retries the backout when SMSVSAM is again available.

3.1.1.2 Failure before Syncpoint

If a task is attempting to commit updates or release VSAM RLS locks when it first detects that SMSVSAM is not available, CICS invokes commit failure processing and produces message *DFHFC0150*, indicating that an attempt to release locks has failed. The locks are retained.

3.1.1.3 Failure before Opening a Data Set

New UOWs that issue requests for OPEN in RLS mode get an error if SMSVSAM is not available. The SMSVSAM failure causes commit-failed or backout-failed UOWs in the CICS regions registered with the SMSVSAM in the MVS system. Transactions running in CICS regions in other MVS images within the Parallel Sysplex are affected only to the extent that they receive LOCKED condition if they try to access records protected by retained locks owned by the CICS regions that were using the failed SMSVSAM.

3.1.2 Prevention

Because SMSVSAM fails if it loses connectivity to the coupling facility lock structure, consider having more than one coupling facility. The possibility of SMSVSAM server failure is minimized if you have two or more coupling facilities.

3.1.3 Recovery

Both DFSMS and CICS must perform recovery processing following an SMSVSAM server address space failure.

3.1.3.1 DFSMS Actions

Recovery from an SMSVSAM failure is typically automatic, requiring no action from operators or other support staff. SMSVSAM restarts itself automatically up to six times. If on the sixth retry SMSVSAM still fails to restart, the system produces message *IGW418D*. When this message appears, you must respond indicating either that you will allow the SMSVSAM server address space to attempt another restart or that automatic restart is to be canceled. If you choose the latter option, you can restart the SMSVSAM server address space manually by entering `VARY SMS,SMSVSAM,ACTIVE` from an MVS console.

3.1.3.2 CICS Actions

After SMSVSAM has restarted, it issues an MVS Event Notification Facility (ENF) signal to communicate with CICS. When CICS gets the ENF notification, it retries any backout-failed or commit-failed UOWs. This process is referred to as *Dynamic RLS Restart*, and users do not have to take any recovery action. However, if there are UOWs that were not retried when CICS received the ENF signal, manual intervention is required. You can verify that shunted UOWs remain by using the `CEMT INQUIRE UOWDSNFAIL` command.

3.1.4 Example

We caused an SMSVSAM failure by issuing the V SMS,SMSVSAM,TERMINATESERVER system command while CICS AORs were processing transactions using VSAM data sets opened in RLS mode. We used teleprocessing network simulator (TPNS) to simulate transaction processing.

Figure 5 on page 20 shows the MVS system logs when an SMSVSAM server address space fails. Typically a failed SMSVSAM server automatically restarts, but use of the V SMS,SMSVSAM,TERMINATESERVER command prevents this.

- 1** We issued the TERMINATESERVER command.
- 2** When a CICS region attempts to access VSAM data sets through RLS mode and detects an SMSVSAM address space failure, it issues message *DFHFC0153* and closes the data sets.
- 3** Message *IEC251I* shows that the VSAM CLOSE routine has detected an SMSVSAM failure while closing a VSAM data set. In this case, message *IEC251I* is just an informational message. You do not have to take any action for this message.
- 4** Message *IEF402I* has been issued to indicate that SMSVSAM failed.
- 5** Message *DFHFC0999* indicates that the CICS file control open/close routine has detected that RLS access is disabled.
- 6** Message *DFHFC4701* shows the backout failures for the inflight UOWs. Our example uses UOW X'AE8B968185C83A00', associated with data set CICSDSW.VSAMU.ITEMACT and task number 09564, for reference.

```

13:33:03.36 CICRSR3 00000290 V SMS,SMSVSAM,TERMINATESERVER 1
13:33:03.54 00000090 IGW572I REQUEST TO TERMINATE SMSVSAM 101
101 00000090 ADDRESS SPACE IS ACCEPTED:
101 00000090 SMSVSAM SERVER TERMINATION SCHEDULED.
13:33:03.61 STC12906 00000090 +DFHFC0153 SCSCPA1 102 2
102 00000090 The previous instance of the SMSVSAM server has failed. File control
102 00000090 RLS access is being closed down.
13:33:03.69 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,VENDOR,,CICSDSW.VSAMU.VENDOR 3
13:33:03.81 00000290 IEF196I IEA995I SYMPTOM DUMP OUTPUT
13:33:03.82 00000290 IEF196I SYSTEM COMPLETION CODE=A03
13:33:03.82 00000290 IEF196I TIME=13.33.03 SEQ=20034 CPU=0000 ASID=0100
13:33:03.83 00000290 IEF196I PSW AT TIME OF ERROR 070C2000 83BC4982 ILC 2 INTC 0D
13:33:03.83 00000290 IEF196I NO ACTIVE MODULE FOUND
13:33:03.83 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,TRMNALDX,,
13:33:03.83 00000290 IEF196I NAME=UNKNOWN
13:33:03.84 00000290 IEF196I DATA AT PSW 03BC497C - 58107165 0A0D47F0 80841F44
13:33:03.84 00000290 IEF196I GPR 0-3 007CEB00 80A03000 007CEAE8 03BBC01F
13:33:03.84 STC12906 00000090 IEC251I CICSDSW.VSAMV.TRMNALDB
13:33:03.85 00000290 IEF196I GPR 4-7 007CEAE8 007CE300 007E2A70 03BC5907
13:33:03.86 00000290 IEF196I GPR 8-11 83BC4908 007DEE88 00000000 0000000C
13:33:03.86 00000290 IEF196I GPR 12-15 007E2A70 007CEB54 83BBEB22 83BC4908
13:33:03.87 00000290 IEF196I END OF SYMPTOM DUMP
13:33:03.78 00000090 IEA995I SYMPTOM DUMP OUTPUT 104
104 00000090 SYSTEM COMPLETION CODE=A03
104 00000090 TIME=13.33.03 SEQ=20034 CPU=0000 ASID=0100
104 00000090 PSW AT TIME OF ERROR 070C2000 83BC4982 ILC 2 INTC 0D
104 00000090 NO ACTIVE MODULE FOUND
104 00000090 NAME=UNKNOWN
104 00000090 DATA AT PSW 03BC497C - 58107165 0A0D47F0 80841F44
104 00000090 GPR 0-3 007CEB00 80A03000 007CEAE8 03BBC01F
104 00000090 GPR 4-7 007CEAE8 007CE300 007E2A70 03BC5907
104 00000090 GPR 8-11 83BC4908 007DEE88 00000000 0000000C
104 00000090 GPR 12-15 007E2A70 007CEB54 83BBEB22 83BC4908
104 00000090 END OF SYMPTOM DUMP
13:33:03.88 00000290 IEF196I IEA848I DUMP SUPPRESSED - ABDUMP MAY NOT DUMP STORAGE FOR KEY
13:33:03.88 00000290 IEF196I 0-7 JOB IEESYSAS
13:33:03.87 00000090 IEA848I DUMP SUPPRESSED - ABDUMP MAY NOT DUMP STORAGE FOR KEY 0-7 JOB
IEESYSAS
13:33:03.88 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,TRMNALDB,,
13:33:03.89 STC12906 00000090 IEC251I CICSDSW.VSAMU.TRMNALDB
13:33:03.96 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,VENDORX,,CICSDSW.VSAMV.VENDOR
13:33:04.19 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,TABLEDBX,,CICSDSW.VSAMV.TABLEDB
13:33:04.22 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,TABLEDB,,CICSDSW.VSAMU.TABLEDB
13:33:04.28 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,PRODCONX,,
13:33:04.30 STC12906 00000090 IEC251I CICSDSW.VSAMV.PRODCONT
13:33:04.33 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,PRODCONT,,
13:33:04.34 STC12906 00000090 IEC251I CICSDSW.VSAMU.PRODCONT
13:33:04.38 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,PARTSX,,CICSDSW.VSAMV.PARTS
13:33:04.43 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,PARTS,,CICSDSW.VSAMU.PARTS
13:33:04.47 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,LABOPSDX,,
13:33:04.48 STC12906 00000090 IEC251I CICSDSW.VSAMV.LABOPSDB
13:33:04.51 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,LABOPSDB,,
13:33:04.51 STC12906 00000090 IEC251I CICSDSW.VSAMU.LABOPSDB
13:33:04.55 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,ITEMMASX,,
13:33:04.56 STC12906 00000090 IEC251I CICSDSW.VSAMV.ITEMMAST
13:33:04.59 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,ITEMMAST,,
13:33:04.60 STC12906 00000090 IEC251I CICSDSW.VSAMU.ITEMMAST
13:33:04.64 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,ITEMACTX,,CICSDSW.VSAMV.ITEMACT
13:33:04.74 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,INVENTOX,,
13:33:04.75 STC12906 00000090 IEC251I CICSDSW.VSAMV.INVENTOR
13:33:04.83 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,INVENTOR,,
13:33:04.85 STC12906 00000090 IEC251I CICSDSW.VSAMU.INVENTOR
13:33:04.90 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,HOTEL1X,,CICSDSW.VSAMV.HOTEL1
13:33:04.93 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,HOTEL1,,CICSDSW.VSAMU.HOTEL1
13:33:04.96 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,EMPACTDB,,
13:33:04.97 STC12906 00000090 IEC251I CICSDSW.VSAMU.EMPACTDB
13:33:05.02 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,DEPSUMDX,,
13:33:05.03 STC12906 00000090 IEC251I CICSDSW.VSAMV.DEPSUMDB
13:33:05.13 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,DEPSUMDB,,
13:33:05.14 STC12906 00000090 IEC251I CICSDSW.VSAMU.DEPSUMDB
13:33:05.18 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,DATAENDX,,
13:33:05.19 STC12906 00000090 IEC251I CICSDSW.VSAMV.DATAENDB
13:33:05.24 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,DATAENDB,,
13:33:05.24 STC12906 00000090 IEC251I CICSDSW.VSAMU.DATAENDB
13:33:05.29 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,CUSTOMEX,,
13:33:05.30 STC12906 00000090 IEC251I CICSDSW.VSAMV.CUSTOMER
13:33:05.37 STC12906 00000090 IEC251I 016-0609,SCSCPA1,SCSCPA1,CUSTOMER,,
13:33:05.37 STC12906 00000090 IEC251I CICSDSW.VSAMU.CUSTOMER

```

Figure 5 (Part 1 of 2). System Messages for an SMSVSAM Server Failure


```

13:33:05.41 STC12906 00000090 IEC251I 016-0609,SCSCPAA1,SCSCPAA1,COMPOSDX,,
13:33:05.41 STC12906 00000090 IEC251I CICSDSW.VSAMV.COMPOSDB
13:33:05.44 STC12906 00000090 IEC251I 016-0609,SCSCPAA1,SCSCPAA1,COMPOSDB,,
13:33:05.45 STC12906 00000090 IEC251I CICSDSW.VSAMU.COMPOSDB
13:33:05.48 STC12906 00000090 IEC251I 016-0609,SCSCPAA1,SCSCPAA1,ACCUNTDX,,
13:33:05.49 STC12906 00000090 IEC251I CICSDSW.VSAMV.ACCUNTDDB
13:33:05.52 STC12906 00000090 IEC251I 016-0609,SCSCPAA1,SCSCPAA1,ACCUNTDDB,,
13:33:05.53 STC12906 00000090 IEC251I CICSDSW.VSAMU.ACCUNTDDB
13:33:12.17 00000090 IEF402I SMSVSAM FAILED IN ADDRESS SPACE 0100 227 4
          227 00000090          SYSTEM ABEND SOF4 - REASON CODE 24
13:33:13.41 STC12906 00000090 IEC251I 016-0609,SCSCPAA1,SCSCPAA1,ITEMACT,,CICSDSW.VSAMU.ITEMACT
13:33:13.64 STC12906 00000090 IEC251I 016-0609,SCSCPAA1,SCSCPAA1,EMPACTDX,,
13:33:13.64 STC12906 00000090 IEC251I CICSDSW.VSAMV.EMPACTDB
13:33:14.95 STC12906 00000090 +DFHFC0999 SCSCPAA1 RLS OPEN of file ITEMACTX failed. RLS access is 5
          disabled.
13:33:15.13 STC12906 00000090 +DFHFC4701 SCSCPAA1 233
          233 00000090 04/21/97 13:33:15 SCSCPAA1 Backout failed for transaction IX8, VSAM 6
          233 00000090 file ITEMACTX, unit of work X'AE8B968464BFD404', task 09721, base
          233 00000090 CICSDSW.VSAMV.ITEMACT, path CICSDSW.VSAMV.ITEMACT, failure code
          233 00000090 X'FB'.
          .
          .
          .
13:33:23.61 STC12906 00000090 +DFHFC0999 SCSCPAA1 RLS OPEN of file ITEMACT failed. RLS access is 5
          disabled.
13:33:23.63 STC12906 00000090 +DFHFC4701 SCSCPAA1 267
          267 00000090 04/21/97 13:33:23 SCSCPAA1 Backout failed for transaction IT8, VSAM 6
          267 00000090 file ITEMACT, unit of work X'AE8B968185C83A00', task 09564, base
          267 00000090 CICSDSW.VSAMU.ITEMACT, path CICSDSW.VSAMU.ITEMACT, failure code
          267 00000090 X'FB'.
          .
          .
          .
13:33:25.80 STC12906 00000090 +DFHFC0999 SCSCPAA1 RLS OPEN of file EMPACTDB failed. RLS access is 5
          disabled.
13:33:25.83 STC12906 00000090 +DFHFC4701 SCSCPAA1 275
          275 00000090 04/21/97 13:33:25 SCSCPAA1 Backout failed for transaction IT8, VSAM 6
          275 00000090 file EMPACTDB, unit of work X'AE8B968185C83A00', task 09564, base
          275 00000090 CICSDSW.VSAMU.EMPACTDB, path CICSDSW.VSAMU.EMPACTDB, failure code
          275 00000090 X'FB'.

```

Figure 5 (Part 2 of 2). System Messages for an SMSVSAM Server Failure

3.1.4.1 Sample CEMT Displays

Figure 6 shows the result of a CEMT INQUIRE UOW command after the simulated SMSVSAM failure recorded in Figure 5 on page 20.

```
CEMT I UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AE8B96816B88DE01) Bac Shu Tra(IT8 ) Tas(0009560)
  Age(00011911) Ter(P015) Netn(SCSTP015) Use(CICSUSER) Dat
  Uow(AE8B968185C83A00) Bac Shu Tra(IT8 ) Tas(0009564)
  Age(00011911) Ter(P123) Netn(SCSTP123) Use(CICSUSER) Dat
  Uow(AE8B968260E60A00) Com Shu Tra(IT8 ) Tas(0009607)
  Age(00011925) Ter(P069) Netn(SCSTP069) Use(CICSUSER)
  Uow(AE8B96829380EC05) Com Shu Tra(IT8 ) Tas(0009624)
  Age(00011925) Ter(P145) Netn(SCSTP145) Use(CICSUSER)
  Uow(AE8B968321710A03) Com Shu Tra(IX8 ) Tas(0009654)
  Age(00011925) Ter(P053) Netn(SCSTP053) Use(CICSUSER)
  Uow(AE8B968327A2DA06) Bac Shu Tra(SX2 ) Tas(0009658)
  Age(00011913) Ter(P080) Netn(SCSTP080) Use(CICSUSER) Dat
  Uow(AE8B9683545E8803) Bac Shu Tra(SC2 ) Tas(0009669)
  Age(00011912) Ter(P098) Netn(SCSTP098) Use(CICSUSER) Dat
  Uow(AE8B96835893EA02) Bac Shu Tra(IT8 ) Tas(0009670)
  Age(00011914) Ter(P163) Netn(SCSTP163) Use(CICSUSER) Dat
+ Uow(AE8B96836EA42E04) Bac Shu Tra(IX8 ) Tas(0009675)
  Age(00011912) Ter(P170) Netn(SCSTP170) Use(CICSUSER) Dat

                                SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL                TIME: 16.51.54 DATE: 04.21.97
PF 1 HELP      3 END      5 VAR      7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 6. CEMT INQUIRE UOW Display for SMSVSAM Failure

The CEMT INQUIRE UOW command is used to retrieve information about UOWs. The panel shows that there are shunted UOWs. **Bac Shu** indicates that a UOW is being backed out, or it has failed to back out one or more of its recoverable resources, and it has been shunted.

Figure 7 on page 23 shows the detail status of one of these UOWs, AE8B968185C83A00.

```

CEMT I UOW
RESULT - OVERTYPE TO MODIFY
Uow(AE8B968185C83A00)
  Uowstate( Backout )
  Waitstate(Shunted)
  Transid(IT8)
  Taskid(0009564)
  Age(00012186)
  Termid(P123)
  Netname(SCSTP123)
  Userid(CICSUSER)
  Waitcause(Dataset)
  Link()
  Sysid()
  Netuowid(..USIBMSC.SCSTP123.oaeH....)

SYSID=PAA1 APPLID=SCSCPAA1
TIME: 16.56.24 DATE: 04.21.97
PF 1 HELP 2 HEX 3 END      5 VAR      7 SBH 8 SFH      10 SB 11 SF

```

Figure 7. CEMT INQUIRE UOW Detail Display for SMSVSAM Failure

Figure 8 shows a CEMT INQ UOWDSNFAIL command display.

```

CEMT I UOWD
STATUS: RESULTS
Dsn(CICSDSW.VSAMU.LABOPSDB) ) Rls Rrc
  Uow(AE8B96816B88DE01) ) Rls
Dsn(CICSDSW.VSAMU.ITEMACT) ) Rls Com
  Uow(AE8B96816B88DE01) ) Rls
Dsn(CICSDSW.VSAMU.EMPACTDB) ) Dat Ope
  Uow(AE8B96816B88DE01) ) Rls
Dsn(CICSDSW.VSAMU.LABOPSDB) ) Rls Rrc
  Uow(AE8B968185C83A00) ) Rls
Dsn(CICSDSW.VSAMU.ITEMACT) ) Dat Ope
  Uow(AE8B968185C83A00) ) Rls
Dsn(CICSDSW.VSAMU.EMPACTDB) ) Dat Ope
  Uow(AE8B968185C83A00) ) Rls
Dsn(CICSDSW.VSAMU.LABOPSDB) ) Rls Rrc
  Uow(AE8B968260E60A00) ) Rls
Dsn(CICSDSW.VSAMU.ITEMACT) ) Rls Com
  Uow(AE8B968260E60A00) ) Rls
+ Dsn(CICSDSW.VSAMU.EMPACTDB) ) Rls Com
  Uow(AE8B968260E60A00) ) Rls

SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL TIME: 16.58.10 DATE: 04.21.97

```

Figure 8. CEMT INQUIRE UOWDSNFAIL Display

The CEMT INQUIRE UOWDSNFAIL command returns information about all data sets involved with shunted UOWs. These UOWs cannot access the data sets through RLS mode because of the SMSVSAM address space failure. UOW AE8B968185C83A00 shows a reason of **openererror** (Ope), indicating that the data set was being opened for backout when the SMSVSAM address space failed. UOW AE8B96816B88DE01 shows a reason of **Rrc**, indicating a repeat read lock

release error. UOW AE8B968260E60A00 shows a reason of **commitfail (Com)**, indicating a failure during commit processing.

Figure 9 shows a detailed UOWDSNFAIL display for data set CICSDSW.VSAMU.ITEMACT and UOW AE8B968185C83A00.

```
CEMT I UOWD
RESULT
Uowdsnfail
  Dsname(CICSDSW.VSAMU.ITEMACT)
  Cause(Dataset)
  Reason(Operror)
  Uow(AE8B968185C83A00)
  Sysid()
  Netname()
  Rlsaccess(Rls)

                                     SYSID=PAA1 APPLID=SCSCPAA1
                                     TIME: 17.01.29 DATE: 04.21.97
PF 1 HELP 2 HEX 3 END          5 VAR          7 SBH 8 SFH          10 SB 11 SF
```

Figure 9. CEMT INQUIRE UOWDSNFAIL Detail Display

Dsname in Figure 9 shows the data set name that has a retained lock due to an Operror, that is, the error occurred when the file was opened for backout. The log (Figure 5 on page 20 **6**) shows that DFHFC4701 has been issued to assist with problem resolution.

Figure 10 on page 25 shows a CICSPlex SM display of UOW status. Some CICSPlex SM displays give additional information to that found in the equivalent CEMT displays.

```

21APR1997 17:15:30 ----- INFORMATION DISPLAY -----
COMMAND ==>
CURR WIN ==> 1          ALT WIN ==>
W1 =UOWORK===UOWORKD==SCSPLEX==SCSCPAA1=21APR1997==17:11:46===CPSM=====1
UOW ID.....          AE8B968185C83A00
CICS System.....     SCSCPAA1
Net UOW ID.....     1910 USIBMSC.SCSTP123 8B968185C83A 0001
Task ID.....         9564
Start Term ID.....   P123
Start Trans ID.....  IT8
Start User ID.....   CICSUSER
State.....           BACKOUT
Wait State.....      SHUNTED
Wait Cause.....      DATASET
Age of Wait.....     03:38:29
Netname Causing Wait
Wait System ID.....

```

Figure 10. CICSplex System Manager (CPSM) UOWORK Detail Display

3.1.4.2 Sample IDCAMS Report

Figure 11 on page 26 is the output from an IDCAMS SHCDS LISTALL command issued after SMSVSAM address space failure. You can see that there were 57 retained locks in total held against records in seven different data sets.

```

IDCAMS SYSTEM SERVICES                                TIME: 13:35:50    04/21/97    PAGE    1
  SHCDS LISTALL                                     00040204
  ----- LISTING FROM SHCDS ----- IDCSH03
-----
SUBSYSTEM NAME  STATUS          RECOVERY      LOCKS      LOCKS      LOCKS
NEEDED         HELD         WAITING      RETAINED
-----
SMSVSAM        BATCH---ACTIVE NO             0           0           0
  DATA SETS IN LOST LOCKS----- 0
  DATA SETS IN NON-RLS UPDATE STATE-- 0
  TRANSACTION COUNT----- 0
SMSVSAM        BATCH---ACTIVE NO             0           0           0
  DATA SETS IN LOST LOCKS----- 0
  DATA SETS IN NON-RLS UPDATE STATE-- 0
  TRANSACTION COUNT----- 0
HSM1462        BATCH---ACTIVE NO             0           0           0
  DATA SETS IN LOST LOCKS----- 0
  DATA SETS IN NON-RLS UPDATE STATE-- 0
  TRANSACTION COUNT----- 0
SCSCPA1        ONLINE--FAILED YES            0           0           57
  DATA SETS IN LOST LOCKS----- 0
  DATA SETS IN NON-RLS UPDATE STATE-- 0
  TRANSACTION COUNT----- 19
----- LISTING FROM SHCDS ----- IDCSH06
-----
----- LISTING FROM SHCDS ----- IDCSH04
-----
SUBSYSTEM NAME---- SMSVSAM      SUBSYSTEM STATUS----BATCH---ACTIVE
IDC31890I DATA SET NOT LISTED
SUBSYSTEM NAME---- SMSVSAM      SUBSYSTEM STATUS----BATCH---ACTIVE
IDC31890I DATA SET NOT LISTED
SUBSYSTEM NAME---- HSM1462      SUBSYSTEM STATUS----BATCH---ACTIVE

DATA SET NAME /      RETAINED  LOST      LOCKS      NON-RLS      PERMIT
CACHE  STRUCTURE  LOCKS    LOCKS    NOT      RECOVERY    UPDATE    FIRST TIME
-----  -----  -----  -----  BOUND    REQUIRED    PERMITTED  SWITCH
-----  -----  -----  -----
HSM14.RLS.BCDS1
HSM14_CACHE          NO        NO        NO        NO        NO        NO
HSM14.RLS.MCDS1
HSM14_CACHE          NO        NO        NO        NO        NO        NO
HSM14.RLS.OCDS
HSM14_CACHE          NO        NO        NO        NO        NO        NO
SUBSYSTEM NAME---- SCSCPA1      SUBSYSTEM STATUS----ONLINE--FAILED

IDCAMS SYSTEM SERVICES                                TIME: 13:35:50    04/21/97    PAGE    2

DATA SET NAME /      RETAINED  LOST      LOCKS      NON-RLS      PERMIT
CACHE  STRUCTURE  LOCKS    LOCKS    NOT      RECOVERY    UPDATE    FIRST TIME
-----  -----  -----  -----  BOUND    REQUIRED    PERMITTED  SWITCH
-----  -----  -----  -----
CICSDSW.VSAMU.EMPACTDB
CICS_CACHE          YES NO        NO        NO        NO        NO
CICSDSW.VSAMU.ITEMACT
CICS_CACHE          YES NO        NO        NO        NO        NO
CICSDSW.VSAMU.VENDOR
CICS_CACHE          YES NO        NO        NO        NO        NO
CICSDSW.VSAMV.EMPACTDB
- NOT ASSIGNED YES NO        NO        NO        NO        NO
CICSDSW.VSAMV.INVENTOR
- NOT ASSIGNED YES NO        NO        NO        NO        NO
CICSDSW.VSAMV.ITEMACT
- NOT ASSIGNED YES NO        NO        NO        NO        NO
CICSDSW.VSAMV.VENDOR
- NOT ASSIGNED YES NO        NO        NO        NO        NO
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 8

IDC0002I IDCAMS PROCESSING COMPLETE. MAXIMUM CONDITION CODE WAS 8

```

Figure 11. IDCAMS SHCDS LISTALL Command Output

3.1.4.3 SMSVSAM Server Restart

Figure 12 on page 28 is the MVS system log when SMSVSAM restarts.

- 1** We issued the V SMS,SMSVSAM,ACTIVE system command to restart the SMSVSAM address space.
- 2** Message **IGW414I** indicates that the SMSVSAM address space is active.
- 3** When CICS receives notification from SMSVSAM, it issues message **DFHFC0568I** and performs dynamic RLS restart processing.
- 4** When CICS has completed dynamic RLS processing, it issues message **DFHFC0569I**.
- 5** Subsequent message **IEC161I** shows that data sets are opened again and implicit VERIFY has succeeded (indicated by the reason code of 062). Data sets were closed when the SMSVSAM server failed (see Figure 5 on page 20, notes **2** and **3**).

Because dynamic RLS restart processing successfully retried all shunted UOWs, the CEMT I UOWD display is empty (Figure 13 on page 30). All files are available.

```

17:25:02.92 CICSRS3 00000290 V SMS,SMSVSAM,ACTIVE 1
17:25:03.02 00000090 IGW415I SMSVSAM SERVER ADDRESS SPACE HAS FAILED AND IS RESTARTING
17:25:03.16 00000290 IEF196I 1 //IEESYSAS JOB MSGLEVEL=1
17:25:03.16 00000290 IEF196I 2 //SMSVSAM EXEC IEESYSAS,PROG=IDAVSJST
17:25:03.16 00000290 IEF196I STMT NO. MESSAGE
17:25:03.17 00000290 IEF196I 2 IEF001I PROCEDURE IEESYSAS WAS EXPANDED USING
SYSTEM
17:25:03.17 00000290 IEF196I LIBRARY SYS1.PROCLIB
17:25:03.17 00000290 IEF196I 3 XXIEESYSAS PROC PROG=IEFBR14
17:25:03.18 00000290 IEF196I 00050000
17:25:03.18 00000290 IEF196I 4 XXIEFPROC EXEC PGM=&PROG
17:25:03.18 00000290 IEF196I 00100000
17:25:03.19 00000290 IEF196I XX* THE IEESYSAS PROCEDURE IS SPECIFIED IN THE
17:25:03.19 00000290 IEF196I 00150000
17:25:03.21 00000290 IEF196I XX* PARAMETER LIST TO IEEMB881 BY MVS COMPONENTS
17:25:03.21 00000290 IEF196I 00200000
17:25:03.22 00000290 IEF196I XX* STARTING FULL FUNCTION SYSTEM ADDRESS SPACES.
17:25:03.22 00000290 IEF196I 00250000
17:25:03.22 00000290 IEF196I IEF0653I SUBSTITUTION JCL - PGM=IDAVSJST
17:25:03.28 00000090 IEF403I IEESYSAS - STARTED - TIME=17.25.03
17:25:12.76 00000290 IEF196I IEF237I 2047 ALLOCATED TO SYS00001
17:25:13.09 00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 459
459 00000090 SYS1.DFPSHCDS.WTSCPLX1.VSHCD1 ADDED.
17:25:13.19 00000290 IEF196I IEF237I 2048 ALLOCATED TO SYS00002
17:25:13.44 00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 461
461 00000090 SYS1.DFPSHCDS.WTSCPLX1.VSHCD2 ADDED.
17:25:13.53 00000290 IEF196I IEF237I 2054 ALLOCATED TO SYS00003
17:25:13.77 00000090 IGW619I SPARE SHARE CONTROL DATA SET 463
463 00000090 SYS1.DFPSHCDS.WTSCPLX1.VSHCD3 ADDED.
17:25:17.42 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE IGWLOCK00 WAS SUCCESSFUL. 464
464 00000090 JOBNAME: SMSVSAM ASID: 001D CONNECTOR NAME: SC42
464 00000090 CFNAME: CF02
17:25:17.44 00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 465
465 00000090 CONNECTED TO DFSMS LOCK STRUCTURE IGWLOCK00
465 00000090 STRUCTURE VERSION:AE6B2DF50CB87A02 SIZE:14336K bytes
465 00000090 MAXIMUM USERS:16 REQUESTED:16
465 00000090 LOCK TABLE ENTRIES:1048576 REQUESTED:1048576
465 00000090 RECORD TABLE ENTRIES:71577 USED:59
17:25:36.99 00000090 IGW321I 59 retained locks
17:25:37.28 00000090 IGW321I No Spheres in Lost Locks
17:25:37.82 00000090 IGW467I DFSMS RLS_MAX_POOL_SIZE PARMLIB VALUE SET DURING 468
468 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
468 00000090 CURRENT VALUE: 100 11
17:25:37.86 00000090 IGW467I DFSMS DEADLOCK_DETECTION PARMLIB VALUE SET DURING 469
469 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
469 00000090 THIS SYSTEM IS OPERATING AS A LOCAL DEADLOCK PROCESSOR.
469 00000090 CURRENT VALUE: 15 4 11
17:25:37.89 00000090 IGW467I DFSMS SMF_TIME PARMLIB VALUE SET DURING 470
470 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
470 00000090 CURRENT VALUE: YES 11
17:25:37.95 00000090 IGW467I DFSMS CF_TIME PARMLIB VALUE SET DURING 471
471 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
471 00000090 CURRENT VALUE: 1800 11
17:25:38.08 00000090 IGW464I DFSMS CF_CACHE REQUEST TO QUIESCE 472
472 00000090 STRUCTURE CACHECIC IS ACCEPTED
17:25:38.67 00000090 IGW414I SMSVSAM SERVER ADDRESS SPACE IS NOW ACTIVE. 2
17:25:38.67 STC12906 00000090 +DFHFC0568I SCSCPA1 File control dynamic RLS restart has started. 3
17:25:38.69 STC12906 00000090 +DFHFC0562 SCSCPA1 The RLS control ACB has been successfully
registered by CICS.
17:25:38.70 STC12906 00000090 +DFHFC0570 SCSCPA1 File control RLS access has been enabled.
17:25:38.74 STC12906 00000090 +DFHFC0569I SCSCPA1 File control dynamic RLS restart has ended. 4
17:25:41.28 00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 479
479 00000090 CONNECTED TO DFSMS CACHE STRUCTURE CICS_CACHE
17:25:41.28 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE CICS_CACHE WAS SUCCESSFUL. 478
478 00000090 JOBNAME: SMSVSAM ASID: 001D CONNECTOR NAME: IXCL001E0002
478 00000090 CFNAME: CF02
17:25:42.92 00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 481
481 00000090 CONNECTED TO DFSMS CACHE STRUCTURE CACHECICS
17:25:42.92 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE CACHECICS WAS SUCCESSFUL. 480
480 00000090 JOBNAME: SMSVSAM ASID: 001D CONNECTOR NAME: IXCL001F0002
480 00000090 CFNAME: CF02
17:25:44.49 00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 483
483 00000090 CONNECTED TO DFSMS CACHE STRUCTURE CACHECIC
17:25:44.49 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE CACHECIC WAS SUCCESSFUL. 482
482 00000090 JOBNAME: SMSVSAM ASID: 001D CONNECTOR NAME: IXCL00200002
482 00000090 CFNAME: CF02

```

Figure 12 (Part 1 of 2). System Messages When the SMSVSAM Server Restarts


```

17:25:44.84 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,ITEMACT,,CICSDSW.VSAMU.ITEMACT,
17:25:44.84 STC12906 00000090 IEC161I CICSDSW.VSAMU.ITEMACT.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:44.85 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,ITEMACT,,CICSDSW.VSAMU.ITEMACT,
17:25:44.85 STC12906 00000090 IEC161I CICSDSW.VSAMU.ITEMACT.INDEX,CATALOG.TOTICF1.VTOTCI5
17:25:44.86 STC12906 00000090 IEC161I 062-0341,SCSCPAA1,SCSCPAA1,ITEMACT,,CICSDSW.VSAMU.ITEMACT,
17:25:44.86 STC12906 00000090 IEC161I CICSDSW.VSAMU.ITEMACT.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:45.75 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,EMPACTDB,,
17:25:45.76 STC12906 00000090 IEC161I CICSDSW.VSAMU.EMPACTDB,CICSDSW.VSAMU.EMPACTDB.DATA,
17:25:45.76 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:45.80 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,EMPACTDB,,
17:25:45.79 STC12906 00000090 IEC161I CICSDSW.VSAMU.EMPACTDB,CICSDSW.VSAMU.EMPACTDB.INDEX,
17:25:45.80 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:45.80 STC12906 00000090 IEC161I 062-0341,SCSCPAA1,SCSCPAA1,EMPACTDB,,
17:25:45.81 STC12906 00000090 IEC161I CICSDSW.VSAMU.EMPACTDB,CICSDSW.VSAMU.EMPACTDB.DATA,
17:25:45.81 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:46.80 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,VENDOR,,CICSDSW.VSAMU.VENDOR,
17:25:46.81 STC12906 00000090 IEC161I CICSDSW.VSAMU.VENDOR.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:46.81 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,VENDOR,,CICSDSW.VSAMU.VENDOR,
17:25:46.82 STC12906 00000090 IEC161I CICSDSW.VSAMU.VENDOR.INDEX,CATALOG.TOTICF1.VTOTCI5
17:25:46.82 STC12906 00000090 IEC161I 062-0341,SCSCPAA1,SCSCPAA1,VENDOR,,CICSDSW.VSAMU.VENDOR,
17:25:46.84 STC12906 00000090 IEC161I CICSDSW.VSAMU.VENDOR.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:48.00 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,VENDORX,,CICSDSW.VSAMV.VENDOR,
17:25:48.01 STC12906 00000090 IEC161I CICSDSW.VSAMV.VENDOR.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:48.02 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,VENDORX,,CICSDSW.VSAMV.VENDOR,
17:25:48.03 STC12906 00000090 IEC161I CICSDSW.VSAMV.VENDOR.INDEX,CATALOG.TOTICF1.VTOTCI5
17:25:48.03 STC12906 00000090 IEC161I 062-0341,SCSCPAA1,SCSCPAA1,VENDORX,,CICSDSW.VSAMV.VENDOR,
17:25:48.04 STC12906 00000090 IEC161I CICSDSW.VSAMV.VENDOR.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:49.06 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,ITEMACTX,,CICSDSW.VSAMV.ITEMACT,
17:25:49.06 STC12906 00000090 IEC161I CICSDSW.VSAMV.ITEMACT.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:49.07 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,ITEMACTX,,CICSDSW.VSAMV.ITEMACT,
17:25:49.08 STC12906 00000090 IEC161I CICSDSW.VSAMV.ITEMACT.INDEX,CATALOG.TOTICF1.VTOTCI5
17:25:49.08 STC12906 00000090 IEC161I 062-0341,SCSCPAA1,SCSCPAA1,ITEMACTX,,CICSDSW.VSAMV.ITEMACT,
17:25:49.09 STC12906 00000090 IEC161I CICSDSW.VSAMV.ITEMACT.DATA,CATALOG.TOTICF1.VTOTCI5
17:25:49.99 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,INVENTOX,,
17:25:50.00 STC12906 00000090 IEC161I CICSDSW.VSAMV.INVENTOR,CICSDSW.VSAMV.INVENTOR.DATA,
17:25:50.00 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:50.02 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,INVENTOX,,
17:25:50.03 STC12906 00000090 IEC161I CICSDSW.VSAMV.INVENTOR,CICSDSW.VSAMV.INVENTOR.INDEX,
17:25:50.06 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:50.06 STC12906 00000090 IEC161I 062-0341,SCSCPAA1,SCSCPAA1,INVENTOX,,
17:25:50.07 STC12906 00000090 IEC161I CICSDSW.VSAMV.INVENTOR,CICSDSW.VSAMV.INVENTOR.DATA,
17:25:50.08 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:50.94 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,EMPACTDX,,
17:25:50.94 STC12906 00000090 IEC161I CICSDSW.VSAMV.EMPACTDB,CICSDSW.VSAMV.EMPACTDB.DATA,
17:25:50.95 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:50.96 STC12906 00000090 IEC161I 056-0525,SCSCPAA1,SCSCPAA1,EMPACTDX,,
17:25:50.97 STC12906 00000090 IEC161I CICSDSW.VSAMV.EMPACTDB,CICSDSW.VSAMV.EMPACTDB.INDEX,
17:25:50.98 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
17:25:50.99 STC12906 00000090 IEC161I 062-0341,SCSCPAA1,SCSCPAA1,EMPACTDX,,
17:25:50.99 STC12906 00000090 IEC161I CICSDSW.VSAMV.EMPACTDB,CICSDSW.VSAMV.EMPACTDB.DATA,
17:25:51.00 STC12906 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5

```

5

Figure 12 (Part 2 of 2). System Messages When the SMSVSAM Server Restarts

```
CEMT I UOWD
STATUS: RESULTS

NOT FOUND

RESPONSE: 1 ERROR
PF 1 HELP      3 END      5 VAR      7 SBH 8 SFH 9 MSG 10 SB 11 SF

SYSID=PAA1 APPLID=SCSCPAA1
TIME: 18.25.26 DATE: 04.21.97
```

Figure 13. CEMT UOWDSNFAIL Display after SMSVSAM Server Restart

3.1.5 Documentation on SMSVSAM Server Failure

You can refer to following documents for more information:

- Chapter 6, “Retained Locks” on page 139
- *DFSMSdfp Storage Administration Reference*, for help in planning for SMSVSAM-related failures
- *CICS Release Guide*, for a description of a dynamic RLS restart.

3.2 Integrated Catalog Facility Failure

ICF catalogs are system data sets that contain such information as where data sets reside and the kind of SMS construct they have. With the introduction of VSAM RLS with DFSMS/MVS Version 1 Release 3, ICF catalogs have new attributes relating to RLS processing. It is important to consider the impact of catalog failure in any discussion of recovery in an RLS environment.

3.2.1 Impact on CICS

CICS is affected by an ICF catalog failure when it tries to:

- Allocate a data set that is cataloged in a damaged ICF catalog

When a job step begins, MVS allocates resources as specified in DD statements in a CICS region start procedure. The allocation routine searches the ICF catalog to retrieve data set information required to complete allocation. If the allocation routine cannot access the ICF catalog,

the allocation fails and thus the CICS region start procedure also fails (see Figure 14 on page 33).

Allocation is also performed by MVS when an application program requests dynamic allocation. The dynamic allocation call fails when the allocation routine cannot access the ICF catalog. CICS requests dynamic allocation according to your request in the file definition, CEMT, or the EXEC CICS SET FILE DSNAME command. When dynamic allocation fails, CICS issues message *DFHFC0952*, including a dynamic allocation error code, and puts the data set into "Unenable" status. Any UOW that tries to access a data set that is cataloged in the damaged ICF catalog will fail (see Figure 15 on page 33).

- Open a data set cataloged in a damaged ICF catalog

When CICS tries to open a data set in a damaged ICF catalog, DFSMSdfp accesses the catalog to retrieve the information necessary to complete open processing. If DFSMSdfp cannot get this information because it cannot access the catalog, CICS gets an open error, issues message *DFHFC0952* or *DFHFC0972*, and sets the file as CLOSED and UNENABLED. Any UOW that tries to access the data set will fail (see Figure 16 on page 34).

- Insert or add a record to a data set in a damaged ICF catalog, and the action causes data set extension processing

Data set extension processing, which includes end of volume (EOV) processing, requires catalog access. When the process cannot access the catalog, it cannot extend the data set. CICS sees this as a NOSPACE condition and abnormally terminates the transaction with an AEIR abend code, unless a specific HANDLE CONDITION has been coded. The data set remains available, as discussed in 3.2.5, "Effect on a Running Transaction" on page 34.

- Close a data set in a damaged ICF catalog

When CICS tries to close a data set in a damaged ICF catalog, DFSMSdfp accesses the catalog to retrieve the information necessary to complete close processing. If DFSMSdfp cannot get this information because it cannot access the catalog, CICS gets a close error (see Figure 17 on page 34) and puts the data set into "Unenable" status. Any UOW that tries to access the data set will fail.

3.2.2 Prevention

If your installation has dual copy volumes, we recommend that you put ICF catalogs on them. Dual copy is an IBM 3990 extended function that duplicates the contents of a source volume to another volume transparently to application programs. Because ICF catalogs are read-intensive data sets, they are good candidates for dual copy volumes. Alternatively, ICF catalogs can be placed on IBM RAMAC volumes. Using RAID-5 technology, IBM RAMAC has redundant availability function so that the failure of a single disk drive does not affect access to its data sets. If either form of redundancy is not available and you have an ICF catalog failure, you have to take recovery action.

3.2.3 Recovery

After an ICF catalog failure, you first have to recover the damaged catalog. You can use the IDCAMS EXPORT and IMPORT commands to back up and restore an ICF catalog. When you restore the catalog successfully, ensure that the catalog information is consistent with existing volume information. You can use the IDCAMS DIAGNOSE command for this purpose. We recommend that you use the integrated catalog forward recovery utility (ICFRU) with IDCAMS EXPORT or IMPORT when you recover an ICF catalog. Because the ICFRU makes forward recovery possible for an ICF catalog, you can minimize mismatches between the catalog and existing data sets. After you have ensured that the catalog information is correct, you may have to use the IDCAMS SHCDS CFREPAIR command to correct CICS and RLS data in the catalog.

After recovering the catalog, you have to determine whether the data sets defined in it should be recovered. You can find such data sets by using the CEMT INQUIRE DATASET command. If there is a data set in the damaged ICF catalog, and the data set has "Unenable" status, you may have to perform a forward recovery against it. We discuss forward recovery in 3.3, "Physical I/O Failure on a VSAM Data Set" on page 35.

3.2.4 Examples

Figure 14 on page 33, Figure 15 on page 33, Figure 16 on page 34, and Figure 17 on page 34 illustrate, respectively, a CICS startup failure, dynamic allocation failure, data set open failure, and data set close failure due to an ICF catalog failure.

```

===
=== Vary offline the pack which contains the ICF catalog
===
      VARY 204D,OFFLINE,FORCE
      *180 IEE800D CONFIRM VARY FORCE FOR 204D - REPLY NO OR YES
      R 180,YES
      IEE600I REPLY TO 180 IS;YES
      IEE793I 204D      PENDING OFFLINE AND BOXED
      ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
      FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42
===
=== Submit job
===
      1 //SCSCPAA5 JOB MSGLEVEL=1                      STC02662
      2 //STARTING EXEC CICTSPKL,SYSIDNT=PAA5,START=INITIAL,VAM=RLS
      3 XXCICTSAOR PROC START=' AUTO',
          ....
      27 XXDFHGCD  DD DSN=&INDEX1..&SYSIDNT..DFHGCD,DISP=SHR
          XX*      AMP=(' BUFND=5,BUFNI=20,BUFSP=122880')
          IEFC653I SUBSTITUTION JCL - DSN=CICSTS.CICS510.PAA5.DFHGCD,DISP=SHR
      28 XXDFHLCD  DD DSN=&INDEX1..&SYSIDNT..DFHLCD,DISP=SHR
          IEFC653I SUBSTITUTION JCL - DSN=CICSTS.CICS510.PAA5.DFHLCD,DISP=SHR
      29 XXDFHTEMP DD DSN=&INDEX1..&SYSIDNT..DFHTEMP,DISP=SHR
          IEFC653I SUBSTITUTION JCL - DSN=CICSTS.CICS510.PAA5.DFHTEMP,DISP=SHR
===
=== DD statement for File INVENTOR
===
      30 XXINVENTOR DD DSN=CICSDSW.VSAMU.INVENTOR,DISP=SHR
      31 XXBATA     DD DSN=CICS.BATRLS.TDBATA,DISP=SHR
      32 XXBATD     DD DSN=CICS.BATRLS.TDBATD,DISP=SHR
      33 XXBATX     DD DSN=CICS.BATRLS.TDBATX,DISP=SHR
STMT NO. MESSAGE
      2 IEF001I PROCEDURE CICTSPKL WAS EXPANDED USING SYSTEM LIBRARY ESA.SYS1.PROCLIB
IEF695I START CICTSPKL WITH JOBNAME SCSCPAA5 IS ASSIGNED TO USER STC      , GROUP SYS1
===
=== Allocation for INVENTOR fails due to icf catalog failure
===
IEC331I 050-026(0000000C,TOTC15),SCSCPAA5,SCSCPAA5,VALO,IGG0CLE5
IEF213I SCSCPAA5 SCSCPAA5 INVENTOR - UNDETERMINED ERROR PROCESSING CATALOGED DATA SET
IGD04001I UNEXPECTED CATALOG LOCATE PROCESSING ERROR - RETURN CODE 246 REASON CODE 0
IEF272I SCSCPAA5 SCSCPAA5 - STEP WAS NOT EXECUTED.
IEF373I STEP/CICS510 /START 1997093.2001
IEF374I STEP/CICS510 /STOP 1997093.2001 CPU      OMIN 00.00SEC SRB      OMIN 00.00SEC VIRT      OK SYS      OK EXT      OK SYS      OK
IEF375I JOB/SCSCPAA5/START 1997093.2001
IEF376I JOB/SCSCPAA5/STOP 1997093.2001 CPU      OMIN 00.00SEC SRB      OMIN 00.00SEC

```

Figure 14. CICS Start Procedure Failure Due to Data Set Allocation Failure

```

===
=== Vary offline the pack which contains the ICF catalog
===
20:20:19.37 CICSRS5 00000290 VARY 204D,OFFLINE,FORCE
20:20:19.44 CICSRS5 00000090 *180 IEE800D CONFIRM VARY FORCE FOR 204D - REPLY NO OR YES
20:20:30.72 CICSRS5 00000290 R 180,YES
20:20:30.78 CICSRS5 00000090 IEE600I REPLY TO 180 IS;YES
20:20:30.79 CICSRS5 00000090 IEE793I 204D      PENDING OFFLINE AND BOXED
          096 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
          096 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42
===
=== CICS attempted a dynamic allocation of file INVENTOR...
===
20:20:56.23          00000090 IEC331I 050-026(0000000C,TOTC15),CATALOG,ALLOCATE,VALO,IGG0CLE5
20:20:56.24          00000090 IEC331I 004-31,CATALOG ,ALLOCATE,OPN VSM ACB,IFG0191X
20:20:56.24          00000090 IEC331I CATALOG.TOTICF1.VTOTC15
20:20:56.26          00000090 IEC161I 004-080,CATALOG,ALLOCATE,SYS00015
===
=== and gets following messages because of ICF catalog failure.
===
20:20:56.32 STC02669 00000090 +DFHFC0952 SCSCPAA5 162
          162 00000090      Dynamic allocation of RLS file INVENTOR failed. Return code
          162 00000090      X'0004',X'17FF' in module DFHFCRO.
20:20:56.33 STC02669 00000090 +DFHFC0955 SCSCPAA5 Associated data set is CICSDSW.VSAMU.INVENTOR.
          Module DFHFCRO.

```

Figure 15. Dynamic Allocation Failure Due to ICF Catalog Error

```

===
=== vary offline the pack which contains the ICF catalog
===
20:35:14.61 CICSRS5 00000290 VARY 204D,OFFLINE,FORCE
20:35:14.66 CICSRS5 00000090 *181 IEE800D CONFIRM VARY FORCE FOR 204D - REPLY NO OR YES
20:35:23.72 CICSRS5 00000290 R 181,YES
20:35:23.77 CICSRS5 00000090 IEE600I REPLY TO 181 IS;YES
          415 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME TOTCI5
          417 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
          417 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42

===
=== CICS attempted to open file 'INVENTOR' and gets the
=== following messages while processing ICF catalog management
===
20:35:58.52 00000090 IEC331I 050-026(0000000C,TOTCI5),CATALOG,ALLOCATE,VALO,IGGOCLES
20:35:58.53 00000090 IEC331I 004-31,CATALOG ,ALLOCATE,OPN VSM ACB,IFG0191X
20:35:58.55 00000090 IEC331I CATALOG.TOTICF1.VTOTCI5
20:35:58.55 00000090 IEC161I 004-080,CATALOG,ALLOCATE,SYS00015

===
=== CICS gets an open error for the file
===
20:35:58.58 STC02674 00000090 +DFHFC0972 SCSCPAAS 485
          485 00000090 RLS OPEN of file INVENTOR failed. VSAM catalog entry not found,
          485 00000090 return code - 8111 X'00000028' in module DFHFCRO.
20:37:48.36 TSU02628 00000090 IEF524I 204D, VOLUME TOTCI5 PENDING OFFLINE

```

Figure 16. Data Set Open Failure Due to ICF Catalog Error

```

===
=== vary offline the pack which contains the ICF catalog
===
20:44:19.33 CICSRS5 00000290 VARY 204D,OFFLINE,FORCE
20:44:19.37 CICSRS5 00000090 *182 IEE800D CONFIRM VARY FORCE FOR 204D - REPLY NO OR YES
20:44:30.42 CICSRS5 00000290 R 182,YES
20:44:30.46 CICSRS5 00000090 IEE600I REPLY TO 182 IS;YES
          505 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
          505 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42

===
=== CICS attempted to close file INVENTOR when ICF catalog fails.
=== Following messages show the catalog failure (IEC331) and after
=== that the close failure (IEC251I)
===
20:44:55.33 00000090 IEC331I 050-026(0000000C,TOTCI5),CATALOG,ALLOCATE,VALO,IGGOCLES
20:44:55.34 00000090 IEC331I 004-31,CATALOG ,ALLOCATE,OPN VSM ACB,IFG0191X
20:44:55.35 00000090 IEC331I CATALOG.TOTICF1.VTOTCI5
20:44:55.36 00000090 IEC161I 004-080,CATALOG,ALLOCATE,SYS00015
20:44:55.40 STC02674 00000090 IEC251I 037(246,000,IGGOCLHA)-0261,SCSCPAAS,SCSCPAAS,INVENTOR,,
20:44:55.40 STC02674 00000090 IEC251I CICSDSW.VSAMU.INVENTOR,CICSDSW.VSAMU.INVENTOR.DATA
20:44:55.41 STC02674 00000090 IEC251I 037(246,000,IGGOCLHA)-0261,SCSCPAAS,SCSCPAAS,INVENTOR,,
20:44:55.41 STC02674 00000090 IEC251I CICSDSW.VSAMU.INVENTOR,CICSDSW.VSAMU.INVENTOR.INDEX

```

Figure 17. Data Set Close Failure Due to ICF Catalog Error

3.2.5 Effect on a Running Transaction

To produce an ICF catalog failure we wrote a program, named CATFAIL. This program is invoked by at transaction code CATF. The program adds new records to data set VENDOR until it has to extend. Because we did a vary offline for the pack where the catalog resides, an ICF catalog failure occurred.

We followed these steps to produce an ICF catalog failure with the messages shown in Figure 18 on page 35 appearing on the MVS log:

- Vary offline the catalog pack **1**
- Run transaction CATF
- Wait until message IEC331I occurs **2**
- CATF has abended and a backout occurs **3**

The file remains open and enabled

```
13:42:48.67 CICSRS5 00000290 V 204D,OFFLINE,FORCE 1
13:42:48.70 CICSRS5 00000090 *900 IEE800D CONFIRM VARY FORCE FOR 204D - REPLY NO OR YES
13:42:52.68 CICSRS5 00000290 R 900,YES
13:42:52.71 CICSRS5 00000090 IEE600I REPLY TO 900 IS;YES
13:42:52.72 00000090 IOS102I DEVICE 204D BOXED, OPERATOR REQUEST
13:42:52.72 00000090 IGW570I SMSVSAM ADDRESS SPACE HAD DETECTED A 945
          945 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME TOTCI5
          945 00000090 SMSVSAM PURGE PROCESSING HAS BEEN INITIATED.
13:42:52.72 00000090 IGW570I SMSVSAM ADDRESS SPACE HAD DETECTED A 944
          944 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME TOTCI5
          944 00000090 SMSVSAM PURGE PROCESSING HAS BEEN INITIATED.
13:42:52.73 00000090 IGW571I SMSVSAM ADDRESS SPACE PURGE PROCESSING HAS 947
          947 00000090 BEEN COMPLETED FOR VOLUME TOTCI5
          947 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
          947 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC52
13:42:52.72 CICSRS5 00000090 IEE793I 204D PENDING OFFLINE AND BOXED
13:42:52.72 00000090 IOS451I 204D, BOXED, NO ONLINE OPERATIONAL PATHS
13:42:52.73 00000090 IGW571I SMSVSAM ADDRESS SPACE PURGE PROCESSING HAS 948
          948 00000090 BEEN COMPLETED FOR VOLUME TOTCI5
          948 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
          948 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC52
13:43:20.95 TSU09630 00000090 IEF524I 204D, VOLUME TOTCI5 PENDING OFFLINE

13:43:47.48 00000090 IEC331I 050-026(0000000C,TOTCI5),IEESYSAS,SMSVSAM,VALO,IGGOCLE5 2
13:43:47.50 STC09717 00000090 IEC070I 037(246,000,IGG0CLHA)-0632,SCSCPAA4,SCSCPAA4,VENDOR,204C,
13:43:47.50 STC09717 00000090 IEC070I TOTCI4,CICSDSW.VSAMU.VENDOR,CICSDSW.VSAMU.VENDOR.DATA,
13:43:47.50 STC09717 00000090 IEC070I CATALOG.TOTICF1.VTOTCI5

3
DFHAC2236 04/15/97 13:43:47 SCSCPAA4 Transaction CATF abend AEIR in program CATFAIL term 002C. Updates to local
recoverable resources will be backed out.
```

Figure 18. Sample ICF Catalog Failure

3.2.6 Documentation on ICF Catalog Failures

You can find additional information in *Managing Catalogs*, which describes an ICF catalog recovery procedure (with or without the ICFRU), and *Access Method Services for the Integrated Catalog Facility*, which contains documentation for IDCAMS commands.

3.3 Physical I/O Failure on a VSAM Data Set

A physical I/O error when accessing a VSAM RLS data set, although rare, must be understood and taken into account in recovery planning. In this section we discuss what happens if CICS gets a physical I/O error when accessing a VSAM RLS data set and explain how you can recover from the problem.

3.3.1 Impact on CICS

Whenever CICS gets an I/O error against a data set, it issues message *DFHFC0157* and tries to back out any inflight UOWs that have made changes to the data set. The backout operation may fail because the backout I/O may also get an I/O error. When a backout failure occurs because of an I/O error, CICS issues message *DFHFC4701* with a failure code of X'24', converts existing locks held by the UOWs to retained locks, and shunts the UOWs. Unlike previous versions of CICS, CICS TS has the ability to retain locks. Other UOWs can still retrieve or update other portions of data sets without loss of data integrity. CICS TS does not put the data set into "Unenable" status even though it gets an I/O error.

Note that CICS maintains locks in the enqueue domain for non-RLS-mode access and its scope is only for a single CICS region; SMSVSAM maintains locks by using the coupling facility lock structure for RLS mode access and its scope is sysplexwide.

3.3.2 Prevention

Using storage devices that have a data redundancy capability is the best way to protect data sets from I/O failures. We also recommend that you define your vital data sets as recoverable in order to make forward recovery possible.

3.3.3 Recovery

If a data set is damaged by anything other than a volume failure, retained locks can be preserved automatically. For a volume failure, you can ensure data integrity only by deleting the IGWLOCK00 structure and forcing CICS to perform lost locks recovery (see 3.3.3.1, “Planning for RLS Data Set Forward Recovery”).

3.3.3.1 Planning for RLS Data Set Forward Recovery

When you perform a forward recovery you have to consider:

- Recovery attributes

If you access the VSAM data set in RLS mode, you must specify recovery attributes in the ICF catalog. Otherwise, CICS will not build the forward recovery log. To define recovery attributes in the ICF catalog, you have to include the following keywords on the IDCAMS DEFINE CLUSTER and ALTER commands.

- LOG(ALL) to cause CICS to build logs for both dynamic backout and forward recovery
- LOGSTREAMID(*log_stream_name*) to tell CICS where to build the forward recovery log

- Forward recovery log

Unlike previous versions of CICS, CICS TS uses the MVS system logger for logging. You can no longer use an existing forward recovery program that worked with log data sets produced by previous versions of CICS.

- Retained locks

If your CICS installation uses RLS access mode to the VSAM data set and it is defined with LOG(ALL) or LOG(UNDO), SMSVSAM may keep retained lock information for the data set. If there is any retained lock information for the data set, you have to take special care of it because retained locks must be preserved to ensure data integrity.

You should follow different procedures for data set corruption without loss of volume and for full loss of volume. The forward recovery procedures for both cases are described in Chapter 17, “Forward Recovery Procedures”, of the *CICS Recovery and Restart Guide*.

The sequence we use illustrates the recovery procedure for total volume loss, which can be caused by physical damage to a disk. In the event of a physical damage to a disk, you can insure data integrity by following these steps:

1. Make the volume inaccessible in RLS mode even after the volume restore by issuing the VARY SMS,CFVOL(volume),QUIESCE command.
2. Restore the volume from backup.
3. ROUTE *ALL,VARY SMS,SMSVSAM,TERMINATESERVER
SMSVSAM servers must be terminated temporarily to delete the lock structure. Verify that all servers have terminated correctly.
4. VARY SMS,SMSVSAM,FORCEDELETELOCKSTRUCTURE
This command deletes the lock structure. Reply FORCEDELETELOCKSTRUCTURESMSVSAMYES to the prompt. Deleting the lock structure ensures that all data sets that have retained locks are set into lost locks condition.
5. ROUTE *ALL,VARY SMS,SMSVSAM,ACTIVE
This command restarts all SMSVSAM servers. CICS performs dynamic RLS restart and lost locks recovery.
6. V SMS,CFVOL(volume),ENABLE
Unquiesce the volume.
7. Do forward recovery.
Run CICSVR or an equivalent forward recovery utility program.
8. Check whether any lost locks remain.
9. Connect data sets back to CICS and let them be reopened.

3.3.3.2 Planning for Non-RLS Data Set Forward Recovery

If a backout against a VSAM non-RLS data set fails because of a physical I/O failure, CICS does not call SMSVSAM to convert the active locks to retained locks. For data sets opened in non-RLS mode, the CICS enqueue domain provides an equivalent function. To display CICS locks associated with shunted UOWs, use CEMT INQ UOWENQ. (Note that INQ UOWENQ is for non-RLS use only! CICS does not perform lost locks recovery for non-RLS files). For data sets opened in non-RLS mode, use the following forward recovery procedure:

1. Close all files that are opened against the failed data set.
2. Create a new data set, using a different name.
3. Restore the backup to the new data set.
4. Apply your forward recovery logs to the restored data set.
5. Delete the old data set.
6. Alter the new data set name, enabling CICS to perform any outstanding backout processing.

3.3.4 Example

We used the following process to simulate a physical I/O failure:

1. Allocate application data sets to an empty volume.
We placed all application data sets on a new volume to avoid getting mixed failure scenarios.
2. Back up the application data sets or the whole volume.
3. Verify that VSAM data sets have LOG(ALL) in their LISTCAT.

4. Start a stand-alone CICS region.

We set up CICS region PAA1 with both RLS and non-RLS access to the application data sets. For non-RLS files, we expect that shunted UOWs get retried automatically as soon as the volume comes back online and is enabled.

5. Run TPNS.

6. Force an I/O error.

We simulated a physical I/O failure by varying the device offline.

Figure 19 on page 40 shows the MVS system log for a physical I/O failure. We extracted the log so that it is easier to see the flow for data sets CICSDSW.VSAMU.VENDOR with UOW(AE69B090BD91E203) and CICSDSW.VSAMV.INVENTOR with UOW(AE69B09F8D2E404).

1 Shows the VARY OFFLINE command for volume TOTCI4. Device 204C is in BOXED status.

2 CICS issues message *DFHFC0157* followed by message *DFHFC0158* for all requests against the data sets residing on the failed volume. After that, CICS tries to back out the changes to the data set. During backout, CICS gets an I/O error and issues message *DFH4701* with a failure code of X'24', indicating an I/O error. UOWs are shunted, and any existing active locks for the UOWs are converted to retained locks.

3 We issued CEMT SET FILE(*) CLO to prevent further I/O errors and their associated messages.

4 We checked whether we had shunted UOWs. The CEMT INQ UOW command shows that we have two tasks, 32750 and 33249, with shunted UOWs and backout failed status.

5 CEMT INQ UOWDSN returns information about UOW failures that are associated with specific data sets. The log shows that we have Dat and Ioe for CAUSE and REASON. A cause of Dat means that the backout of a UOW has failed for this data set. The reason for the data set failure is I/O error.

6 CEMT INQ UOWENQ returns information about locks held by the enqueue domain for non-RLS files, in this case CICSDSW.VSAMV.INVENTOR. These are CICS-managed locks, and they do not use the coupling facility lock structure.

7 We must terminate the SMSVSAM server to delete the lock structure. To prevent CICS from attempting to retry the UOWs when the server restarts, we do a CFVOL Quiesce for volume TOTCI4.

8 We put the volume back online.

9 The volume has been recovered in the meantime. Now we are going to terminate the SMSVSAM server on all images. All connections to the lock structure (IGWLOCK00) are gone, FAILED PERSISTENT.

10 We delete the lock structure and check, using the D XCF,STR,STRNAME=IGWLOCK00 command, that it is no longer allocated.

11 SMSVSAM is restarted, with resultant lost locks.

12 When the SMSVSAM server is back, it signals CICS that dynamic RLS restart can be done. CICS issues message *DFHFC0555* and performs lost

locks recovery. During dynamic RLS restart, CICS attempts to retry shunted UOWs but fails with message *DFH4701* because the volume is still quiesced.

13 CFVOL is enabled.

14 The CEMT INQ UOW and UOWDSN commands show that the UOW (task 32750) is shunted and still in backout failed status, waiting for the RLS data set, CICSDSW.VSAMU.VENDOR, to become available. The previously shunted UOW (task 33249) has completed because non-RLS data sets are now available.

15 Files are reopened to CICS and shunted UOWs are retried by using CEMT SET DSN(*) RETRY. After that we have no more shunted UOWs. CEMT INQ UOW shows all UOWs as inflight.

```

13:27:42.40 CICSRS4 00000090 IEE421I RO *ALL,V 204C,OFFLINE,F 770 1
770 00000090 SYSNAME RESPONSES -----
770 00000090 SC42 *072 IEE800D CONFIRM VARY FORCE FOR 204C - REPLY NO OR YES
13:28:46.48 CICSRS4 00000290 R 72,YES
13:28:46.56 *ROUT034 00000090 IEE600I REPLY TO 072 IS;YES
13:28:46.62 00000090 IGW570I SMSVSAM ADDRESS SPACE HAD DETECTED A 791
791 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME TOTCI4
791 00000090 SMSVSAM PURGE PROCESSING HAS BEEN INITIATED.
13:28:46.57 00000090 IOS102I DEVICE 204C BOXED, OPERATOR REQUEST
13:28:46.62 *ROUT034 00000090 IEE793I 204C PENDING OFFLINE AND BOXED
13:28:46.57 00000090 IOS451I 204C, BOXED, NO ONLINE OPERATIONAL PATHS
13:29:06.50 STC03216 00000090 +DFHFC0157 SCSCPA1 336 2
336 00000090 SC2 P089 CICSUSER An I/O error has occurred on base data set
336 00000090 CICSDSW.VSAMU.VENDOR accessed via file VENDOR component code X'00'.
13:29:06.53 STC03216 00000090 +DFHFC0158 SCSCPA1 337
337 00000090 00000,00000000,000000000000,D,,SCSCPA1,SCSCPA1,0000,DA,VENDOR
337 00000090 ,00- OP,UNKNOWN COND. ,00000000000000,VSAM
13:29:06.54 STC03216 00000090 +DFHFC4701 SCSCPA1 338
338 00000090 03/25/97 13:29:06 SCSCPA1 Backout failed for transaction SC2, VSAM
338 00000090 file VENDOR, unit of work X'AE69B090BD91E203', task 32750, base
338 00000090 CICSDSW.VSAMU.VENDOR, path CICSDSW.VSAMU.VENDOR, failure code X'24'.
13:29:07.98 STC03216 00000090 +DFHFC0157 SCSCPA1 408
408 00000090 SX6 P175 CICSUSER An I/O error has occurred on base data set
408 00000090 CICSDSW.VSAMV.INVENTOR accessed via file INVENTOX component code
408 00000090 X'00'.
13:29:07.99 STC03216 00000090 +DFHFC0158 SCSCPA1 409
409 00000090 97084,13290797,000000043000,D,TOTCI4,SCSCPA1,SCSCPA1,204C,DA,INVENT
409 00000090 OX, ,UNKNOWN COND. ,00000087000508,VSAM
13:29:08.01 STC03216 00000090 +DFHFC4701 SCSCPA1 410
410 00000090 03/25/97 13:29:08 SCSCPA1 Backout failed for transaction SX6, VSAM
410 00000090 file INVENTOX, unit of work X'AE69B09CF8D2E404', task 33249, base
410 00000090 CICSDSW.VSAMV.INVENTOR, path CICSDSW.VSAMV.INVENTOR, failure code
410 00000090 X'24'.
13:28:53.57 CICSRS4 00000290 F SCSCPA1,CEMT S FILE(*) CLO 3
426 00000090 Fil(INVENTOX) Vsa Ope Ena Rea Upd Add Del Sha CLOSE
REQUESTED
430 00000090 Fil(VENDOR ) Vsa Ope Ena Rea Upd Add Del Sha CLOSE
REQUESTED
13:29:08.62 STC03216 00000090 + RESPONSE: NORMAL TIME: 13.29.09 DATE: 03.25.97 431
431 00000090 SYSID=PAA1 APPLID=SCSCPA1
13:29:23.07 STC03216 00000090 +DFHFC0967 SCSCPA1 646
646 00000090 Error detected while closing Non-RLS file INVENTOX - VSAM codes
646 00000090 X'0004',X'0094' in module DFHFCFS.
13:32:19.81 CICSRS4 00000290 F SCSCPA1,CEMT I UOW 4
699 00000090 Uow(AE69B090BD91E203) Bac Shu Tra(SC2 ) Tas(0032750)
13:32:19.96 STC03216 00000090 + Age(00000194) Ter(P089) Netn(SCSTP089) Use(CICSUSER) Dat 700
702 00000090 Uow(AE69B09CF8D2E404) Bac Shu Tra(SX6 ) Tas(0033249)
702 00000090 Age(00000193) Ter(P175) Netn(SCSTP175) Use(CICSUSER) Dat
711 00000090 RESPONSE: NORMAL TIME: 13.32.20 DATE: 03.25.97
711 00000090 SYSID=PAA1 APPLID=SCSCPA1
13:32:34.30 CICSRS4 00000290 F SCSCPA1,CEMT I UOWDSN 5
713 00000090 Dsn(CICSDSW.VSAMU.VENDOR ) Dat
713 00000090 Ioe Uow(AE69B090BD91E203) Rls
715 00000090 Dsn(CICSDSW.VSAMV.INVENTOR ) Dat
715 00000090 Ioe Uow(AE69B09CF8D2E404)
729 00000090 RESPONSE: NORMAL TIME: 13.32.35 DATE: 03.25.97
729 00000090 SYSID=PAA1 APPLID=SCSCPA1
13:32:41.91 CICSRS4 00000290 F SCSCPA1,CEMT I UOWENQ 6
731 00000090 Uow(AE69B09CF8D2E404) Tra(SX6 ) Tas(0033249) Ret Dat
731 00000090 Own Res(CICSDSW.VSAMV.INVENTOR ) Rls(022) Enq(00000000)
732 00000090 RESPONSE: NORMAL TIME: 13.32.42 DATE: 03.25.97
732 00000090 SYSID=PAA1 APPLID=SCSCPA1
14:24:22.39 CICSRS4 00000290 V SMS,CFVOL(TOTCI4),QUIESCE 7
14:24:22.81 00000090 IGW462I DFSMS CF CACHE REQUEST TO QUIESCE 841
841 00000090 VOLUME TOTCI4 IS ACCEPTED
14:25:55.16 00000090 IGW462I DFSMS CF CACHE REQUEST TO QUIESCE 842
842 00000090 VOLUME TOTCI4 IS COMPLETED.
842 00000090 VOLUME TOTCI4 IS NOW QUIESCED.
14:33:16.24 CICSRS4 00000290 RO *ALL,V 204C,ONLINE,UNCOND 8
14:33:16.60 *ROUT034 00000090 IEE302I 204C ONLINE
14:36:13.26 CICSRS4 00000290 RO *ALL,V SMS,SMSVSAM,TERMINATESERVER 9
14:36:13.38 00000090 IGW572I REQUEST TO TERMINATE SMSVSAM 860
860 00000090 ADDRESS SPACE IS ACCEPTED:
860 00000090 SMSVSAM SERVER TERMINATION SCHEDULED.

```

Figure 19 (Part 1 of 4). System Messages from a Physical I/O Failure

```

14:36:51.45 CICSRS4 00000290 D XCF,STR,STRNAME=IGWLOCK00
14:37:04.21 CICSRS4 00000090 IXC360I 14.36.51 DISPLAY XCF 951
951 00000090 STRNAME: IGWLOCK00
951 00000090 STATUS: ALLOCATED
951 00000090 POLICY SIZE : 28600 K
951 00000090 POLICY INITSIZE: 14300 K
951 00000090 REBUILD PERCENT: 75
951 00000090 PREFERENCE LIST: CF02 CF01
951 00000090 EXCLUSION LIST IS EMPTY
951 00000090
951 00000090 ACTIVE STRUCTURE
951 00000090 -----
951 00000090 ALLOCATION TIME: 03/24/1997 21:48:46
951 00000090 CFNAME : CF02
951 00000090 COUPLING FACILITY: 009672.IBM.02.000000040104
951 00000090 PARTITION: 1 CPCID: 01
951 00000090 ACTUAL SIZE : 14336 K
951 00000090 STORAGE INCREMENT SIZE: 256 K
951 00000090 VERSION : AE68DE82 3DA6CA03
951 00000090 DISPOSITION : KEEP
951 00000090 ACCESS TIME : NOLIMIT
951 00000090 MAX CONNECTIONS: 16
951 00000090 # CONNECTIONS : 12
951 00000090
951 00000090 CONNECTION NAME ID VERSION SYSNAME JOBNAME ASID STATE
951 00000090 -----
951 00000090 SC42 05 00050042 SC42 SMSVSAM 0101 FAILED-PERSISTENT
951 00000090 SC43 06 00060047 SC43 SMSVSAM 00FD FAILED-PERSISTENT
951 00000090 SC47 04 0004002F SC47 SMSVSAM 00FE FAILED-PERSISTENT
951 00000090 SC48 03 00030042 SC48 SMSVSAM 00FE FAILED-PERSISTENT
951 00000090 SC49 08 0008005E SC49 SMSVSAM 00FD FAILED-PERSISTENT
951 00000090 SC50 02 00020095 SC50 SMSVSAM 000A FAILED-PERSISTENT
951 00000090 SC52 0C 000C000A SC52 SMSVSAM 000A FAILED-PERSISTENT
951 00000090 SC53 01 000100A1 SC53 SMSVSAM 000A FAILED-PERSISTENT
951 00000090 SC54 07 00070031 SC54 SMSVSAM 00FD FAILED-PERSISTENT
951 00000090 SC55 0A 000A002E SC55 SMSVSAM 0063 FAILED-PERSISTENT
951 00000090 SC61 09 00090029 SC61 SMSVSAM 000A FAILED-PERSISTENT
951 00000090 SC62 0B 000B000D SC62 SMSVSAM 000A FAILED-PERSISTENT
14:38:39.36 CICSRS4 00000290 V SMS,SMSVSAM,FORCEDELETELOCKSTRUCTURE 10
14:38:39.42 00000090 *073 IGW526A SMSVSAM DELETE LOCK STRUCTURE REQUESTED. REPLY 'CANCEL'
TO ABORT, 'FORCEDELETELOCKSTRUCTURESMSVSAMYES' TO PROCEED.
14:39:11.95 CICSRS4 00000290 R 73 SUPPRESSED
14:39:11.99 CICSRS4 00000090 IEE600I REPLY TO 073 IS;SUPPRESSED
14:39:15.67 00000090 IGW527I SMSVSAM FORCE DELETE LOCK STRUCTURE 960
960 00000090 PROCESSING IS NOW COMPLETE
14:39:30.64 CICSRS4 00000290 D XCF,STR,STRNAME=IGWLOCK00
14:39:30.98 CICSRS4 00000090 IXC360I 14.39.30 DISPLAY XCF 962
962 00000090 STRNAME: IGWLOCK00
962 00000090 STATUS: NOT ALLOCATED
962 00000090 POLICY SIZE : 28600 K
962 00000090 POLICY INITSIZE: 14300 K
962 00000090 REBUILD PERCENT: 75
962 00000090 PREFERENCE LIST: CF02 CF01
962 00000090 EXCLUSION LIST IS EMPTY
15:10:32.29 CICSRS4 00000290 V SMS,SMSVSAM,ACTIVE 11
15:10:32.37 00000090 IGW415I SMSVSAM SERVER ADDRESS SPACE HAS FAILED AND IS RESTARTING
15:10:38.18 00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 313
313 00000090 SYS1.DFPHSCDS.WTSCPLX1.VSHCDS1 ADDED.
15:10:38.23 00000290 IEF196I IEF237I 2048 ALLOCATED TO SYS00002
15:10:38.34 00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 315
315 00000090 SYS1.DFPHSCDS.WTSCPLX1.VSHCDS2 ADDED.
15:10:38.50 00000290 IEF196I IEF237I 2054 ALLOCATED TO SYS00003
15:10:38.60 00000090 IGW619I SPARE SHARE CONTROL DATA SET 317
317 00000090 SYS1.DFPHSCDS.WTSCPLX1.VSHCDS3 ADDED.
15:10:40.22 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE IGWLOCK00 WAS SUCCESSFUL. 318
318 00000290 JOBNAME: SMSVSAM ASID: 0103 CONNECTOR NAME: SC42
318 00000290 CFNAME: CF02
15:10:40.23 00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 319
319 00000090 CONNECTED TO DFSMS LOCK STRUCTURE IGWLOCK00
319 00000090 STRUCTURE VERSION:AE69C09C083D6C01 SIZE:14336K bytes
319 00000090 MAXIMUM USERS:16 REQUESTED:16
319 00000090 LOCK TABLE ENTRIES:1048576 REQUESTED:1048576
319 00000090 RECORD TABLE ENTRIES:71577 USED:0
15:11:00.95 00000090 IGW321I No retained locks
15:11:02.63 00000090 IGW321I 4 spheres in Lost Locks
15:11:03.24 00000090 IGW467I DFSMS RLS MAX_POOL_SIZE PARMLIB VALUE SET DURING 322
322 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
322 00000090 CURRENT VALUE: 100 1

```

Figure 19 (Part 2 of 4). System Messages from a Physical I/O Failure

```

15:11:03.31      00000090 IGW467I DFSMS DEADLOCK_DETECTION PARMLIB VALUE SET DURING 323
                323 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
                323 00000090 THIS SYSTEM IS OPERATING AS A LOCAL DEADLOCK PROCESSOR.
                323 00000090 CURRENT VALUE: 15 4 1
15:11:03.35      00000090 IGW467I DFSMS SMF_TIME PARMLIB VALUE SET DURING 324
                324 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
                324 00000090 CURRENT VALUE: YES 1
15:11:03.40      00000090 IGW467I DFSMS CF_TIME PARMLIB VALUE SET DURING 325
                325 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
                325 00000090 CURRENT VALUE: 1800 1
15:11:03.60      00000090 IGW462I DFSMS CF CACHE REQUEST TO QUIESCE 326
                326 00000090 VOLUME TOTCI4 IS ACCEPTED
15:11:03.71      00000090 IGW414I SMSVSAM SERVER ADDRESS SPACE IS NOW ACTIVE.
15:11:03.72 STC03216 00000090 +DFHFC0568I SCSCPA1 File control dynamic RLS restart has started. 12
15:11:03.74 STC03216 00000090 +DFHFC0562 SCSCPA1 The RLS control ACB has been successfully
                registered by CICS.
15:11:03.75 STC03216 00000090 +DFHFC0555 SCSCPA1 One or more data sets are in lost locks status.
                CICS will perform lost locks recovery.
15:11:03.75 STC03216 00000090 +DFHFC0570 SCSCPA1 File control RLS access has been enabled.
15:11:03.79 STC03216 00000090 +DFHFC0569I SCSCPA1 File control dynamic RLS restart has ended.
15:11:12.69 STC03216 00000090 +DFHFC0500 SCSCPA1 RLS OPEN of file VENDOR failed. VSAM has returned
                code X'0008' in R15 and reason X'00C6'.
15:11:12.71 STC03216 00000090 +DFHFC470I SCSCPA1 353
                353 00000090 03/25/97 15:11:12 SCSCPA1 Backout failed for transaction SC2, VSAM
                file VENDOR, unit of work X'AE69B090BD91E203', task 32750, base
                CICSDSW.VSAMU.VENDOR, path CICSDSW.VSAMU.VENDOR, failure code X'FB'.
15:13:54.11 CICSRS4 00000290 V SMS,CFVOL(TOTCI4),ENABLE 13
15:13:54.36      00000090 IGW463I DFSMS CF CACHE REQUEST TO ENABLE 746
                746 00000090 VOLUME TOTCI4 IS COMPLETED.
                746 00000090 DFSMS CF VOLUME STATUS = "CF_ENABLED"
15:16:27.47 CICSRS4 00000290 F SCSCPA1,CEMT I UOW 14
                754 00000090 Uow(AE69B090BD91E203) Bac Shu Tra(SC2 ) Tas(0032750)
                754 00000090 Age(00006441) Ter(P089) Netn(SCSTP089) Use(CICSUSER) Dat
                765 00000090 RESPONSE: NORMAL TIME: 15.16.28 DATE: 03.25.97
                765 00000090 SYSID=PAA1 APPLID=SCSCPA1
15:16:34.08 CICSRS4 00000290 F SCSCPA1,CEMT I UOWDSN
15:16:34.18 STC03216 00000090 + 767
                767 00000090 Dsn(CICSDSW.VSAMU.VENDOR ) Dat
                767 00000090 Ope Uow(AE69B090BD91E203) R1s
                776 00000090 RESPONSE: NORMAL TIME: 15.16.34 DATE: 03.25.97
                776 00000090 SYSID=PAA1 APPLID=SCSCPA1
15:17:18.09 CICSRS4 00000290 F SCSCPA1,CEMT S FILE(*) OPEN
15:17:29.38 STC03216 00000090 IEC161I 056-0525,SCSCPA1,SCSCPA1,INVENTOR,,
15:17:29.38 STC03216 00000090 IEC161I CICSDSW.VSAMU.INVENTOR,CICSDSW.VSAMU.INVENTOR.DATA,
15:17:29.38 STC03216 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
15:17:29.38 STC03216 00000090 IEC161I 056-0525,SCSCPA1,SCSCPA1,INVENTOR,,
15:17:29.39 STC03216 00000090 IEC161I CICSDSW.VSAMU.INVENTOR,CICSDSW.VSAMU.INVENTOR.INDEX,
15:17:29.39 STC03216 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
15:17:29.39 STC03216 00000090 IEC161I 062-0341,SCSCPA1,SCSCPA1,INVENTOR,,
15:17:29.39 STC03216 00000090 IEC161I CICSDSW.VSAMU.INVENTOR,CICSDSW.VSAMU.INVENTOR.DATA,
15:17:29.40 STC03216 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
15:17:29.40 STC03216 00000090 IEC161I 013(00000004 660C0020 00000012 7F438CB8)-0581,SCSCPA1,
15:17:29.41 STC03216 00000090 IEC161I SCSCPA1,INVENTOR,,CICSDSW.VSAMU.INVENTOR,,
15:17:29.41 STC03216 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
15:17:39.04 STC03216 00000090 IEC161I 056-0525,SCSCPA1,SCSCPA1,VENDOR,,CICSDSW.VSAMU.VENDOR,
15:17:39.05 STC03216 00000090 IEC161I CICSDSW.VSAMU.VENDOR.DATA,CATALOG.TOTICF1.VTOTCI5
15:17:39.05 STC03216 00000090 IEC161I 056-0525,SCSCPA1,SCSCPA1,VENDOR,,CICSDSW.VSAMU.VENDOR,
15:17:39.06 STC03216 00000090 IEC161I CICSDSW.VSAMU.VENDOR.INDEX,CATALOG.TOTICF1.VTOTCI5
15:17:39.06 STC03216 00000090 IEC161I 062-0341,SCSCPA1,SCSCPA1,VENDOR,,CICSDSW.VSAMU.VENDOR,
15:17:39.07 STC03216 00000090 IEC161I CICSDSW.VSAMU.VENDOR.DATA,CATALOG.TOTICF1.VTOTCI5
15:17:39.08 STC03216 00000090 IEC161I 013(00000004 660C0020 0000000B 7F4384A0)-0581,SCSCPA1,
15:17:39.10 STC03216 00000090 IEC161I SCSCPA1,VENDOR,,CICSDSW.VSAMU.VENDOR,,
15:17:39.78 STC03216 00000090 IEC161I CATALOG.TOTICF1.VTOTCI5
                + 945
                948 00000090 Fil(INVENTOX) Vsa Ope Ena Rea Upd Add Del Sha NORMAL
                948 00000090 Dsn( CICSDSW.VSAMU.INVENTOR )
15:17:39.96 STC03216 00000090 + Fil(VENDOR ) Vsa Ope Ena Rea Upd Add Del Sha NORMAL 952
                952 00000090 R1s Dsn( CICSDSW.VSAMU.VENDOR )
                952 00000090 RESPONSE: NORMAL TIME: 15.17.40 DATE: 03.25.97
                952 00000090 SYSID=PAA1 APPLID=SCSCPA1

```

Figure 19 (Part 3 of 4). System Messages from a Physical I/O Failure

```

15:22:19.56 CICSRS4 00000290 F SCSCPA1,CEMT S DSN(*) RETRY 15
          963 00000090 Dsn(CICSDSW.VSAMU.VENDOR ) Vsa NORMAL
          963 00000090 Fil(0001) Val Bas Rec Ava Unq
15:22:30.23 STC03216 00000090 + RESPONSE: NORMAL TIME: 15.22.30 DATE: 03.25.97 968
          968 00000090 SYSID=PAA1 APPLID=SCSCPA1
15:22:55.07 CICSRS4 00000290 F SCSCPA1,CEMT I UOWDSN
15:22:55.12 STC03216 00000090 + 970
          970 00000090 NOT FOUND
          970 00000090 RESPONSE: 1 ERROR TIME: 15.22.55 DATE: 03.25.97
          970 00000090 SYSID=PAA1 APPLID=SCSCPA1
15:23:22.63 CICSRS4 00000290 F SCSCPA1,CEMT I UOW
15:23:22.70 STC03216 00000090 + 972
          972 00000090 Uow(AE699F3021990005) Inf Act Tra(CSSY) Tas(0000004)
          972 00000090 Age(00011554) Use(CICSUSER)
          972 00000090 Uow(AE699F3021CDA605) Inf Act Tra(CSSY) Tas(0000005)
          972 00000090 Age(00011554) Use(CICSUSER)
          972 00000090 Uow(AE699F30381FCC06) Inf Act Tra(CSTP) Tas(0000007)
          972 00000090 Age(00011554) Use(CICSUSER)
          .
          .
          .
          .
          974 00000090 Age(00011520) Use(CICSUSER)
          974 00000090 Uow(AE699F506D89D200) Inf Act Tra(COIE) Tas(0000029)
          974 00000090 Age(00011520) Use(CICSUSER)
          974 00000090 Uow(AE69AFF1B5F3C405) Inf Act Tra(CEMT) Tas(0023491)
          974 00000090 Age(00007056) Ter(109A) Netn(SC02109A) Use(CICSUSER)
          974 00000090 Uow(AE69B0C8BCD76E03) Inf Act Tra(CSNE) Tas(0000020)
          974 00000090 Age(00006830) Use(CICSUSER)
          974 00000090 Uow(AE69C8F43EAD2600) Inf Act Tra(CEMT) Tas(0033918)
15:23:22.76 STC03216 00000090 + Age(00000342) Ter(179C) Netn(SC02179C) Use(CICSUSER) 975
          975 00000090 Uow(AE69CA3B10710A06) Inf Act Tra(CEMT) Tas(0033962)
          975 00000090 Age(00000000) Ter(CRS4) Use(CICSUSER)
15:23:22.78 STC03216 00000090 + RESPONSE: NORMAL TIME: 15.23.23 DATE: 03.25.97 976
          976 00000090 SYSID=PAA1 APPLID=SCSCPA1

```

Figure 19 (Part 4 of 4). System Messages from a Physical I/O Failure

3.3.5 Documentation on Physical I/O Failures

The following manuals are recommended for more information about dealing with physical I/O failures:

- *CICS Recovery and Restart Guide*
- *CICSVR User's Guide and Reference*
- *Access Method Services for the Integrated Catalog Facility*

3.4 Sharing Control Data Set Failure

In this section we discuss the impact on a CICS system of an SHCDS failure.

SMSVSAM uses SHCDSs to ensure the integrity of a VSAM data sharing environment if RLS locks are lost. The SHCDS contains the following information:

- Name of the coupling facility lock structure in use
- System status for each system or failed system instance
- Time at which the system failed
- List of subsystems and their status
- List of open data sets using the coupling facility
- List of data sets with unbound locks

- List of data sets in permit non-RLS backout state

Because these data sets are vital to the RLS process, SMSVSAM maintains duplicate information in two "active" SHCDSs, with one or more "spare" data sets.

If at least two active and one spare SHCDSs are not available when SMSVSAM initializes, messages *IGW608A* and *IGW609A* are issued. The SMSVSAM address space will not initialize without all these SHCDSs.

3.4.1 Impact

Because the SHCDSs are critical to VSAM RLS support, SMSVSAM duplicates information into two active SHCDSs and has at least one spare data set. If one of the active SHCDSs experiences an I/O failure, SMSVSAM replaces the damaged SHCDS with a spare SHCDS, trying to keep two active SHCDSs and one spare SHCDS at all times. Whenever there are fewer than this number, SMSVSAM issues message *IGW608A* or *IGW609A*. *IGW608A* indicates that the SHCDS is not duplexed, and *IGW609A* indicates that there is no spare SHCDS. SMSVSAM can still provide VSAM RLS support even if only one SHCDS is available. When SMSVSAM loses the last active SHCDS and there is no spare SHCDS available, it terminates and restarts. During initialization, SMSVSAM detects that it has no SHCDS data sets and issues a highlighted message prompting the operator to make an SHCDS active. While the server is down, RLS activity is prohibited.

Inaccessibility to SHCDS is transparent to application programs unless SMSVSAM has totally lost the accessibility to SHCDS. In this case, CICS gets an error when it tries to open a data set.

3.4.2 Prevention of SHCDS Failure

Plan to put SHCDSs on DASD that has high-availability function. Because you cannot define multiple SHCDSs on the same volume, and SMSVSAM duplexes information into at least two active SHCDSs, the SHCDSs have a native fault-tolerant capability. However, if you plan to allocate SHCDSs to RAMAC volumes, do not allocate them in the same drawer lest you lose all of the active SHCDSs at one time. RAMAC emulates multiple 3390-3 (or 3380-K) DASD in a drawer, so it is possible to lose accessibility to all emulated volumes in a drawer when hardware failures occur and the drawer cannot recover data.

3.4.3 Recovery

Whenever an SHCDS is lost, recover it immediately — do not wait until all active and spare SHCDSs have failed!

To build a replacement SHCDS, follow these steps:

1. Define a new SHCDS using the IDCAMS DEFINE command.

Ensure that:

- The newly defined SHCDS has exactly the same primary size as the existing active and spare SHCDSs

- The newly defined SHCDS has a data set name of **SYS1.DFPSCHDS.anyname.Vvolser**, where *anyname* can be any name you choose and *volser* must be the volume serial number where the SHCDS is to reside.
2. Add an active SHCDS
MVS system command `V SMS,SHCDS(anyname.V volser),NEW` causes SMSVSAM to add the new SHCDS. You do not have to include `SYS1.DFPSHCDS` in the command.
 3. Add a spare SHCDS
MVS system command `V SMS,SHCDS(anyname.V volser),NEWSPARE` causes SMSVSAM to add a new, spare SHCDS.

3.4.4 Example

Figure 20 on page 47 shows the example we used in our test environment. We allocated three SHCDSs, each on its own volume. We simulated SHCDS failure by varying offline the volume containing the SHCDS.

- 1** Shows the output of a D SMS SHCDS command. We have two active and one spare SHCDSs.
- 2** We issued a `V 2047,OFFLINE,FORCE` against the volume where the first active SHCDS resided, resulting in messages *IGW619I*, *IGW615W*, and *IGW614W*. *IGW619I* indicates that SMSVSAM has unallocated the primary SHCDS, *IGW615W* that there was a failure with the primary SHCDS, and *IGW614W* that our spare was converted to a primary. Message *IGW609A* indicates that there is no spare SHCDS and immediate action is required.
- 3** The D SMS SHCDS command now shows two active SHCDS data sets and no spares.
- 4** Next we forced offline the volume where the second SHCDS resided.
- 5** The D SMS,SHCDS command now shows that there is only one active SHCDS.
- 6** We then forced offline the volume where the last SHCDS resided.
- 7** If SMSVSAM loses its last active SHCDS and has no spare, it terminates and restarts. Because SHCDSs will not be available, SMSVSAM will issue a WTOR and wait to complete the initialization. In this phase, SMSVSAM cannot process any request against RLS files.
- 8** We issued `CEMT INQ UOW` and `CEMT INQ UOWDSN` to determine whether there were shunted UOWs and any backout activity related to them.
- 9** We brought the volumes back online.
- 10** `V SMS,SHCDS(WTSCPLX1.VSHCDS1),NEW` command adds the first SHCDS to SMSVSAM.
- 11** `V SMS,SHCDS(WTSCPLX1.VSHCDS2),NEW` adds the second SHCDS.

- 12** V SMS,SHCDS(WTSCPLX1.VSHCDS3),NEWSPARE reconnects the spare. Remember that unless you have at least two active and one spare SHCDS, SMSVSAM will not initialize.
- 13** The D SMS,SHCDS command verifies that all SHCDSs are back and active.
- 14** After getting back all SHCDSs, SMSVSAM restarts and notifies CICS.
- 15** CICS performs dynamic RLS restart and processes any shunted UOWs.
- 16** The CEMT INQ UOWD command verifies that no shunted UOWs remain.

```

15:26:23.38 CICSRS5 00000290 D SMS,SHCDS 1
15:26:23.52          00000090 IEE932I 500
                    500 00000090 IGW612I 15:26:23  DISPLAY SMS,SHCDS
                    500 00000090 Name           Size %UTIL Status Type
                    500 00000090 WTSCPLX1.VSHCDS1 10800Kb 2% GOOD ACTIVE
                    500 00000090 WTSCPLX1.VSHCDS2 10800Kb 2% GOOD ACTIVE
                    500 00000090 WTSCPLX1.VSHCDS3 10800Kb 2% GOOD SPARE
                    500 00000090 -----0Kb 0% N/A N/A
                    500 00000090 -----0Kb 0% N/A N/A
                    500 00000090 -----0Kb 0% N/A N/A
                    500 00000090 -----0Kb 0% N/A N/A
                    500 00000090 -----0Kb 0% N/A N/A
                    500 00000090 -----0Kb 0% N/A N/A
                    500 00000090 -----0Kb 0% N/A N/A
15:27:13.69 CICSRS5 00000290 V 2047,OFFLINE,FORCE 2
15:26:11.69 JOB03693 00000090 $HASP250 NCPGEN PURGED -- (JOB KEY WAS AE6B0C61)
15:27:13.76 CICSRS5 00000090 *374 IEE800D CONFIRM VARY FORCE FOR 2047 - REPLY NO OR YES
15:27:18.17 CICSRS5 00000290 R 374,YES
15:27:18.29          00000090 IGW570I SMSVSAM ADDRESS SPACE HAD DETECTED A 521
                    521 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME SHCDS1
                    521 00000090 SMSVSAM PURGE PROCESSING HAS BEEN INITIATED.
15:27:18.29          00000090 IGW571I SMSVSAM ADDRESS SPACE PURGE PROCESSING HAS 522
                    522 00000090 BEEN COMPLETED FOR VOLUME SHCDS1
                    522 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
                    522 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42
15:27:18.28          00000090 IOS102I DEVICE 2047 BOXED, OPERATOR REQUEST
15:27:18.29 CICSRS5 00000090 IEE793I 2047 PENDING OFFLINE AND BOXED
15:27:18.29          00000090 IOS451I 2047, BOXED, NO ONLINE OPERATIONAL PATHS
15:27:18.37          00000090 IGW570I SMSVSAM ADDRESS SPACE HAD DETECTED A 524
                    524 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME SHCDS1
                    524 00000090 SMSVSAM PURGE PROCESSING HAS BEEN INITIATED.
15:27:18.38          00000090 IGW571I SMSVSAM ADDRESS SPACE PURGE PROCESSING HAS 525
                    525 00000090 BEEN COMPLETED FOR VOLUME SHCDS1
                    525 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
                    525 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42
15:27:26.40 CICSRS5 00000290 D SMS,SHCDS
15:27:26.57          00000290 IEF196I IEC331I 050-026(0000000C,SHCDS1),IEESYSAS,SMSVSAM,VALO,
                    IGG0CLE5
15:27:26.57          00000090 IEC331I 050-026(0000000C,SHCDS1),IEESYSAS,SMSVSAM,VALO,IGG0CLE5
15:27:26.64          00000290 IEF196I IGD104I SYS1.DFP SHCDS.WTSCPLX1.VSHCDS1 RETAINED,
15:27:26.64          00000290 IEF196I DDNAME=SYS0001
15:27:27.98          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 533
                    533 00000090 SYS1.DFP SHCDS.WTSCPLX1.VSHCDS1 DELETED.
15:27:27.99          00000090 *IGW615W SHARE CONTROL DATA SET SYS1.DFP SHCDS.WTSCPLX1.VSHCDS1 HAS
                    FAILED
15:27:38.86          00000090 *IGW614W SHARE CONTROL DATA SET SYS1.DFP SHCDS.WTSCPLX1.VSHCDS3 538
                    538 00000090 HAS BEEN CONVERTED FROM A SPARE TO A PRIMARY
                    538 00000090 SHARING CONTROL DATA SET
15:27:38.87          00000090 *IGW609A NO SPARE SHARE CONTROL DATA SETS EXIST. IMMEDIATE ACTION
                    REQUIRED
15:27:38.92          00000090 IEE932I 540
                    540 00000090 IGW612I 15:27:38  DISPLAY SMS,SHCDS 3
                    540 00000090 Name           Size %UTIL Status Type
                    540 00000090 WTSCPLX1.VSHCDS2 10800Kb 2% GOOD ACTIVE
                    540 00000090 WTSCPLX1.VSHCDS3 10800Kb 2% GOOD ACTIVE
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
                    540 00000090 -----0Kb 0% N/A N/A
15:27:43.42 STC03692 00000090 +DFHLG0777 SCSCPAA4 542

```

Figure 20 (Part 1 of 5). System Messages When an SHCDS Fails

```

15:27:51.62 CICSRS5 00000290 V 2048,OFFLINE,FORCE 4
15:27:51.69 CICSRS5 00000090 *375 IEE800D CONFIRM VARY FORCE FOR 2048 - REPLY NO OR YES
15:27:56.18 CICSRS5 00000290 R 375,YES
15:28:07.19 00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 566
566 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS2 DELETED.
15:28:07.20 00000090 *IGW615W SHARE CONTROL DATA SET SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS2 HAS
FAILED
15:28:07.30 00000090 IEE932I 568 5
568 00000090 IGW612I 15:28:07 DISPLAY SMS,SHCDS
568 00000090 Name Size %UTIL Status Type
568 00000090 WTSCPLX1.VSHCDS3 10800Kb 2% GOOD ACTIVE
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
568 00000090 -----0Kb 0% N/A N/A
15:28:23.18 CICSRS5 00000290 V 2054,OFFLINE,FORCE 6
15:28:23.25 CICSRS5 00000090 *376 IEE800D CONFIRM VARY FORCE FOR 2054 - REPLY NO OR YES
15:28:27.90 CICSRS5 00000290 R 376,YES
15:28:27.98 CICSRS5 00000090 IEE600I REPLY TO 376 IS;YES
15:28:27.99 00000090 IGW570I SMSVSAM ADDRESS SPACE HAD DETECTED A 581
581 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME SHCDS3
15:28:28.00 00000090 SMSVSAM PURGE PROCESSING HAS BEEN INITIATED.
IGW570I SMSVSAM ADDRESS SPACE HAD DETECTED A 582
582 00000090 VARY OFFLINE,FORCE COMMAND FOR VOLUME SHCDS3
582 00000090 SMSVSAM PURGE PROCESSING HAS BEEN INITIATED.
15:28:27.99 CICSRS5 00000090 IEE793I 2054 PENDING OFFLINE AND BOXED
15:28:28.01 00000090 IGW571I SMSVSAM ADDRESS SPACE PURGE PROCESSING HAS 583
583 00000090 BEEN COMPLETED FOR VOLUME SHCDS3
583 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
583 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42
15:28:28.01 00000090 IGW571I SMSVSAM ADDRESS SPACE PURGE PROCESSING HAS 585
585 00000090 BEEN COMPLETED FOR VOLUME SHCDS3
585 00000090 ALL KNOWLEDGE OF THIS VOLUME HAS BEEN REMOVED
585 00000090 FROM THE SMSVSAM ADDRESS SPACE ON SYSTEM: SC42
15:28:27.99 00000090 IOS102I DEVICE 2054 BOXED, OPERATOR REQUEST
15:28:27.99 00000090 IOS451I 2054, BOXED, NO ONLINE OPERATIONAL PATHS
15:29:52.51 00000090 IEF281I 2047 NOW OFFLINE - DEVICE IS BOXED
15:29:52.53 00000090 IEF281I 2048 NOW OFFLINE - DEVICE IS BOXED
15:29:52.53 00000090 IEF524I 2054, VOLUME SHCDS3 PENDING OFFLINE
15:31:38.10 CICSRS5 00000290 D SMS,SHCDS
15:31:38.24 00000290 IEF196I IEC331I 050-026(0000000C,SHCDS3),IEESYSAS,SMSVSAM,VALO,
IGGOCLE5
15:31:38.24 00000090 IEC331I 050-026(0000000C,SHCDS3),IEESYSAS,SMSVSAM,VALO,IGGOCLE5
15:31:38.29 00000290 IEF196I IGD104I SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 RETAINED,
15:31:38.29 00000290 IEF196I DDNAME=SYS00003
15:31:38.80 00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 646
646 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 DELETED.
15:31:38.81 00000090 IGW416I TERMINATING ERROR DETECTED IN SMSVSAM SERVER ADDRESS SPACE. 7
143 00000090 RETURN CODE (IN HEX): 00000024
143 00000090 REASON CODE (IN HEX): 00000614
143 00000090 MODNAME: IGWXSCRQ
143 00000090 RETURN ADDR (IN HEX): 875A54B4
15:31:38.80 00000090 *IGW615W SHARE CONTROL DATA SET SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 HAS
FAILED
15:31:38.85 00000090 IGW416I TERMINATING ERROR DETECTED IN SMSVSAM SERVER ADDRESS SPACE.
648 00000090 RETURN CODE (IN HEX): 00000024
648 00000090 REASON CODE (IN HEX): 67260614
648 00000090 MODNAME: IGWXS90
648 00000090 RETURN ADDR (IN HEX): 87573E00
15:31:38.85 STC03692 00000090 +DFHFC0153 SCSCPAA4 649
649 00000090 The previous instance of the SMSVSAM server has failed. File control
649 00000090 RLS access is being closed down.

```

Figure 20 (Part 2 of 5). System Messages When an SHCDS Fails

```

15:31:38.90 STC03692 00000090 IEC251I 016-0609,SCSCPAA4,SCSCPAA4,TRMNALDX,,,
15:31:38.90 STC03692 00000090 IEC251I CICSDSW.VSAMV.TRMNALDB
15:31:38.93          00000290 IEF196I IEA995I SYMPTOM DUMP OUTPUT
15:31:38.93          00000290 IEF196I SYSTEM COMPLETION CODE=A03
                144 00000090 SYSTEM COMPLETION CODE=A03
15:31:57.66 STC03692 00000090 IEC251I 016-0609,SCSCPAA4,SCSCPAA4,VENDOR,,CICSDSW.VSAMU.VENDOR
15:32:02.73 STC03692 00000090 +DFHFC0999 SCSCPAA4 RLS OPEN of file VENDOR failed. RLS access is
                disabled.
15:32:02.74 STC03692 00000090 +DFHFC4701 SCSCPAA4 836
                836 00000090 03/26/97 15:32:02 SCSCPAA4 Backout failed for transaction SC2, VSAM
                836 00000090 file VENDOR, unit of work X'AE6B0DEB03729C03', task 18280, base
                836 00000090 CICSDSW.VSAMU.VENDOR, path CICSDSW.VSAMU.VENDOR, failure code X'FB'.
15:32:06.30          00000090 *IGW611A SHARE CONTROL DATA SET NEVER ASSIGNED
15:32:06.30          00000090 *IGW609A NO SPARE SHARE CONTROL DATA SETS EXIST. IMMEDIATE ACTION
                REQUIRED
15:32:32.28 CICSRS5 00000290 F SCSCPAA4,CEMT I UOW 8
15:32:33.12 STC03692 00000090 + 853
                857 00000090 Uow(AE6B0DEB03729C03) Bac Shu Tra(SC2 ) Tas(0018280)
                857 00000090 Age(00000035) Ter(P087) Netn(SCSTP087) Use(CICSUSER) Dat
                886 00000090 RESPONSE: NORMAL TIME: 15.32.34 DATE: 03.26.97
                886 00000090 SYSID=PAA4 APPLID=SCSCPAA4
15:32:40.95 CICSRS5 00000290 F SCSCPAA4,CEMT I UOWD
15:32:41.10 STC03692 00000090 + 888
                889 00000090 Dsn(CICSDSW.VSAMU.VENDOR ) Dat
                889 00000090 Ope Uow(AE6B0DEB03729C03) Rls
                920 00000090 RESPONSE: NORMAL TIME: 15.32.42 DATE: 03.26.97
                920 00000090 SYSID=PAA4 APPLID=SCSCPAA4
15:33:14.25 CICSRS5 00000290 V 2047,ONLINE,UNCOND 9
15:33:14.45 CICSRS5 00000090 IEE302I 2047 ONLINE
15:33:19.69 CICSRS5 00000290 V 2048,ONLINE,UNCOND
15:33:19.86 CICSRS5 00000090 IEE302I 2048 ONLINE
15:33:27.37 CICSRS5 00000290 V 2054,ONLINE,UNCOND
15:33:27.55 CICSRS5 00000090 IEE302I 2054 ONLINE
15:33:58.39 CICSRS5 00000290 V SMS,SHCDS(WTSCPLX1.VSHCDS1),NEW 10
15:33:58.53          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 040
                040 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:33:58.53          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 459
                459 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:33:58.53          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 977
                977 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:33:58.53          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 768
                768 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:33:58.53          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 592
                592 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:33:58.53          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 638
                638 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:33:58.53          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 142
                142 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:35:06.43          00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE IGWLOCK00 WAS SUCCESSFUL. 224
15:33:58.85          00000290 IEF196I IEF237I 2047 ALLOCATED TO SYS00001
15:34:04.08          00000290 IEF196I IEF237I 2047 ALLOCATED TO SYS00001
15:34:04.17          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 219
                219 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:34:04.18          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 936
                936 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS1 ADDED.
15:34:36.19 CICSRS5 00000290 V SMS,SHCDS(WTSCPLX1.VSHCDS2),NEW 11
15:34:41.61          00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 939
                939 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS2 ADDED.

```

Figure 20 (Part 3 of 5). System Messages When an SHCDS Fails

```

15:34:59.48 CICSRS5 00000290 V SMS,SHCDS(WTSCPLX1.VSHCDS3),NEWSPARE 12
15:34:59.58      00000090 IGW619I SPARE SHARE CONTROL DATA SET 042
                042 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:34:59.58      00000090 IGW619I SPARE SHARE CONTROL DATA SET 461
                461 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:34:36.30      00000090 IGW619I ACTIVE SHARE CONTROL DATA SET 616
                616 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS2 ADDED.
15:34:59.58      00000090 IGW619I SPARE SHARE CONTROL DATA SET 979
                979 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:34:59.58      00000090 IGW619I SPARE SHARE CONTROL DATA SET 770
                770 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:34:59.59      00000090 IGW619I SPARE SHARE CONTROL DATA SET 640
                640 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:34:59.59      00000090 IGW619I SPARE SHARE CONTROL DATA SET 594
                594 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:34:59.59      00000090 IGW619I SPARE SHARE CONTROL DATA SET 144
                144 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:34:59.63      00000290 IEF196I IEF237I 2054 ALLOCATED TO SYS00003
15:35:04.78      00000290 IEF196I IEF237I 2054 ALLOCATED TO SYS00003
15:35:04.83      00000090 IGW619I SPARE SHARE CONTROL DATA SET 223
                223 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
15:35:04.84      00000090 IGW619I SPARE SHARE CONTROL DATA SET 942
                942 00000090 SYS1.DFPPSHCDS.WTSCPLX1.VSHCDS3 ADDED.
                224 00000290 JOBNAME: SMSVSAM ASID: 0052 CONNECTOR NAME: SC48
                224 00000290 CFNAME: CF02
15:35:06.44      00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 225
                225 00000090 CONNECTED TO DFSMS LOCK STRUCTURE IGWLOCK00
                225 00000090 STRUCTURE VERSION&#58;AE69C09C083D6C01 SIZE:14336K bytes
                225 00000090 MAXIMUM USERS:16 REQUESTED:16
                225 00000090 LOCK TABLE ENTRIES:1048576 REQUESTED:1048576
                225 00000090 RECORD TABLE ENTRIES:71577 USED:74
15:35:10.94      00000090 IGW321I 74 retained locks
15:35:11.11      00000090 IGW321I No Spheres in Lost Locks
15:35:11.19 CICSRS5 00000290 D SMS,SHCDS 13
15:35:11.29      00000090 IEE932I 944
                944 00000090 IGW612I 15:35:11 DISPLAY SMS,SHCDS
                944 00000090 Name Size %UTIL Status Type
                944 00000090 WTSCPLX1.VSHCDS1 10800Kb 2% GOOD ACTIVE
                944 00000090 WTSCPLX1.VSHCDS2 10800Kb 2% GOOD ACTIVE
                944 00000090 WTSCPLX1.VSHCDS3 10800Kb 2% GOOD SPARE
                944 00000090 -----0Kb 0% N/A N/A
                944 00000090 -----0Kb 0% N/A N/A
                944 00000090 -----0Kb 0% N/A N/A
                944 00000090 -----0Kb 0% N/A N/A
                944 00000090 -----0Kb 0% N/A N/A
                944 00000090 -----0Kb 0% N/A N/A
                944 00000090 -----0Kb 0% N/A N/A
                944 00000090 -----0Kb 0% N/A N/A
15:35:11.39      00000090 IGW467I DFSMS RLS_MAX_POOL_SIZE PARMLIB VALUE SET DURING 228
                228 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC48
                228 00000090 CURRENT VALUE: 100 1
15:35:11.45      00000090 IGW467I DFSMS DEADLOCK DETECTION PARMLIB VALUE SET DURING 229
                229 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC48
                229 00000090 THIS SYSTEM IS OPERATING AS A LOCAL DEADLOCK PROCESSOR.
                229 00000090 CURRENT VALUE: 15 4 1
15:35:11.45      00000090 IGW467I DFSMS SMF_TIME PARMLIB VALUE SET DURING 230
                230 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC48
                230 00000090 CURRENT VALUE: YES 1
15:35:11.50      00000090 IGW467I DFSMS CF_TIME PARMLIB VALUE SET DURING 231
                231 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC48
                231 00000090 CURRENT VALUE: 1800 1
15:35:12.18      00000090 IGW414I SMSVSAM SERVER ADDRESS SPACE IS NOW ACTIVE.
15:35:13.89      00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE IGWLOCK00 WAS SUCCESSFUL. 945
                945 00000290 JOBNAME: SMSVSAM ASID: 006E CONNECTOR NAME: SC42
                945 00000290 CFNAME: CF02

```

Figure 20 (Part 4 of 5). System Messages When an SHCDS Fails

```

15:35:13.90      00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 946
                946 00000090 CONNECTED TO DFSMS LOCK STRUCTURE IGWLOCK00
                946 00000090 STRUCTURE VERSION&#58;AE69C09C083D6C01 SIZE:14336K bytes
                946 00000090 MAXIMUM USERS:16 REQUESTED:16
                946 00000090 LOCK TABLE ENTRIES:1048576 REQUESTED:1048576
                946 00000090 RECORD TABLE ENTRIES:71577 USED:74
15:35:18.13      00000090 IGW321I 74 retained locks
15:35:18.29      00000090 IGW321I No Spheres in Lost Locks
15:35:18.84      00000090 IGW467I DFSMS RLS_MAX_POOL_SIZE PARMLIB VALUE SET DURING 949
                949 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
                949 00000090 CURRENT VALUE: 100 2
15:35:18.86      00000090 IGW467I DFSMS DEADLOCK_DETECTION PARMLIB VALUE SET DURING 950
                950 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
                950 00000090 THIS SYSTEM IS OPERATING AS THE GLOBAL DEADLOCK PROCESSOR.
                950 00000090 CURRENT VALUE: 15 4 2
15:35:18.88      00000090 IGW467I DFSMS SMF_TIME PARMLIB VALUE SET DURING 951
                951 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
                951 00000090 CURRENT VALUE: YES 2
15:35:18.90      00000090 IGW467I DFSMS CF_TIME PARMLIB VALUE SET DURING 952
                952 00000090 SMSVSAM ADDRESS SPACE INITIALIZATION ON SYSTEM: SC42
                952 00000090 CURRENT VALUE: 1800 2
15:35:19.41      00000090 IGW414I SMSVSAM SERVER ADDRESS SPACE IS NOW ACTIVE.
15:35:19.42 STC03692 00000090 +DFHFC0568I SCSCPAA4 File control dynamic RLS restart has started.
15:35:19.44 STC03692 00000090 +DFHFC0562 SCSCPAA4 The RLS control ACB has been successfully
                registered by CICS.
15:35:19.45 STC03692 00000090 +DFHFC0570 SCSCPAA4 File control RLS access has been enabled.
15:35:19.53 STC03692 00000090 +DFHFC0569I SCSCPAA4 File control dynamic RLS restart has ended.
15:35:22.49      00000090 IGW453I SMSVSAM ADDRESS SPACE HAS SUCCESSFULLY 961
                961 00000090 CONNECTED TO DFSMS CACHE STRUCTURE CICS_CACHE
15:35:29.90 STC03692 00000090 IEC161I 056-0525,SCSCPAA4,SCSCPAA4,VENDOR,,CICSDSW.VSAMU.VENDOR,
15:35:29.90 STC03692 00000090 IEC161I CICSDSW.VSAMU.VENDOR.DATA,CATALOG.TOTICF1.VTOTC15
15:35:29.90 STC03692 00000090 IEC161I 056-0525,SCSCPAA4,SCSCPAA4,VENDOR,,CICSDSW.VSAMU.VENDOR,
15:35:29.91 STC03692 00000090 IEC161I CICSDSW.VSAMU.VENDOR.INDEX,CATALOG.TOTICF1.VTOTC15
15:35:29.92 STC03692 00000090 IEC161I 062-0341,SCSCPAA4,SCSCPAA4,VENDOR,,CICSDSW.VSAMU.VENDOR,
15:35:29.93 STC03692 00000090 IEC161I CICSDSW.VSAMU.VENDOR.DATA,CATALOG.TOTICF1.VTOTC15
15:35:56.48 CICSRS5 00000290 F SCSCPAA4,CEMT I UOWD
15:35:56.55 STC03692 00000090 + 019
                019 00000090 NOT FOUND
                019 00000090 RESPONSE: 1 ERROR TIME: 15.35.57 DATE: 03.26.97
                019 00000090 SYSID=PAA4 APPLID=SCSCPAA4

```

Figure 20 (Part 5 of 5). System Messages When an SHCDS Fails

3.4.5 Documentation on SHCDS Failures

You can find detailed information on SHCDSs and their definition and maintenance in the *DFSMSdfp Storage Administration Reference* manual.

Chapter 4. MVS System Logger Failures

The MVS system logger is a component of MVS/ESA Version 5 Release 2 and OS/390 that enables system and subsystem components to use system logging functions for transaction recovery, database media failure recovery, and multisystem online log merging.

CICS uses the MVS system logger for its system logs (DFHLOG and DFHSHUNT), forward recovery logs, and user journals. User journals can also be written to SMF data sets.

The MVS system logger requires a coupling facility. The MVS system logger environment comprises:

- The IXGLOGR address space and any associated data spaces
- Log streams
- Log data sets
- Staging data sets

In this chapter we look at the recovery implications for the CICS/ESA log environment specifically in these areas. We briefly discuss the components and detail specific error and recovery scenarios. Figure 21 on page 54 shows the environment we used for the tests involving CICS and the MVS system logger. It shows two MVS images, SC42 and SC52, and two coupling facilities, CF01 and CF02.

We used three structures, all usually resident in CF02, to contain the CICS log streams for all of the CICS regions: LOG_DFHLOG_P01, LOG_DFHSHUNT_P01, and LOG_USERBWFP_P01. All of our regions shared these structures. We ran most of the tests on system SC42, but SC52 was always available to assist in recovery.

We used staging data sets for the purposes of the tests but actually did not require them as both coupling facilities were failure-independent.

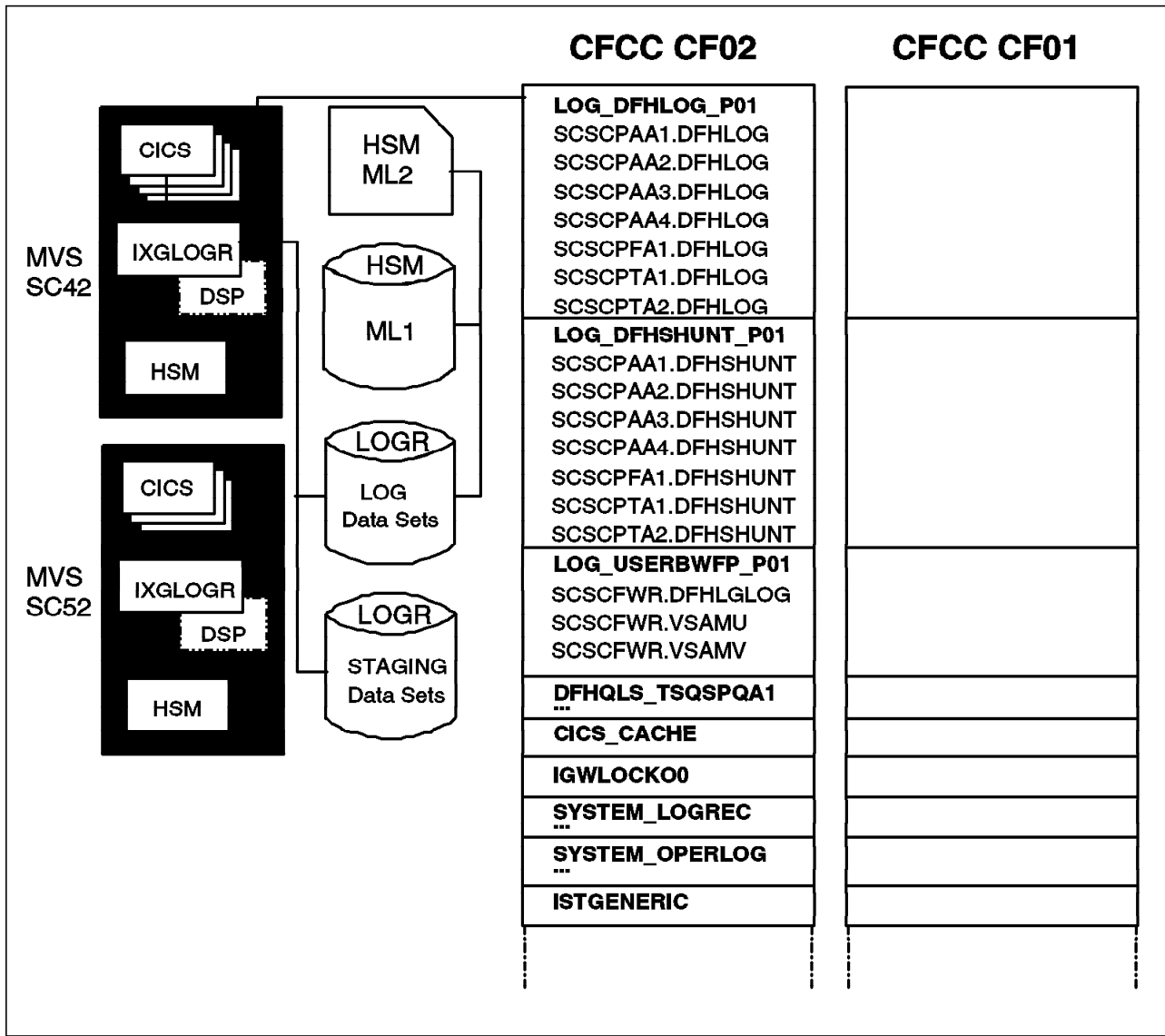


Figure 21. The IXGLOGR Environment Used in Our Tests

Note: We used TPNS to drive a test workload through our system. It does not represent a typical busy workload. For example, there were times during the tests when no CICS writes were performed. In a production environment, you may get messages and error codes in addition to those produced in our tests.

4.1 IXGLOGR Failure

The IXGLOGR provides the services that subsystems and application programs use to exploit the MVS system logger facility.

IXGLOGR may use zero or more data spaces, called SYSIXGnn. These data spaces are used to store a copy of data currently in the coupling facility, if duplexing is required. In the event of a coupling facility failure, recovery data can be obtained from the data space.

Initially, no data spaces are started. On the first request to connect to a log stream where the structure data must be duplexed in a data space, the MVS system logger creates the data space. This data space is treated as a common pool; that is, it may contain log data for one or more log streams and one or more structures. Subsequent data spaces are initiated as more space is required.

Reasons for address space failure may include:

- IXGLOGR address space abnormal termination. This is typically an S1C5 abend indicating an unrecoverable error.
- The operator cancels IXGLOGR by mistake.
- IXGLOGR loses access to its only couple data set.

If the reason for failure is the loss of access to the only remaining couple data set, a new couple data set should be defined and activated as soon as possible.

4.1.1 Impact

If IXGLOGR fails, CICS recognizes the failure, and the fact that the IXGLOGR address space is not available. At this stage, all CICS logging is terminated immediately.

CICS recognizes an MVS system logger failure when it attempts to write a record to the DFHLOG log stream using the IXGWRITE macro, issues an IXGBRWSE request to check the availability of the log stream, or attempts to connect to the logger with a IXGCONN macro. CICS performs an IXGBRWSE every 10 sec so that, if there is no write activity during a particular period, it can still detect log errors such as loss of IXGLOGR and log stream errors.

IXGLOGR failure causes CICS to terminate with a U1800 abend. See 5.1, "CICS Abnormal Termination" on page 95 for more information about the effects of the CICS failure on any in-flight transactions and UOWs. When CICS is restarted, it should initialize successfully with an emergency restart.

4.1.2 Prevention

There is little that can be done to prevent IXGLOGR failure. However, it may be a good idea to use NetView to catch the failure so that if IXGLOGR does fail, it gets restarted straight away.

4.1.3 Recovery

Restart IXGLOGR as soon as possible by issuing MVS command S IXGLOGRS.

After CICS abends, it can be restarted through:

- The MVS ARM policy
- An MVS automated operations facility, such as NetView
- An MVS command issued by the operator.

On CICS emergency restart, IXGLOGR may or may not be available. If it is not available, the CICS restart is halted during system log initialization. CICS treats this as a temporary error condition. CICS attempts to connect to the log stream every 3 sec. It reports such activity every 10 attempts through a *DFHLG0777* message to the MVS system log.

As soon as IXGLOGR is restarted, CICS reconnects to the structure. On successful log stream recovery, CICS system log initialization completes, and control is given to CICS. See 5.1, "CICS Abnormal Termination" on page 95 for information about how CICS handles any transaction or UOW recovery.

Note: If you are in a recovery situation where you have issued an MVS force command against IXGLOGR and the coupling facility structures used by IXGLOGR, there is risk of corruption in the CICS system logs. If you are not using staging data sets, you may have to perform a CICS initial start.

4.1.4 Example

Figure 22 on page 57 shows the effects of IXGLOGR failure:

- 1** The MVS FORCE IXGLOGR command causes IXGLOGR to fail.
- 2** Errors on the CICS system log cause CICS to abend.
- 3** IXGLOGR abends.
- 4** The CICS emergency restart attempts to reconnect to its log streams.
- 5** CICS waits until IXGLOGR service is available.
- 6** IXGLOGR is restarted.
- 7** CICS system log initializes successfully.
- 8** Control is given to CICS.

MVS system logger codes returned to CICS while the logger is down include X'00000890', IXGLOGR has failed and is not available, and X'00000891', IXGLOGR is not available because it is initializing.

```

12:55:19.75 CICSRS3 00000290 FORCE IXGLOGR 1
12:55:19.85 TSU09960 00000090 IEE301I IXGLOGR
12:55:19.88 00000090 IEE316I OPERATIONS LOG HAS FAILED ON SYSTEM SC42 UNABLE TO WRITE TO
LOG STREAM - RETURN CODE 0008-0890
12:55:20.23 00000090 IEE319I OPERATIONS LOG HAS FAILED. SYSLOG IS NOW RECEIVING HARDCOPY
MESSAGE SET.
12:55:20.37 STC09937 00000090 +DFHME0126 SCSCPAA1 794
794 00000090 Error in SYMREC invocation. Return code in R15 = X'000C', Reason code
794 00000090 in R0 = X'0F1C'.
12:55:20.37 STC09937 00000090 +DFHFG0772 SCSCPAA1 795
795 00000090 An error has occurred during MVS logger operation IXGWRITE for log
795 00000090 stream SCSCPAA1.DFHLOG. MVS logger codes: X'00000008', X'00000890'.
12:55:20.38 STC09937 00000090 +DFHME0116 SCSCPAA1 796
796 00000090 (Module:DFHMEME) CICS symptom string for message DFHFG0772 is
796 00000090 PIDS/565501800 LVLS/510 MS/DFHFG0772 RIDS/DFHL2HSF PTF5/UN91603
796 00000090 VALU/H00000890
12:55:20.39 STC09937 00000090 +DFHFG0735 SCSCPAA1 797 2
797 00000090 A failure has occurred while writing to the system log (DFHLOG).
797 00000090 Access to the system log has been lost. CICS will be terminated.
12:55:20.90 STC09937 00000090 EYUXE0003I SCSCPAA1 End of Task entered for CICSplex SM 120
12:55:20.91 STC09590 00000090 +EYUTS0001I SCSCPAA1 Topology Disconnect for SCSCPAA1 Initiated
12:55:20.92 STC09590 00000090 +EYUTS0003I SCSCPAA1 Topology Disconnect for SCSCPAA1 Complete
12:55:31.40 STC09937 00000090 +DFHDU0303I SCSCPAA1 Transaction Dump Data set DFHDMPA closed.
12:55:31.40 STC09937 00000090 +DFHKE1800 SCSCPAA1 ABNORMAL TERMINATION OF CICS FOR MVS/ESA IS
COMPLETE.
12:55:42.34 STC09937 00000090 IEF450I SCSCPAA1 SCSCPAA1 - ABEND=S000 U1800 REASON=00000000 832
832 00000090 TIME=12.55.42
12:55:44.92 00000090 IEF402I IXGLOGR FAILED IN ADDRESS SPACE 0013 833 3
833 00000090 SYSTEM ABEND S1C5 - REASON CODE 020004
12:55:50.72 STC09937 00000290 -SCSCPAA1 ENDED. NAME- TOTAL CPU TIME= 4.57 TOTAL
ELAPSED TIME= 50.1
12:55:50.88 STC09937 00000090 $HASP395 SCSCPAA1 ENDED
12:55:52.76 00000090 IXG056I SYSTEM LOGGER ADDRESS SPACE HAS ENDED
12:55:53.89 INTERNAL 00000290 S C51AOR,SYSIDNT=PAA1,START=AUTO,JOBNAME=SCSCPAA1,VAM=RLS 4
865 00000090 THE ELEMENT WAS RESTARTED WITH PERSISTENT START TEXT.
12:55:53.99 00000090 IXC812I JOBNAME SCSCPAA1, ELEMENT SYSCICS_SCSCPAA1 FAILED. 866
12:55:54.00 00000290 IXC813I JOBNAME SCSCPAA1, ELEMENT SYSCICS_SCSCPAA1 868
868 00000090 WAS RESTARTED WITH THE FOLLOWING START TEXT:
868 00000090 S C51AOR,SYSIDNT=PAA1,START=AUTO,JOBNAME=SCSCPAA1,VAM=RLS
868 00000090 THE RESTART METHOD USED WAS DETERMINED BY THE ACTIVE POLICY.
12:55:54.93 STC09962 00000081 $HASP100 SCSCPAA1 ON STCINRDR
12:55:55.50 STC09962 00000290 IEF695I START C51AOR WITH JOBNAME SCSCPAA1 IS ASSIGNED TO USER STC
, GROUP SYS1
12:55:55.51 STC09962 00000090 $HASP373 SCSCPAA1 STARTED
12:55:55.56 STC09962 00000090 IEF403I SCSCPAA1 - STARTED - TIME=12.55.55
12:56:02.61 STC09962 00000090 +DFHDM0101I SCSCPAA1 CICS is initializing.
12:56:21.35 STC09962 00000090 +DFHFG0103I SCSCPAA1 System log (DFHLOG) initialization has started
12:56:21.37 STC09962 00000090 +DFHFG0777 SCSCPAA1 153
153 00000090 A temporary error condition occurred during MVS logger operation
153 00000090 IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
153 00000090 X'00000008', X'00000890'.
12:56:26.81 STC09962 00000090 +DFHFC0562 SCSCPAA1 The RLS control ACB has been successfully registered
by CICS.
12:56:26.82 STC09962 00000090 +DFHFC0570 SCSCPAA1 File control RLS access has been enabled.

```

Figure 22 (Part 1 of 2). IXGLOGR Failure

```

12:56:35.63 CICSRS3 00000290 D XCF,STR,STRNAME=LOG_DFHLOG_P01
12:56:35.94 CICSRS3 00000090 IXC360I 12.56.35 DISPLAY XCF 222
222 00000090 STRNAME: LOG_DFHLOG_P01
222 00000090 STATUS: ALLOCATED
222 00000090 POLICY SIZE : 14848 K
222 00000090 POLICY INITSIZE: 9728 K
222 00000090 REBUILD PERCENT: 1
222 00000090 PREFERENCE LIST: CF02 CF01
222 00000090 EXCLUSION LIST IS EMPTY
222 00000090
222 00000090 ACTIVE STRUCTURE
222 00000090 -----
222 00000090 ALLOCATION TIME: 07/26/96 19:46:08
222 00000090 CFNAME : CF02
222 00000090 COUPLING FACILITY: 009672.IBM.02.000000040104
222 00000090 PARTITION: 1 CPCID: 01
222 00000090 ACTUAL SIZE : 9728 K
222 00000090 STORAGE INCREMENT SIZE: 256 K
222 00000090 VERSION : AD39B434 3864EE00
222 00000090 DISPOSITION : DELETE
222 00000090 ACCESS TIME : 0
222 00000090 MAX CONNECTIONS: 32
222 00000090 # CONNECTIONS : 1
222 00000090
222 00000090 CONNECTION NAME ID VERSION SYSNAME JOBNAME ASID STATE
222 00000090 -----
222 00000090 IXGLOGR_SC52 02 00020010 SC52 IXGLOGR 0013 ACTIVE
12:56:53.86 STC09962 00000090 +DFHLOG777 SCSCPAA1 230 5
230 00000090 A temporary error condition occurred during MVS logger operation
230 00000090 IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
230 00000090 X'00000008', X'00000890'.
13:01:05.52 STC09962 00000090 +DFHLOG777 SCSCPAA1 266
266 00000090 A temporary error condition occurred during MVS logger operation
266 00000090 IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
266 00000090 X'00000008', X'00000890'.
13:02:19.64 CICSRS3 00000290 S IXGLOGRS 6
13:02:19.93 STC09966 00000081 $HASP100 IXGLOGRS ON STCINRDR
13:02:20.21 STC09966 00000290 IEF695I START IXGLOGRS WITH JOBNAME IXGLOGRS IS ASSIGNED TO USER STC
, GROUP SYS1
13:02:20.21 STC09966 00000090 $HASP373 IXGLOGRS STARTED
13:02:20.40 STC09966 00000090 $HASP395 IXGLOGRS ENDED
13:02:20.65 00000090 IEF403I IEESYSAS - STARTED - TIME=13.02.20
13:02:26.08 STC09962 00000090 +DFHLOG104I SCSCPAA1 System log (DFHLOG) initialization has ended 7
13:02:26.08 STC09962 00000090 +DFHLOG103I SCSCPAA1 System log (DFHSHUNT) initialization has started.
13:02:26.46 00000290 IXG201I REQUEST TO CONNECT TO LOGSTREAM SCSCPAA1.DFHSHUNT 312
312 00000090 IN STRUCTURE LOG_DFHSHUNT_P01 ACCEPTED.
312 00000090 CONNECTION TO ADDITIONAL LOGSTREAMS MAY FAIL DUE TO INSUFFICIENT
312 00000090 STRUCTURE STORAGE
13:02:28.27 STC09962 00000090 +DFHLOG104I SCSCPAA1 System log (DFHSHUNT) initialization has ended.
13:02:28.27 STC09962 00000090 +DFHLOG102I SCSCPAA1 Log manager domain initialization has ended.
13:02:28.28 STC09962 00000090 +DFHER5730 SCSCPAA1 User recovery beginning
successfully started.
13:02:39.96 STC09962 00000090 +DFHER5731 SCSCPAA1 No active user records on the system log
13:02:39.96 STC09962 00000090 +DFHER5732 SCSCPAA1 User recovery completed
13:02:39.98 STC09962 00000090 +DFHTD0101I SCSCPAA1 Transient Data initialization has ended.
13:02:39.98 STC09962 00000090 +DFHFC0101I SCSCPAA1 File Control initialization has ended.
13:02:40.01 STC09962 00000090 +DFHCP0102I SCSCPAA1 CPI initialization has ended.
13:02:40.02 STC09962 00000090 +DFHPR0105I SCSCPAA1 Partner resource manager initialization has ended.
13:02:40.02 STC09962 00000090 +DFHAI0102I SCSCPAA1 AITM initialization has ended.
13:02:40.55 STC09962 00000090 +DFHSI1519I SCSCPAA1 The interregion communication session was
successfully started.
13:02:41.59 STC09962 00000090 +DFHAP1203I SCSCPAA1 Language Environment/370 is being initialized.
13:02:47.39 STC09962 00000090 +DFHSI8430I SCSCPAA1 About to link to PLT programs during the third
stage of initialization.
13:02:47.48 STC09962 00000090 +EYUNX0001I SCSCPAA1 LMAS PLTPI program starting
13:02:47.56 STC09962 00000090 +DFHSI8434I SCSCPAA1 Control returned from PLT programs during the third
stage of initialization.
13:02:47.61 STC09962 00000090 +DFHSI1517 SCSCPAA1 Control is being given to CICS 8

```

Figure 22 (Part 2 of 2). IXGLOGR Failure

4.1.5 Documentation on Logger Address Space Failure

See *MVS/ESA SP V5 Setting Up a Sysplex* for more information about planning and recovery for MVS system logger applications.

4.2 Log Stream Errors

Log streams are storage areas residing within a coupling facility structure. They are the first level of log storage for CICS TS log data. Optionally, log data can also be written to staging and/or log data sets.

Log streams are logs for the CICS system logs, forward recovery logs and, optionally, user journals. User journals can, however, be routed directly to an SMF data set instead of a log stream.

4.2.1 Log Stream Full

A log stream-full condition indicates that the structure space allocated for this log stream has no more space available in the coupling facility.

4.2.1.1 Impact

Any write requests may fail until either the structure size is increased or offload processing can relieve the bottleneck.

4.2.1.2 Prevention

Ensure that the structure size is planned carefully to take into account the requirements of all connected log streams. Use CICS utility DFHLSCU for initial calculation of the size of each CICS system log. For further tuning use SMF records 88. For log sizing information relating to the DFHSHUNT and forward recovery logs, see *CICS and VSAM Record Level Sharing: Implementation Guide*.

Before the log stream becomes full, MVS system logger messages are issued to the system console indicating an offload failure for the particular log stream. Ensure that any such messages issued to the system console are actioned promptly. For example, the *IXG251I* message in one of the test cases (see 4.2.1.4 Example 1) indicated that there was a problem allocating the forward-recovery log data set. Then came the *IXG301I* message, as a result of the previous allocation failure, notifying offload processing failure for the log stream. Finally, the structure became full for this log stream, and CICS issued the *DFHLG0772* error message that resulted in the CICS quiesce of all open data sets associated with this log stream.

To reduce the number of logstream-full conditions, consider reducing the HIGHOFFLOAD parameter to force earlier destage to log data sets. Also, ensure that the current log data sets reside on high-performance DASD and do not suffer from device contention.

4.2.1.3 Recovery

Issue MVS operator command SETXCF START,ALTER... to increase the size of the structure. Remember that free space may not be available in the coupling facility to satisfy this request, and even if there is, the space acquired will be evenly distributed across all connected log streams. It is a good idea to size the log streams and structures carefully and consider the potential growth requirements for increased workload and recovery situations. Manage your offload data sets by either archiving or deleting them.

4.2.1.4 Example 1

Figure 23 on page 61 shows the effects of a forward recovery log stream with insufficient space:

- 1** A catalog-error condition causes dynamic allocation failure to the current log data set and failure to create new log data set.
- 2** Offload processing fails for the log data set.
- 3** A logstream-full condition arises when all space in the structure for this log stream is allocated.
- 4** CICS quiesces all open data sets associated with this log stream, issuing message *DFHFC4800*.
- 5** Data sets associated with the failed log stream cannot be opened in RLS mode.

MVS system logger codes returned to CICS when a log stream is full include:

- X'00000409', warning: previous offload error - may lead to X'0000085D'
- X'0000085D', the structure space available for this log stream is full due to offload errors
- X'00000860', the structure space available for this log stream is full due to a throughput bottleneck


```

19:52:15.82 STC07389 00000090 IEF403I SCSCPAA1 - STARTED - TIME=19.52.15
19:52:19.45 STC07389 00000090 +DFHDM010I SCSCPAA1 CICS is initializing.
19:52:20.49 STC07389 00000090 +DFHLG010I SCSCPAA1 Log manager domain initialization has started.
19:52:20.54 STC07389 00000090 +DFHSI1500 SCSCPAA1 CICS for MVS/ESA Version 5.1.0 Startup is in
progress.
19:52:20.55 STC07389 00000090 +DFHXS1100I SCSCPAA1 Security initialization has started.
19:52:21.43 STC07389 00000090 +DFHSI1501I SCSCPAA1 Loading CICS nucleus.
19:52:22.07 STC07389 00000090 +DFHXS1102I SCSCPAA1 Security is inactive.
19:52:22.09 STC07389 00000090 +DFHLDU0304I SCSCPAA1 Transaction Dump Data set DFHDMPA opened.
19:52:25.47 STC07389 00000090 +DFHXS1101I SCSCPAA1 Security initialization has ended.
19:52:26.42 STC07389 00000090 +DFHRM0141 SCSCPAA1 Recovery manager autostart override record is not
present. Normal processing continues.
19:52:26.49 STC07389 00000090 +DFHMN0105I SCSCPAA1 Using default Monitoring Control Table.
19:52:26.49 STC07389 00000090 +DFHMN0109I SCSCPAA1 CICS Monitoring is active.
19:52:27.85 STC07389 00000090 +DFHSI1502I SCSCPAA1 CICS startup is Emergency.
19:52:27.85 STC07389 00000090 +DFHTS0100I SCSCPAA1 Temporary Storage initialization has started.
19:52:28.19 STC07389 00000090 +DFHLG0103I SCSCPAA1 System log (DFHLOG) initialization has started.
19:52:28.48 STC07389 00000090 +DFHLG0104I SCSCPAA1 System log (DFHLOG) initialization has ended.
19:52:28.49 STC07389 00000090 +DFHLG0103I SCSCPAA1 System log (DFHSHUNT) initialization has started.
19:52:28.86 STC07389 00000090 +DFHTS0101I SCSCPAA1 Temporary Storage initialization has ended.
19:52:28.86 STC07389 00000090 +DFHSI1503I SCSCPAA1 Terminal data sets are being opened.
19:52:29.09 STC07389 00000090 +DFHLG0104I SCSCPAA1 System log (DFHSHUNT) initialization has ended.
19:52:29.09 STC07389 00000090 +DFHLG0102I SCSCPAA1 Log manager domain initialization has ended.
19:52:29.25 STC07389 00000090 +DFHKE0406I SCSCPAA1 817
817 00000090 CICS is about to wait for predecessors defined in the MVS automatic
817 00000090 restart management policy for this region.
19:52:29.44 STC07389 00000090 +DFHCP0101I SCSCPAA1 CPI initialization has started.
19:52:29.44 STC07389 00000090 +DFHPR0104I SCSCPAA1 Partner resource manager initialization has
started.
19:52:29.44 STC07389 00000090 +DFHAI0101I SCSCPAA1 AITM initialization has started.
19:52:29.45 STC07389 00000090 +DFHER5730 SCSCPAA1 User recovery beginning
19:52:29.55 STC07389 00000090 +DFHFC0100I SCSCPAA1 File Control initialization has started.
19:52:29.74 STC07389 00000090 +DFHZC0126I SCSCPAA1 No VTAM sessions persisted for an EMERGENCY
restart.
19:52:29.91 STC07389 00000090 +DFHTD0100I SCSCPAA1 Transient Data initialization has started.
19:52:31.71 00000290 IXG251I IKJ56228I DATA SET CICS.SCSCPFA1.DFHLOG.A0000000 NOT IN CATALOG
OR CATALOG CAN NOT BE ACCESSED
19:52:31.76 STC07389 00000090 +DFHFC0562 SCSCPAA1 The RLS control ACB has been successfully registered
by CICS.
19:52:31.76 STC07389 00000090 +DFHFC0570 SCSCPAA1 File control RLS access has been enabled.
19:52:32.87 00000290 IXG251I IKJ56893I DATA SET CICS.SCSCFWR.VSAMV.A0000001 NOT ALLOCATED+
19:52:32.87 00000290 IXG251I IGD17103I CATALOG ERROR WHILE DEFINING VSAM DATA SET CICS.SCSCFW
R.VSAMV.A0000001
19:52:32.87 00000290 IXG251I RETURN CODE IS 68 REASON CODE IS 20 IGGOCLEW
19:52:32.88 00000290 IXG251I IGD306I UNEXPECTED ERROR DURING IGGOCLEW PROCESSING
19:52:32.88 00000290 IXG251I RETURN CODE 68 REASON CODE 20
19:52:32.88 00000290 IXG251I THE MODULE THAT DETECTED THE ERROR IS IGDVTSUC
19:52:32.89 00000290 IXG251I SMS MODULE TRACE BACK - VTSCU VTSCT VTSCH VTSVD VTSCT VTSR
SSIRT
19:52:32.89 00000290 IXG251I SYMPTOM RECORD CREATED, PROBLEM ID IS IGD00028
19:52:32.89 00000290 IXG251I IGD17219I UNABLE TO CONTINUE DEFINE OF DATA SET CICS.SCSCFWR.VSA
MV.A0000001
19:52:32.89 00000090 IXG301I SYSTEM LOGGER FAILED TO OFFLOAD DATA FOR LOG STREAM 843
843 00000090 SCSCFWR.VSAMV IN STRUCTURE LOG_USERBWP_P01. RETURN CODE: 00000008
843 00000090 REASON CODE: 00000805 DIAG1: 00000004 DIAG2: 000042CF DIAG3:
843 00000090 0107001B DIAG4: 00000000
19:52:49.29 STC07389 00000090 IEC161I 242(00000008 0000002E 00000025 7F4232B0)-0665,SCSCPAA1,
19:52:49.29 STC07389 00000090 IEC161I SCSCPAA1,INVENTOX,,CICSDSW.VSAMV.INVENTOR,,
19:52:49.30 STC07389 00000090 IEC161I CATALOG.TOTICF1.VTOTCAT
19:52:49.30 STC07389 00000090 +DFHFC0500 SCSCPAA1 RLS OPEN of file INVENTOX failed. VSAM has returned
code X'0008' in R15 and reason X'00B1'.
20:10:27.86 00000290 IXG251I IKJ56228I DATA SET CICS.SCSCFWR.VSAMV.A0000000 NOT IN CATALOG OR
CATALOG CAN NOT BE ACCESSED
20:10:28.14 00000290 IXG251I IKJ56893I DATA SET CICS.SCSCFWR.VSAMV.A0000001 NOT ALLOCATED+
20:10:28.14 00000290 IXG251I IGD17103I CATALOG ERROR WHILE DEFINING VSAM DATA SET CICS.SCSCFW
R.VSAMV.A0000001
20:10:28.14 00000290 IXG251I RETURN CODE IS 68 REASON CODE IS 20 IGGOCLEW

```

Figure 23 (Part 1 of 3). Forward Recovery Log Stream Full

```

20:10:28.15      00000290 IXG251I IGD306I UNEXPECTED ERROR DURING IGGOCLEW PROCESSING
20:10:28.15      00000290 IXG251I RETURN CODE 68 REASON CODE 20
20:10:28.15      00000290 IXG251I THE MODULE THAT DETECTED THE ERROR IS IGDVTSCU
20:10:28.15      00000290 IXG251I SMS MODULE TRACE BACK - VTSCU VTSC T VTSCH VTS CD VTS CC VTS CR
SSIRT
20:10:28.16      00000290 IXG251I SYMPTOM RECORD CREATED, PROBLEM ID IS IGD00045
20:10:28.16      00000290 IXG251I IGD17219I UNABLE TO CONTINUE DEFINE OF DATA SET CICS.SCSCFWR.VSA
MV.A0000001
20:10:28.17      00000090 IXG301I SYSTEM LOGGER FAILED TO OFFLOAD DATA FOR LOG STREAM 154
154 00000090 SCSCFWR.VSAMV IN STRUCTURE LOG_USERBWFP_P01. RETURN CODE: 00000008
154 00000090 REASON CODE: 00000805 DIAG1: 0000001C DIAG2: 17080002 DIAG3:
154 00000090 0107001B DIAG4: 00000000
20:11:00.95      00000290 IXG251I IKJ56228I DATA SET CICS.SCSCFWR.VSAMV.A0000000 NOT IN CATALOG OR
CATALOG CAN NOT BE ACCESSED
20:11:00.97 STC07389 00000090 +DFHME0126 SCSCPAA1 171
171 00000090 Error in SYMREC invocation. Return code in R15 = X'000C', Reason code
171 00000090 in R0 = X'0F1C'.
20:11:00.98 STC07389 00000090 +DFHLG0772 SCSCPAA1 172 3
172 00000090 An error has occurred during MVS logger operation IXGWRITE for log
172 00000090 stream SCSCFWR.VSAMV. MVS logger codes: X'00000008', X'0000085D'
20:11:00.99 STC07389 00000090 +DFHME0116 SCSCPAA1 173
173 00000090 (Module:DFHMEME) CICS symptom string for message DFHLG0772 is
173 00000090 PIDS/565501800 LVLS/510 MS/DFHLG0772 RIDS/DFHL2HSF PTF5/UN91603
173 00000090 VALU/H0000085D
20:11:01.00 STC07389 00000090 +DFHFC4800 SCSCPAA1 174 4
174 00000090 07/17/96 20:11:01 SCSCPAA1 A failure has been detected on forward
174 00000090 recovery log stream SCSCFWR.VSAMV. The associated RLS data set has
174 00000090 been quiesced. Data set CICSDSW.VSAMV.ITEMACT
20:11:01.01 STC07389 00000090 +DFHFC4800 SCSCPAA1 175
175 00000090 07/17/96 20:11:01 SCSCPAA1 A failure has been detected on forward
175 00000090 recovery log stream SCSCFWR.VSAMV. The associated RLS data set has
175 00000090 been quiesced. Data set CICSDSW.VSAMV.EMPACTDB
20:11:01.02 STC07389 00000090 +DFHFC4800 SCSCPAA1 176
176 00000090 07/17/96 20:11:01 SCSCPAA1 A failure has been detected on forward
176 00000090 recovery log stream SCSCFWR.VSAMV. The associated RLS data set has
176 00000090 been quiesced. Data set CICSDSW.VSAMV.DEPSUMDB
20:11:01.23      00000290 IXG251I IKJ56893I DATA SET CICS.SCSCFWR.VSAMV.A0000001 NOT ALLOCATED+
20:11:01.23      00000290 IXG251I IGD17103I CATALOG ERROR WHILE DEFINING VSAM DATA SET CICS.SCSCFW
R.VSAMV.A0000001
20:11:01.23      00000290 IXG251I RETURN CODE IS 68 REASON CODE IS 20 IGGOCLEW
20:11:01.24      00000290 IXG251I IGD306I UNEXPECTED ERROR DURING IGGOCLEW PROCESSING
20:11:01.24      00000290 IXG251I RETURN CODE 68 REASON CODE 20
20:11:01.24      00000290 IXG251I THE MODULE THAT DETECTED THE ERROR IS IGDVTSCU
20:11:01.24      00000290 IXG251I SMS MODULE TRACE BACK - VTSCU VTSC T VTSCH VTS CD VTS CC VTS CR
SSIRT
20:11:01.25      00000290 IXG251I SYMPTOM RECORD CREATED, PROBLEM ID IS IGD00046
20:11:01.25      00000290 IXG251I IGD17219I UNABLE TO CONTINUE DEFINE OF DATA SET CICS.SCSCFWR.VSA
MV.A0000001
20:11:01.25      00000090 IXG301I SYSTEM LOGGER FAILED TO OFFLOAD DATA FOR LOG STREAM 186
186 00000090 SCSCFWR.VSAMV IN STRUCTURE LOG_USERBWFP_P01. RETURN CODE: 00000008
186 00000090 REASON CODE: 00000805 DIAG1: 0000001C DIAG2: 17080002 DIAG3:
186 00000090 0107001B DIAG4: 00000000
20:11:02.14 STC07389 00000090 +DFHFC0526 SCSCPAA1 187
187 00000090 An error occurred on the request to the CICS log manager to close the
187 00000090 forward recovery log stream for file ITEMACTX. Module DFHFCRO.
20:11:02.63 STC07389 00000090 +DFHFC6001 07/17/96 20:11:02 SCSCPAA1 Data set successfully quiesced by
CICS. Data set CICSDSW.VSAMV.ITEMACT
20:11:02.90 STC07389 00000090 +DFHFC0526 SCSCPAA1 189
189 00000090 An error occurred on the request to the CICS log manager to close the
189 00000090 forward recovery log stream for file DEPSUMDX. Module DFHFCRO.
20:11:03.39 STC07389 00000090 +DFHFC6001 07/17/96 20:11:03 SCSCPAA1 Data set successfully quiesced by
CICS. Data set CICSDSW.VSAMV.DEPSUMDB
20:11:03.64 STC07389 00000090 +DFHFC0526 SCSCPAA1 191
191 00000090 An error occurred on the request to the CICS log manager to close the
191 00000090 forward recovery log stream for file EMPACTDX. Module DFHFCRO.
20:11:04.07 STC07389 00000090 +DFHFC6001 07/17/96 20:11:04 SCSCPAA1 Data set successfully quiesced by
CICS. Data set CICSDSW.VSAMV.EMPACTDB

```

Figure 23 (Part 2 of 3). Forward Recovery Log Stream Full

```

20:11:16.46 STC07389 00000090 +DFHSM0133 SCSCPAA1 CICS is under stress (short on storage above 16MB).
20:11:16.91 STC07389 00000090 +DFHSM0134 SCSCPAA1 CICS is no longer short on storage above 16MB.
20:11:18.40 STC07389 00000090 +DFHME0126 SCSCPAA1 195
195 00000090 Error in SYMREC invocation. Return code in R15 = X'000C', Reason code
195 00000090 in R0 = X'0F1C'.
20:11:18.40 STC07389 00000090 +DFHLG0772 SCSCPAA1 196
196 00000090 An error has occurred during MVS logger operation IXGWRITE for log
196 00000090 stream SCSCFWR.VSAMV. MVS logger codes: X'00000008', X'0000085D'.
20:11:18.41 STC07389 00000090 +DFHME0116 SCSCPAA1 197
197 00000090 (Module:DFHMEME) CICS symptom string for message DFHLG0772 is
197 00000090 PIDS/565501800 LVLS/510 MS/DFHLG0772 RIDS/DFHL2HSF PTF5/UN91603
197 00000090 VALU/H0000085D
20:11:18.42 STC07389 00000090 +DFHFC4800 SCSCPAA1 198
198 00000090 07/17/96 20:11:18 SCSCPAA1 A failure has been detected on forward
198 00000090 recovery log stream SCSCFWR.VSAMV. The associated RLS data set has
198 00000090 been quiesced. Data set CICSDSW.VSAMV.VENDOR
20:11:18.47 00000290 IXG251I IKJ56228I DATA SET CICS.SCSCFWR.VSAMV.A0000000 NOT IN CATALOG OR
CATALOG CAN NOT BE ACCESSED
20:11:18.82 00000290 IXG251I IKJ56893I DATA SET CICS.SCSCFWR.VSAMV.A0000001 NOT ALLOCATED+
20:11:18.82 00000290 IXG251I IGD17103I CATALOG ERROR WHILE DEFINING VSAM DATA SET CICS.SCSCFW
R.VSAMV.A0000001
20:11:18.82 00000290 IXG251I RETURN CODE IS 68 REASON CODE IS 20 IGGOCLEW
20:11:18.83 00000290 IXG251I IGD306I UNEXPECTED ERROR DURING IGGOCLEW PROCESSING
20:11:18.83 00000290 IXG251I RETURN CODE 68 REASON CODE 20
20:11:18.83 00000290 IXG251I THE MODULE THAT DETECTED THE ERROR IS IGDVTSCU
20:11:18.83 00000290 IXG251I SMS MODULE TRACE BACK - VTSCU VTSC T VTSCH VTSCD VTSCC VTSCR
SSIRT
20:11:18.84 00000290 IXG251I SYMPTOM RECORD CREATED, PROBLEM ID IS IGD00047
20:11:18.84 00000290 IXG251I IGD17219I UNABLE TO CONTINUE DEFINE OF DATA SET CICS.SCSCFWR.VSA
MV.A0000001
20:11:18.85 00000090 IXG301I SYSTEM LOGGER FAILED TO OFFLOAD DATA FOR LOG STREAM 211
211 00000090 SCSCFWR.VSAMV IN STRUCTURE LOG_USERBWF_P01. RETURN CODE: 00000008
211 00000090 REASON CODE: 00000805 DIAG1: 0000001C DIAG2: 17080002 DIAG3:
211 00000090 0107001B DIAG4: 00000000
20:11:19.27 STC07389 00000090 +DFHFC6001 07/17/96 20:11:19 SCSCPAA1 Data set successfully quiesced by
CICS. Data set CICSDSW.VSAMV.VENDOR
20:11:19.40 STC07389 00000090 +DFHFC0525 SCSCPAA1 216 5
216 00000090 RLS OPEN of file INVENTOX failed because the forward recovery log
216 00000090 stream could not be opened. Module DFHFCRO

```

Figure 23 (Part 3 of 3). Forward Recovery Log Stream Full

4.2.1.5 Example 2

Figure 24 on page 64 shows the effects of a logstream-full condition on the DFHLOG log stream. The error condition was caused by specifying HIGHOFFLOAD(100) and LOWOFFLOAD(5) in the DFHLOG log stream definition and starting up CICS with SYSLOG=KEEP.

- 1** DFHLOG gradually fills the available DASD for the offload data sets, getting occasional 860 errors.
- 2** When the offload DASD is full, the logger issues 805 (dynamic allocation error) and 409. (managed to write but there is a problem with previous offload) return codes to CICS.
- 3** Nothing is done, so CICS finally gets an 85D (Coupling Facility is full and offload has failed).
- 4** CICS abends with code U1800.
- 5** Meanwhile the operator has freed some DASD space, CICS is ARM emergency restarted.
- 6** Because we restarted with SYSLOG=KEEP, we still get 860 return codes.

```

19:34:08.15 STC04460 00000090 +DFHLG0777 SCSCPFA1 824      1
      824 00000090 A temporary error condition occurred during MVS logger operation
      824 00000090 IXGWRITE for log stream SCSCPFA1.DFHLOG. MVS logger codes:
      824 00000090 X'00000008', X'00000860'
19:40:02.29 STC04460 00000090 +DFHLG0777 SCSCPFA1 838      1
      838 00000090 A temporary error condition occurred during MVS logger operation
      838 00000090 IXGWRITE for log stream SCSCPFA1.DFHLOG. MVS logger codes:
      838 00000090 X'00000008', X'00000860'
19:54:16.01 STC04460 00000090 +DFHLG0777 SCSCPFA1 842      1
      842 00000090 A temporary error condition occurred during MVS logger operation
      842 00000090 IXGWRITE for log stream SCSCPFA1.DFHLOG. MVS logger codes:
      842 00000090 X'00000008', X'00000860'
20:23:04.34          00000290 IXG251I IKJ56893I DATA SET CICS.SCSCPFA1.DFHLOG.A0000011 NOT
      ALLOCATED+
20:23:04.36          00000290 IXG251I IGD17273I ALLOCATION HAS FAILED FOR ALL VOLUMES SELECTED FOR
      DATA SET CICS.SCSCPFA1.DFHLOG.A0000011
20:23:04.37          00000290 IXG251I IGD17290I THERE WERE 1 CANDIDATE STORAGE GROUPS OF WHICH THE
      FIRST 1 WERE ELIGIBLE FOR VOLUME SELECTION.
20:23:04.38          00000290 IXG251I THE CANDIDATE STORAGE GROUPS WERE: SGLOGGER
20:23:04.39          00000290 IXG251I IGD17279I 1 VOLUMES WERE REJECTED BECAUSE THEY DID NOT HAVE
      SUFFICIENT SPACE
20:23:04.39          00000290 IXG251I IGD17219I UNABLE TO CONTINUE DEFINE OF DATA SET CICS.SCSCPFA1.
      DFHLOG.A0000011
20:23:04.40          00000090 IXG301I SYSTEM LOGGER FAILED TO OFFLOAD DATA FOR LOG STREAM 869      2
      869 00000090 SCSCPFA1.DFHLOG IN STRUCTURE LOG DFHLOG_P01. RETURN CODE: 00000008
      869 00000090 REASON CODE: 0000805 DIAG1: 00000004 DIAG2: 00004379 DIAG3:
      869 00000090 0107001B DIAG4: 00000000
20:23:04.59 STC04460 00000090 +DFHLG0775 SCSCPFA1 870      2
      870 00000090 The MVS logger has returned an alert during operation IXGWRITE for
      870 00000090 log stream SCSCPFA1.DFHLOG. The log stream writer offload task is
      870 00000090 failing. MVS logger codes: X'00000004' X'00000409'
20:23:05.98 STC04460 00000090 +DFHLG0772 SCSCPFA1 871      3
      871 00000090 An error has occurred during MVS logger operation IXGWRITE for log
      871 00000090 stream SCSCPFA1.DFHLOG. MVS logger codes: X'00000008', X'0000085D'
20:23:05.99 STC04460 00000090 +DFHME0116 SCSCPFA1 872
      872 00000090 (Module:DFHMEME) CICS symptom string for message DFHLG0772 is
      872 00000090 PIDS/565501800 LVLS/510 MS/DFHLG0772 RIDS/DFHL2HSF PTF5/UN95188
      872 00000090 VALU/H0000085D
20:23:06.02 STC04460 00000090 +DFHLG0735 SCSCPFA1 873      4
      873 00000090 A failure has occurred while writing to the system log (DFHLOG).
      873 00000090 Access to the system log has been lost. CICS will be terminated.
20:23:06.60          00000090 IXG301I SYSTEM LOGGER FAILED TO OFFLOAD DATA FOR LOG STREAM 884
      884 00000090 SCSCPFA1.DFHLOG IN STRUCTURE LOG DFHLOG_P01. RETURN CODE: 00000008
      884 00000090 REASON CODE: 0000805 DIAG1: 00000004 DIAG2: 00004379 DIAG3:
      884 00000090 0107001B DIAG4: 00000000
20:23:49.24 STC04460 00000090 +DFHDU0303I SCSCPFA1 Transaction Dump Data set DFHDMPA closed.
20:23:49.24 STC04460 00000090 +DFHKE1800 SCSCPFA1 ABNORMAL TERMINATION OF CICS FOR MVS/ESA IS
      COMPLETE.
20:23:52.92 STC04460 00000090 IEF450I SCSCPFA1 SCSCPFA1 - ABEND=S000 U1800 REASON=00000000 909      5
      909 00000090 TIME=20.23.52
20:23:53.56 STC04460 00000090 IEF404I SCSCPFA1 - ENDED - TIME=20.23.53
20:23:53.58 STC04460 00000090 $HASP395 SCSCPFA1 ENDED
20:23:55.73 INTERNAL 00000290 S CICTSFOR,SYSIDNT=PFA1,START=INITIAL,JOBNAME=SCSCPFA1,VAM=RLS
20:23:55.80          00000090 IXC812I JOBNAME SCSCPFA1, ELEMENT SYSCICS_SCSCPFA1 FAILED. 917
      917 00000090 THE ELEMENT WAS RESTARTED WITH PERSISTENT START TEXT.
20:23:55.80          00000290 IXC813I JOBNAME SCSCPFA1, ELEMENT SYSCICS_SCSCPFA1 918
      918 00000290 WAS RESTARTED WITH THE FOLLOWING START TEXT:
      918 00000290 S CICTSFOR,SYSIDNT=PFA1,START=INITIAL,JOBNAME=SCSCPFA1,VAM=RLS
      918 00000290 THE RESTART METHOD USED WAS DETERMINED BY THE ACTIVE POLICY.
20:23:56.78 STC04523 00000081 $HASP100 SCSCPFA1 ON STCINRDR
20:23:57.85 STC04523 00000290 IEF695I START CICTSFOR WITH JOBNAME SCSCPFA1 IS ASSIGNED TO USER STC
      , GROUP SYS1
20:23:57.86 STC04523 00000090 $HASP373 SCSCPFA1 STARTED
20:23:57.88 STC04523 00000090 IEF403I SCSCPFA1 - STARTED - TIME=20.23.57
20:23:59.95 STC04523 00000090 DFHPA1101 SCSCPFA1 DFHSIT6$ IS BEING LOADED.
20:23:59.96 STC04523 00000090 DFHPA1108 SCSCPFA1 DFHSIT6$ HAS BEEN LOADED. (GENERATED AT: MM/DD=
      02/20 HH:MM= 16:04).
20:23:59.98 STC04523 00000090 DFHPA1100 SCSCPFA1 OVERRIDE PARAMETERS FROM JCL EXEC STATEMENT:
20:23:59.98 STC04523 00000090 DFHPA1927 SCSCPFA1 START=INITIAL,APPLID=SCSCPFA1,GRPLIST=(DFHLIST,
      PFALIST,RLSLIST),MNSUBSYS=PFA1,SYSIDNT=PFA1,SYSIN
20:23:59.99 STC04523 00000090 DFHPA1102 SCSCPFA1 OVERRIDE PARAMETERS FROM SYSIN:

```

Figure 24 (Part 1 of 3). DFHLOG Log Stream Full

```

20:24:00.29 STC04523 00000090 DFHPA1927 SCSCPFA1 SYSLOG=KEEP,
20:24:00.30 STC04523 00000090 DFHPA1927 SCSCPFA1 .END
20:24:00.32 STC04523 00000090 DFHPA1103 SCSCPFA1 END OF FILE ON SYSIN.
20:24:00.32 STC04523 00000090 DFHPA1930 SCSCPFA1 CSDFRLOG=01 HAS BEEN IGNORED AS CSDRECOV=ALL HAS
NOT BEEN SPECIFIED.
20:24:00.59 STC04523 00000090 +DFHPA1934I SCSCPFA1 START TYPE CHANGED TO AUTO
20:24:00.60 STC04523 00000090 +DFHTR0103 TRACE TABLE SIZE IS 64K
20:24:00.93 STC04523 00000090 +DFHSM0122I SCSCPFA1 Limit of DSA storage below 16MB is 5,120K.
20:24:00.93 STC04523 00000090 +DFHSM0123I SCSCPFA1 Limit of DSA storage above 16MB is 60M.
20:24:00.94 STC04523 00000090 +DFHSM0113I SCSCPFA1 Storage protection is not active.
20:24:00.95 STC04523 00000090 +DFHSM0126I SCSCPFA1 Transaction isolation is not active.
20:24:00.95 STC04523 00000090 +DFHSM0120I SCSCPFA1 Reentrant programs will not be loaded into
read-only storage.
20:24:01.12 STC04523 00000090 +DFHDM0101I SCSCPFA1 CICS is initializing.
20:24:01.75 STC04523 00000090 +DFHLG0101I SCSCPFA1 Log manager domain initialization has started.
20:24:01.79 STC04523 00000090 +DFHSI1500 SCSCPFA1 CICS for MVS/ESA Version 5.1.0 Startup is in
progress.
20:24:01.80 STC04523 00000090 +DFHXS1100I SCSCPFA1 Security initialization has started.
20:24:01.93 STC04523 00000090 +DFHXS1102I SCSCPFA1 Security is inactive.
20:24:01.94 STC04523 00000090 +DFHDM0304I SCSCPFA1 Transaction Dump Data set DFHDMPB opened.
20:24:02.21 STC04523 00000090 +DFHSI1501I SCSCPFA1 Loading CICS nucleus.
20:24:05.88 STC04523 00000090 +DFHXS1101I SCSCPFA1 Security initialization has ended.
20:24:08.06 STC04523 00000090 IEC161I 056-084,SCSCPFA1,SCSCPFA1,DFHGCD,,,
20:24:08.06 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHGCD,CICSTS.CICS510.PFA1.DFHGCD.DATA,
20:24:08.07 STC04523 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
20:24:10.43 STC04523 00000090 IEC161I 056-084,SCSCPFA1,SCSCPFA1,DFHGCD,,,
20:24:10.44 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHGCD,CICSTS.CICS510.PFA1.DFHGCD.INDEX,
20:24:10.45 STC04523 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
20:24:10.50 STC04523 00000090 IEC161I 062-086,SCSCPFA1,SCSCPFA1,DFHGCD,,,
20:24:10.51 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHGCD,CICSTS.CICS510.PFA1.DFHGCD.DATA,
20:24:10.51 STC04523 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
20:24:10.58 STC04523 00000090 +DFHRM0141 SCSCPFA1 Recovery manager autostart override record is not
present. Normal processing continues.
20:24:11.03 STC04523 00000090 +DFHMN0105I SCSCPFA1 Using default Monitoring Control Table.
20:24:11.03 STC04523 00000090 +DFHMN0109I SCSCPFA1 CICS Monitoring is active.
20:24:11.21 STC04523 00000090 +DFHSI1502I SCSCPFA1 CICS startup is Emergency.
20:24:11.23 STC04523 00000090 +DFHTS0100I SCSCPFA1 Temporary Storage initialization has started.
20:24:11.26 STC04523 00000090 +DFHLG0103I SCSCPFA1 System log (DFHLOG) initialization has started.
20:24:11.94 STC04523 00000090 +DFHLG0104I SCSCPFA1 System log (DFHLOG) initialization has ended.
20:24:11.94 STC04523 00000090 +DFHLG0103I SCSCPFA1 System log (DFHSHUNT) initialization has started.
20:24:11.96 STC04523 00000090 +DFHSI1503I SCSCPFA1 Terminal data sets are being opened.
20:24:12.03 STC04523 00000090 +DFHSI1592 SCSCPFA1 CICS applid not (yet) active to VTAM.
20:24:12.04 STC04523 00000090 +DFHSI1572 SCSCPFA1 Unable to OPEN VTAM ACB - RC=00000008, ACB
Code=5A.
20:24:12.20 STC04523 00000090 +DFHLG0104I SCSCPFA1 System log (DFHSHUNT) initialization has ended.
20:24:12.21 STC04523 00000090 +DFHLG0102I SCSCPFA1 Log manager domain initialization has ended.
20:24:12.47 STC04523 00000090 IEC161I 056-084,SCSCPFA1,SCSCPFA1,DFHTEMP,,,
20:24:12.47 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHTEMP,
20:24:12.48 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHTEMP.DATA,CATALOG.TOTICF1.VTOTCI3
20:24:12.51 STC04523 00000090 IEC161I 062-086,SCSCPFA1,SCSCPFA1,DFHTEMP,,,
20:24:12.51 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHTEMP,
20:24:12.52 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHTEMP.DATA,CATALOG.TOTICF1.VTOTCI3
20:24:12.56 STC04523 00000090 +DFHTS0101I SCSCPFA1 Temporary Storage initialization has ended.
20:24:12.62 STC04523 00000090 +DFHKE0406I SCSCPFA1 024
024 00000090 CICS is about to wait for predecessors defined in the MVS automatic
024 00000090 restart management policy for this region.
20:24:12.70 STC04523 00000090 +DFHCP0101I SCSCPFA1 CPI initialization has started.
20:24:12.70 STC04523 00000090 +DFHPR0104I SCSCPFA1 Partner resource manager initialization has
started.
20:24:12.71 STC04523 00000090 +DFHAI0101I SCSCPFA1 AITM initialization has started.
20:24:12.72 STC04523 00000090 +DFHER5730 SCSCPFA1 User recovery beginning
20:24:12.76 STC04523 00000090 +DFHTD0100I SCSCPFA1 Transient Data initialization has started.
20:24:12.79 STC04523 00000090 +DFHFC0100I SCSCPFA1 File Control initialization has started.
20:24:13.12 STC04523 00000090 IEC161I 056-084,SCSCPFA1,SCSCPFA1,DFHINTRA,,,
20:24:13.13 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHINTRA,
20:24:13.13 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHINTRA.DATA,CATALOG.TOTICF1.VTOTCI3
20:24:13.17 STC04523 00000090 IEC161I 062-086,SCSCPFA1,SCSCPFA1,DFHINTRA,,,
20:24:13.17 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHINTRA,
20:24:13.18 STC04523 00000090 IEC161I CICSTS.CICS510.PFA1.DFHINTRA.DATA,CATALOG.TOTICF1.VTOTCI3

```

Figure 24 (Part 2 of 3). DFHLOG Log Stream Full

```

20:24:14.03 STC04523 00000090 +DFHFC0562 SCSCPFA1 The RLS control ACB has been successfully
                           registered by CICS.
20:24:14.04 STC04523 00000090 +DFHFC0570 SCSCPFA1 File control RLS access has been enabled.
20:24:17.86 STC04523 00000090 +DFHER5731 SCSCPFA1 No active user records on the system log
20:24:17.86 STC04523 00000090 +DFHER5732 SCSCPFA1 User recovery completed
20:24:17.94 STC04523 00000090 +DFHTD0101I SCSCPFA1 Transient Data initialization has ended.
20:24:22.97 STC04523 00000090 +DFHFC0101I SCSCPFA1 File Control initialization has ended.
20:24:22.98 STC04523 00000090 +DFHCP0102I SCSCPFA1 CPI initialization has ended.
20:24:22.98 STC04523 00000090 +DFHPR0105I SCSCPFA1 Partner resource manager initialization has
                           ended.
20:24:22.99 STC04523 00000090 +DFHAI0102I SCSCPFA1 AITM initialization has ended.
20:24:23.41 STC04523 00000090 +DFHSI1519I SCSCPFA1 The interregion communication session was
                           successfully started.
20:24:25.44 STC04523 00000090 +DFHAP1204I SCSCPFA1 COBOL2 is being initialized.
20:24:25.56 STC04523 00000090 +DFHSI8430I SCSCPFA1 About to link to PLT programs during the third
                           stage of initialization.
20:24:25.61 STC04523 00000090 +EYUNX0001I SCSCPFA1 LMAS PLTPI program starting
20:24:25.68 STC04523 00000090 +DFHSI8434I SCSCPFA1 Control returned from PLT programs during the
                           third stage of initialization.
20:24:25.72 STC04523 00000090 +DFHSI1517 SCSCPFA1 Control is being given to CICS.
20:24:25.82 STC04523 00000090 +DFHLG0777 SCSCPFA1 052
                           052 00000090 A temporary error condition occurred during MVS logger operation
                           052 00000090 IXGWRITE for log stream SCSCPFA1.DFHLOG. MVS logger codes:
                           052 00000090 X'00000008', X'00000860'
20:24:26.81 STC04523 00000090 +EYUXL0003I SCSCPFA1 CPSM Version 120 LMAS startup in progress
20:24:28.90 STC04523 00000090 +EYUXL0022I SCSCPFA1 LMAS Phase I initialization complete
20:24:29.09 STC04523 00000090 +EYUXL0020I SCSCPFA1 ESSS connection in progress to CICSplex(SCSPLEX)
20:24:29.12 STC04523 00000090 +EYUXL0004I SCSCPFA1 ESSS connection complete
20:24:29.17 STC04523 00000090 +EYUCL0006I SCSCPFA1 ESSS link to SCSCPCA1 established
20:24:29.18 STC04523 00000090 +EYUXL0007I SCSCPFA1 LMAS Phase II initialization complete
20:24:29.18 STC02690 00000090 +EYUTS0001I SCSCPCA1 Topology Connect for SCSCPFA1 Initiated
20:24:30.70 STC04318 00000090 +EYUTS0001I SCSCPCB1 Topology Join for SCSCPFA1 Initiated
20:24:30.69 STC02690 00000090 +EYUCL0012I SCSCPCA1 Connection of SCSCPCA1 to SCSCPFA1 complete
20:24:30.70 STC02690 00000090 +EYUTS0003I SCSCPCA1 Topology Connect for SCSCPFA1 Complete
20:24:31.84 STC04318 00000090 +EYUTS0003I SCSCPCB1 Topology Join for SCSCPFA1 Complete
20:40:32.78 STC04523 00000090 +DFHLG0777 SCSCPFA1 069
                           069 00000090 A temporary error condition occurred during MVS logger operation
                           069 00000090 IXGWRITE for log stream SCSCPFA1.DFHLOG. MVS logger codes:
                           069 00000090 X'00000008', X'00000860'.

```

6

Figure 24 (Part 3 of 3). DFHLOG Log Stream Full

4.2.1.6 Documentation on Log Stream Full

CICSplex SM provides JRNLNAME and STREAMNM view commands to show CICS information about log streams. See *CICSplex System Manager for MVS/ESA Operations Reference* for more information.

4.2.2 Log Stream Damage

Log streams may become permanently damaged when log data cannot be recovered from either the DASD staging data sets or the local storage buffers after a system, sysplex, or coupling facility failure. For more information about DASD staging data sets, see 4.5, “Staging Data Set Full Errors” on page 91.

CICS recognizes that a log stream has been damaged by either attempting to write a record to the DFHLOG log stream using the IXGWRITE macro, issuing an IXGBRWSE request to check the availability of the log stream, or attempting to connect to it with an IXGCONN macro. CICS performs an IXGBRWSE every 10 sec so that, even if there is no write activity during a particular period, it still detects loss of contact with a log stream.

4.2.2.1 Impact

If a CICS system log stream is damaged, CICS is automatically quiesced, allowing all transactions in progress to complete with no further logging to the system log.

If a forward recovery log stream becomes damaged, CICS is automatically quiesced, allowing all transactions in progress to complete with no further logging to the forward recovery log.

CICS treats log stream damage as a severe error.

4.2.2.2 Prevention

Protect the data in the coupling facility by using staging data sets. Protect the offload data sets by using devices such as RAMAC or the dual copy facilities of a 3990 DASD controller.

4.2.2.3 Recovery

After damage to the log stream, CICS attempts at restart to reconnect to its log streams. On reconnection, the MVS system logger notifies CICS of a missing-blocks error condition. CICS recognizes the error and terminates with a U1800 abend. Therefore an initial start is required to start CICS successfully after log stream damage. At an initial start, CICS is notified of the log errors, takes a dump, and allocates a new log stream.

Note: Although the CICS system restarts successfully, utilities such as CICSVR or any programs that scan the log streams may abend if they receive a missing-blocks error condition as a result of the previously damaged log stream.

4.2.2.4 Example

Figure 25 on page 69 shows the effects of a damaged log stream.

Note: No staging data sets were allocated on this system, and no peer systems had connections to the LOG_DFHLOG_P01 structure for this test.

- 1** The MVS FORCE IXGLOGR command causes IXGLOGR to fail.
- 2** IXGLOGR abends.
- 3** Log errors on the CICS system log cause CICS to abend.
- 4** CICS emergency restart attempts to connect to its log stream but has to wait because IXGLOGR is unavailable.
- 5** The connection to LOG_DFHLOG_P01 shows as failed-persistent.
- 6** The connection to the structure is forced with a SETXCF command to effect log stream damage.
- 7** IXGLOGR is restarted.
- 8** Missing data from the log stream causes the CICS emergency restart to abend.
- 9** CICS is restarted with an initial start.
- 10** CICS system log initialization is successful.

11 Control is given to CICS.

MVS system logger codes returned to CICS when a log stream is damaged include:

- X'00000405', the log stream has previously lost log blocks
- X'00000407', there may be log blocks permanently missing
- X'0000084B', log data is permanently missing from the log stream
- X'0000084D', end of log stream prematurely reached.


```

13:28:05.67 CICSRS3 00000290 FORCE IXGLOGR 1
13:28:05.78 TSU09960 00000090 IEE301I IXGLOGR FORCE COMMAND ACCEPTED
13:28:08.67 00000090 IEF402I IXGLOGR FAILED IN ADDRESS SPACE 0061 934 2
          934 00000090 SYSTEM ABEND S1C5 - REASON CODE 020004
13:28:08.73 00000090 IXG056I SYSTEM LOGGER ADDRESS SPACE HAS ENDED
13:28:14.23 STC09962 00000090 +DFHFG0772 SCSCPA1 952
          952 00000090 An error has occurred during MVS logger operation IXGBRWSE START for
          952 00000090 log stream SCSCPA1.DFHLOG. MVS logger codes: X'00000008',
          952 00000090 X'00000890'.
13:28:14.24 STC09962 00000090 +DFHME0116 SCSCPA1 954
          954 00000090 (Module:DFHMEME) CICS symptom string for message DFHFG0772 is
          954 00000090 PIDS/565501800 LVLS/510 MS/DFHFG0772 RIDS/DFHL2HS7 PTF5/UN91603
          954 00000090 VALU/H00000890
13:28:14.25 STC09962 00000090 +DFHDU0201 SCSCPA1 ABOUT TO TAKE SDUMP. DUMP CODE: LG0772 , DUMPID:
          28/0001
13:28:25.88 STC09962 00000090 +DFHDU0202 SCSCPA1 SDUMPX COMPLETE. SDUMPX RETURN CODE X'00'
13:28:25.89 STC09962 00000090 +DFHFG0735 SCSCPA1 009
          009 00000090 A failure has occurred while reading from the system log (DFHLOG).
          009 00000090 Access to the system log has been lost. CICS will be terminated.
13:28:26.48 STC09962 00000090 EYUXE0003I SCSCPA1 End of Task entered for CICSplex SM 120
13:28:26.50 STC09962 00000090 +EYUTS0001I SCSCPCA1 Topology Disconnect for SCSCPA1 Initiated
13:28:26.51 STC09962 00000090 +EYUTS0003I SCSCPCA1 Topology Disconnect for SCSCPA1 Complete
13:28:28.48 STC09962 00000090 +DFHDU0303I SCSCPA1 Transaction Dump Data set DFHDMPB closed.
13:28:28.48 STC09962 00000090 +DFHKE1800 SCSCPA1 ABNORMAL TERMINATION OF CICS FOR MVS/ESA IS
          COMPLETE.
13:28:28.89 STC09962 00000090 IEF450I SCSCPA1 SCSCPA1 - ABEND=S000 U1800 REASON=00000000 083 3
          083 00000090 TIME=13.28.28
13:28:29.20 STC09962 00000290 -
          --- PAGING COUNTS ---
          -----TIMINGS (MINS.)-----
13:28:29.20 STC09962 00000290 -JOBNAME STEPNAME PROCSTEP RC EXCP CPU SRB VECT VAFF
          CLOCK SERV PG PAGE SWAP VIO SWAPS
13:28:29.20 STC09962 00000290 -SCSCPA1 STARTING CICS510 U1800 1151 .23 .03 .00 .00
          32.5 2091K 0 0 70 0 1
13:28:29.33 STC09962 00000090 IEF404I SCSCPA1 - ENDED - TIME=13.28.29
13:28:29.33 STC09962 00000290 -SCSCPA1 ENDED. NAME- TOTAL CPU TIME= .23 TOTAL
          ELAPSED TIME= 32.5
13:28:29.35 STC09962 00000090 $HASP395 SCSCPA1 ENDED
13:28:30.20 INTERNAL 00000290 S C51AOR,SYSIDNT=PAA1,START=AUTO,JOBNAME=SCSCPA1,VAM=RLS
13:28:30.22 00000090 IXC812I JOBNAME SCSCPA1, ELEMENT SYSCICS_SCSCPA1 FAILED. 095
          095 00000090 THE ELEMENT WAS RESTARTED WITH PERSISTENT START TEXT.
13:28:30.23 00000290 IXC813I JOBNAME SCSCPA1, ELEMENT SYSCICS_SCSCPA1 096
          096 00000090 WAS RESTARTED WITH THE FOLLOWING START TEXT:
          096 00000090 S C51AOR,SYSIDNT=PAA1,START=AUTO,JOBNAME=SCSCPA1,VAM=RLS
          096 00000090 THE RESTART METHOD USED WAS DETERMINED BY THE ACTIVE POLICY.
13:28:30.56 STC09988 00000081 $HASP100 SCSCPA1 ON STCINRDR
13:28:31.26 STC09988 00000290 IEF695I START C51AOR WITH JOBNAME SCSCPA1 IS ASSIGNED TO USER STC
          , GROUP SYS1
13:28:31.26 STC09988 00000090 $HASP373 SCSCPA1 STARTED
13:28:31.30 STC09988 00000090 IEF403I SCSCPA1 - STARTED - TIME=13.28.31
13:28:37.95 STC09988 00000090 +DFHDM0101I SCSCPA1 CICS is initializing.
13:28:49.50 STC09988 00000090 +DFHFG0103I SCSCPA1 System log (DFHLOG) initialization has started.
13:28:49.51 STC09988 00000090 +DFHFG0777 SCSCPA1 318 4
          318 00000090 A temporary error condition occurred during MVS logger operation
          318 00000090 IXGCONN CONNECT for log stream SCSCPA1.DFHLOG. MVS logger codes:
          318 00000090 X'00000008', X'00000890'.
13:28:51.00 STC09988 00000090 +DFHTS0101I SCSCPA1 Temporary Storage initialization has ended.
13:28:51.01 STC09988 00000090 +DFHSI1503I SCSCPA1 Terminal data sets are being opened.
13:28:51.20 STC09988 00000090 +DFHKE0406I SCSCPA1 336
          336 00000090 CICS is about to wait for predecessors defined in the MVS automatic
          336 00000090 restart management policy for this region.
13:28:51.41 STC09988 00000090 +DFHCP0101I SCSCPA1 CPI initialization has started.
13:28:51.42 STC09988 00000090 +DFHPR0104I SCSCPA1 Partner resource manager initialization has
          started.
13:28:51.42 STC09988 00000090 +DFHAI0101I SCSCPA1 AITM initialization has started.
13:28:51.54 STC09988 00000090 +DFHFC0100I SCSCPA1 File Control initialization has started.
13:28:51.71 STC09988 00000090 +DFHZC0126I SCSCPA1 No VTAM sessions persisted for an EMERGENCY
          restart.
13:28:51.89 STC09988 00000090 +DFHTD0100I SCSCPA1 Transient Data initialization has started.

```

Figure 25 (Part 1 of 4). Log Stream Damage

```

13:28:52.16 STC09988 00000090 +DFHFC0562 SCSCPAA1 The RLS control ACB has been successfully registered
                                by CICS.
13:28:52.16 STC09988 00000090 +DFHFC0570 SCSCPAA1 File control RLS access has been enabled.
13:29:21.59 STC09988 00000090 +DFHFG0777 SCSCPAA1 358 4
                                A temporary error condition occurred during MVS logger operation
                                IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
                                X'00000008', X'00000890'
13:30:20.74 CICSRS3 00000290 D XCF,STR,STRNAME=LOG_DFHLOG_P01
13:30:21.07 CICSRS3 00000090 IXC360I 13.30.20 DISPLAY XCF 396
                                STRNAME: LOG_DFHLOG_P01
                                STATUS: ALLOCATED
                                POLICY SIZE : 14848 K
                                POLICY INITSIZE: 9728 K
                                REBUILD PERCENT: 1
                                PREFERENCE LIST: CF02 CF01
                                EXCLUSION LIST IS EMPTY
                                ACTIVE STRUCTURE
                                -----
                                ALLOCATION TIME: 07/26/96 19:46:08
                                CFNAME : CF02
                                COUPLING FACILITY: 009672.IBM.02.000000040104
                                PARTITION: 1 CPCID: 01
                                ACTUAL SIZE : 9728 K
                                STORAGE INCREMENT SIZE: 256 K
                                VERSION : AD39B434 3864EE00
                                DISPOSITION : DELETE
                                ACCESS TIME : 0
                                MAX CONNECTIONS: 32
                                # CONNECTIONS : 1
                                CONNECTION NAME ID VERSION SYSNAME JOBNAME ASID STATE
                                -----
                                IXGLOGR_SC42 01 0001005E SC42 IXGLOGR 0061 FAILED-PERSISTENT 5
13:30:24.50 STC09988 00000090 +DFHFG0777 SCSCPAA1 397
                                A temporary error condition occurred during MVS logger operation
                                IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
                                X'00000008', X'00000890'.
13:30:55.96 STC09988 00000090 +DFHFG0777 SCSCPAA1 401
                                A temporary error condition occurred during MVS logger operation
                                IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
                                X'00000008', X'00000890'.
13:31:23.46 CICSRS3 00000290 SETXCF FORCE,CONNECTION,CONNNAME=ALL,STRNAME=LOG_DFHLOG_P01 6
13:31:23.91 CICSRS3 00000090 IXC363I THE SETXCF FORCE FOR ALL CONNECTIONS FOR STRUCTURE 405
                                LOG_DFHLOG_P01 WAS COMPLETED:
                                CONNECTIONS DELETED BUT ALSO RESULTED IN STRUCTURE DEALLOCATION
13:31:27.42 STC09988 00000090 +DFHFG0777 SCSCPAA1 406
                                A temporary error condition occurred during MVS logger operation
                                IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
                                X'00000008', X'00000890'.
13:31:59.08 CICSRS3 00000290 D XCF,STR,STRNAME=LOG_DFHLOG_P01
13:31:59.34 CICSRS3 00000090 IXC360I 13.31.59 DISPLAY XCF 411
                                STRNAME: LOG_DFHLOG_P01
                                STATUS: NOT ALLOCATED
                                POLICY SIZE : 14848 K
                                POLICY INITSIZE: 9728 K
                                REBUILD PERCENT: 1
                                PREFERENCE LIST: CF02 CF01
                                EXCLUSION LIST IS EMPTY
13:32:20.66 CICSRS3 00000290 S IXGLOGRS 7
13:32:20.93 STC09990 00000081 $HASP100 IXGLOGRS ON STCINRDR
13:32:21.45 STC09990 00000290 IEF695I START IXGLOGRS WITH JOBNAME IXGLOGRS IS ASSIGNED TO USER STC
                                , GROUP SYS1
13:32:21.45 STC09990 00000090 $HASP373 IXGLOGRS STARTED
13:32:21.51 STC09990 00000090 IEF403I IXGLOGRS - STARTED - TIME=13.32.21
13:32:21.65 STC09990 00000090 $HASP395 IXGLOGRS ENDED

```

Figure 25 (Part 2 of 4). Log Stream Damage

```

13:32:21.87      00000090 IEF403I IEESYSAS - STARTED - TIME=13.32.21
13:32:24.00      00000290 IXG212E RECOVERY FOR LOGSTREAM SCSCPAA1.DFHLOG 447
                447 00000090 IN STRUCTURE LOG_DFHLOG_P01 WAS NOT SUCCESSFUL.
                447 00000090 DATA MAY BE LOST FOR THE CONNECTION ON SYSTEM SC42 DUE TO:
                447 00000090 NO STAGING DATASETS USED BY THE LOGSTREAM.
13:32:26.66      00000290 IXG201I REQUEST TO CONNECT TO LOGSTREAM SCSCPTA1.DFHSHUNT 448
                448 00000090 IN STRUCTURE LOG_DFHSHUNT_P01 ACCEPTED.
                448 00000090 CONNECTION TO ADDITIONAL LOGSTREAMS MAY FAIL DUE TO INSUFFICIENT
                448 00000090 STRUCTURE STORAGE
13:32:28.42      00000090 *IFB098E LOGREC OVERFLOW CONDITION. RECORDS LOST ON SYSTEM SC42 449
                449 00000090 LOG STREAM NAME: SYSPLEX.LOGREC.ALLRECS
13:32:30.33 STC09988 00000090 +DFHLOG777 SCSCPAA1 450
                450 00000090 A temporary error condition occurred during MVS logger operation
                450 00000090 IXGCONN CONNECT for log stream SCSCPAA1.DFHLOG. MVS logger codes:
                450 00000090 X'00000008', X'00000891'.
13:32:32.60      00000290 IXG212E RECOVERY FOR LOGSTREAM SCSCPTA1.DFHLOG 451
                451 00000090 IN STRUCTURE LOG_DFHLOG_P01 WAS NOT SUCCESSFUL.
                451 00000090 DATA MAY BE LOST FOR THE CONNECTION ON SYSTEM SC42 DUE TO:
                451 00000090 NO STAGING DATASETS USED BY THE LOGSTREAM.
13:32:36.43      00000290 IXG212E RECOVERY FOR LOGSTREAM SCSCPAA1.DFHLOG 452
                452 00000090 IN STRUCTURE LOG_DFHLOG_P01 WAS NOT SUCCESSFUL.
                452 00000090 DATA MAY BE LOST FOR THE CONNECTION ON SYSTEM SC42 DUE TO:
                452 00000090 NO STAGING DATASETS USED BY THE LOGSTREAM.
13:32:42.99 STC09988 00000090 +DFHME0126 SCSCPAA1 457
                457 00000090 Error in SYMREC invocation. Return code in R15 = X'000C', Reason code
                457 00000090 in R0 = X'0F1C'.
13:32:42.99 STC09988 00000090 +DFHLOG772 SCSCPAA1 458
                458 00000090 An error has occurred during MVS logger operation IXGCONN CONNECT for
                458 00000090 log stream SCSCPAA1.DFHLOG. MVS logger codes: X'00000004',
                458 00000090 X'00000407'.
13:32:43.00 STC09988 00000090 +DFHME0116 SCSCPAA1 460
                460 00000090 (Module:DFHMEME) CICS symptom string for message DFHLOG772 is
                460 00000090 PIDS/565501800 LVLS/510 MS/DFHLOG772 RIDS/DFHL2HS2 PTF5/UN91603
                460 00000090 VALU/H00000407
13:32:43.01 STC09988 00000090 +DFHDU0201 SCSCPAA1 ABOUT TO TAKE SDUMP. DUMPCODE: LG0772 , DUMPID:
                29/0001
13:32:55.05 STC09988 00000090 +DFHDU0202 SCSCPAA1 SDUMPX COMPLETE. SDUMPX RETURN CODE X'00'
13:32:55.06 STC09988 00000090 +DFHLOG104I SCSCPAA1 System log (DFHLOG) initialization has ended.
13:32:55.06 STC09988 00000090 +DFHLOG103I SCSCPAA1 System log (DFHSHUNT) initialization has started.
13:32:55.72      00000290 IXG201I REQUEST TO CONNECT TO LOGSTREAM SCSCPAA1.DFHSHUNT 516
                516 00000090 IN STRUCTURE LOG_DFHSHUNT_P01 ACCEPTED.
                516 00000090 CONNECTION TO ADDITIONAL LOGSTREAMS MAY FAIL DUE TO INSUFFICIENT
                516 00000090 STRUCTURE STORAGE
13:32:55.94 STC09988 00000090 +DFHLOG104I SCSCPAA1 System log (DFHSHUNT) initialization has ended.
13:32:55.94 STC09988 00000090 +DFHLOG102I SCSCPAA1 Log manager domain initialization has ended.
13:32:55.95 STC09988 00000090 +DFHER5730 SCSCPAA1 User recovery beginning
                ,MNSUBSYS=PTA1,SYSIDNT=PTA1,SYSIN

```

Figure 25 (Part 3 of 4). Log Stream Damage

```

13:32:57.27 STC09988 00000090 +DFHFG0772 SCSCPA1 575
                    575 00000090 An error has occurred during MVS logger operation IXGBRWSE READCURSOR
                    575 00000090 for log stream SCSCPA1.DFHLOG. MVS logger codes: X'00000004',
                    575 00000090 X'00000405'.
13:32:57.28 STC09988 00000090 +DFHME0116 SCSCPA1 576
                    576 00000090 (Module:DFHMEME) CICS symptom string for message DFHFG0772 is
                    576 00000090 PIDS/565501800 LVLS/510 MS/DFHFG0772 RIDS/DFHL2HSG PTF5/UN91603
                    576 00000090 VALU/H00000405
13:32:57.29 STC09988 00000090 +DFHDU0201 SCSCPA1 ABOUT TO TAKE SDUMP. DUMPCODE: LG0772 , DUMPID:
                    29/0002
13:33:04.63 STC09988 00000090 +DFHDU0202 SCSCPA1 SDUMPX COMPLETE. SDUMPX RETURN CODE X'00'
13:33:04.94          00000290 IEF196I IGD100I 2022 ALLOCATED TO DDNAME SYS00108 DATACLAS ( )
13:33:05.14 STC09988 00000090 +DFHFG0738 SCSCPA1 598
                    598 00000090 A failure has occurred while reading the system log (DFHLOG). The
                    598 00000090 requested data could not be found. CICS will be terminated. Next CICS
                    598 00000090 start will be INITIAL.
13:33:06.07 STC09988 00000090 +DFHDM0303I SCSCPA1 Transaction Dump Data set DFHDMPA closed.
13:33:06.07 STC09988 00000090 +DFHKE1800 SCSCPA1 ABNORMAL TERMINATION OF CICS FOR MVS/ESA IS
                    COMPLETE.
13:33:14.95 STC09988 00000090 IEF450I SCSCPA1 SCSCPA1 - ABEND=S000 U1800 REASON=00000000 606
                    606 00000090 TIME=13.33.14
13:33:15.21 STC09988 00000290 -
                    -----TIMINGS (MINS.)-----
                    ---
                    ---PAGING COUNTS---
13:33:15.21 STC09988 00000290 -JOBNAME STEPNAME PROCSTEP RC EXCP CPU SRB VECT VAFF
                    CLOCK SERV PG PAGE SWAP VIO SWAPS
13:33:15.21 STC09988 00000290 -SCSCPA1 STARTING CICS510 U1800 863 .13 .00 .00 .00
                    4.7 851K 0 0 70 0 1
13:33:15.70 STC09988 00000090 IEF404I SCSCPA1 - ENDED - TIME=13.33.15
13:33:15.70 STC09988 00000290 -SCSCPA1 ENDED. NAME- TOTAL CPU TIME= .13 TOTAL
                    ELAPSED TIME= 4.7
13:33:15.71 STC09988 00000090 $HASP395 SCSCPA1 ENDED
13:50:22.79 INSTREAM 00000290 S C51AOR,SYSIDNT=PAA1,START=INITIAL,JOBNAME=SCSCPA1,VAM=RLS
13:50:22.85 JOB10009 00000090 IEF165I // S C51FOR,SYSIDNT=PF1,START=INITIAL,JOBNAME=SCSCPFA1, 605
                    605 00000090 VAM=MIX
13:50:23.02 STC10011 00000081 $HASP100 SCSCPA1 ON STCINRDR
13:50:23.37 STC10011 00000290 IEF695I START C51AOR WITH JOBNAME SCSCPA1 IS ASSIGNED TO USER STC
                    , GROUP SYS1
13:50:23.37 STC10011 00000090 $HASP373 SCSCPA1 STARTED
13:50:23.39          00000090 $HASP309 INIT A INACTIVE ***** C=ABCDE
13:50:23.40 STC10011 00000090 IEF403I SCSCPA1 - STARTED - TIME=13.50.23
13:50:29.72 STC10011 00000090 +DFHDM0101I SCSCPA1 CICS is initializing.
13:50:47.71 STC10011 00000090 +DFHFC0562 SCSCPA1 The RLS control ACB has been successfully registered
                    by CICS.
13:50:47.93 STC10011 00000090 +DFHFC0570 SCSCPA1 File control RLS access has been enabled.
13:51:14.85 STC10011 00000090 +DFHFG0103I SCSCPA1 System log (DFHLOG) initialization has started.
13:51:15.43 STC10011 00000090 +DFHFG0772 SCSCPA1 982
                    982 00000090 An error has occurred during MVS logger operation IXGCONN CONNECT for
                    982 00000090 log stream SCSCPA1.DFHLOG. MVS logger codes: X'00000004',
                    982 00000090 X'00000407'.
13:51:15.44 STC10011 00000090 +DFHME0116 SCSCPA1 983
                    983 00000090 (Module:DFHMEME) CICS symptom string for message DFHFG0772 is
                    983 00000090 PIDS/565501800 LVLS/510 MS/DFHFG0772 RIDS/DFHL2HS2 PTF5/UN91603
                    983 00000090 VALU/H00000407
13:51:15.45 STC10011 00000090 +DFHDU0201 SCSCPA1 ABOUT TO TAKE SDUMP. DUMPCODE: LG0772 , DUMPID:
                    1/0001
13:51:18.56 STC10011 00000090 +DFHDU0202 SCSCPA1 SDUMPX COMPLETE. SDUMPX RETURN CODE X'00'
                    993 00000090
13:51:18.57 STC10011 00000090 +DFHFG0104I SCSCPA1 System log (DFHLOG) initialization has ended
13:51:18.58 STC10011 00000090 +DFHFG0103I SCSCPA1 System log (DFHSHUNT) initialization has started.
13:51:18.79          00000290 IEF196I IGD100I 2022 ALLOCATED TO DDNAME SYS00112 DATACLAS ( )
13:51:18.92 STC10011 00000090 +DFHFG0104I SCSCPA1 System log (DFHSHUNT) initialization has ended.
13:51:33.15 STC10011 00000090 +DFHSI1517 SCSCPA1 Control is being given to CICS

```

Figure 25 (Part 4 of 4). Log Stream Damage

4.2.2.5 Documentation on Log Stream Damage

Refer to *MVS/ESA V5 Setting Up a Sysplex*.

4.3 Coupling Facility Errors

At structure definition time, the sysplex administrator determines the space allocation for each structure within a particular coupling facility. The size of an IXGLOGR structure should be based on the calculated maximum size requirements of each connected log stream. The calculation should take into account parameters of active operational use, potential workload growth, and dynamic recovery requirements.

Each connected log stream is apportioned an equal share of the space. For example, if a structure is a maximum size of 24MB and two log streams are active, each log stream is assigned 12MB. However, if another log stream is activated in this structure, each of the three would then be assigned 8MB.

4.3.1 Coupling Facility Failure

A coupling facility failure could occur as a result of a hardware failure (probably a power failure), improper allocation of log stream storage, or loss of connectivity to it.

4.3.1.1 Impact

Coupling facility failure in a CICS RLS system will disable access to all data sets being accessed in RLS mode and, more importantly, disable all CICS system logging unless a suitably configured alternate coupling facility is available. With a suitably configured system, the only impact of a coupling facility failure should be the time to recognize the error and rebuild the structures into the alternate coupling facility.

4.3.1.2 Prevention

Configure a Parallel Sysplex such that there are no single points of failure. Then, if a coupling facility fails, any allocated structures residing in that coupling facility can be rebuilt into the alternate coupling facility by the structure owner. IXGLOGR owns the CICS log structures, SMSVSAM owns the lock and cache structures for VSAM RLS, and CICS owns the structure for temporary storage queues. The latter are not rebuilt, though, in a case of a coupling facility failure.

4.3.1.3 Recovery

The coupling facility failure messages are issued to all systems in the Parallel Sysplex at the time of the failure. The subsystems that own the structures will then drive the rebuild of the structures. Within seconds, the structures should recover successfully into the new coupling facility, and, in the case of log stream data, CICS logging should resume automatically.

4.3.1.4 Example

Figure 26 on page 75 shows the effects of a coupling facility failure:

1 Ensure configuration set up such that the allocated structures can be recovered to an alternate coupling facility. The LOG_DFHLOG_P01 structure is defined in CF01.

2 CF01 is deactivated from the Hardware Master Console (HMC). It is seen as a CF failure by MVS.

3 Error messages are issued as CF01 fails.

4 Recovery messages are issued as structures are rebuilt in CF02.

5 The LOG_DFHLOG_P01 structure is now in CF02.

MVS system logger codes returned to CICS when a coupling facility fails include X'00000864', no connectivity to the coupling facility exists for this log stream.

```

09:18:22.87 CICRSR4 00000290 D XCF,CF,CFNAME=CF02 1
09:18:23.21 CICRSR4 00000090 IXC362I 09.18.22 DISPLAY XCF 556
556 00000090 CFNAME: CF02
556 00000090 COUPLING FACILITY : 009672.IBM.02.000000040104
556 00000090 PARTITION: 1 CPCID: 01
556 00000090 POLICY DUMP SPACE SIZE: 2048 K
556 00000090 ACTUAL DUMP SPACE SIZE: 2048 K
556 00000090 STORAGE INCREMENT SIZE: 256 K
556 00000090
556 00000090 CONNECTED SYSTEMS:
556 00000090 SC42 SC43 SC47 SC48 SC49 SC50 SC52
556 00000090 SC53 SC54 SC55 SC61 SC62
556 00000090
556 00000090 STRUCTURES:
556 00000090 CACHECIC CACHECICS CICS_CACHE DFHXQLS_TSQSPQA1
556 00000090 DSNDSGB_LOCK1 DSNDSGB_SCA DSNDSGC_GBPO DSNDSGC_LOCK1
556 00000090 DSNDSGC_SCA IEFAUTOS IGWLOCK00 ISGLOCK
556 00000090 ISTGENERIC IXC_DEFAULT_1 IXC_DEFAULT_2 LOG_DFHSUNT_P01
556 00000090 SYSTEM_LOGREC SYSTEM_OPERLOG
09:18:28.05 CICRSR4 00000290 D XCF,CF,CFNAME=CF01 1
09:18:28.30 CICRSR4 00000090 IXC362I 09.18.28 DISPLAY XCF 558
558 00000090 CFNAME: CF01
558 00000090 COUPLING FACILITY : 009672.IBM.02.000000040104
558 00000090 PARTITION: 1 CPCID: 00
558 00000090 POLICY DUMP SPACE SIZE: 2048 K
558 00000090 ACTUAL DUMP SPACE SIZE: 2048 K
558 00000090 STORAGE INCREMENT SIZE: 256 K
558 00000090
558 00000090 CONNECTED SYSTEMS:
558 00000090 SC42 SC43 SC47 SC48 SC49 SC50 SC52
558 00000090 SC53 SC54 SC61 SC62
558 00000090
558 00000090 STRUCTURES:
558 00000090 LOG_DFHLOG_P01

>>>>>>>> CF01 is deactivated from the HMC console 2

09:24:49.08 00000090 *IXL158I PATH 08 IS NOW NOT-OPERATIONAL TO CUID: FFFD 388 3
388 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
388 00000090 PARTITION: 1 CPCID: 00
09:24:49.08 STC10748 00000090 +DFHLG0777 SCSCPAA4 390
390 00000090 A temporary error condition occurred during MVS logger operation
390 00000090 IXGWRITE for log stream SCSCPAA4.DFHLOG. MVS logger codes:
390 00000090 X'00000008', X'00000864'.
09:24:49.08 00000090 *IXL158I PATH A4 IS NOW NOT-OPERATIONAL TO CUID: FFFD 389
389 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
389 00000090 PARTITION: 1 CPCID: 00
09:24:49.38 00000090 IXC518I SYSTEM SC52 NOT USING 391
391 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
391 00000090 PARTITION: 1 CPCID: 00
391 00000090 NAMED CF01
391 00000090 REASON: CONNECTIVITY LOST.
391 00000090 REASON FLAG: 13300001.
09:24:49.38 STC10748 00000090 +DFHLG0777 SCSCPAA4 392
392 00000090 A temporary error condition occurred during MVS logger operation
392 00000090 IXGBRWSE START for log stream SCSCPAA4.DFHLOG. MVS logger codes:
392 00000090 X'00000008', X'00000864'.
09:24:53.11 STC10745 00000090 +DFHLG0777 SCSCPTA1 564
564 00000090 A temporary error condition occurred during MVS logger operation
564 00000090 IXGBRWSE START for log stream SCSCPTA1.DFHLOG. MVS logger codes:
564 00000090 X'00000008', X'00000864'.
09:24:53.12 STC10746 00000090 +DFHLG0777 SCSCPAA1 565
565 00000090 A temporary error condition occurred during MVS logger operation
565 00000090 IXGBRWSE START for log stream SCSCPAA1.DFHLOG. MVS logger codes:
565 00000090 X'00000008', X'00000864'.
09:24:53.12 STC10751 00000090 +DFHLG0777 SCSCPFA1 566
566 00000090 A temporary error condition occurred during MVS logger operation
566 00000090 IXGWRITE for log stream SCSCPFA1.DFHLOG. MVS logger codes:
566 00000090 X'00000008', X'00000864'.

```

Figure 26 (Part 1 of 3). Coupling Facility Failure

```

09:24:53.16 STC10751 00000090 +DFHLG0777 SCSCPFA1 567
                    567 00000090 A temporary error condition occurred during MVS logger operation
                    567 00000090 IXGBRWSE START for log stream SCSCPFA1.DFHLOG. MVS logger codes:
                    567 00000090 X'00000008', X'00000864'.
09:24:55.91          00000290 IXC526I STRUCTURE LOG_DFHLOG_P01 IS REBUILDING FROM 394
                    394 00000290 COUPLING FACILITY CF01 TO COUPLING FACILITY CF02.
                    394 00000290 REBUILD START REASON: CONNECTIVITY LOST TO STRUCTURE
                    394 00000290 INFO108: 00000007 00000000.
09:24:56.00          00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE LOG_DFHLOG_P01 WAS SUCCESSFUL.
                    395
                    395 00000290 JOBNAME: IXGLOGR ASID: 0015 CONNECTOR NAME: IXGLOGR_SC52
                    395 00000290 CFNAME: CF02
09:24:56.00          00000290 IXL015I STRUCTURE ALLOCATION INFORMATION FOR 396
                    396 00000290 STRUCTURE LOG_DFHLOG_P01, CONNECTOR NAME IXGLOGR_SC52
                    396 00000290 CFNAME ALLOCATION STATUS/FAILURE REASON
                    396 00000290 -----
                    396 00000290 CF01 RESTRICTED BY REBUILD OTHER
                    396 00000290 CF02 STRUCTURE ALLOCATED
09:24:56.65          00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE LOG_DFHLOG_P01 WAS SUCCESSFUL.
                    569
                    569 00000290 JOBNAME: IXGLOGR ASID: 0015 CONNECTOR NAME: IXGLOGR_SC42
                    569 00000290 CFNAME: CF02
09:25:01.69          00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPAA4.DFHLOG 397
                    397 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
09:25:02.13          00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPTA2.DFHLOG 398
                    398 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
09:25:02.47          00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPAA4.DFHLOG 570
                    570 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
09:25:03.01          00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPTA2.DFHLOG 571
                    571 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
09:25:05.12          00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPFA1.DFHLOG 406
                    406 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
09:25:05.33          00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPFA1.DFHLOG 572
                    572 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
09:25:05.73          00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPAA1.DFHLOG 407
                    407 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
09:25:05.86          00000090 IXG111I STRUCTURE REBUILD FOR STRUCTURE LOG_DFHLOG_P01 IS COMPLETE.
                    408
                    408 00000090 LOGSTREAM DATA DEFINED TO THIS STRUCTURE IS AVAILABLE
09:25:06.14          00000090 IXG111I STRUCTURE REBUILD FOR STRUCTURE LOG_DFHLOG_P01 IS COMPLETE.
                    573
                    573 00000090 LOGSTREAM DATA DEFINED TO THIS STRUCTURE IS AVAILABLE

```

4

Figure 26 (Part 2 of 3). Coupling Facility Failure


```

09:27:01.94 CICSRS4 00000290 D XCF,STR,STRNM=LOG_DFHLOG_P01
09:27:02.40 CICSRS4 00000090 IXC360I 09.27.01 DISPLAY_XCF 579
579 00000090 STRNAME: LOG_DFHLOG_P01
579 00000090 STATUS: ALLOCATED
579 00000090 POLICY SIZE : 14848 K
579 00000090 POLICY INITSIZE: 9728 K
579 00000090 REBUILD PERCENT: 1
579 00000090 PREFERENCE LIST: CF02 CF01
579 00000090 EXCLUSION LIST IS EMPTY
579 00000090
579 00000090 ACTIVE STRUCTURE
579 00000090 -----
579 00000090 ALLOCATION TIME: 04/16/1997 09:24:55
579 00000090 CFNAME : CF02
579 00000090 COUPLING FACILITY: 009672.IBM.02.000000040104
579 00000090 PARTITION: 1 CPCID: 01
579 00000090 ACTUAL SIZE : 9728 K
579 00000090 STORAGE INCREMENT SIZE: 256 K
579 00000090 VERSION : AE8515BB 352F7F00
579 00000090 DISPOSITION : DELETE
579 00000090 ACCESS TIME : 0
579 00000090 MAX CONNECTIONS: 32
579 00000090 # CONNECTIONS : 2
579 00000090
579 00000090 CONNECTION NAME ID VERSION SYSNAME JOBNAME ASID STATE
579 00000090 -----
579 00000090 IXGLOGR_SC42 02 00020052 SC42 IXGLOGR 0015 ACTIVE
579 00000090 IXGLOGR_SC52 01 000100C5 SC52 IXGLOGR 0015 ACTIVE
579 00000090
579 00000090 STRUCTURE IN TRANSITION
579 00000090 -----
579 00000090 REASON IN TRANSITION: CONNECT OR DISCONNECT IN PROGRESS
579 00000090 ALLOCATION TIME: 04/16/1997 09:10:13
579 00000090 CFNAME : CF01 NO SYSTEMS CONNECTED TO COUPLING FACILITY
579 00000090 COUPLING FACILITY: 009672.IBM.02.000000040104
579 00000090 PARTITION: 1 CPCID: 00
579 00000090 ACTUAL SIZE : N/A
579 00000090 STORAGE INCREMENT SIZE: 256 K
579 00000090 VERSION : AE851272 1C348D05

```

Figure 26 (Part 3 of 3). Coupling Facility Failure

4.3.1.5 Documentation on Coupling Facility Failure

Refer to *OS/390 MVS Setting Up a Sysplex* and *OS/390 Continuous Availability in a Parallel Sysplex*.

4.3.2 Loss of Connection

Connectivity to a coupling facility can be lost as a result of a channel path failure or a hardware problem. Loss of connection to the coupling facility should be of little concern to the MVS system logger.

4.3.2.1 Impact

With a suitably configured system, the only impact of lost connection to the coupling facility should be the time to recognize the error and rebuild the structures into the alternate coupling facility.

4.3.2.2 Prevention

Configure a Parallel Sysplex such that there are no single points of failure. Then, if coupling facility connectivity is lost, any allocated structures residing in that coupling facility can be rebuilt into the alternate coupling facility by the structure owner. Also ensure that there is peer connectivity at the structure level so that another system in the same sysplex can move the contents of the failed system's log streams to DASD log data sets. The recommended

configuration is that approximately 10 to 20 log streams share a given structure. Therefore multiple systems share a particular structure by design, which inherently provides peer connectivity. Thus for certain types of log stream failure (for example, when a system has failed but its staging data sets are available), a peer system can offload log data to the log data sets, and the log stream does not get damaged.

4.3.2.3 Recovery

The coupling facility failure messages are issued to all systems in the Parallel Sysplex at the time of the failure. The subsystems that own the structures then drive the rebuild of the structures. Within seconds, the structures should recover successfully into the new coupling facility, and, in the case of log stream data, CICS logging should resume automatically.

4.3.2.4 Example

Figure 27 on page 79 shows the effects of lost connection to the coupling facility:

- 1** Ensure configuration set up such that the allocated structures can be recovered to an alternate coupling facility. The LOG_DFHLOG_P01 structure is defined in CF01.
- 2** Vary all CFCC channel paths offline.
- 3** Structure rebuild commences.
- 4** Error messages are issued while rebuild is in progress.
- 5** Structure rebuild completes successfully.

MVS system logger codes returned to CICS when connectivity is lost to a coupling facility include X'00000861', structure rebuild in progress.

```

17:42:02.85 HAIMO 00000290 CF CHP(44),OFFLINE,FORCE 2
17:42:03.10 00000090 *IXL126I CONFIG WILL FORCE OFFLINE LAST CHP(44) TO COUPLING FACILITY CF01
17:42:03.10 00000090 *048 IXL127A REPLY CANCEL OR CONTINUE
17:42:11.79 HAIMO 00000290 R 48,CONTINUE
17:42:11.82 HAIMO 00000090 IEE600I REPLY TO 048 IS;CONTINUE
17:42:11.89 00000090 IXC518I SYSTEM SC42 NOT USING 407
407 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
407 00000090 PARTITION: 1 CPCID: 00
407 00000090 NAMED CF01
407 00000090 REASON: CONNECTIVITY LOST.
407 00000090 REASON FLAG: 13300001.
17:42:11.93 HAIMO 00000090 IEE503I CHP(44),OFFLINE
17:42:11.93 HAIMO 00000090 IEE712I CONFIG PROCESSING COMPLETE
17:42:15.65 00000290 IXC526I STRUCTURE LOG_DFHLOG_P01 IS REBUILDING FROM 822 3
822 00000290 COUPLING FACILITY CF01 TO COUPLING FACILITY CF02.
822 00000290 REBUILD START REASON: CONNECTIVITY LOST TO STRUCTURE
822 00000290 INFO108: 00000007 00000005.
17:42:15.72 STC14651 00000090 +DFHLOG777 SCSCPTA1 410 4
410 00000090 A temporary error condition occurred during MVS logger operation
410 00000090 IXGBRWSE START for log stream SCSCPTA1.DFHLOG. MVS logger codes:
410 00000090 X'00000008', X'00000861'.
17:42:15.79 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE LOG_DFHLOG_P01 WAS SUCCESSFUL. 823 5
823 00000290 JOBNAME: IXGLOGR ASID: 0014 CONNECTOR NAME: IXGLOGR_SC52
823 00000290 CFNAME: CF02
17:42:15.79 00000290 IXL015I STRUCTURE ALLOCATION INFORMATION FOR 824
824 00000290 STRUCTURE LOG_DFHLOG_P01, CONNECTOR NAME IXGLOGR_SC52
824 00000290 CFNAME ALLOCATION STATUS/FAILURE REASON
824 00000290 -----
824 00000290 CF01 RESTRICTED BY REBUILD OTHER
824 00000290 CF02 STRUCTURE ALLOCATED
17:42:16.01 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE LOG_DFHLOG_P01 WAS SUCCESSFUL. 411
411 00000290 JOBNAME: IXGLOGR ASID: 0014 CONNECTOR NAME: IXGLOGR_SC42
411 00000290 CFNAME: CF02
17:42:29.26 00000290 IXG209I RECOVERY FOR LOGSTREAM SCSCPTA1.DFHLOG 826
826 00000290 IN STRUCTURE LOG_DFHLOG_P01 COMPLETED SUCCESSFULLY.
17:42:34.57 00000090 IXG111I STRUCTURE REBUILD FOR STRUCTURE LOG_DFHLOG_P01 IS COMPLETE. 832
832 00000090 LOGSTREAM DATA DEFINED TO THIS STRUCTURE IS AVAILABLE

```

Figure 27. Lost Connectivity to the DFHLOG Structure

4.3.2.5 Documentation on Loss of Connection

Refer to *OS/390 MVS Setting Up a Sysplex*.

4.3.3 Structure Rebuild Failure

Occasionally, there may be a requirement to rebuild a structure. We have already looked at an automated rebuild from one coupling facility to another after a hardware failure. It is also possible to effect a structure rebuild by using an MVS operator command. For example, it may be necessary to move a structure from one coupling facility to another to free up a machine for a repair action or a configuration upgrade.

4.3.3.1 Impact

If a structure rebuild fails, the users of that structure are notified, in this case through MVS system logger return codes, that the log stream connection is invalid. The application (CICS) abends and must connect to a new log stream by doing an emergency restart.

4.3.3.2 Prevention

Ensure that the Parallel Sysplex configuration provides the capability to rebuild structures in alternative coupling facilities; that is, the configuration should provide connectivity, capacity, and availability for normal, recovery, and fallback operations. Also ensure that operational procedures are in place and tested on a regular basis.

4.3.3.3 Recovery

If a structure rebuild fails, determine the cause of the failure. It may be due to:

- Insufficient space in the target coupling facility
- A policy definition that prevents structure allocation in the target coupling facility
- Unavailability of the target coupling facility.

Once you determine the cause of the problem, either resolve it and reissue the rebuild command or revert to using the structure in the original coupling facility.

4.3.3.4 Example

Figure 28 on page 81 shows the effects of a structure rebuild failure:

- 1** Ensure insufficient free space available in target coupling facility. Displays show that 9728KB has been allocated in CF01 and that there is 1024KB free in CF02. The LOG_DFHLOG_P01 structure is defined in CF01.
- 2** CF01 is deactivated from the Hardware Master Console.
- 3** CICS regions get X'00000864', no connectivity to CF, return code from MVS.
- 4** The rebuild starts automatically as a result of CF01 failure.
- 5** Rebuild fails because of insufficient space.
- 6** MVS logger returns error code X'0000082D' to the CICS log manager, resulting in the CICS region abnormally terminating.
- 7** Storage available in CF02 is altered, resulting in free space of 146176Kb.
- 8** The log stream is not allocated.
- 9** A failed CICS system is restarted.
- 10** Connection to the DFHLOG and DFHSHUNT log streams is successful.
- 11** Recovery is complete.

MVS system logger codes returned to CICS when a structure rebuild fails include X'00000861', structure rebuild in progress, and X'0000082D', the log stream token is invalid because it has been disconnected.

You may also see message *DFHRM0201 04/16/97 09:57:20 SCSCPTA1 0 backout-failed and 1 commit-failed UOWs were reconstructed* in the CSMT message log of the restarted CICS systems. The UOW is first reconstructed and then processed. Additional messages are issued if the UOW is not resolved during initialization.

```

09:31:17.48 CICSRS4 00000290 D CF,CFNAME=CF01 1
09:31:17.56 CICSRS4 00000090 IXL150I 09.31.17 DISPLAY CF 615
615 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
615 00000090 PARTITION: 1 CPCID: 00
615 00000090 CONTROL UNIT ID: FFFB
615 00000090 NAMED CF01
615 00000090 COUPLING FACILITY SPACE UTILIZATION
615 00000090 ALLOCATED SPACE DUMP SPACE UTILIZATION
615 00000090 STRUCTURES: 9728 K 1 STRUCTURE DUMP TABLES: 0 K""
615 00000090 DUMP SPACE: 2048 K TABLE COUNT: 0
615 00000090 FREE SPACE: 489216 K FREE DUMP SPACE: 2048 K
615 00000090 TOTAL SPACE: 500992 K TOTAL DUMP SPACE: 2048 K
615 00000090 MAX REQUESTED DUMP SPACE: 0 K
615 00000090 VOLATILE: NO STORAGE INCREMENT SIZE: 256 K
615 00000090 CFLEVEL: 3
615 00000090 COUPLING FACILITY SPACE CONFIGURATION
615 00000090 IN USE FREE TOTAL
615 00000090 CONTROL SPACE: 11776 K 489216 K 500992 K
615 00000090 NON-CONTROL SPACE: 0 K 0 K 0 K
615 00000090 SENDER PATH PHYSICAL LOGICAL
615 00000090 04 ONLINE ONLINE
615 00000090 44 ONLINE ONLINE
615 00000090 COUPLING FACILITY DEVICE SUBCHANNEL STATUS
615 00000090 FFF0 09DE OPERATIONAL/IN USE
615 00000090 FFF1 09DF OPERATIONAL/IN USE
615 00000090 FFF2 09E0 OPERATIONAL/IN USE
615 00000090 FFF3 09E1 OPERATIONAL/IN USE
615 00000090
09:31:22.12 CICSRS4 00000290 D CF,CFNAME=CF02 1
09:31:22.19 CICSRS4 00000090 IXL150I 09.31.22 DISPLAY CF 617
617 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
617 00000090 PARTITION: 1 CPCID: 01
617 00000090 CONTROL UNIT ID: FFF7
617 00000090 NAMED CF02
617 00000090 COUPLING FACILITY SPACE UTILIZATION
617 00000090 ALLOCATED SPACE DUMP SPACE UTILIZATION
617 00000090 STRUCTURES: 497920 K STRUCTURE DUMP TABLES: 0 K
617 00000090 DUMP SPACE: 2048 K TABLE COUNT: 0
617 00000090 FREE SPACE: 1024 K 1 FREE DUMP SPACE: 2048 K""
617 00000090 TOTAL SPACE: 500992 K TOTAL DUMP SPACE: 2048 K
617 00000090 MAX REQUESTED DUMP SPACE: 512 K
617 00000090 VOLATILE: NO STORAGE INCREMENT SIZE: 256 K
617 00000090 CFLEVEL: 3
617 00000090 COUPLING FACILITY SPACE CONFIGURATION
617 00000090 IN USE FREE TOTAL
617 00000090 CONTROL SPACE: 499968 K 1024 K 500992 K
617 00000090 NON-CONTROL SPACE: 0 K 0 K 0 K
617 00000090 SENDER PATH PHYSICAL LOGICAL
617 00000090 05 ONLINE ONLINE
617 00000090 45 ONLINE ONLINE
617 00000090 COUPLING FACILITY DEVICE SUBCHANNEL STATUS
617 00000090 FFE0 09DA OPERATIONAL/IN USE
617 00000090 FFE1 09DB OPERATIONAL/IN USE
617 00000090 FFE2 09DC OPERATIONAL/IN USE
617 00000090 FFE3 09DD OPERATIONAL/IN USE
617 00000090

```

Figure 28 (Part 1 of 6). Structure Rebuild Failure

```

09:31:29.41 CICSRS4 00000290 D XCF,CF,CFNAME=CF01 1
09:31:29.76 CICSRS4 00000090 IXC362I 09.31.29 DISPLAY XCF 619
        619 00000090 CFNAME: CF01
        619 00000090 COUPLING FACILITY : 009672.IBM.02.000000040104
        619 00000090 PARTITION: 1 CPCID: 00
        619 00000090 POLICY DUMP SPACE SIZE: 2048 K
        619 00000090 ACTUAL DUMP SPACE SIZE: 2048 K
        619 00000090 STORAGE INCREMENT SIZE: 256 K
        619 00000090
        619 00000090 CONNECTED SYSTEMS:
        619 00000090 SC42 SC43 SC47 SC48 SC49 SC50 SC52
        619 00000090 SC53 SC54 SC61 SC62
        619 00000090
        619 00000090 STRUCTURES:
        619 00000090 LOG_DFHLOG_P01
09:31:35.19 CICSRS4 00000290 D XCF,CF,CFNAME=CF02 1
09:31:35.52 CICSRS4 00000090 IXC362I 09.31.35 DISPLAY XCF 621
        621 00000090 CFNAME: CF02
        621 00000090 COUPLING FACILITY : 009672.IBM.02.000000040104
        621 00000090 PARTITION: 1 CPCID: 01
        621 00000090 POLICY DUMP SPACE SIZE: 2048 K
        621 00000090 ACTUAL DUMP SPACE SIZE: 2048 K
        621 00000090 STORAGE INCREMENT SIZE: 256 K
        621 00000090
        621 00000090 CONNECTED SYSTEMS:
        621 00000090 SC42 SC43 SC47 SC48 SC49 SC50 SC52
        621 00000090 SC53 SC54 SC55 SC61 SC62
        621 00000090 STRUCTURES:
        621 00000090 CACHECIC CACHECICS CICS_CACHE DFHXQLS_TSQSPQA1
        621 00000090 DSNDSGB_LOCK1 DSNDSGB_SCA DSNDSGC_GBPO DSNDSGC_LOCK1
        621 00000090 DSNDSGC_SCA IEFAUTOS IGWLOCK00 ISGLOCK
        621 00000090 ISTGENERIC IXC_DEFAULT_1 IXC_DEFAULT_2 LOG_DFHSHUNT_P01
        621 00000090 SYSTEM_LOGREC SYSTEM_OPERLOG

>>>>>>>> CF01 is deactivated from the HMC 2

09:32:11.59 00000090 *IXL158I PATH 04 IS NOW NOT-OPERATIONAL TO CUID: FFFB 622
        622 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
        622 00000090 PARTITION: 1 CPCID: 00
09:32:11.59 00000090 *IXL158I PATH 44 IS NOW NOT-OPERATIONAL TO CUID: FFFB 623
        623 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
        623 00000090 PARTITION: 1 CPCID: 00
09:32:13.35 STC10746 00000090 +DFHLG0777 SCSCPA1 624 3
        624 00000090 A temporary error condition occurred during MVS logger operation
        624 00000090 IXGBRWSE START for log stream SCSCPA1.DFHLOG. MVS logger codes:
        624 00000090 X'00000008', X'00000864'.
09:32:13.38 STC10751 00000090 +DFHLG0777 SCSCPF1 625 3
        625 00000090 A temporary error condition occurred during MVS logger operation
        625 00000090 IXGWRITE for log stream SCSCPF1.DFHLOG. MVS logger codes:
        625 00000090 X'00000008', X'00000864'.
09:32:14.17 STC10751 00000090 +DFHLG0777 SCSCPF1 626 3
        626 00000090 A temporary error condition occurred during MVS logger operation
        626 00000090 IXGBRWSE START for log stream SCSCPF1.DFHLOG. MVS logger codes:
        626 00000090 X'00000008', X'00000864'.
09:32:14.98 STC10745 00000090 +DFHLG0777 SCSCPT1 628 3
        628 00000090 A temporary error condition occurred during MVS logger operation
        628 00000090 IXGBRWSE START for log stream SCSCPT1.DFHLOG. MVS logger codes:
        628 00000090 X'00000008', X'00000864'.
09:32:11.83 00000090 *IXL158I PATH 08 IS NOW NOT-OPERATIONAL TO CUID: FFFD 423
        423 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
        423 00000090 PARTITION: 1 CPCID: 00
09:32:15.98 STC10747 00000090 +DFHLG0777 SCSCPT2 426 3
        426 00000090 A temporary error condition occurred during MVS logger operation
        426 00000090 IXGBRWSE START for log stream SCSCPT2.DFHLOG. MVS logger codes:
        426 00000090 X'00000008', X'00000864'.
09:32:11.83 00000090 *IXL158I PATH A4 IS NOW NOT-OPERATIONAL TO CUID: FFFD 424
        424 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
        424 00000090 PARTITION: 1 CPCID: 00

```

Figure 28 (Part 2 of 6). Structure Rebuild Failure

```

09:32:15.98 STC10748 00000090 +DFHLG0777 SCSCPAA4 425
                425 00000090 A temporary error condition occurred during MVS logger operation
                425 00000090 IXGBRWSE START for log stream SCSCPAA4.DFHLOG. MVS logger codes:
                425 00000090 X'00000008', X'00000864'.
09:32:16.28      00000090 IXC518I SYSTEM SC52 NOT USING 427
                427 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
                427 00000090 PARTITION: 1 CPCID: 00
                427 00000090 NAMED CF01
                427 00000090 REASON: CONNECTIVITY LOST.
                427 00000090 REASON FLAG: 13300001.
09:32:16.28 STC10748 00000090 +DFHLG0777 SCSCPAA4 428
                428 00000090 A temporary error condition occurred during MVS logger operation
                428 00000090 IXGWRITE for log stream SCSCPAA4.DFHLOG. MVS logger codes:
                428 00000090 X'00000008', X'00000864'.

>>>>>>>>>> The rebuild starts automatically as a result of CF01 failure

09:32:18.68      00000290 IXL013I IXLCONN REQUEST FOR STRUCTURE LOG_DFHLOG_P01 FAILED. 629
                629 00000290 JOBNAME: IXGLOGR ASID: 0015 CONNECTOR NAME: IXGLOGR_SC42
                629 00000290 IXLCONN RETURN CODE: 0000000C, REASON CODE: 02010C08
09:32:18.68      00000290 IXL015I STRUCTURE ALLOCATION INFORMATION FOR 630
                630 00000290 STRUCTURE LOG_DFHLOG_P01, CONNECTOR NAME IXGLOGR_SC42
                630 00000290 CFNAME ALLOCATION STATUS/FAILURE REASON
                630 00000290 -----
                630 00000290 CF01 RESTRICTED BY REBUILD OTHER
                630 00000290 CF02 INSUFFICIENT SPACE
09:32:19.71      00000090 IXG101I STRUCTURE REBUILD INTO STRUCTURE LOG_DFHLOG_P01 631
                631 00000090 STOPPED FOR REASON: CONNECTION TO THE NEW STRUCTURE FAILED
09:32:20.27      00000290 IXG205I DISCONNECT COMPLETED FOR LOGSTREAM SCSCPTA1.DFHLOG 632
                632 00000290 IN STRUCTURE LOG_DFHLOG_P01 DUE TO REBUILD FAILURE.
09:32:20.57      00000290 IXG205I DISCONNECT COMPLETED FOR LOGSTREAM SCSCPAA1.DFHLOG 633
                633 00000290 IN STRUCTURE LOG_DFHLOG_P01 DUE TO REBUILD FAILURE.
09:32:21.32 STC10745 00000090 +DFHLG0772 SCSCPTA1 634
                634 00000090 An error has occurred during MVS logger operation IXGBRWSE START for
                634 00000090 log stream SCSCPTA1.DFHLOG. MVS logger codes: X'00000008',
                634 00000090 X'0000082D'.
09:32:21.33 STC10745 00000090 +DFHME0116 SCSCPTA1 635
                635 00000090 (Module:DFHMEME) CICS symptom string for message DFHLG0772 is
                635 00000090 PIDS/565501800 LVLS/510 MS/DFHLG0772 RIDS/DFHL2HS7 PTFS/UN95188
                635 00000090 VALU/H0000082D
09:32:21.35 STC10745 00000090 +DFHDU0201 SCSCPTA1 ABOUT TO TAKE SDUMP. DUMPCODE: LG0772 , DUMPID:
                1/0001
09:32:22.17      00000290 IXG205I DISCONNECT COMPLETED FOR LOGSTREAM SCSCPFA1.DFHLOG 637
                637 00000290 IN STRUCTURE LOG_DFHLOG_P01 DUE TO REBUILD FAILURE.
09:32:24.06      00000290 IXG211E RECOVERY FOR LOGSTREAM SCSCPTA1.DFHLOG 431
                431 00000290 IN STRUCTURE LOG_DFHLOG_P01 WAS NOT SUCCESSFUL: CONNECT TO LOGSTREAM
                431 00000290 NEEDING RECOVERY FAILED.
                431 00000290 DIAGNOSTIC INFORMATION: 00000000 00000000 03070001 00000000
09:32:44.57 STC10745 00000090 +DFHKE1800 SCSCPTA1 ABNORMAL TERMINATION OF CICS FOR MVS/ESA IS
                COMPLETE.
09:32:45.82 STC10746 00000090 +DFHDU0209 SCSCPAA1 RETRYING SDUMP.
09:32:48.59 STC10751 00000090 +DFHDU0209 SCSCPFA1 RETRYING SDUMP.
09:32:48.60 STC10751 00000090 +DFHDU0208 SCSCPFA1 SDUMP BUSY - CICS WILL RETRY IN FIVE SECONDS.
09:32:48.66 STC10745 00000090 IEF450I SCSCPTA1 SCSCPTA1 - ABEND=S000 U1800 REASON=00000000 687
                687 00000090 TIME=09.32.48
09:34:19.89 CICSRS4 00000290 SETXCF START,ALTER,STRNM=DSNDSGB_SCA,SIZE=20224
09:34:20.12 CICSRS4 00000090 IXC530I SETXCF START ALTER REQUEST FOR STRUCTURE DSNDSGB_SCA ACCEPTED.
09:34:58.26 CICSRS4 00000090 IXC533I SETXCF REQUEST TO ALTER STRUCTURE DSNDSGB_SCA 783
                783 00000090 COMPLETED. TARGET ATTAINED.
                783 00000090 CURRENT SIZE: 20224 K TARGET: 20224 K
09:34:58.26      00000290 IXC534I SETXCF REQUEST TO ALTER STRUCTURE DSNDSGB_SCA 784
                784 00000290 COMPLETED. TARGET ATTAINED.
                784 00000290 CURRENT SIZE: 20224 K TARGET: 20224 K
                784 00000290 CURRENT ENTRY COUNT: 1995 TARGET: 1995
                784 00000290 CURRENT ELEMENT COUNT: 3990 TARGET: 3990

```

Figure 28 (Part 3 of 6). Structure Rebuild Failure

```

09:35:34.59 CICSRS4 00000290 D CF,CFNAME=CF02
09:35:34.66 CICSRS4 00000090 IXL150I 09.35.34 DISPLAY CF 788
788 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
788 00000090 PARTITION: 1 CPCID: 01
788 00000090 CONTROL UNIT ID: FFF7
788 00000090 NAMED CF02
788 00000090 COUPLING FACILITY SPACE UTILIZATION
788 00000090 ALLOCATED SPACE DUMP SPACE UTILIZATION
788 00000090 STRUCTURES: 352768 K STRUCTURE DUMP TABLES: 0 K
788 00000090 DUMP SPACE: 2048 K TABLE COUNT: 0
788 00000090 FREE SPACE: 146176 K FREE DUMP SPACE: 2048 K
788 00000090 TOTAL SPACE: 500992 K TOTAL DUMP SPACE: 2048 K
788 00000090 MAX REQUESTED DUMP SPACE: 512 K
788 00000090 VOLATILE: NO STORAGE INCREMENT SIZE: 256 K
788 00000090 CFLEVEL: 3
788 00000090 COUPLING FACILITY SPACE CONFIGURATION
788 00000090 IN USE FREE TOTAL
788 00000090 CONTROL SPACE: 354816 K 146176 K 7 500992 K
788 00000090 NON-CONTROL SPACE: 0 K 0 K 0 K
788 00000090 SENDER PATH PHYSICAL LOGICAL
788 00000090 05 ONLINE ONLINE
788 00000090 45 ONLINE ONLINE
788 00000090 COUPLING FACILITY DEVICE SUBCHANNEL STATUS
788 00000090 FFE0 09DA OPERATIONAL/IN USE
788 00000090 FFE1 09DB OPERATIONAL/IN USE
788 00000090 FFE2 09DC OPERATIONAL/IN USE
788 00000090 FFE3 09DD OPERATIONAL/IN USE
788 00000090
09:55:54.63 CICSRS4 00000290 D XCF,STR,STRNM=LOG_DFHLOG_P01 8
09:55:54.88 CICSRS4 00000090 IXC360I 09.55.54 DISPLAY XCF 265
265 00000090 STRNAME: LOG_DFHLOG_P01
265 00000090 STATUS: NOT ALLOCATED
265 00000090 POLICY SIZE : 14848 K
265 00000090 POLICY INITSIZE: 9728 K
265 00000090 REBUILD PERCENT: 1
265 00000090 PREFERENCE LIST: CF02 CF01
265 00000090 EXCLUSION LIST IS EMPTY
09:57:04.14 STC10916 00000090 IEF403I SCSCPTA1 - STARTED - TIME=09.57.04 9
09:57:05.33 STC10916 00000090 IEC161I 056-084,SCSCPTA1,SCSCPTA1,DFHLCD,,
09:57:05.33 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1,DFHLCD,CICSTS.CICS510.PTA1,DFHLCD.DATA,
09:57:05.34 STC10916 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
09:57:05.37 STC10916 00000090 IEC161I 056-084,SCSCPTA1,SCSCPTA1,DFHLCD,,
09:57:05.38 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1,DFHLCD,CICSTS.CICS510.PTA1,DFHLCD.INDEX,
09:57:05.38 STC10916 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
09:57:05.44 STC10916 00000090 IEC161I 062-086,SCSCPTA1,SCSCPTA1,DFHLCD,,
09:57:05.44 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1,DFHLCD,CICSTS.CICS510.PTA1,DFHLCD.DATA,
09:57:05.45 STC10916 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
09:57:05.55 STC10916 00000090 DFHPA1101 SCSCPTA1 DFHSIT6$ IS BEING LOADED.
09:57:05.56 STC10916 00000090 DFHPA1108 SCSCPTA1 DFHSIT6$ HAS BEEN LOADED. (GENERATED AT: MM/DD=
02/20 HH:MM= 16:04).
.
.
.
.
09:57:06.10 STC10916 00000090 +DFHTR0103 TRACE TABLE SIZE IS 64K
09:57:06.37 STC10916 00000090 +DFHSM0122I SCSCPTA1 Limit of DSA storage below 16MB is 5,120K.
09:57:06.37 STC10916 00000090 +DFHSM0123I SCSCPTA1 Limit of DSA storage above 16MB is 60M.
09:57:06.38 STC10916 00000090 +DFHSM0113I SCSCPTA1 Storage protection is not active.
09:57:06.38 STC10916 00000090 +DFHSM0126I SCSCPTA1 Transaction isolation is not active.
09:57:06.39 STC10916 00000090 +DFHSM0120I SCSCPTA1 Reentrant programs will not be loaded into
read-only storage.
09:57:06.57 STC10916 00000090 +DFHDM0101I SCSCPTA1 CICS is initializing.
09:57:07.20 STC10916 00000090 +DFHXS1100I SCSCPTA1 Security initialization has started.
09:57:07.27 STC10916 00000090 +DFHLG0101I SCSCPTA1 Log manager domain initialization has started.
09:57:07.31 STC10916 00000090 +DFHS11500 SCSCPTA1 CICS for MVS/ESA Version 5.1.0 Startup is in
progress.
09:57:07.32 STC10916 00000090 +DFHXS1102I SCSCPTA1 Security is inactive.

```

Figure 28 (Part 4 of 6). Structure Rebuild Failure


```

09:57:07.43 STC10916 00000090 +DFHDU0304I SCSCPTA1 Transaction Dump Data set DFHMPA opened.
09:57:07.44 STC10916 00000090 +DFHSI1501I SCSCPTA1 Loading CICS nucleus.
09:57:11.33 STC10916 00000090 +DFHXS1101I SCSCPTA1 Security initialization has ended.
09:57:11.46 STC10916 00000090 IEC161I 056-084,SCSCPTA1,SCSCPTA1,DFHGCD,,
09:57:11.47 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHGCD,CICSTS.CICS510.PTA1.DFHGCD.DATA,
09:57:11.48 STC10916 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
09:57:11.53 STC10916 00000090 IEC161I 056-084,SCSCPTA1,SCSCPTA1,DFHGCD,,
09:57:11.53 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHGCD,CICSTS.CICS510.PTA1.DFHGCD.INDEX,
09:57:11.54 STC10916 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
09:57:11.60 STC10916 00000090 IEC161I 062-086,SCSCPTA1,SCSCPTA1,DFHGCD,,
09:57:11.60 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHGCD,CICSTS.CICS510.PTA1.DFHGCD.DATA,
09:57:11.61 STC10916 00000090 IEC161I CATALOG.TOTICF1.VTOTCI3
09:57:11.67 STC10916 00000090 +DFHRM0141 SCSCPTA1 Recovery manager autostart override record is not
present. Normal processing continues.
09:57:12.04 STC10916 00000090 +DFHMN0105I SCSCPTA1 Using default Monitoring Control Table.
09:57:12.05 STC10916 00000090 +DFHMN0109I SCSCPTA1 CICS Monitoring is active.
09:57:12.27 STC10916 00000090 +DFHSI1502I SCSCPTA1 CICS startup is Emergency.
09:57:12.29 STC10916 00000090 +DFHTS0100I SCSCPTA1 Temporary Storage initialization has started.
09:57:12.43 STC10916 00000090 +DFHLG0103I SCSCPTA1 System log (DFHLOG) initialization has started.
09:57:13.18          00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE LOG_DFHLOG_PO1 WAS SUCCESSFUL. 10
370
370 00000290 JOBNAME: IXGLOGR ASID: 0015 CONNECTOR NAME: IXGLOGR_SC42
370 00000290 CFNAME: CF02
09:57:13.18          00000290 IXL015I STRUCTURE ALLOCATION INFORMATION FOR 371
371 00000290 STRUCTURE LOG_DFHLOG_PO1, CONNECTOR NAME IXGLOGR_SC42
371 00000290 CFNAME ALLOCATION STATUS/FAILURE REASON
371 00000290 -----
371 00000290 CF02 STRUCTURE ALLOCATED
371 00000290 CF01 PREFERRED CF ALREADY SELECTED
09:57:14.14          00000290 IXG212E RECOVERY FOR LOGSTREAM SCSCPTA1.DFHLOG 372
372 00000290 IN STRUCTURE LOG_DFHLOG_PO1 WAS NOT SUCCESSFUL.
372 00000290 DATA MAY BE LOST FOR THE CONNECTION ON SYSTEM SC42 DUE TO:
372 00000290 NO STAGING DATASETS USED BY THE LOGSTREAM.
09:57:15.00 STC10916 00000090 +DFHLG0104I SCSCPTA1 System log (DFHLOG) initialization has ended.
09:57:15.00 STC10916 00000090 +DFHLG0103I SCSCPTA1 System log (DFHSHUNT) initialization has started.
09:57:15.01 STC10916 00000090 +DFHSI1503I SCSCPTA1 Terminal data sets are being opened.
09:57:15.12 STC10916 00000090 IEC161I 056-084,SCSCPTA1,SCSCPTA1,DFHTEMP,,
09:57:15.13 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHTEMP,
09:57:15.13 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHTEMP.DATA,CATALOG.TOTICF1.VTOTCI3
09:57:15.17 STC10916 00000090 IEC161I 062-086,SCSCPTA1,SCSCPTA1,DFHTEMP,,
09:57:15.17 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHTEMP,
09:57:15.18 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHTEMP.DATA,CATALOG.TOTICF1.VTOTCI3
09:57:15.23 STC10916 00000090 +DFHTS0101I SCSCPTA1 Temporary Storage initialization has ended.
09:57:15.80          00000290 IXG201I REQUEST TO CONNECT TO LOGSTREAM SCSCPTA1.DFHSHUNT 385 10
385 00000290 IN STRUCTURE LOG_DFHSHUNT_PO1 ACCEPTED.
385 00000290 CONNECTION TO ADDITIONAL LOGSTREAMS MAY FAIL DUE TO INSUFFICIENT
385 00000290 STRUCTURE STORAGE
09:57:15.80          00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE LOG_DFHSHUNT_PO1 WAS SUCCESSFUL.
383
383 00000290 JOBNAME: IXGLOGR ASID: 0015 CONNECTOR NAME: IXGLOGR_SC42
383 00000290 CFNAME: CF02
09:57:15.80          00000290 IXL015I STRUCTURE ALLOCATION INFORMATION FOR 384
384 00000290 STRUCTURE LOG_DFHSHUNT_PO1, CONNECTOR NAME IXGLOGR_SC42
384 00000290 CFNAME ALLOCATION STATUS/FAILURE REASON
384 00000290 -----
384 00000290 CF02 STRUCTURE ALLOCATED
384 00000290 CF01 PREFERRED CF ALREADY SELECTED

```

Figure 28 (Part 5 of 6). Structure Rebuild Failure

```

09:57:16.05 STC10916 00000090 +DFHLG0104I SCSCPTA1 System log (DFHSHUNT) initialization has ended.
09:57:16.05 STC10916 00000090 +DFHLG0102I SCSCPTA1 Log manager domain initialization has ended.
09:57:16.12 STC10916 00000090 +DFHKE0406I SCSCPTA1 388
          388 00000090 CICS is about to wait for predecessors defined in the MVS automatic
          388 00000090 restart management policy for this region.
09:57:16.27 STC10916 00000090 +DFHCP0101I SCSCPTA1 CPI initialization has started.
09:57:16.27 STC10916 00000090 +DFHPR0104I SCSCPTA1 Partner resource manager initialization has
          started.
09:57:16.29 STC10916 00000090 +DFHAI0101I SCSCPTA1 AITM initialization has started.
09:57:16.30 STC10916 00000090 +DFHZC0170I SCSCPTA1 CICS registered successfully to VTAM generic
          resource name CICSTOR.
09:57:16.32 STC10916 00000090 +DFHER5730 SCSCPTA1 User recovery beginning
09:57:16.38 STC10916 00000090 +DFHTD0100I SCSCPTA1 Transient Data initialization has started.
09:57:16.41 STC10916 00000090 +DFHFC0100I SCSCPTA1 File Control initialization has started.
09:57:16.65 STC10916 00000090 IEC161I 056-084,SCSCPTA1,SCSCPTA1,DFHINTRA,,,
09:57:16.66 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHINTRA,
09:57:16.66 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHINTRA.DATA,CATALOG.TOTICF1.VTOTCI3
09:57:16.70 STC10916 00000090 IEC161I 062-086,SCSCPTA1,SCSCPTA1,DFHINTRA,,,
09:57:16.70 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHINTRA,
09:57:16.71 STC10916 00000090 IEC161I CICSTS.CICS510.PTA1.DFHINTRA.DATA,CATALOG.TOTICF1.VTOTCI3
09:57:16.87 STC10916 00000090 +DFHZC0126I SCSCPTA1 No VTAM sessions persisted for an EMERGENCY
          restart.
09:57:17.43 STC10916 00000090 +DFHFC0101I SCSCPTA1 File Control initialization has ended.
09:57:20.83 STC10916 00000090 +DFHER5731 SCSCPTA1 No active user records on the system log
09:57:20.84 STC10916 00000090 +DFHER5732 SCSCPTA1 User recovery completed
09:57:20.84 STC10916 00000090 +DFHTD0101I SCSCPTA1 Transient Data initialization has ended.
09:57:20.86 STC10916 00000090 +DFHCP0102I SCSCPTA1 CPI initialization has ended.
09:57:20.87 STC10916 00000090 +DFHPR0105I SCSCPTA1 Partner resource manager initialization has
          ended.
09:57:20.87 STC10916 00000090 +DFHAI0102I SCSCPTA1 AITM initialization has ended.
09:57:21.39 STC10916 00000090 +DFHSI1519I SCSCPTA1 The interregion communication session was
          successfully started.
09:57:23.00 STC10916 00000090 +DFHAP1204I SCSCPTA1 COBOL2 is being initialized.
09:57:23.13 STC10916 00000090 +DFHSI8430I SCSCPTA1 About to link to PLT programs during the third
          stage of initialization.
09:57:23.25 STC10916 00000090 +EYUNX0001I SCSCPTA1 LMAS PLTPI program starting
09:57:23.38 STC10916 00000090 +DFHSI8434I SCSCPTA1 Control returned from PLT programs during the
          third stage of initialization.
09:57:23.45 STC10916 00000090 +DFHSI1517 SCSCPTA1 Control is being given to CICS. 11

```

Figure 28 (Part 6 of 6). Structure Rebuild Failure

4.3.3.5 Documentation on Structure Rebuild Failure

Refer to *MVS/ESA V5 Setting Up a Sysplex*.

4.4 Log Data Set Errors

Log data sets are the files on DASD that receive any destaged data from a log stream. The use of these data sets depends primarily on the application's requirements for log retention.

For CICS system logs, size the coupling facility structure large enough so that data movement to log data sets is not generally necessary for active logs. If, however, you want to keep the system logs (SYSLOG=KEEP in SIT), log data sets will be allocated and will have to be managed by an archive or delete process.

For user journals and forward recovery logs, carefully plan the size and expected number of log data sets. If you determine that the LS_SIZE parameter at log stream definition time is insufficient and your log data sets are too small, you can change the size of any new allocations by first disconnecting all systems from the log stream and then using the ALTER LS_SIZE parameter in the IXCMIAPU utility.

Note: It is possible to delete a log stream and redefine it with a larger LS_SIZE. Be aware, however, that this approach deletes *all* of the log data sets associated with the log stream.

The high and low offload thresholds provide guidance to the system as to when it should migrate data from the structure to log data sets for a particular log stream. The following are typical values:

- For DFHLOG and DFHSHUNT: HIGHOFFLOAD=95, LOWOFFLOAD=60
- For DFHLOG and DFHSHUNT with SYSLOG=KEEP: HIGHOFFLOAD=95, LOWOFFLOAD=5
- For forward recovery: HIGHOFFLOAD=80, LOWOFFLOAD=0

Refer to the *CICS Migration Guide* and *MVS/ESA SP V5 Setting up a Sysplex* for discussions of log stream definition parameters.

The data offload frequency and size of transfer from the log stream to the log data sets are generally triggered by these thresholds. Data is also offloaded when:

- IXGLOGR fails; offload is driven by a peer connector.
- The system fails; offload is driven by a peer connector.
- The staging data set becomes full. See 4.5.1, “Impact” on page 92 for more information.

4.4.1 Log Data Set Unavailable

The following conditions could be encountered by the MVS logger at data set allocation time:

- Unable to allocate the log data set because of system error. For example, the user catalog is unavailable, or DFHSM cannot recall the data set. This is a temporary error condition.
- A log data set is no longer available, for example, after a volume failure; that is, the data set has been deleted and cannot be recovered, but CICSVR needs to access it to perform a forward recovery operation. Note that this is really a double-error condition. You would normally only be attempting to access a log data set for forward recovery if you have lost a VSAM data set and you need to do a data set restore and forward recovery.

4.4.1.1 Impact

If the problem is an allocation error, it may be possible to fix the error and subsequently reallocate the log data set. As such, the impact may not be too great.

If the log data set cannot be recovered, for example, it has an I/O error or has been deleted, there will be some data loss. Recovery procedures should be in place to handle this situation if the data is critical. We recommend that you make backup copies of the forward recovery log streams so that you have a recovery option.

If a forward recovery log becomes unavailable, take an immediate backup of the associated data set. If DFHLOG or DFHSHUNT log streams are those that can not off-load destaged data to log data sets, you have to INITIAL restart CICS.

4.4.1.2 Prevention

DASD subsystem facilities can be used to provide high data availability. For example, you could place the log data sets on DASD volumes, using the dual copy facility. This would ensure that the volume is duplexed (RAID 1) and any physical media error does not affect access to the data. You could also place the log data sets on RAMAC volumes, which provide similar high availability (RAID 5) by automatically reconstructing data in the event of device failure.

Use CICSVR to take archive copies of log data from the forward recovery log stream. In the event of the loss of a log data set used in recovery processing, you could use an archive copy as input.

4.4.1.3 Recovery

Take a new backup of all data sets using this forward recovery log stream as soon as possible.

IXGLOGR closes the log data set and creates a new one.

4.4.1.4 Example

Figure 29 shows the effect of an allocation error on a forward recovery log data set.

- 1** Current log data set is unavailable because of allocation errors.
- 2** IXGLOGR attempts to create another log data set but fails, also because of allocation errors.
- 3** Logging continues until a logstream-full condition, at which point message *DFHLG0772* (not shown here) is issued.

MVS system logger codes returned to CICS when the log data set directory is full include X'00000409', warning: previous offload error - may lead to X'0000085D', and X'0000085D', the structure space available for this log stream is full and attempts to offload the data have failed.

```
18:46:38.12 00000290 IEF196I IEC161I CICS.SCSCFWR.VSAMV.A0000002,
18:46:38.12 00000090 IEC161I CICS.SCSCFWR.VSAMV.A0000002,
18:46:38.14 00000290 IEF196I IEC161I CICS.SCSCFWR.VSAMV.A0000002.DATA,CATALOG.TOTICF1.VTOTCI1
18:46:38.14 00000090 IEC161I CICS.SCSCFWR.VSAMV.A0000002.DATA,CATALOG.TOTICF1.VTOTCI1
18:46:38.95 00000290 IXG251I IKJ56893I DATA SET CICS.SCSCFWR.VSAMV.A0000003 NOT ALLOCATED+
18:46:38.95 00000290 IXG251I IGD17103I CATALOG ERROR WHILE DEFINING VSAM DATA SET CICS.SCSCFW
R.VSAMV.A0000003
18:46:38.96 00000290 IXG251I RETURN CODE IS 68 REASON CODE IS 20 IGGOCLEW
18:46:38.96 00000290 IXG251I IGD306I UNEXPECTED ERROR DURING IGGOCLEW PROCESSING
18:46:38.97 00000290 IXG251I RETURN CODE 68 REASON CODE 20
18:46:38.98 00000290 IXG251I THE MODULE THAT DETECTED THE ERROR IS IGDVTSCU
18:46:38.98 00000290 IXG251I SMS MODULE TRACE BACK - VTSCU VTSCT VTSCH VTSCD VTSCC VTSCR
SSIRT
18:46:38.98 00000290 IXG251I SYMPTOM RECORD CREATED, PROBLEM ID IS IGD00011
18:46:38.99 00000290 IXG251I IGD17219I UNABLE TO CONTINUE DEFINE OF DATA SET CICS.SCSCFWR.VSA
MV.A0000003
18:46:39.00 00000090 IXG301I SYSTEM LOGGER FAILED TO OFFLOAD DATA FOR LOG STREAM 451
451 00000090 SCSCFWR.VSAMV IN STRUCTURE LOG USERBWF_P01. RETURN CODE: 00000008
451 00000090 REASON CODE: 00000805 DIAG1: 00000008 DIAG2: 00000008 DIAG3:
451 00000090 01010001 DIAG4: 83B755E0
18:46:41.77 STC09652 00000090 +DFHLG0775 SCSCPA44 452
452 00000090 The MVS logger has returned an alert during operation IXGWRITE for
452 00000090 log stream SCSCFWR.VSAMV. The log stream writer offload task is
452 00000090 failing. MVS logger codes: X'00000004' X'00000409'.
```

Figure 29. Log Data Set Allocation Error

4.4.1.5 Documentation on Log Data Set Unavailable

Refer to the following manuals for additional information:

- *DFSMS/MVS Access Method Services*
- *OS/390 MVS System Commands*
- *DFSMSHsm Managing Your Own Data*

4.4.2 Log Data Set I/O Errors

Log data set I/O errors can occur as a result of physical damage to the relevant volume or loss of path to that volume.

4.4.2.1 Impact

If an I/O error occurs on a CICS system log, CICS abends and must be restarted with an INITIAL start option.

4.4.2.2 Prevention

Protect the log data sets from DASD failures by using devices such as RAMAC or the dual copy facilities provided by the 3990 DASD controller. This will ensure that any I/O errors caused by media failures do not affect the log data set.

4.4.2.3 Recovery

When data set I/O errors occur on a log data set, IXGLOGR tries to recover by closing the current log data set and allocating a new one. If this process fails, the I/O error is characterized as an unrecoverable I/O error, and you have to resolve the allocation errors. An example of an unrecoverable error would be IXGLOGR attempting to allocate a new log data set but being prevented from doing so by insufficient space on the DASD volume.

If the coupling facility is full, IXGLOGR rejects any IXGWRITE requests, although IXGBRWSE and IXGDELET may continue to work.

CICS can be restarted with an INITIAL start option as soon as the error has been resolved.

4.4.2.4 Example

Figure 30 on page 90 shows the effects of a log data set failure.

- 1** Disable the volume to SMS to prevent access to the log data set.
- 2** IXGLOGR and CICS issue error messages.
- 3** CICS terminates.
- 4** IXGLOGR cannot allocate a new log data set.

MVS system logger codes returned to CICS when a log data set receives an I/O error include X'0000084A', log stream unreadable because of I/O error.

```

12:38:36.96 CICSRS7 00000290 V SMS,VOL(TEMPO3,WTSCPLX1),D 1
12:38:37.17 CICSRS7 00000090 IGD010I VOLUME (TEMPO3,WTSCPLX1) STATUS IS NOW DISABLED
12:38:50.85 00000290 IXG251I IKJ56893I DATA SET CICS.SCSCPTA2.DFHLOG.A0000002 NOT ALLOCATED+
12:38:50.85 00000290 IXG251I IGD17260I DATA SET CICS.SCSCPTA2.DFHLOG.A0000002 NOT ALLOCATED
BECAUSE
12:38:50.86 00000290 IXG251I REQUIRED VOLUME TEMPO3 NOT ENABLED
12:38:50.87 STC15613 00000090 +DFHME0126 SCSCPTA2 026
026 00000090 Error in SYMREC invocation. Return code in R15 = X'000C', Reason code
026 00000090 in R0 = X'0F1C'.
12:38:50.87 STC15613 00000090 +DFHLG0772 SCSCPTA2 027
027 00000090 An error has occurred during MVS logger operation IXGBRWSE START for 2
027 00000090 log stream SCSCPTA2.DFHLOG. MVS logger codes: X'00000008',
027 00000090 X'0000084A'.
12:38:50.89 STC15613 00000090 +DFHME0116 SCSCPTA2 028
028 00000090 (Module:DFHMEME) CICS symptom string for message DFHLG0772 is
028 00000090 PIDS/565501800 LVLS/510 MS/DFHLG0772 RIDSD/DFHL2HS7 PTF5/UN91603
028 00000090 VALU/H0000084A
12:38:50.93 STC15613 00000090 +DFHDU0201 SCSCPTA2 ABOUT TO TAKE SDUMP. DUMP CODE: LG0772 , DUMPID:
5/0001
12:38:54.88 STC15613 00000090 +DFHDU0202 SCSCPTA2 SDUMPX COMPLETE. SDUMPX RETURN CODE X'00'
12:38:54.89 STC15613 00000090 +DFHLG0740 SCSCPTA2 032
032 00000090 While writing data to the system log (DFHLOG), a lost data warning 2
032 00000090 was received. CICS will be quiesced so inflight tasks can complete.
032 00000090 Next CICS start will be INITIAL.
12:38:55.07 STC15613 00000090 +DFHTM1715 SCSCPTA2 CICS for MVS/ESA is being quiesced by userid
CICSUSER in transaction CSQC.
12:38:55.07 STC15613 00000090 +DFHDM0102I SCSCPTA2 CICS is quiescing.
12:38:55.10 00000290 IEF196I IGD100I 2024 ALLOCATED TO DDNAME SYS00003 DATA CLAS ( )
12:38:55.31 STC15613 00000090 +EYUNX0051I SCSCPTA2 LMAS termination initiated
12:38:55.40 STC15613 00000090 +EYUNX0052I SCSCPTA2 MAS termination ECB posted
12:38:55.46 STC15613 00000090 +EYUNX0052I SCSCPTA2 KNL termination ECB posted
12:38:55.52 STC15613 00000090 +EYUNX0070I SCSCPTA2 XLWA termination ECB posted
12:38:55.54 STC15613 00000090 +DFHTM1781 SCSCPTA2 CICS shutdown cannot complete because some
non-system user tasks have not terminated.
12:38:55.56 STC15613 00000090 +DFHCESD SCSCPTA2 SHUTDOWN ASSIST TRANSACTION CESD STARTING. SHUTDOWN
IS NORMAL.
12:39:00.70 STC15613 00000090 +EYUXL0011I SCSCPTA2 LMAS shutdown in progress
12:39:00.73 STC15613 00000090 +EYUCL0005I SCSCPTA2 ESSS Receive Link Task terminated
12:39:00.76 STC15648 00000090 +EYUTS0001I SCSCPCA1 Topology Disconnect for SCSCPTA2 Initiated
12:39:00.76 STC15613 00000090 +EYUCL0007I SCSCPTA2 SCSCPTA2 link to SCSCPCB1 terminated
12:39:00.76 STC15619 00000090 +EYUTS0001I SCSCPCB1 Topology Disconnect for SCSCPTA2 Initiated
12:39:00.76 STC15648 00000090 +EYUTS0003I SCSCPCA1 Topology Disconnect for SCSCPTA2 Complete
12:39:00.78 STC15619 00000090 +EYUTS0003I SCSCPCB1 Topology Disconnect for SCSCPTA2 Complete
12:39:00.84 STC15613 00000090 +EYUXM0004I SCSCPTA2 Message Services termination complete
12:39:00.92 STC15613 00000090 +EYUXL0023I SCSCPTA2 Trace Services termination requested
12:39:00.97 STC15613 00000090 +EYUXZ0001I SCSCPTA2 Trace Services termination complete
12:39:01.05 STC15613 00000090 +EYUXL0012I SCSCPTA2 ESSS disconnect complete
12:39:01.12 STC15613 00000090 +EYUXL0016I SCSCPTA2 LMAS shutdown complete
12:39:05.93 STC15613 00000090 +DFHTM1782I SCSCPTA2 All non-system tasks have been successfully
terminated.
12:39:06.41 STC15613 00000090 +DFHZC2305I SCSCPTA2 Termination of VTAM sessions beginning
12:39:06.43 STC15613 00000090 +DFHZC0172I SCSCPTA2 CICS deregistered successfully from VTAM generic
resource name CICSTOR prior to ACB closure.
12:39:06.78 STC15613 00000090 +DFHZC2316 SCSCPTA2 VTAM ACB is closed
12:39:07.78 STC15613 00000090 +DFHTM1711I SCSCPTA2 About to link to phase 2 PLT programs.
12:39:07.85 STC15613 00000090 +EYUNX0001I SCSCPTA2 RMAS PLTPI program starting
12:39:07.86 STC15613 00000090 +DFHTM1712I SCSCPTA2 Control returned from phase 2 PLT programs.
12:39:08.19 STC15613 00000090 +DFHRM0131 SCSCPTA2 Resynchronization required with IRC resources.
12:39:11.20 00000290 IEF196I IEF285I SYS1.DUMP.D0812.H16.SC52.SCSCPTA2.S00002 CATALOGED
12:39:11.21 00000290 IEF196I IEF285I VOL SER NOS= DUMP02.
12:39:11.23 00000090 IEA611I COMPLETE DUMP ON SYS1.DUMP.D0812.H16.SC52.SCSCPTA2.S00002 062
062 00000090 DUMPID=002 REQUESTED BY JOB (SCSCPTA2)
062 00000090 FOR ASID (004E)
062 00000090 INCIDENT TOKEN: WTSCPLX1 SC52 08/12/1996 16:38:50
12:39:12.26 STC15613 00000090 +DFHRM0204 SCSCPTA2 There are no indoubt, commit-failed or backout-failed
UOWs.

```

Figure 30 (Part 1 of 2). Log Data Set I/O Failure

```

12:39:12.39      00000290 IXG251I IKJ56893I DATA SET CICS.SCSCPTA2.DFHLOG.A0000002 NOT ALLOCATED+
12:39:12.40      00000290 IXG251I IGD17260I DATA SET CICS.SCSCPTA2.DFHLOG.A0000002 NOT ALLOCATED
                    BECAUSE
12:39:12.40      00000290 IXG251I REQUIRED VOLUME TEMPO3 NOT ENABLED
12:39:12.43 STC15613 00000090 +DFHME0126 SCSCPTA2 067
                    067 00000090 Error in SYMREC invocation. Return code in R15 = X'000C', Reason code
                    067 00000090 in R0 = X'0F1C'.
12:39:12.44 STC15613 00000090 +DFHMG0772 SCSCPTA2 068
                    068 00000090 An error has occurred during MVS logger operation IXGDELET RANGE for
                    068 00000090 log stream SCSCPTA2.DFHLOG. MVS logger codes: X'00000008',
                    068 00000090 X'0000084A'.
12:39:12.45 STC15613 00000090 +DFHME0116 SCSCPTA2 069
                    069 00000090 (Module:DFHMEME) CICS symptom string for message DFHMG0772 is
                    069 00000090 PIDS/565501800 LVLS/510 MS/DFHMG0772 RIDSD/DFHL2HS5 PTFU/UN91603
                    069 00000090 VALU/H0000084A
12:39:12.47 STC15613 00000090 +DFHDU0201 SCSCPTA2 ABOUT TO TAKE SDUMP. DUMPCODE: LG0772 , DUMPID:
                    5/0002
12:39:15.15      00000090 $HASPO99 ALL AVAILABLE FUNCTIONS COMPLETE
12:39:16.06 STC15613 00000090 +DFHDU0202 SCSCPTA2 SDUMPX COMPLETE. SDUMPX RETURN CODE X'00'
12:39:16.06 STC15613 00000090 IEA794I SVC DUMP HAS CAPTURED: 071
                    071 00000090 DUMPID=003 REQUESTED BY JOB (SCSCPTA2)
                    071 00000090 DUMP TITLE=CICS DUMP: SYSTEM=SCSCPTA2 CODE=LG0772 ID=5/0002
                    071 00000090
12:39:16.33      00000290 IEF196I IGD100I 2024 ALLOCATED TO DDNAME SYS00004 DATACLAS (      )
12:39:16.33 STC15613 00000090 +DFHRM0130 SCSCPTA2 Recovery manager has successfully quiesced.
12:39:17.13      00000290 IXG251I IKJ56893I DATA SET CICS.SCSCPTA2.DFHLOG.SC52 NOT ALLOCATED+
12:39:17.14      00000290 IXG251I IGD17260I DATA SET CICS.SCSCPTA2.DFHLOG.SC52 NOT ALLOCATED
                    BECAUSE
12:39:17.14      00000290 IXG251I REQUIRED VOLUME TEMPO3 NOT ENABLED
12:39:17.37 STC15613 00000090 +DFHDU0303I SCSCPTA2 Transaction Dump Data set DFHDMPA closed.
12:39:17.70      00000290 IXG251I IKJ56893I DATA SET CICS.SCSCPTA2.DFHSHUNT.SC52 NOT ALLOCATED+
12:39:17.71      00000290 IXG251I IGD17260I DATA SET CICS.SCSCPTA2.DFHSHUNT.SC52 NOT ALLOCATED
                    BECAUSE
12:39:17.71      00000290 IXG251I REQUIRED VOLUME TEMPO3 NOT ENABLED
12:39:17.73 STC15613 00000090 +DFHKE1799 SCSCPTA2 TERMINATION OF CICS FOR MVS/ESA IS COMPLETE.
12:39:17.97 STC15613 00000090 IEF404I SCSCPTA2 - ENDED - TIME=12.39.17
12:39:17.99 STC15613 00000090 $HASP395 SCSCPTA2 ENDED

```

3
4

Figure 30 (Part 2 of 2). Log Data Set I/O Failure

4.4.2.5 Documentation on Log Data Set I/O Errors

The following manuals should be referred to for additional information:

- *DFSMS/MVS Access Method Services*
- *OS/390 MVS System Commands*
- *DFSMSHsm Managing Your Own Data*

4.5 Staging Data Set Full Errors

Staging data sets are used to contain a copy of log stream data only where the connection to a coupling facility is deemed to be a single point of failure, regardless of the volatility state of the coupling facility.

In a production environment, you should have two or more nonvolatile stand-alone coupling facilities available with no single point of failure, so staging data sets should not be necessary.

If staging data sets are necessary, they map to one log stream per system. They are allocated when the first application issues a connect request to the log stream, and they are deleted when the last connector to the log stream for this system disconnects.

When an application disconnects from a log stream (assuming it is the last connection in the system to that log stream), the connection terminates cleanly or fails. The connection fails whenever IXGLOGR cannot flush the log data that this system wrote out of the structure and onto the log data sets. If the connection terminates cleanly, the staging data set is deleted. If the connection fails, the data set is not deleted but is left available for subsequent recovery.

4.5.1 Impact

If a staging data set becomes full, there will be a performance degradation of any task using the log stream because the IXGLOGR must offload data to its log data sets before it can resume duplex logging.

4.5.2 Prevention

Ensure that staging data sets are sufficiently large for the volume of log data. Use the CICS DFHLSCU utility to estimate the size of the staging data sets.

Use SMF record type 88 to monitor staging data set use:

- Check field SMF88ETT to see whether the high threshold mark for staging data sets is being reached. If you never find that the high threshold mark is reached, your staging data set may be larger than necessary.
- Check field SMF88ETF to see whether you are getting one or more staging data set full conditions. If you are, your staging data set may be too small and should probably be enlarged.

Use the sample reporting program in SYS1.SAMPLIB library, member name IXGRPT1, to process these SMF records.

CICS log stream statistics are also available, but they are at the region level and are not sysplexwide.

4.5.3 Recovery

IXGLOGR will immediately begin offloading coupling facility data to DASD log data sets. However, this offloading process can negatively affect the performance of all log streams in that structure.

If you have to change the staging data set size, know that it is a *disruptive* process. The staging data set must actually be deleted and then reallocated in order to change its size. This involves disconnecting from the log stream and therefore cleanly closing any tasks connected to that log stream.

4.5.4 Example

Figure 31 on page 93 shows the effects of a staging data set becoming full:

- The staging data set is defined with insufficient space for the workload.
- The MVS system logger returns error codes to CICS identifying temporary errors, while offloading to log data sets takes place to alleviate the problem.

MVS system logger codes returned to CICS while a staging data set is full include X'00000865', the staging data set is full.


```
11:55:59.21 STC17087 00000090 +DFHLG0777 SCSCPAA1 209
                209 00000090  A temporary error condition occurred during MVS logger operation
                209 00000090  IXGWRITE for log stream SCSCPAA1.DFHLOG. MVS logger codes:
                209 00000090  X'00000008', X'00000865'.
```

Figure 31. Staging Data Set Full

4.5.5 Documentation on Staging Data Set Full

Refer to the following manuals for additional information:

- *DFSMS/MVS Access Method Services*
- *OS/390 MVS System Commands*
- *DFSMSHsm Managing Your Own Data*

Chapter 5. CICS Abnormal Termination and Communication Failures

In this chapter we analyze the problems that can occur when CICS is canceled or abends. First we investigate the failures when CICS works with recoverable resources (AORs) and when it works without recoverable resources (TORs) and explain how CICS does the recovery.

Then we investigate the problems that can occur when there is an error in the communication between two CICSs (exchange lognames failure) and a UOW is distributed between them.

5.1 CICS Abnormal Termination

In this section we explain the problems that can occur if CICS fails, is canceled, or, during an immediate shutdown, has in-flight tasks.

5.1.1 Impact

When CICS is canceled or terminates with a *shut down immediate*, the active locks that SMSVSAM held for in-flight tasks are converted to retained locks. Locked records cannot be accessed by transactions in other CICS regions.

Transactions in other CICS regions will wait for an active lock. If, however, a transaction running in a different CICS region requests locks owned by the failed UOW, the transaction receives the LOCKED response. If the program does not handle this condition, the transaction abends with code AEX8.

The only case in which tasks from other CICSs can read a record with a retained lock is when the file is opened with the READINTEG(UNCOMMITTED) option, which is the default value. With this option you read the file without read integrity, however.

5.1.2 Prevention

When you terminate CICS by means of a CEMT PERFORM SHUTDOWN or SHUTDOWN IMMEDIATE command, use the shutdown assist transaction because it attempts to purge and back out long-running tasks. This is the best way of avoiding unacceptable delay in the process of normal or immediate shutdown of CICS.

The shutdown assist transaction behaves in the following ways:

- In the initial stage of the assisted shutdown, it attempts to complete a normal shutdown in a reasonable time. After a time allowed for transactions to finish normally, that is, after the number of tasks in the system has not reduced over a period of eight samples, it proceeds to issue a normal purge for each remaining task.
- Its operation is quicker for an immediate shutdown. It proceeds to issue a normal purge of tasks if the number of tasks in the system has not reduced over a period of only four samples.

The shutdown assist transaction default value is CESD, and the default shutdown assist program is DFHCESD. You could change the name of the shutdown assist transaction by changing the SDTRAN system initialization parameter or

specifying its name on the SDTRAN option of the PERFORM SHUTDOWN command. You can also modify the DFHCESD program because its source code is provided.

Remember that, if the program named by the CESD transaction cannot be located, CICS waits indefinitely for all user tasks to complete, which may cause shutdown to hang. This behavior is similar for an immediate, as well as for a normal, shutdown.

For more information about the use of the shutdown assist transaction and how it works, see the *CICS Operations and Utility Guide*.

With the use of the shutdown assist transaction in a normal shutdown, there is no reason for you to do an immediate shutdown. The only exception is when you are using persistent session support, in which case, if you perform a normal shutdown of CICS, VTAM does not retain the sessions.

5.1.3 Recovery

Specify the START=AUTO option for the restart of CICS after an abnormal termination to recover all CICS the recoverable resources. CICS determines the type of start to perform, using information retrieved from the recovery manager's control record in the global catalog, which, in the case of a previous abnormal termination, indicates that emergency restart is needed.

In an emergency restart, the backout of UOWs starts automatically when initialization is almost complete and after the completion of PLTPI processing and continues after message *DFHSI1517 Control is being given to CICS* has been issued. Therefore, the emergency restart is not delayed but takes place concurrently with new tasks starting in CICS. At this point the behavior depends on whether CICS is recovering UOWs that access RLS data sets or non-RLS data sets:

- In an emergency restart, any locks that were held on non-RLS data sets before the CICS failure are reacquired as active locks.

When new tasks attempt to access non-RLS data that is locked by a backout task, they wait until the end of the backout task.

- SMSVSAM holds the retained locks on RLS data sets, and the locks do not change while backout is being performed.

In this case if any new transaction attempts to access RLS data locked by a backout task, it receives the LOCKED condition.

If there are problems in the emergency restart, CICS can be restarted with a COLD or INITIAL option.

- INITIAL start works like COLD start in previous versions of CICS. It does not back out any resources, and CICS loses the information about all recoverable resources.

INITIAL start is necessary only when;

- CICS is started for the first time.
- CICS has a failure that makes it impossible to do AUTO or COLD restart.

- COLD start is similar to INITIAL. The difference between the two is:

- COLD start takes into account the state of the global catalog that can contain data from a previous run of CICS. This data is preserved.

- The state of the system log is preserved on a COLD start. CICS keeps information saved in the system log from a previous run.
- On a COLD start, CICS uses the old logname token in the exchange lognames process when connecting to partner systems.

COLD starts can be beneficial if you make many resource definition changes in CICS, but you should cold start CICS only when there are no shunted UOWs holding retained locks on resources local to that CICS.

With interconnected CICS regions, in an interconnected environment the only CICS region that has no risk of information loss on a COLD restart is a TOR without recoverable resources.

When a COLD or INITIAL start is necessary, use the recovery manager utility program (DFHRMUTIL) to modify the autostart record in the global catalog and thereby change the type of start CICS is to perform. With the DFHRMUTIL utility, you avoid the risk of modifying the START system initialization parameter and forgetting to back out this change with the consequent loss of recovery information in the next start of CICS.

A tool for improving emergency restart which is the MVS ARM, which can restart an MVS subsystem in place if it abends (or if a monitor program notifies ARM of a stall condition). It can restart a CICS region in place or restart all the elements of a workload (for example, CICS TORs, AORs, and FORs) on another MVS image after a CICS failure.

For more information about MVS automatic restart management, see the *CICS Recovery and Restart Guide*.

To improve restart time in the case of abnormal termination or immediate shutdown of a CICS region, you could use VTAM persistent session support. With this support, if a CICS system is restarted within the time specified in the PSDINT system initialization parameter, it can immediately use the sessions retained by VTAM (there is no need for network flows to rebind them). For more information about VTAM persistent session support, see the *CICS Recovery and Restart Guide*.

5.1.4 Examples

In this section we test the recovery actions of CICS after failures in a TOR and an AOR. We also test the use of the shutdown assist transaction in a normal and immediate shutdown of CICS.

5.1.4.1 CICS TOR Abnormal Termination

The example is of a failure in TOR PTA1 in an environment of various CICSs interconnected as shown in Figure 32 on page 98.

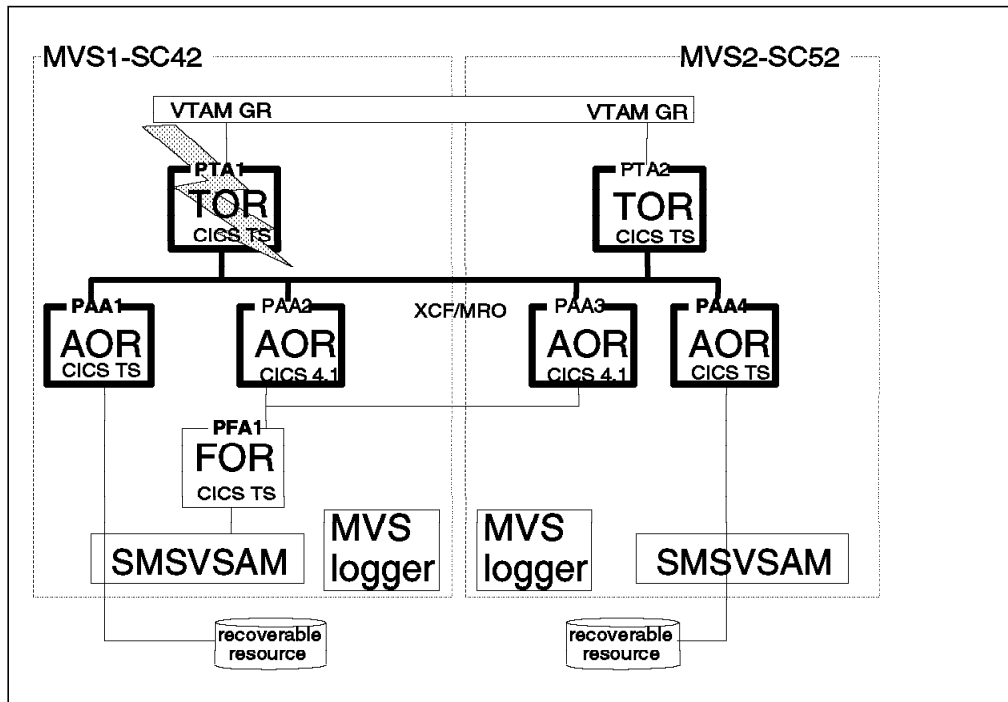


Figure 32. TOR Failure

The region has no recoverable resources, so when it restarts it does not recover any resources, but the restart must be as soon as possible because the TOR serves as the interface for all users to access the applications in other CICSs.

To improve the restart of CICS we use VTAM persistent sessions.

We specify the PSDINT=500 parameter in the system initialization table. This parameter specifies that VTAM is to hold sessions in a recovery-pending state for 5 minutes after a failure of CICS.

Then with two users working on region PTA1, we issue

```
CEMT P SHUT I NOSDTRAN
```

in this region. For these users it appears as if CICS is "hanging"; the screen on display at the time of the failure remains until persistent session recovery is complete (when CICS restarts).

Then we restart CICS with START=AUTO and the messages shown in Figure 33 on page 99 appear in the log.

```
DFHTD0101I SCSCPTA2 Transient Data initialization has ended.
DFHCP0102I SCSCPTA2 CPI initialization has ended.
DFHPR0105I SCSCPTA2 Partner resource manager initialization has ended.
DFHAI0102I SCSCPTA2 AITM initialization has ended.
DFHZC0124I SCSCPTA2
VTAM sessions persisted for an EMERGENCY start. Inquires issued 1,
sessions persisting 2, sessions terminated 0, sessions OPNDSTed 2,
sessions in error 0.
DFHSI1519I SCSCPTA2 The interregion communication session was
                    successfully started.
DFHSI8430I SCSCPTA2 About to link to PLT programs during the third stage
                    of initialization.
DFHSI8434I SCSCPTA2 Control returned from PLT programs during the third
                    stage of initialization.
DFHSI1517 SCSCPTA2 Control is being given to CICS.
```

Figure 33. VTAM Persistent Session Support Log Messages

After receiving the message, the two users clean their screens and enter a transaction code.

Another way of improving the restart time of a TOR is use of the VTAM generic resources function. When you use this function you must have two or more TORs, and all AORs must be connected to all TORs.

You specify the generic resource name on the GRNAME system initialization table parameter; the name must be the same for all the TORs. Generic resource names do not have to be defined to VTAM but must be distinct from network names and unique within the network.

You must also define the ISTGENERIC structure in the active coupling facility resource management (CFRM) policy for the Sysplex as shown in the JCL example in Figure 34 on page 100.

```

//STEP1 EXEC PGM=IXCMIAPU
//SYSPRINT DD SYSOUT=*
//SYSABEND DD SYSOUT=*
//SYSIN DD *
DATA TYPE(CFRM) REPORT(YES)

DEFINE POLICY NAME(CFRM02) REPLACE(YES)
CF NAME(CF01)
TYPE(009672)
MFG(IBM)
PLANT(02)
SEQUENCE(000000040104)
PARTITION(1)
CPCID(00)
DUMPSPACE(2000)

CF NAME(CF02)
TYPE(009672)
MFG(IBM)
PLANT(02)
SEQUENCE(000000040104)
PARTITION(1)
CPCID(01)
DUMPSPACE(2000)

STRUCTURE NAME(ISTGENERIC)
SIZE(326)
PREFLIST(CF02,CF01)

/*

```

Figure 34. ISTGENERIC Structure Definition

VTAM uses RACF class VTAMAPPL to validate the generic resource name. So the generic resource name must be in RACF class VTAMAPPL. For more information about defining a VTAMAPPL profile, see the *CICS RACF Security Guide*.

The user connects to the TORs, using the generic resource name, and VTAM establishes the connection to one of the members of the generic resource (one of the TORs). Which member VTAM chooses depends on whether any affinities exist and on VTAM's session-balancing algorithms. In this environment, if one TOR goes down, all transactions in this region abend, but users can log on immediately using the generic name because VTAM connects them to one of the other TORs.

When CICS starts up with VTAM generic resource name support, the messages shown in Figure 35 on page 101 appear in the startup of CICS.


```
DFHAI0101I SCSCPTA1 AITM initialization has started.  
DFHZC0170I SCSCPTA1 CICS registered successfully to VTAM generic resource  
name CICSTOR.  
DFHTD0100I SCSCPTA1 Transient Data initialization has started.
```

Figure 35. VTAM Generic Resource Function Startup Log Messages

You can also see the generic name of CICS by using the CEMT INQ VTAM command, as shown in Figure 36.

```
I VTAM  
STATUS: RESULTS - OVERTYPE TO MODIFY  
Vta Ope Psd( 000000 ) Reg Grn(CICSTOR )
```

Figure 36. CEMT INQUIRE VTAM: CICS Generic Name

CICSTOR is the generic name of this CICS.

The messages shown in Figure 37 appear in the log at CICS normal shutdown.

```
DFHZC2305I SCSCPTA1 Termination of VTAM sessions beginning  
DFHZC0172I SCSCPTA1 CICS deregistered successfully from VTAM generic  
resource name CICSTOR prior to ACB closure.  
DFHZC2316 SCSCPTA1 VTAM ACB is closed  
DFHTM1711I SCSCPTA1 About to link to phase 2 PLT programs.
```

Figure 37. VTAM Generic Resource Function Shutdown Log Messages

For more detailed information about VTAM generic resource support, see the *VTAM Network Implementation Guide*.

5.1.4.2 CICS AOR Abnormal Termination

This example is of a PAA1 AOR abend, as shown in Figure 38 on page 102.

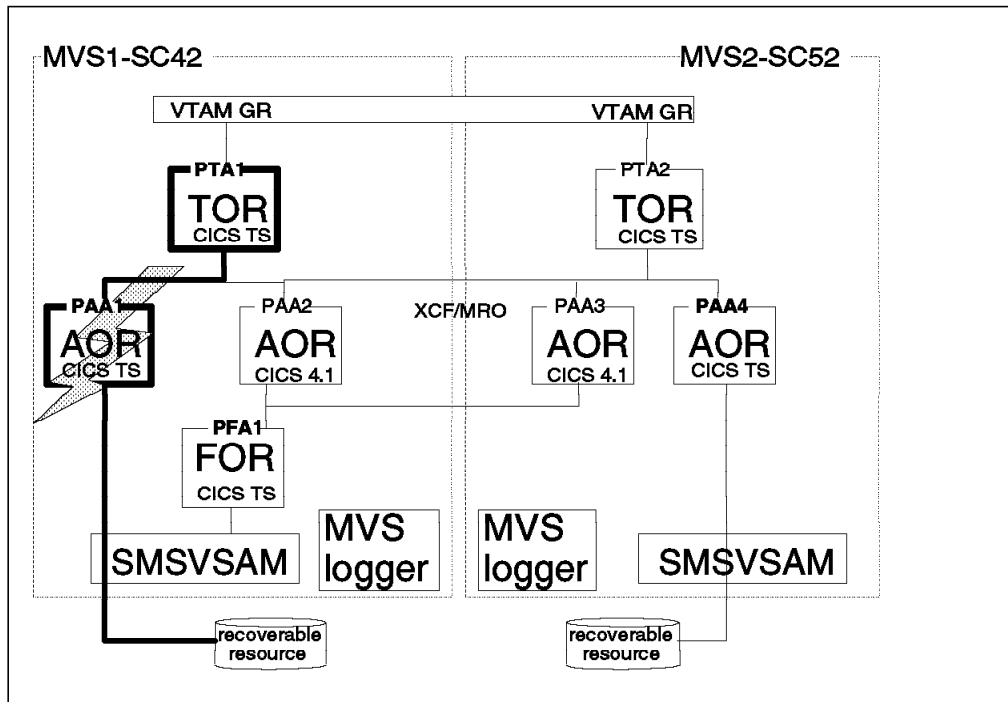


Figure 38. AOR Failure

We used the access method services SHCDS LISTSUBSYS(SCSCPAA1) subcommand to check whether the PAA1 region whose VTAM application identifier is SCSCPAA1 holds any locks.

Figure 39 shows the job we used to run this command.

```
//SHCDS JOB (999,POK),'CICS510',CLASS=A,MSGCLASS=T,
//          NOTIFY=&SYSUID
//          EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
SHCDS LISTSUBSYS(SCSCPAA1)
/*
```

Figure 39. SHCDS LISTSUBSYS Job

Figure 40 on page 103 shows the output of the command.

```

IDCAMS  SYSTEM SERVICES

SHCDS LISTSUBSYS(SCSCPAA1)
----- LISTING FROM SHCDS ----- IDCSH03
-----
SUBSYSTEM NAME  STATUS          RECOVERY      LOCKS      LOCKS      LOCKS
-----          -----          -NEEDED-      HELD       WAITING    RETAINED
SCSCPAA1        ONLINE--FAILED YES            0           0           6

DATA SETS IN LOST LOCKS-----          0
DATA SETS IN NON-RLS UPDATE STATE--      0
TRANSACTION COUNT-----                2
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
IDC0002I IDCAMS PROCESSING COMPLETE.  MAXIMUM CONDITION CODE WAS 0

```

Figure 40. SHCDS LISTSUBSYS Output for AOR Failure Scenario

The subcommand LISTSUBSYS(SCSCPAA1) shows:

- Sharing protocol and current status of the SCSCPAA1 subsystem. In our case it is online (because this CICS is an online commit protocol application, and not a batch job) and failed (because this CICS is not currently active).
- If recovery is required for the subsystem: YES, because it had in-flight tasks locking recoverable resources when it failed.
- Number of:
 - Locks held: none.
 - Locks waiting: none.
 - Locks retained: the SCSCPAA1 subsystem has six retained locks.
 - Data sets shared by the application in lost locks state: none.
 - Data sets in NON-RLS UPDATE PERMITTED state: none.
 - Current transactions: SCSCPAA1 subsystem had two transactions in-flight when it abended.

To see which data sets have these retained locks, we again use the access method services SHCDS LISTSUBSYSDS(SCSCPAA1) subcommand as shown in Figure 39 on page 102.

Figure 41 on page 104 shows the result of running this job.

```

SHCDS LISTSUBSYS(SCSCPAA1)
----- LISTING FROM SHCDS ----- IDC5H04
-----
SUBSYSTEM NAME----- SCSCPAA1          SUBSYSTEM STATUS-----ONLINE--FAILED

DATA SET NAME /      RETAINED  LOST   LOCKS   NON-RLS   PERMIT
CACHE STRUCTURE     LOCKS    LOCKS  BOUND  RECOVERY  UPDATE   FIRST TIME
-----            -----  -----  -----  -----  -----  -----
CICSDSW.VSAMU.ACCUNTDB
CACHECIC              NO      NO     NO     NO        NO        NO
CICSDSW.VSAMU.COMPOSDB
CICS_CACHE            NO      NO     NO     NO        NO        NO
CICSDSW.VSAMU.ITEMMAST
CICS_CACHE            NO      NO     NO     NO        NO        NO
CICSDSW.VSAMU.LABOPSDB
CACHECICS             NO      NO     NO     NO        NO        NO
CICSDSW.VSAMU.PRODCONT
CACHECICS             NO      NO     NO     NO        NO        NO
CICSDSW.VSAMU.TABLEDB
CICS_CACHE            NO      NO     NO     NO        NO        NO
CICSDSW.VSAMV.ACCUNTDB
CACHECIC              NO      NO     NO     NO        NO        NO
CICSDSW.VSAMV.COMPOSDB
CICS_CACHE            NO      NO     NO     NO        NO        NO
CICSDSW.VSAMV.ITEMMAST
CACHECIC              NO      NO     NO     NO        NO        NO
CICSDSW.VSAMV.LABOPSDB
CACHECIC              NO      NO     NO     NO        NO        NO
CICSDSW.VSAMV.PRODCONT
CICS_CACHE            NO      NO     NO     NO        NO        NO
CICSDSW.VSAMV.TABLEDB
CICS_CACHE            NO      NO     NO     NO        NO        NO
CICSDSW.VSAMV.VENDOR
CACHECICS           YES    NO    NO    NO      NO    NO
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
IDC0002I IDCAMS PROCESSING COMPLETE.  MAXIMUM CONDITION CODE WAS 0

```

Figure 41. SHCDS LISTSUBSYS(SCSCPAA1) Output for AOR Failure Scenario

The subcommand LISTSUBSYS(SCSCPAA1) shows:

- Sharing protocol and current status of the SCSCPAA1 subsystem. In our case it is online and failed.
- The SCSCPAA1 subsystem is sharing 13 data sets and owns retained locks on one of these data sets (CICSDSW.VSAMV.VENDOR).
- None of the data sets:
 - Has locks that are not bound to the data set
 - Has forward recovery set in its catalog entries
 - Is in NON-RLS UPDATE PERMITTED state

With the information of the previous two jobs we know that two transactions were in-flight when CICS abended and these transactions had six active locks,

which became retained locks when CICS abended, on the CICSDSW.VSAMV.VENDOR data set.

To see more information about the data set with retained locks, we use the SHCDS LISTDS(CICSDSW.VSAMV.VENDOR) subcommand of IDCAMS, as shown in Figure 42.

```
//SHCDS JOB (999,POK),'CICS510',CLASS=A,MSGCLASS=T,
//          NOTIFY=&SYSUID
//          EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
SHCDS LISTDS(CICSDSW.VSAMV.VENDOR)
/*
```

Figure 42. SHCDS LISTDS Job

Figure 43 shows the result of running the SHCDS LISTDS subcommand.

```
SHCDS LISTDS(CICSDSW.VSAMV.VENDOR)
----- LISTING FROM SHCDS ----- IDC5H02
-----
DATA SET NAME----CICSDSW.VSAMV.VENDOR
CACHE STRUCTURE----CACHECICS
RETAINED LOCKS-----YES    NON-RLS UPDATE PERMITTED-----NO
LOST LOCKS-----NO        PERMIT FIRST TIME-----NO
LOCKS NOT BOUND-----NO    FORWARD RECOVERY REQUIRED-----NO
RECOVERABLE-----YES

                SHARING SUBSYSTEM STATUS
SUBSYSTEM      SUBSYSTEM      RETAINED   LOST       NON-RLS UPDATE
NAME           STATUS           LOCKS      LOCKS      PERMITTED
-----
SCSCPAA1      ONLINE--FAILED   YES        NO         NO
SCSCPFA1      ONLINE--ACTIVE   NO         NO         NO
IDC0001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0

IDC0002I IDCAMS PROCESSING COMPLETE.  MAXIMUM CONDITION CODE WAS 0
```

Figure 43. SHCDS LISTDS Output for AOR Failure Scenario

The LISTDS(CICSDSW.VSAMV.VENDOR) subcommand shows:

- Assigned coupling facility structure. CACHE STRUCTURE: CACHECICS in our case.
- If the subsystem sharing the data set owns:
 - Retained locks: YES in our case.
 - Lost locks: NO.
- If locks are not bound to the data set: NO.
- Whether the sphere accessed in RLS mode is recoverable or nonrecoverable. RECOVERABLE: YES in our case.

- Non-RLS update permitted status: NO.
- Status of RLS usage for a data set since setting the non-RLS update permitted state: NO.
- Whether forward recovery is set in the catalog entry: NO.
- A list of the subsystems sharing this data set and their status relative to the data set. In our case another active CICS (SCSCPFA1) is using this data set, but it does not have any retained locks for it.

We restart the CICS region with START=AUTO, and CICS actually does an emergency restart and recovers automatically all resources. CICS issues messages related to the recovery process, as shown in Figure 44.

```

DFHRM0202 07/24/96 20:03:42 SCSCPAA1 2 inflight UOWs were reconstructed.
DFHFC6028 07/24/96 20:03:42 SCSCPAA1 File Control RLS quiesce system
                                     transaction CFQS has started.
DFHFC6028 07/24/96 20:03:42 SCSCPAA1 File Control RLS quiesce system
                                     transaction CFQR has started.

```

Figure 44. Emergency Restart Messages

Message DFHRM0202 shows the number of units of work recovered by CICS (two in our case).

If we were to restart CICS with START INITIAL or COLD instead of AUTO, CICS would not back out the changes made by the two transactions, with consequent loss of data integrity.

5.1.4.3 Shutdown Procedures

These examples show the messages that appear in a normal shutdown of CICS with the CESD transaction and in an immediate shutdown CICS, with and without the CESD transaction. In the three cases the only user transaction that is working with recoverable resources is the CECI transaction and, it is in a write operation on the EMPACTDB file.

Below we present the messages that appear when we shut down CICS with the CEMT PERFORM SHUTDOWN command. The SDTRAN system initialization parameter is coded with CESD transaction.

Figure 45 on page 107 shows the messages that appear in the MVS system log.

| | | | |
|-------------|----------|-------------|---|
| 12:36:35.13 | STC09574 | +DFHTM1715 | SCSCPAA1 CICS for MVS/ESA is quiesced by userid CICSUSER in transaction CEMT at netname SC02006D. |
| 12:36:35.13 | STC09574 | +DFHDM0102I | SCSCPAA1 CICS is quiescing. |
| 12:36:35.31 | STC09574 | +DFHTM1781 | SCSCPAA1 CICS shutdown cannot complete because some non-system user tasks have not terminated. |
| 12:36:35.32 | STC09574 | +DFHCESD | SCSCPAA1 SHUTDOWN ASSIST TRANSACTION CESD STARTING. SHUTDOWN IS NORMAL. |
| 12:38:35.36 | STC09574 | +DFHCESD | SCSCPAA1 THERE ARE NOW 0002 TASKS STILL IN THE SYSTEM. |
| 12:38:52.16 | STC09574 | +DFHDU0303I | SCSCPAA1 Transaction Dump Data set DFHDMPB closed. |
| 12:38:52.17 | STC09574 | +DFHCESD | SCSCPAA1 PURGING TRANID CECI, TERMID 006C, USERID CICSUSER, TASKNO 000037 |
| 12:38:54.23 | STC09574 | +DFHCESD | SCSCPAA1 THERE ARE NOW 0001 TASKS STILL IN THE SYSTEM. |
| 12:38:56.85 | STC09574 | +DFHTM1782I | SCSCPAA1 All non-system tasks have been successfully terminated. |
| 12:38:57.90 | STC09574 | +DFHZC2305I | SCSCPAA1 Termination of VTAM sessions beginning. |
| 12:38:58.70 | STC09574 | +DFHZC2316 | SCSCPAA1 VTAM ACB is closed. |
| 12:38:59.73 | STC09574 | +DFHTM1711I | SCSCPAA1 About to link to phase 2 PLT programs. |
| 12:38:59.85 | STC09574 | +DFHTM1712I | SCSCPAA1 Control returned from phase 2 PLT programs. |
| 12:39:01.27 | STC09574 | +DFHFC0563 | SCSCPAA1 The RLS control ACB has been successfully unregistered by CICS. |
| 12:39:02.55 | STC09574 | +DFHRM0204 | SCSCPAA1 There are no indoubt, commit-failed or backout-failed UOWs. |
| 12:39:03.04 | STC09574 | +DFHRM0130 | SCSCPAA1 Recovery manager has successfully quiesced. |
| 12:39:05.75 | STC09574 | +DFHKE1799 | SCSCPAA1 TERMINATION OF CICS FOR MVS/ESA IS COMPLETE. |

Figure 45. CEMT PERFORM SHUTDOWN Messages: MVS System Log

Figure 46 on page 108 shows the messages that appear in the CICS MSGUSR log.

```

DFHZC5966 I 07/26/96 12:36:26 SCSCPAA1 INSTALL started for TERMINAL
      ( 006D) (Module name: DFHBSTZ).
DFHZC6935 I 07/26/96 12:36:26 SCSCPAA1 Autoinstall for terminal 006D with
      NETNAME SC02006D using model or template
      DFHLU2M2 successful.
DFHZC3461 I 07/26/96 12:36:26 SCSCPAA1 006D CSNE Node SC02006D session
      started. ((2) Module name: DFHZOPX)
DFHPG0210 07/26/96 12:36:35 SCSCPAA1 006D CICSUSER CEMT PPT entry for
      DFHPLTC$ has been system autoinstalled.
DFHAC2236 07/26/96 12:38:52 SCSCPAA1 Transaction CECI abend ATCH in
      program DFHECID term 006C. Updates to local
      recoverable resources will be backed out.
DFHZC3441 I 07/26/96 12:38:57 SCSCPAA1 Orderly termination of VTAM
      sessions requested.
      ((1) Module name: DFHZSHU)
DFHZC3462 I 07/26/96 12:38:58 SCSCPAA1 006C CSNE Node SC02006C session
      terminated. ((2) Module name: DFHZCLS)
DFHZC3462 I 07/26/96 12:38:58 SCSCPAA1 006D CSNE Node SC02006D session
      terminated. ((2) Module name: DFHZCLS)
DFHFC0201 07/26/96 12:39:01 SCSCPAA1 RLS file EMPACTDB has been
      deallocated. Module DFHFCRO.
DFHRM0205 07/26/96 12:39:02 SCSCPAA1 An activity keypoint has been
      successfully taken.
DFHLG0743 07/26/96 12:39:02 SCSCPAA1 Tail of log stream SCSCPAA1.DFHLOG
      deleted at block id X'00000000012E9E5E'.

```

Figure 46. CEMT PERFORM SHUTDOWN Messages: CICS MSGUSR Log

After a user on terminal SC02006D issues CEMT P SHUT command, CICS starts the CESD transaction. This transaction waits 2 minutes, begins the test, and sends a message indicating that there are still two tasks in the system. After eight samples the CESD transaction proceeds to purge tasks (transaction CECI in this case). The abend code of these tasks is ATCH.

In the next test we shut down CICS by issuing a CEMT PERFORM SHUTDOWN IMMEDIATE command. Figure 47 on page 109 shows the messages that appear in the MVS system log.


```

13:46:17.80 STC09608 +DFHTM1703 SCSCPAA1 401
                    401 CICS for MVS/ESA is being terminated by userid
                    401 CICSUSER in transaction CEMT at netname SC02006B.
13:46:17.81 STC09608 +DFHTM1781 SCSCPAA1 CICS shutdown cannot complete
                    because some non-system user tasks
                    have not terminated
13:46:17.82 STC09608 +DFHCESD SCSCPAA1 SHUTDOWN ASSIST TRANSACTION
                    CESD STARTING. SHUTDOWN IS IMMEDIATE.
13:46:19.90 STC09608 +DFHCESD SCSCPAA1 THERE ARE NOW 0005 TASKS STILL
                    IN THE SYSTEM.
13:46:28.32 STC09608 +DFHDU0303I SCSCPAA1 Transaction Dump Data set
                    DFHDMPB closed.
13:46:28.32 STC09608 +DFHCESD SCSCPAA1 PURGING TRANID CONL,
                    TERMID ????, USERID CICSUSER,
                    TASKNO 000024
13:46:28.33 STC09608 +DFHCESD SCSCPAA1 PURGING TRANID COIO,
                    TERMID ????, USERID CICSUSER,
                    TASKNO 000029
13:46:28.33 STC09608 +DFHCESD SCSCPAA1 PURGING TRANID COIE,
                    TERMID ????, USERID CICSUSER,
                    TASKNO 000030
13:46:28.33 STC09608 +DFHCESD SCSCPAA1 PURGING TRANID CECI,
                    TERMID 006D, USERID CICSUSER,
                    TASKNO 000035
13:46:30.38 STC09608 +DFHCESD SCSCPAA1 THERE ARE NOW 0004 TASKS
                    STILL IN THE SYSTEM.
13:46:39.59 STC09608 +DFHZC2316 SCSCPAA1 VTAM ACB is closed
13:46:47.17 STC09608 +DFHCESD SCSCPAA1 ACTIVE: TRANID CONL,
                    TERMID ????, USERID CICSUSER,
                    TASKNO 000024
13:46:47.17 STC09608 +DFHCESD SCSCPAA1 ACTIVE: TRANID COIO,
                    TERMID ????, USERID CICSUSER,
                    TASKNO 000029
13:46:47.18 STC09608 +DFHCESD SCSCPAA1 ACTIVE: TRANID COIE,
                    TERMID ????, USERID CICSUSER,
                    TASKNO 000030
13:46:47.20 STC09608 +DFHTM1703 SCSCPAA1 CICS for MVS/ESA is being
                    terminated by userid CICSUSER in
                    transaction CESD.
13:46:48.45 STC09608 +DFHKE1799 SCSCPAA1 TERMINATION OF CICS FOR
                    MVS/ESA IS COMPLETE.

```

Figure 47. CEMT PERFORM SHUTDOWN I Messages: MVS System Log

Figure 48 on page 110 shows the messages that appear in the CICS MSGUSR log.

```

DFHZC5966 I 07/26/96 13:45:08 SCSCPAA1 INSTALL started for TERMINAL
( 006B) (Module name: DFHBSTZ).
DFHZC6935 I 07/26/96 13:45:08 SCSCPAA1 Autoinstall for terminal 006B with
NETNAME SC02006B using model or template
DFHLU2M2 successful.
DFHZC3461 I 07/26/96 13:45:08 SCSCPAA1 006B CSNE Node SC02006B session
started. ((2) Module name: DFHZOPX)
DFHFC0200 07/26/96 13:46:00 SCSCPAA1 RLS file EMPACTDB has been allocated
to data set CICSDSW.VSAMU.EMPACTDB. Module
DFHFCRO.
DFHAC2236 07/26/96 13:46:28 SCSCPAA1 Transaction CECI abend ATCH in
program DFHECID term 006D. Updates to local
recoverable resources will be backed out. .
DFHZC3443 I 07/26/96 13:46:39 SCSCPAA1 VTAM has been cancelled or the
ACB has been forceclosed. VTAM sessions
terminated. ((5) Module name: DFHZSHU)
DFHZC3437 I 07/26/96 13:46:39 SCSCPAA1 006B CSNE Node SC02006B action
taken: CLSDST ABTASK ABSEND ABRECV
((1) Module name: DFHZNAC)
DFHZC3437 I 07/26/96 13:46:39 SCSCPAA1 006D CSNE Node SC02006D action
taken: CLSDST ABTASK ABSEND ABRECV
((1) Module name: DFHZNAC)
DFHZC3462 I 07/26/96 13:46:39 SCSCPAA1 006B CSNE Node SC02006B session
terminated. ((2) Module name: DFHZCLS)
DFHZC3462 I 07/26/96 13:46:39 SCSCPAA1 006D CSNE Node SC02006D session
terminated. ((2) Module name: DFHZCLS)

```

Figure 48. CEMT PERFORM SHUTDOWN I Messages: CICS MSGUSR Log

In this case a user on terminal SC02006B issues the CEMT P SHUT I command, then CICS starts the CESD transaction. This transaction does not wait 2 minutes. It begins the test and sends a message indicating that there are still five tasks in the system. After four samples the CESD transaction proceeds to purge tasks.

In the last test we shut down CICS by issuing a CEMT PERFORM SHUTDOWN IMMEDIATE NOSDTRAN command, that is, without the CESD transaction. In this case the messages shown in Figure 49 appear in the MVS system log.

```

19:45:04.75 STC09685 +DFHTM1703 SCSCPAA1 316
316 CICS for MVS/ESA is being terminated by userid
316 CICSUSER in transaction CEMT at netname SC02006B.
19:45:10.31 STC09685 +DFHDU0303I SCSCPAA1 Transaction Dump Data set
DFHDMPA closed.
19:45:10.32 STC09685 +DFHKE1799 SCSCPAA1 TERMINATION OF CICS FOR
MVS/ESA IS COMPLETE.

```

Figure 49. CEMT PERFORM SHUTDOWN I NOSDTRAN Messages: MVS System Log

In the three cases the only user transaction that is working with recoverable resources is CECI, and it is in a write operation on the EMPACTDB file. When we use the CESD transaction, it cancels the CECI transaction in normal as well as immediate shutdown, so there are no retained locks after CICS shutdown. When we do not use the CESD transaction (in the last test) and we issue an

immediate shutdown, there are retained locks after the shutdown of CICS because the CECI transaction is in-flight. We can see this because when we restart CICS in the last test, the messages shown in Figure 50 on page 111 appear in the CICS MSGUSR log.

```
DFHRM0202 07/26/96 19:46:15 SCSCPAA1 1 inflight UOWs were reconstructed.
DFHFC6028 07/26/96 19:46:15 SCSCPAA1 File Control RLS quiesce system
                                     transaction CFQS has started.
DFHFC6028 07/26/96 19:46:15 SCSCPAA1 File Control RLS quiesce system
                                     transaction CFQR has started.
```

Figure 50. Emergency Restart Messages: Use of CESD Transaction

Message DFHRM0202 indicates that a unit of work was backed out.

As you can see, the best way to shutdown CICS is with normal shutdown, using the CESD transaction. The CESD transaction allows as many tasks as possible to commit or back out cleanly but it purges long-running tasks to avoid locking resources (retained locks) after the shutdown of CICS.

5.1.5 Documentation on Abnormal Termination

For more information about VTAM persistent session recovery, see the *CICS Recovery and Restart Guide*, *CICS Resource Definition Guide*, and *CICS System Definition Guide*.

For more information about ARM, see the *CICS Recovery and Restart Guide*. For more information about CICS COLD and INITIAL start, see the *CICS Recovery and Restart Guide* and the *CICS System Definition Guide*. For more information about the use of the DFHRMUTIL utility, see the *CICS Operations and Utility Guide*. For more information about the use of the CESD transaction and the DFHCESD program, see the *CICS Operations and Utility Guide*. For more information about the SHCDS command, see *DFSMS/MVS 1.3 Access Method Services for ICF*.

5.2 Resynchronization Failure

When communication between two CICSs is restarted after a failure, each CICS verifies the lognames it exchanged with the other CICS. An exchange lognames (XLN) failure during the process of resynchronization should never occur in normal operation. If there is a failure, the recovery protocol has been corrupted.

The reason for the resynchronization failure could be:

- A COLD/WARM log mismatch: because one of the CICSs was restarted by an INITIAL start.
- A lognames mismatch: because the logname data is corrupted.

5.2.1 Impact

When resynchronization failure occurs, retained locks need to be resolved manually.

If the CICSs are connected using ISC, the ISC link is unavailable until the SET CONNECTION NOTPENDING command is issued.

If the CICSs are connected using MRO, new work can begin between the CICS using the MRO links, whatever the condition of the existing work.

5.2.2 Prevention

The best way to avoid resynchronization failure is by starting CICS with START=AUTO. If you start CICS with START=COLD, you do not have resynchronization problems, but CICS does not recover any local resources, and this is not desirable when you have distributed UOWs that modify records in various interconnected CICSs.

If you are not interested in the recovery of local resources, you could set the XLNACTION option in the CONNECTION definition to FORCE. The XLNACTION option specifies the action to be taken when a new logname is received from the partner system. The default value for this option is KEEP, so recovery information is kept, and no action is taken for in-doubt UOWs (which remain shunted).

If you specify XLNACTION(FORCE), the predefined decisions for in-doubt UOWs (as defined in the ACTION option of the TRANSACTION definition) are implemented, before any new work with the new logname is started. CICS also deletes any information retained for possible resolution of UOWs that were in-doubt at the partner system.

Setting XLNACTION(FORCE) allows no investigation of shunted UOWs after an exchange lognames failure and therefore represents a risk to data integrity.

When you use the XLNACTION(KEEP) option, you can also use the WAIT, WAITTIME, and ACTION in-doubt options in the definition of the transactions.

With WAIT(YES), the in-doubt UOW is to wait (it remains shunted) the time specified in the WAITTIME option. When this time expires, CICS back outs or commits (it depends on the ACTION option) the changes made by the transaction.

If you do not specify WAITTIME (the default value is zero), the transaction will wait indefinitely.

On MRO connections to pre-CICS TS, and on LU6.1 connections to all levels of CICS, lognames are not used, and the XLNACTION option is ignored.

5.2.3 Recovery

The recovery actions are not automatic. You must issue the CEMT INQUIRE CONNECTION command to investigate which connections are INSERVICE and ACQUIRED but in PENDSTATUS(PENDING), which means that resynchronization work is outstanding for the connection but cannot be completed because of the exchange lognames failure.

Then you must issue CEMT INQUIRE UOWLINK(XXXXXX), where XXXXXX is the NETNAME of the system in pending status. With CEMT I UOWLINK(XXXXXX), you see information about UOWs that require resynchronization with system XXXXXX. This command shows the role of the XXXXXX system (ROLE option; it should be COORDINATOR) and the resynchronization status of the connection (RESYNCSTATUS option). If RESYNCSTATUS is COLDSTART, system XXXXXX has been started with a new logname (with the START=COLD parameter).

To see more information about the UOW you must issue the CEMT INQUIRE UOW UOWLINK(XXXXXXXX) command. The output of this command shows whether syncpoint processing of the UOW has been deferred (WAITSTATE option; it should be SHUNTED) and the type of resource that caused this condition (WAITCAUSE option; it should be CONNECTION, meaning a failure of a session to the coordinator).

Finally you can find the resources locked by the transactions by using the CEMT INQUIRE UOWDSNFAIL command for files managed by SMSVSAM and the CEMT INQUIRE UOWENQ command for other resources.

5.2.4 Examples

In this section we test the recovery actions of CICS TS after failures in other CICS TSs or CICS/ESA 4.1s, with UOWs distributed between them. We focus on the cases where the connection goes to a pending state due to a resynchronization failure.

5.2.4.1 Two CICS TSs Connected with XCF/MRO Links

The example is of a failure in the AOR named PAA4 in an environment of various CICSs interconnected as shown in Figure 51.

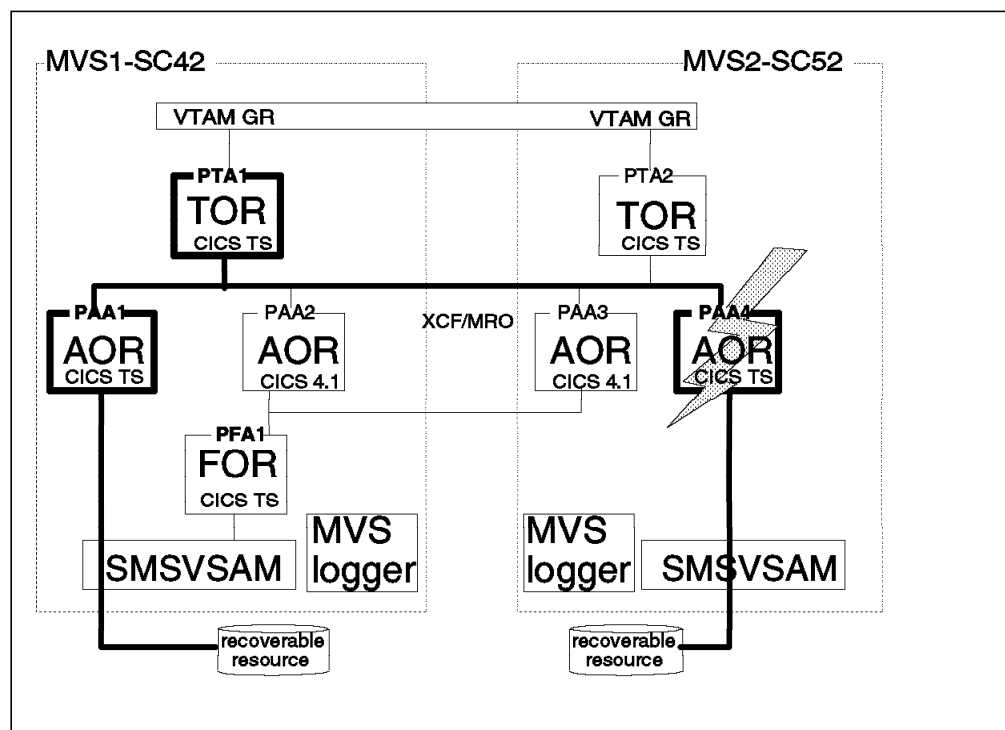


Figure 51. Failure in a CICS TS Region (PAA4) with a UOW Distributed with Another CICS TS Region (PAA1)

To create a distributed UOW, we create a file named EMPACTDB, which is local for region PAA1, and another file named DEPSUMDB, which is local for region PAA4 and remote for region PAA1.

We use the new CICS TS in-doubt testing tool, the CIND transaction, to cause a failure in syncpoint processing.

The CIND transaction changes the UOW to a distributed UOW by adding itself to the UOW as the syncpoint initiator and coordinator. It simulates a link to a remote CICS system that has assumed the syncpoint coordinator role and has sent a syncpoint PREPARE request to CICS. This request forces CICS to assume the role of a syncpoint subordinate. As a syncpoint subordinate, during the two-phase commit syncpoint protocol, CICS itself becomes in-doubt as to the outcome of the UOW. While CICS is in-doubt, CIND simulates a link failure to the syncpoint coordinator.

In our case we use CIND to shunt a UOW that is distributed across two CICSs (PAA1 and PAA4). CIND must be activated on the coordinator CICS region, so that it can assume the role of syncpoint initiator and coordinator before any other CICS regions try to do so.

In our test we start the CECI transaction on the PAA1 region. This transaction writes on the EMPACTDB file and on the DEPSUMDB file, which is local on the PAA4 region.

The CECI transaction is the UOW that initiates the syncpoint activity, and it is called the *initiator*. The mirror transaction (started automatically on the PAA4 region at any request to the DEPSUMDB file) receives syncpoint requests from CECI, and it is called an *agent*. Between the commit flow and the committed flow, the initiator is in-doubt, but the agent is not. The local UOW that is not in-doubt is called the *coordinator*, because it coordinates the commitment of resources on both systems. In our test, the CECI transaction on the PAA1 region is the subordinate UOW, and the mirror transaction running on the PAA4 region is the coordinator, so we start the CIND transaction on the PAA4 region with the CIND ON command, and the message shown in Figure 52 appears on the screen.

```
DFHIN1001 07/29/96 19:15:30 SCSCPAA4 006D CICSUSER The indoubt tool is
now active for DFHTCIND tranclass transactions.
```

Figure 52. CIND ON Activation Message

When active, CIND forces all transactions defined to be in a new transaction class, DFHTCIND, to fail in-doubt when they reach syncpoint. In our test we put the mirror transactions (CSMI, CSM1, CSM2, CSM3, CSM5) of the PAA4 region in transaction group DFHTCIND (by defining the TRANCLASS(DFHTCIND) option in the transaction definition).

The CECI transaction on the PAA1 region and all the mirror transactions on the PAA4 region have the following INDOUBT options:

Action : Backout
WAIT : Yes
WAITTime : 00 , 00 , 00

where WAIT(YES) specifies that when a failure occurs in the coordinate system, the in-doubt UOW must wait, and it waits indefinitely because WAITTIME is zero.

We start the CECI transaction on the PAA1 region and perform write operations on the DEPSUMDB and EMPACTDB files. Because the CECI is conversational, both writes are in the same UOW. We also write a record in the DE22 transient data (TD) queue that is local to the PAA1 region, and another record in the DE23 TD queue that is local to the PAA4 region (it is defined as remote in the PAA1 system). The TD queues were defined with RECOVSTATUS(LOGICAL).

When the function shipping work to the PAA4 region starts the mirror transaction (CSMI), the message shown in Figure 53 appears in the log of the PAA4 region, indicating that CIND simulates a link on transaction CSMI.

```
DFHIN1009 07/31/96 13:27:07 SCSCPAA4 The indoubt tool has added
      coordinator link DFHINDSP to UOW X'AD3FA8CF46675805' for
      transaction CSMI task number 0071.
```

Figure 53. Messages When the Mirror Transaction CSMI Starts Using CIND Tool

We end CECI, and the message shown in Figure 54 appears on the terminal from which the CECI transaction was started in the PAA1 region.

```
DFHAC2201 13:29:08 SCSCPAA1 Transaction CECI has lost contact with its
      coordinator system during syncpoint processing and has abended with code
      ASP1. The unit of work is shunted until contact is restored.
```

Figure 54. Simulated Link Failure Message

CIND simulates a link to a remote region from the PAA4 region. CIND also simulates a link failure, which also results in the simulated link failure message shown in Figure 54.

We also see the messages shown in Figure 55 on page 116 in the log of the PAA1 region.

```

DFHAC2231 07/31/96 13:29:08 SCSCPAA1 Transaction CECI running program
          DFHECIP term 006B has lost contact with its coordinator
          system during syncpoint and has abended with code ASP1.
          The unit of work is shunted until contact is restored.
DFHRM0106 07/31/96 13:29:08 SCSCPAA1 Intersystem session failure.
          Resource updates will not be committed or backed out
          until session recovery. Failure date 07/31/96 failure
          time 13:29:08 remote system SCSCPAA4 transaction CECI
          task number 00011982 terminal 006B user CICSUSER network
          UOW X'1910'/USIBMSC.SC02006B/X'3FA7EB4F57920001'
          local UOW X'AD3FA7EB4F579201'.

```

Figure 55. Messages on PAA1 Region at CECI Transaction Termination

Figure 56 shows the messages in the log of the PAA4 region.

```

DFHAC2231 07/31/96 13:29:08 SCSCPAA4 Transaction CSMI running program
          DFHMIRS term S11 has lost contact with its
          coordinator system during syncpoint and has abended with
          code ASP1. The unit of work is shunted until contact is
          restored.
DFHRM0106 07/31/96 13:29:08 SCSCPAA4 Intersystem session failure.
          Resource updates will not be committed or backed out
          until session recovery. Failure date 07/31/96 failure time
          13:29:08 remote system DFHINDSP transaction CSMI
          task number 00000071 terminal S11 user CICSUSER network
          UOW X'1910'/USIBMSC.SC02006B/X'3FA7EB4F57920001'
          local UOW X'AD3FA8CF46675805'.
DFHIN1010 07/31/96 13:29:08 SCSCPAA4 Coordinator DFHINDSP is not
          available. The indoubt tool has caused RM domain to
          shunt UOW X'AD3FA8CF46675805' for transaction CSMI task
          number 0071.

```

Figure 56. Messages on PAA4 Region at CECI Transaction Termination

As you can see, the NETWORK UOW is the same in both CICSs, which is useful when you want to match the UOWs of different CICSs with a lot of activity.

We use the CEMT I UOWDSNFAIL command to display the data sets that have been locked by shunted UOWs in the PAA1 region, as shown in Figure 57.

```

I UOWDSN
STATUS: RESULTS
Dsn(CICSDSW.VSAMU.EMPACTDB                ) Con
Uow(AD3FA7EB4F579201) Sys(PAA4) Net(SCSCPAA4) R1s

```

Figure 57. CEMT INQUIRE UOWDSN: Resources Locked by UOW AD3FA7EB4F579201

To see more information, we position the cursor alongside *Dsn* and press Enter. The panel shown in Figure 58 on page 117 is displayed.


```

I UOWDSN
RESULT
Uowdsnfail
Dsn(CICSDSW.VSAMU.EMPACTDB)
Cause(Connection)
Reason()
Uow(AD3FA7EB4F579201)
Sysid(PAA4)
Netname(SCSCPAA4)
Rlsaccess(Rls)

```

Figure 58. CEMT INQUIRE UOWDSN: Detailed Information for Resources Locked by UOW AD3FA7EB4F579201

Figure 59 shows the result of the same command on the PAA4 region.

```

I UOWDSN
STATUS: RESULTS
Dsn(CICSDSW.VSAMU.DEPSUMDB) ) Con
Uow(AD3FA8CF46675805) Net(DFHINDSP) Rls

```

Figure 59. CEMT INQUIRE UOWDSN of Resources Locked by UOW AD3FA8CF46675805

To see more information, we position the cursor alongside *Dsn* and press Enter. The panel shown in Figure 60 is displayed.

```

I UOWDSN
RESULT
Uowdsnfail
Dsn(CICSDSW.VSAMU.DEPSUMDB)
Cause(Connection)
Reason()
Uow(AD3FA8CF46675805)
Sysid()
Netname(DFHINDSP)
Rlsaccess(Rls)

```

Figure 60. CEMT INQUIRE UOWDSN: Detailed Information for Resources Locked by UOW AD3FA8CF46675805

You can see that the cause of the failures for both data sets is an intersystem connection error. The name of the system to which connectivity was lost is SYSID(PAA4) for the PAA1 region and NETNAME(DFHINDSP) (the connection simulated by the CIND transaction) for the PAA4 region. The command also indicates the UOWs that have failed.

We use the CEMT I UOWENQ command to display the data sets open in non-RLS mode and other resources, TD queues in our case, that have been locked by shunted UOWs in the PAA1 region, as shown in Figure 61 on page 118.

```

I UOWENQ
STATUS: RESULTS
Uow(AD3FA7EB4F579201) Tra(CECI) Tas(0011982) Ret Tdq Own
Res(DE22 ) R1e(004) Enq(00000000)

```

Figure 61. CEMT INQUIRE UOWENQ: Resources Locked by UOW AD3FA7EB4F579201

To see more information, we position the cursor alongside *Uow* and press Enter. The panel shown in Figure 62 is displayed.

```

I UOWENQ
RESULT
Uowenq
Uow(AD3FA7EB4F579201)
Transid(CECI)
Taskid(0011982)
State(Retained)
Type(Tdq)
Relation(Owner)
Resource(DE22)
R1en(004)
Enqfails(00000000)
Netuowid(..USIBMSC.SC02006B.x.|.k...)
Qualifier(TOQ)
Q1en(005)

```

Figure 62. CEMT INQUIRE UOWENQ: Detailed Information for Resources Locked by UOW AD3FA7EB4F579201

Figure 63 shows the result of the same command on the PAA4 region.

```

I UOWENQ
STATUS: RESULTS
Uow(AD3FA8CF46675805) Tra(CSMI) Tas(0000071) Ret Tdq Own
Res(DE23 ) R1e(004) Enq(00000000)

```

Figure 63. CEMT INQUIRE UOWENQ: Resources Locked by UOW AD3FA8CF46675805

To see more information, we position the cursor alongside *Uow* and press Enter. The panel shown in Figure 64 on page 119 is displayed.

```

I UOWENQ
RESULT
  Uowenq
  Uow(AD3FA8CF46675805)
  Transid(CSMI)
  Taskid(0000071)
  State(Retained)
  Type(Tdq)
  Relation(Owner)
  Resource(DE23)
  Rlen(004)
  Enqfails(00000000)
  Netuowid(..USIBMSC.SC02006B.x.|.k...)
  Qualifier(TOQ)
  Qlen(005)

```

Figure 64. CEMT INQUIRE UOWENQ: Detailed Information for Resources Locked by UOW AD3FA8CF46675805

In this case the command does not indicate the reason for the failure, but it does indicate the state in which the enqueue is held. In our case this state is RETAINED, that is, the owning UOW has been shunted.

To see these shunted UOWs in both systems we issue the CEMT I UOW command. Figure 65 shows the result of issuing the command on the PAA1 region.

```

I UOW(*9201)
STATUS: RESULTS - OVERTYPE TO MODIFY
  Uow(AD3FA7EB4F579201) Ind Shu Tra(CECI) Tas(0011982)
    Age(00000200) Ter(006B) Netn(SC02006B) Use(CICSUSER) Con Lin(SCSCPAA4)

```

Figure 65. CEMT INQUIRE UOW(*9201)

To see more information, we position the cursor alongside *Uow* and press Enter. The panel shown in Figure 66 on page 120 is displayed.

```

I UOW(*9201)
RESULT - OVERTYPE TO MODIFY
Uow(AD3FA7EB4F579201)
Uowstate( Indoubt )
Waitstate(Shunted)
Transid(CECI)
Taskid(0011982)
Age(00000225)
Termid(006B)
Netname(SC02006B)
Userid(CICSUSER)
Waitcause(Connection)
Link(SCSCPAA4)
Sysid(PAA4)
Netuowid(..USIBMSC.SC02006B.x.|.k...)

```

Figure 66. CEMT INQUIRE UOW(*9201): for UOW AD3FA7EB4F579201

Figure 67 shows the result of issuing the command on the PAA4 region.

```

I UOW(*5805)
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD3FA8CF46675805) Ind Shu Tra(CSMI) Tas(0000071)
Age(00000563) Ter(S11 ) Netn(SCSCPAA1) Use(CICSUSER) Con Lin(DFHINDSP)

```

Figure 67. CEMT INQUIRE UOW(*5805)

To see more information, we position the cursor alongside *Uow* and press Enter. The panel shown in Figure 68 is displayed.

```

I UOW(*5805)
RESULT - OVERTYPE TO MODIFY
Uow(AD3FA8CF46675805)
Uowstate( Indoubt )
Waitstate(Shunted)
Transid(CSMI)
Taskid(0000071)
Age(00000589)
Termid(S11)
Netname(SCSCPAA1)
Userid(CICSUSER)
Waitcause(Connection)
Link(DFHINDSP)
Sysid()
Netuowid(..USIBMSC.SC02006B.x.|.k...)

```

Figure 68. CEMT INQUIRE UOW(*5805): for UOW AD3FA8CF46675805

The CEMT I UOW commands indicate the following:

- In both systems the UOW was shunted because of the failure of a session to the coordinator of the UOW during the in-doubt period. We see this information in WAITCAUSE(CONNECTION).

- On the PAA1 region this information is shown:
 - NETNAME(SC02006B): terminal used to start the CECI transaction on the PAA1 region
 - LINK(SCSCPAA4) and SYSID(PAA4): netname and sysid of the failed link
- On the PAA4 region this information is shown:
 - NETNAME(SCSCPAA1): network name of the remote region where the UOW was started (using an XCF/MRO session)
 - LINK(DFHINDSP): netname of the failed system (generated by the CIND transaction)

To see more information about the connections involved in the UOWs we issue the CEMT INQUIRE UOWLINK command. Figure 69 shows the result of issuing the CEMT I UOWLINK command on the PAA1 region.

```

I UOWLINK
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow1(01DA0003) Uow(AD3FA7EB4F579201) Con Lin(SCSCPAA4)
Coo Irc War Sys(PAA4) Net(..USIBMSC.SC02006B.x.|.k...)
  
```

Figure 69. CEMT INQUIRE UOWLINK: PAA1 Region

To see more information, we position the cursor alongside *Uow1* and press Enter. The panel shown in Figure 70 is displayed.

```

I UOWLINK
RESULT - OVERTYPE TO MODIFY
Uowlink(01DA0003)
Uow(AD3FA7EB4F579201)
Type(Connection)
Link(SCSCPAA4)
Action( )
Role(Coordinator)
Protocol(Irc)
Resyncstatus(Warmstart)
Sysid(PAA4)
Rmiqfy()
Netuowid(..USIBMSC.SC02006B.x.|.k...)
  
```

Figure 70. CEMT INQUIRE UOWLINK: Detailed Information about Connections Involved in UOWs

Figure 71 on page 122 shows the result of issuing the CEMT I UOWLINK command on the PAA4 region.

```

I UOWLINK
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow1(016D0011) Uow(AD3FA8CF46675805) Con Lin(SCSCPAA1)
      Sub Irc War Sys(PAA1)                      Net(..USIBMSC.SC02006B.x.|.k..)
Uow1(01940002) Uow(AD3FA8CF46675805) Con Lin(DFHINDSP)
      Coo                                          Net(..USIBMSC.SC02006B.x.|.k..)

```

Figure 71. CEMT INQUIRE UOWLINK: PAA4 Region

To see more information about the first link, we position the cursor alongside *Uow1(016D0011)* and press Enter. The panel shown in Figure 72 is displayed.

```

I UOWLINK
RESULT - OVERTYPE TO MODIFY
Uowlink(016D0011)
Uow(AD3FA8CF46675805)
Type(Connection)
Link(SCSCPAA1)
Action(          )
Role(Subordinate)
Protocol(Irc)
Resyncstatus(Warmstart)
Sysid(PAA1)
Rmiqfy()
Netuowid(..USIBMSC.SC02006B.x.|.k...)

```

Figure 72. CEMT INQUIRE UOWLINK: Detailed Information about *Uow1(016D0011)*

To see more information about the second link, we position the cursor alongside *Uow1(01940002)* and press Enter. The panel shown in Figure 73 is displayed.

```

I UOWLINK
RESULT - OVERTYPE TO MODIFY
Uowlink(01940002)
Uow(AD3FA8CF46675805)
Type(Connection)
Link(DFHINDSP)
Action(          )
Role(Coordinator)
Protocol()
Resyncstatus()
Sysid()
Rmiqfy()
Netuowid(..USIBMSC.SC02006B.x.|.k...)

```

Figure 73. CEMT INQUIRE UOWLINK: Detailed Information about *Uow1(01940002)*

The CEMT I UOWLINK commands indicate the following:

- The PAA1 region is connected to PAA4, using the IRC protocol (it is an XCF/MRO connection). The PAA4 region is the coordinator (we see this in

the ROLE option), and the connection is operating normally (we see this in RESYNCSTATUS(WARMSTART)).

- The PAA4 region has two connections:
 - One connection is to the PAA1 region, which has the role of subordinate, and it is operating normally.
 - The other connection is to remote system DFHINDSP (we see this in the LINK option). This is the link generated by the CIND transaction, which also simulates the failure.
- The NETUOWID is the same in both systems, indicating that this is a distributed UOW.

To verify the status of the connections, we use the CEMT I CONNECTION command. Figure 74 shows the result of issuing the CEMT I CONNECTION command on the PAA1 region.

```
I CONN
STATUS: RESULTS - OVERTYPE TO MODIFY
Con(PAA4) Net(SCSCPAA4)   Ins Acq Xcf           Rec
```

Figure 74. CEMT INQUIRE CONNECTION: Connections Installed on PAA1 Region

To see more information, we position the cursor alongside *Con* and press Enter. The panel shown in Figure 75 is displayed.

```
I CONN
RESULT - OVERTYPE TO MODIFY
Connection(PAA4)
Netname(SCSCPAA4)
Pendstatus( Notpending )
Servstatus( Inservice )
Connstatus( Acquired )
Accessmethod(Xcf)
Protocol()
Purgetype(           )
Xlnstatus()
Recovstatus( Recovdata )
Uowaction(           )
Grname()
Membername()
Affinity(           )
Remotesystem()
Rname()
Rnetname()
```

Figure 75. CEMT INQUIRE CONNECTION: Detailed Information about Connections Installed on PAA1 Region

Figure 76 on page 124 shows the result of issuing the CEMT I CONNECTION command on the PAA4 region.

```

I CONN
STATUS: RESULTS - OVERTYPE TO MODIFY
Con(PAA1) Net(SCSCPAA1)    Ins Acq Xcf          Rec

```

Figure 76. CEMT INQUIRE CONNECTION: Connections Installed on PAA4 Region

To see more information, we position the cursor alongside *Con* and press Enter. The panel shown in Figure 77 is displayed.

```

I CONN
RESULT - OVERTYPE TO MODIFY
Connection(PAA1)
Netname(SCSCPAA1)
Pendstatus( Notpending )
Servstatus( Inservice )
Connstatus( Acquired )
Accessmethod(Xcf)
Protocol()
Purgetype(          )
Xlnstatus()
Recovstatus( Recovdata )
Uowaction(          )
Gname()
Membername()
Affinity(          )
Remotesystem()
Rname()
Rnetname()

```

Figure 77. CEMT INQUIRE CONNECTION: Detailed Information about Connections Installed on PAA4 Region

As you can see, the CEMT INQUIRE CONNECTION command did not report any failure.

We shut down the PAA4 region by issuing the CEMT P SHUT I NOSDTRAN command.

Now the status of the connection in the PAA1 region is INSERVICE, RELEASED. Figure 78 shows the result of issuing the CEMT I UOWLINK command.

```

I UOWLINK
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow1(01DA0003) Uow(AD3FA7EB4F579201) Con Lin(SCSCPAA4)
Coo Irc  Una Sys(PAA4)          Net(..USIBMSC.SC02006B.x|.k...

```

Figure 78. CEMT INQUIRE UOWLINK: Information about Connections Involved in UOWs

To see more information, we position the cursor alongside *Uow1* and press Enter. The panel shown in Figure 79 on page 125 is displayed.


```

I UOWLINK
RESULT - OVERTYPE TO MODIFY
Uowlink(01DA0003)
Uow(AD3FA7EB4F579201)
Type(Connection)
Link(SCSCPAA4)
Action(          )
Role(Coordinator)
Protocol(Irc)
Resyncstatus(Unavailable)
Sysid(PAA4)
Rmiqfy()
Netuowid(..USIBMSC.SC02006B.x.|.k...)

```

Figure 79. CEMT INQUIRE UOWLINK: Detailed Information about Connections Involved in UOWs

The resynchronization status of the connection changes to UNAVAILABLE because the connection is not acquired.

We start up PAA4 CICS with the START=INITIAL parameter to cause a resynchronization failure.

With this startup, CICS does not back out any change made on the data sets by the UOW in-flight during the shutdown. All TD queues from a previous run are lost.

When the PAA1 region restores the connection to PAA4, it receives a new logname during the MRO bind process from the PAA4 region. The connected system has restarted with a start type of INITIAL, and the PAA1 region reports this event with the log message shown in Figure 80.

```

DFHIR3748 07/31/96 13:56:38 SCSCPAA1 Initial start of connected system
PAA4, netname SCSCPAA4, protocol IRC was detected.

```

Figure 80. PAA1 Region Log Message during INITIAL Start

We issue the CEMT I CONNECTION command on the PAA1 region to see the status of the connection, as shown in Figure 81.

```

I CONN
STATUS: RESULTS - OVERTYPE TO MODIFY
Con(PAA4) Net(SCSCPAA4) Pen Ins Acq Xcf          Unk

```

Figure 81. CEMT INQUIRE CONNECTION after Restart of PAA4: Connections Installed on PAA1 Region

To see more information, we position the cursor alongside *Con* and press Enter. The panel shown in Figure 82 on page 126 is displayed.

```

I CONN
RESULT - OVERTYPE TO MODIFY
Connection(PAA4)
Netname(SCSCPAA4)
Pendstatus( Pending )
Servstatus( Inservice )
Connstatus( Acquired )
Accessmethod(Xcf)
Protocol()
Purgetype(          )
Xlnstatus()
Recovstatus( Unknown )
Uowaction(          )
Grname()
Membername()
Affinity(          )
Remotesystem()
Rname()
Rnetname()

```

Figure 82. CEMT INQUIRE CONNECTION after Restart of PAA4: Detailed Display of Connections in PAA1 Region

The PENDSTATUS for connection PAA4 is PENDING, which means that resynchronization work is outstanding for the connection, and this work cannot be completed because of the exchange lognames failure.

Although there is a resynchronization problem, the connection is ACQUIRED and INSERVICE and new work can begin between the two CICSs.

We can see more information by issuing the CEMT I UOWLINK command in the PAA1 region, as shown in Figure 83.

```

I UOWLINK
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow1(01DA0003) Uow(AD3FA7EB4F579201) Con Lin(SCSCPAA4)
Coo Irc Co1 Sys(PAA4) Net(..USIBMSC.SC02006B.x.|.k...)

```

Figure 83. CEMT INQUIRE UOWLINK after Restart of PAA4: Connections Involved in UOWs

To see more information, we position the cursor alongside *Uow1* and press Enter. The panel shown in Figure 84 on page 127 is displayed.

```

I UOWLINK
RESULT - OVERTYPE TO MODIFY
Uowlink(01DA0003)
Uow(AD3FA7EB4F579201)
Type(Connection)
Link(SCSCPAA4)
Action(          )
Role(Coordinator)
Protocol(Irc)
Resyncstatus(Coldstart)
Sysid(PAA4)
Rmiqfy()
Netuowid(..USIBMSC.SC02006B.x.|.k...)

```

Figure 84. CEMT INQUIRE UOWLINK after Restart of PAA4: Detailed display of Connections Involved in UOWs

The RESYNCSTATUS of COLDSTART confirms that system PAA4 has been started with a new logname. The role of PAA4 is COORDINATOR, which means that PAA4 is the syncpoint coordinator.

We can now use the CEMT INQUIRE UOW LINK(SCSCPAA4) command to show all UOWs that are in-doubt and have system SCSCPAA4 as the coordinator system. This command yields the same information as that in Figure 65 on page 119 and Figure 66 on page 120.

To see the resources that have been locked by this shunted UOW, we issue the CEMT INQ UOWDSN UOW(*9201) and CEMT INQ UOWENQ UOW(*9201) commands. These commands give the same information as that in Figure 57 on page 116 and Figure 58 on page 117 for CEMT INQ UOWDSN and Figure 61 on page 118 and Figure 62 on page 118 for CEMT INQ UOWENQ.

With this information, we know the name of the failed transaction and the locked resources. We must now decide whether updates to the locked resources should be committed or backed out.

We can use the CEMT SET UOW command to commit, back out, or force the uncommitted updates made by the shunted UOW. If we issue CEMT SET UOW FORCE, the locked resources will be committed or backed out, as specified on the ACTION option of the TRANSACTION resource definition (the CECI transaction in our case). If we issue the CEMT INQ TRAN command, the INDOUBT option of this command displays the ACTION option of the TRANSACTION resource definition.

In our example, we issue the CEMT SET UOW COMMIT command to commit the changes of the EMPACTDB file and the DE22 TD queue (local resources). The message shown in Figure 85 on page 128 appears in the log of PAA1 region.

```

DFHRM0104 07/31/96 14:28:07 SCSCPAA1 Intersystem session failure.
      Resource updates are being committed. Local resources may be
      out of sync with those on the remote system. Failure date
      07/31/96 failure time 13:29:08 remote system SCSCPAA4
      transaction CECI task number 00011982 terminal 006B user
      CICSUSER network UOW
      X'1910'/USIBMSC.SC02006B/X'3FA7EB4F57920001'
      local UOW X'AD3FA7EB4F579201'.

```

Figure 85. PAA1 Region Messages after CEMT SET UOW COMMIT

Now the CEMT I UOWDSN and CEMT I UOWENQ commands show nothing because all changes to local resources were committed, but the CEMT I CONNECTION command shows the same information as that in Figure 81 on page 125 and Figure 82 on page 126. CEMT I UOWLINK also shows the same information as that in Figure 83 on page 126 and Figure 84 on page 127.

Figure 86 shows the result of issuing the CEMT I UOW(*9201) command.

```

CEMT I UOW(*9201)
STATUS: RESULTS - OVERTYPE TO MODIFY
      Uow(AD3FA7EB4F579201) Hco Wai Tra(CECI) Tas(0011982)
      Age(00000002) Ter(006B) Netn(SC02006B) Use(CICSUSER) Wai

```

Figure 86. CEMT INQUIRE UOW(AD3FA7EB4F579201): Changes to Recoverable Resources Committed

To see more information, we position the cursor alongside *Uow* and press Enter. The panel shown in Figure 87 is displayed.

```

I UOW(*9201)
RESULT - OVERTYPE TO MODIFY
      Uow(AD3FA7EB4F579201)
      Uowstate(Hcommit)
      Waitstate(Waiting)
      Transid(CECI)
      Taskid(0011982)
      Age(00000038)
      Termid(006B)
      Netname(SC02006B)
      Userid(CICSUSER)
      Waitcause(Waitforget)
      Link()
      Sysid()
      Netuowid(..USIBMSC.SC02006B.x.|.k...)

```

Figure 87. CEMT INQUIRE UOW(AD3FA7EB4F579201)

The new state of the UOW has the following values:

- UOWSTATE(HCOMMIT): HEURISTIC COMMIT; the UOW has been forcibly committed.

- WAITSTATE(WAITING): syncpoint processing has completed on this system, but not on all systems involved in the distributed UOW.
- WAITCAUSE(WAITFORGET): this UOW is waiting for FORGET from participants in the syncpoint.

We can see that the PAA1 region retains recovery information about the UOW until the PAA4 region tells PAA1 (by means of a "forget" flow) that the information can be discarded, but PAA4 was restarted with START=INITIAL so it will never send the "forget" flow.

We must use the CEMT SET CONNECTION(PAA4) NOTPENDING command to clear the pending condition. After we issue this command, a message appears in the log of the PAA1 region, as shown in Figure 88.

```
DFHRM0127 07/31/96 14:39:56 SCSCPAA1 Clear pending issued. The connection
to the remote system has been set NOTPENDING.
Original failure date 07/31/96 failure time 13:29:08 remote
system SCSCPAA4 transaction CECI task number 00011982 terminal
006B user CICSUSER network
UOW X'1910'/USIBMSC.SC02006B/X'3FA7EB4F57920001' local UOW
X'AD3FA7EB4F579201'.
```

Figure 88. PAA1 Region Log Messages after SET CONNECTION(PAA4) NOTPENDING

Now CEMT I UOWLINK and CEMT I UOW(*9201) show nothing, and the connection has PENDSTATUS(NOTPENDING).

In this example we did the test with an XCF/MRO link, but the same failure would occur if we were to do the same test but with ISC links.

If we do the same test but restart CICS with START=COLD, the resources in the PAA1 region are backed out, and the connection never goes to a pending state because in this case the PAA4 region retains resynchronization information about distributed UOWs. We can see this work in the messages of the CICS log, as shown in Figure 89 on page 130, when we test a COLD restart of the PAA4 region after a failure with a distributed UOW in-flight, with the same environment as in the previous test.

```

DFHSI1511I SCSCPAA4 Installing group list RLSLIST.
DFHLOG103I SCSCPAA4 System log (DFHLOG) initialization has started.
DFHLOG104I SCSCPAA4 System log (DFHLOG) initialization has ended.
DFHLOG103I SCSCPAA4 System log (DFHSHUNT) initialization has started.
DFHLOG104I SCSCPAA4 System log (DFHSHUNT) initialization has ended.
DFHRM0228 SCSCPAA4
1 indoubt UOWs have been recovered for the purpose of remote
resynchronization. Local resources are not synchronized with these
UOWs.
DFHSI1519I SCSCPAA4 The interregion communication session was
successfully started.
DFHAP1203I SCSCPAA4 Language Environment/370 is being initialized.
DFHSI8430I SCSCPAA4 About to link to PLT programs during the third stage
of initialization.
DFHSI8434I SCSCPAA4 Control returned from PLT programs during the third
stage of initialization.
DFHSI1517 SCSCPAA4 Control is being given to CICS.

```

Figure 89. Messages during Cold Start of CICS

Then we commit the changes on the PAA1 region by issuing CIND RESYNC COMMIT in the the PAA4 region. Figure 90 shows the messages that appear in the log of the PAA4 region after CIND RESYNC COMMIT is issued.

```

DFHRM0208 07/31/96 15:16:53 SCSCPAA4 Intersystem session recovery. A unit
of work recovered only for remote resynchronization
is now being committed. Local resources are not
synchronized with the unit of work. Original failure
date 07/31/96 failure time 14:57:54 remote system
DFHINDSP transaction CSMI task number 00000052
terminal S11 user CICSUSER network
UOW X'1910'/USIBMSC.SC02006B/X'3FBC17BE72B80001'
local UOW X'AD3FBCDF6D0BF200'.
DFHIN1012 07/31/96 15:16:53 SCSCPAA4 The indoubt tool is resynchronizing
UOW X'AD3FBCDF6D0BF200' for transaction CSMI task
number 0052. DFHINDSP coordinator UOW status is
commit. Recovery manager UOW status is commit.
DFHIN1007 07/31/96 15:16:53 SCSCPAA4 006D CICSUSER Initiation of
resynchronization for units of work awaiting
coordinator DFHINDSP is now complete.
DFHRM0235 07/31/96 15:16:53 SCSCPAA4 Intersystem session recovery. Local
resources are not synchronized. Original failure
date 07/31/96 failure time 14:59:45 remote system
SCSCPAA1 transaction CSMI task number 00000052
terminal S11 user CICSUSER network UOW
X'1910'/USIBMSC.SC02006B/X'3FBC17BE72B80001'
local UOW X'AD3FBCDF6D0BF200'.

```

Figure 90. PAA4 Region Log after CIND RESYNC COMMIT

If we issue CIND RESYNC BACKOUT instead of CIND RESYNC COMMIT, we will see message DFHRM0209 instead of DFHRM0208.

5.2.4.2 Connection between CICS/ESA 4.1 and CICS TS

When we have an MRO connection between a CICS/ESA 4.1 and a CICS TS, if we cancel CICS/ESA 4.1 and then cold start it, CICS TS detects that the other region is a pre-CICS TS region, and CICS TS takes the action specified in the ACTION option of the TRANSACTION definition. That is, CICS will back out or commit the changes made by the UOWs in-flight during the abend of the CICS/ESA 4.1 region in accordance with the ACTION option. We can see this behavior in the messages of the CICS log shown in Figure 91. We obtained these messages during a test of a failure of a CICS/ESA 4.1 (PAA2) region with a UOW, distributed with a CICS TS (PAA1) region after a cold restart of the CICS/ESA 4.1 region.

```
DFHAC2231 08/08/96 12:41:39 SCSCPAA1 Transaction CECI running program
          DFHECIP term 006C has lost contact with its coordinator system
          during syncpoint and has abended with code ASP1. The unit of
          work is shunted until contact is restored.
DFHRM0106 08/08/96 12:41:39 SCSCPAA1 Intersystem session failure.
          Resource updates will not be committed or backed out until
          session recovery. Failure date 08/08/96 failure time 12:41:39
          remote system SCSCPAA2 transaction CECI task number 00002235
          terminal 006C user CICSUSER network UOW
          X'1910'/USIBMSC.SC02006C/X'49ACE2E870E20001' local UOW
          X'AD49ACE2E870E203'.
DFHRM0113 08/08/96 12:45:57 SCSCPAA1 Intersystem session recovery. The
          system has reinitialized. Resource updates will be backed out.
          Original failure date 08/08/96 failure time 12:41:39 remote
          system SCSCPAA2 transaction CECI task number 00002235 terminal
          006C user CICSUSER network UOW
          X'1910'/USIBMSC.SC02006C/X'49ACE2E870E20001' local UOW
          X'AD49ACE2E870E203'.
DFHFC3004 08/08/96 12:45:57 SCSCPAA1 Record backed out because of the
          forced back out of an indoubt unit of work. Diagnostic
          information follows in message DFHFC3010. The record was
          updated by unit of work X'AD49ACE2E870E203' for file DEPSUMDX,
          base data set CICSDSW.VSAMV.DEPSUMDB
DFHFC3010 08/08/96 12:45:57 SCSCPAA1 Diagnostic information for unit of
          work X'AD49ACE2E870E203' and file DEPSUMDX. Update was a
          write-add made by transaction CECI at terminal 006c under task
          number 02235. Key length 16, data length 30, base ESDS RBA
          X'00000000', record key X'D8D7D8D7D8D7D8D7D8D7D8D7D8D7'
```

Figure 91. CICS Log Messages after Cold Start of a CICS/ESA 4.1 Region

As you can see, message DFHRM0113 indicates that the UOW is backed out in accordance with the ACTION option in the TRANSACTION definition.

If we have an ISC connection between CICS/ESA 4.1 and CICS TS, and the same problem occurs, the CICS TS region goes to a resynchronization failure state. This is the environment we test in this section.

Our example is of a failure in the CICS/ESA 4.1 PAA0 region connected to the PAA1 region (CICS TS region) with ISC links, as shown in Figure 92 on page 132.

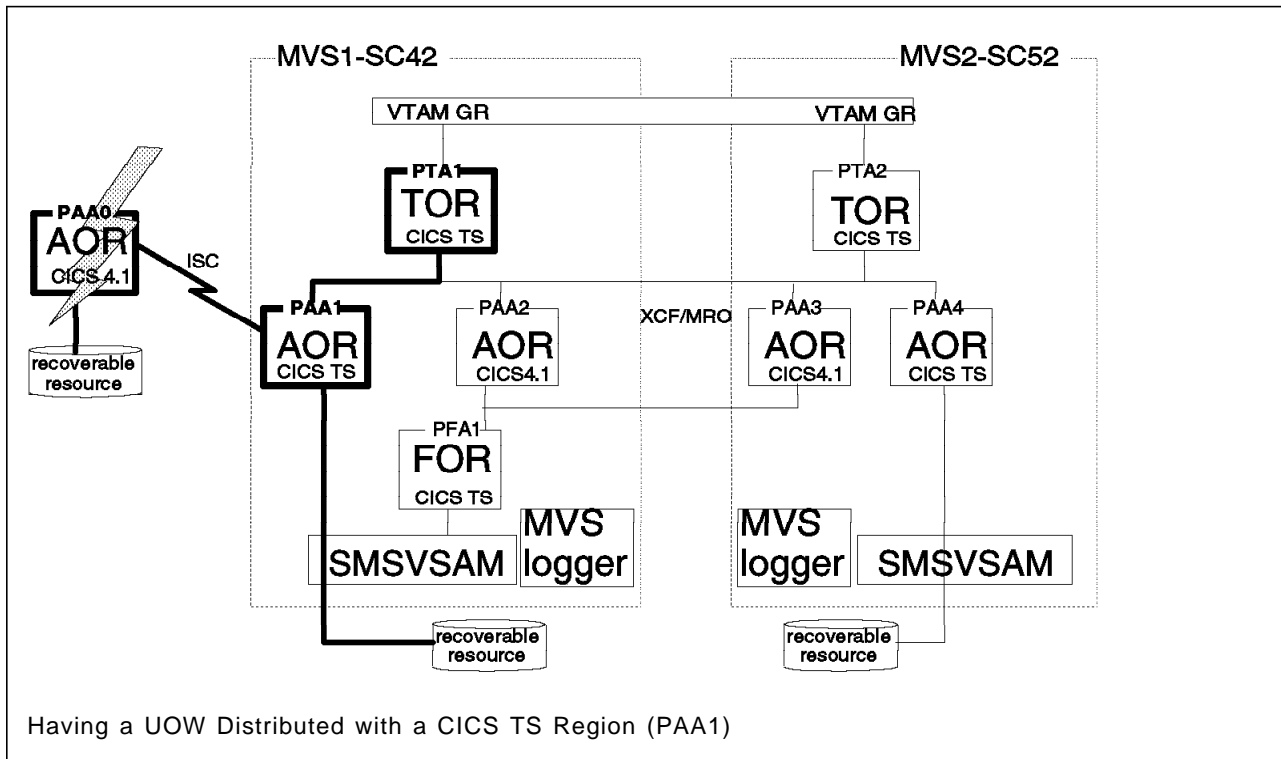


Figure 92. Failure in a CICS/ESA 4.1 Region (PAA0)

We start the CECI transaction on the PAA1 region. This transaction writes a record in a recoverable file local to this region accessed in RLS mode, and the same UOW writes another record in a recoverable file remote to this region and local to the PAA0 region. In this case we cannot use the CIND transaction on the PAA0 region because it is a CICS/ESA 4.1 region, so, to force a shunted UOW in the PAA1 region, we shut down the PAA0 region by issuing the CEMT P SHUT IMMEDIATE command.

After the shutdown of the PAA0 region, we end the CECI transaction, and the message shown in Figure 93 appears on our screen attached to the CICS (PAA1 region):

```
DFHAC2201 15:10:53 SCSCPAA1 Transaction CECI has lost contact with its
coordinator system during syncpoint processing and has abended with code
ASP1. The unit of work is shunted until contact is restored.
```

Figure 93. Lost Contact Message

Figure 94 on page 133 shows the CICS log messages of the PAA1 region.


```

DFHZC3461 I 08/06/96 15:06:40 SCSCPAA1 -AAC CSNE Node SCSCPAA0 session
          started ((2) Module name: DFHZOPX)
DFHZC3424 E 08/06/96 15:10:43 SCSCPAA1 -AAC CECI Session failure. Session
          terminated immediately. ((2) Module name: DFHZNSP)
DFHZC3437 I 08/06/96 15:10:43 SCSCPAA1 -AAC CSNE Node SCSCPAA0 action
          taken: CLSDST ABTASK ABSEND ABRECV ((1) Module name: DFHZNAC)
DFHZC3424 E 08/06/96 15:10:43 SCSCPAA1 -AAA CSNE Session failure. Session
          terminated immediately. ((2) Module name: DFHZNSP)
DFHZC3437 I 08/06/96 15:10:43 SCSCPAA1 -AAA CSNE Node SCSCPAA0 action
          taken: CLSDST ABTASK ABSEND ABRECV ((1) Module name: DFHZNAC)
DFHZC3424 E 08/06/96 15:10:43 SCSCPAA1 -AAB CSNE Session failure. Session
          terminated immediately. ((2) Module name: DFHZNSP)
DFHZC3437 I 08/06/96 15:10:43 SCSCPAA1 -AAB CSNE Node SCSCPAA0 action
          taken: CLSDST ABTASK ABSEND ABRECV ((1) Module name: DFHZNAC)
DFHZC3462 I 08/06/96 15:10:43 SCSCPAA1 -AAA CSNE Node SCSCPAA0 session
          terminated. ((2) Module name: DFHZCLS)
DFHZC3462 I 08/06/96 15:10:43 SCSCPAA1 -AAB CSNE Node SCSCPAA0 session
          terminated. ((2) Module name: DFHZCLS)
DFHAC2231 08/06/96 15:10:53 SCSCPAA1 Transaction CECI running program
DFHECIP term 006C has lost contact with its coordinator system
during syncpoint and has abended with code ASP1. The unit of
work is shunted until contact is restored.
DFHRM0106 08/06/96 15:10:53 SCSCPAA1 Intersystem session failure.
Resource updates will not be committed or backed out until
session recovery. Failure date 08/06/96 failure time 15:10:53
remote system SCSCPAA0 transaction CECI task number 00000134
terminal 006C user CICSUSER network UOW X'1910'/USIBMSC.SC0200
6C/X'474A6A5AAD620001' local UOW X'AD474A6A5AAD6202'.
DFHZC3462 I 08/06/96 15:10:53 SCSCPAA1 -AAC CSNE Node SCSCPAA0 session
          terminated. ((2) Module name: DFHZCLS)

```

Figure 94. CICS Log Messages after PAA0 Region Immediate Shutdown

Then we issue the CEMT I UOWDSN and CEMT I UOW(*) SHUNTED commands, and they give the same information shown in Figure 57 on page 116, Figure 58 on page 117, Figure 65 on page 119, and Figure 66 on page 120.

Figure 95 shows the output of the CEMT I UOWLINK command.

```

I UOWLINK
STATUS: RESULTS - OVERTYPE TO MODIFY
      Uow1(016C000F) Uow(AD474A6A5AAD6202) Con Lin(SCSCPAA0)
      Coo Appc Una Sys(PAA0)                               Net(..USIBMSC.SC02006C.φ.!....)

```

Figure 95. UOWLINK Display

To see more information, we position the cursor alongside *Uow1* and press Enter. Figure 96 on page 134 shows a more detailed view.

```

I UOWLINK
RESULT - OVERTYPE TO MODIFY
Uowlink(016C000F)
Uow(AD474A6A5AAD6202)
Type(Connection)
Link(SCSCPAA0)
Action(          )
Role(Coordinator)
Protocol(Appc)
Resyncstatus(Unavailable)
Sysid(PAA0)
Rmiqfy()
Netuowid(..USIBMSC.SC02006C.φ.!.....)

```

Figure 96. UOWLINK Detailed Display

Figure 97 shows the connection status information.

```

I CONN
STATUS: RESULTS - OVERTYPE TO MODIFY
Con(PAA0) Net(SCSCPAA0)    Ins Rel Vta Appc      Rec

```

Figure 97. Connection Status Display

To see more information, we position the cursor alongside *Con*, press Enter and see the display in Figure 98.

```

I CONN
RESULT - OVERTYPE TO MODIFY
Connection(PAA0)
Netname(SCSCPAA0)
Pendstatus( Notpending )
Servstatus( Inservice )
Connstatus( Released )
Accessmethod(Vtam)
Protocol(Appc)
Purgetype(          )
Xlnstatus()
Recovstatus( Recovdata )
Uowaction(          )
Grname()
Membername()
Affinity(          )
Remotesystem()
Rname()
Rnetname()

```

Figure 98. Connection Status Detailed Display

Then we restart the PAA0 region with START=COLD. Figure 99 on page 135 shows the messages that appear in the the log of PAA1 region.

```

DFHZA3461 I 08/06/96 15:30:04 SCSCPAA1 -AAB CSNE Node SCSCPAA0 session
          started. ((1) Module name: DFHZOPX)
DFHZA3461 I 08/06/96 15:30:04 SCSCPAA1 -AAA CSNE Node SCSCPAA0 session
          started. ((2) Module name: DFHZOPX)
DFHZA4900 I 08/06/96 15:30:04 SCSCPAA1 -AAB CLS1 CNOS received from Node
          SCSCPAA0 System PAA0 Modename , Max = 10, Win=0, successful.
          ((1) Module name: DFHZGCN)
DFHRS2111 08/06/96 15:30:04 SCSCPAA1 Cold/Warm restart mismatch with
          system PAA0, netname SCSCPAA0, protocol APPC.
DFHRS2111 08/06/96 15:30:04 SCSCPAA1 Cold/Warm restart mismatch with
          system PAA0, netname SCSCPAA0, protocol APPC.

```

Figure 99. PAA1 Region Log Messages after Cold Start of PAA0 Region

Message DFHRS2111 in Figure 99 shows that the PAA1 region received a cold start indication from the PAA0 region during the exchange log names sequence.

We can see in the log of the PAA0 region the message shown in Figure 100.

```

DFHZN2110 08/06/96 15:30:04 SCSCPAA0 Abnormal reply to exchange log name
          command received from system: PAA1 .

```

Figure 100. PAA0 Region Log Messages after Cold Start

The abnormal reply of the message indicates that region PAA1 detected a logname mismatch.

Now we issue the CEMT I CONNECTION command (see Figure 101).

```

I CONN
STATUS: RESULTS - OVERTYPE TO MODIFY
Con(PAA0) Net(SCSCPAA0) Pen Ins Acq Vta Appc      Xno Unk

```

Figure 101. PAA0 Connection Status

To see more information, we position the cursor alongside *Con* and press Enter. We get the display shown in Figure 102 on page 136.

```

I CONN
RESULT - OVERTYPE TO MODIFY
Connection(PAA0)
Netname(SCSCPAA0)
Pendstatus( Pending )
Servstatus( Inservice )
Connstatus( Acquired )
Accessmethod(Vtam)
Protocol(Appc)
Purgetype(          )
Xlnstatus(Xnotdone)
Recovstatus( Unknown )
Uowaction(          )
Grname()
Membername()
Affinity(          )
Remotesystem()
Rname()
Rnetname()

```

Figure 102. PAA0 Connection Status Detailed Display

The XLNSTATUS(XNOTDONE) field indicates that the exchange lognames flow for the Advanced Program-to-Program Communication (APPC) connection has not completed successfully.

The connection remains in PENDSTATUS(PENDING) because resynchronization work is outstanding for the connection and the work cannot be completed because of the exchange lognames failure.

In this case, if we start a transaction on the PAA1 region and try to access a file on the PAA0 region, we receive a SYSIDERR condition. When there is a resynchronization failure in an APPC connection, we can not use any session of the connection until we issue the CEMT SET CONNECTION NOTPENDING command.

We issue the CEMT I UOWLINK command (see Figure 103).

```

I UOWLINK
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow1(016C000F) Uow(AD474A6A5AAD6202) Con Lin(SCSCPAA0)
Coo Appc Co1 Sys(PAA0) Net(..USIBMSC.SC02006C.¢.!....)

```

Figure 103. PAA0 UOWLINK Status Display

To see more information, we position the cursor alongside *Uow/and* press Enter. We get the detailed display shown in Figure 104 on page 137.

```

I UOWLINK
RESULT - OVERTYPE TO MODIFY
Uowlink(016C000F)
Uow(AD474A6A5AAD6202)
Type(Connection)
Link(SCSCPAA0)
Action(          )
Role(Coordinator)
Protocol(Appc)
Resyncstatus(Coldstart)
Sysid(PAA0)
Rmiqfy()
Netuowid(..USIBMSC.SC02006C.φ.!.....)

```

Figure 104. PA00 UOWLINK Detailed Status Display

The RESYNCSTATUS(COLDSTART) confirms that the PA00 region has been started with a new logname.

Now we must do the same work we did in the first example of resynchronization failure. In this case we issue the CEMT SET UOW BACKOUT command to back out the changes of the local file of the PAA1 region. Figure 105 shows the messages that appear in the log of CICS after the CEMT SET UOW BACKOUT command is issued.

```

DFHRM0105 08/06/96 15:39:25 SCSCPAA1 Intersystem session failure.
          Resource updates are being backed out. Local resources may be
          out of sync with those on the remote system. Failure date
          08/06/96 failure time 15:10:53 remote system SCSCPAA0
          transaction CECI task number 00000134 terminal 006C user
          CICSUSER network UOW
          X'1910'/USIBMSC.SC02006C/X'474A6A5AAD620001' local UOW
          X'AD474A6A5AAD6202'.
DFHRS2111 08/06/96 15:39:25 SCSCPAA1 Cold/Warm restart mismatch with
          system PAA0, netname SCSCPAA0, protocol APPC.
DFHFC3004 08/06/96 15:39:25 SCSCPAA1 Record backed out because of the
          forced back out of an indoubt unit of work. Diagnostic
          information follows in message DFHFC3010. The record was
          updated by unit of work X'AD474A6A5AAD6202' for file EMPACTDB,
          base data set CICSWSW.VSAMU.EMPACTDB
DFHFC3010 08/06/96 15:39:25 SCSCPAA1 Diagnostic information for unit of
          work X'AD474A6A5AAD6202' and file EMPACTDB. Update was a
          write-add made by transaction CECI at terminal 006C under
          task number 00134. Key length 15, data length 110, base ESDS
          RBA X'00000000', record key X'F4F7F4F7F4F7F4F7F4F7F4F7F4F7F4'

```

Figure 105. CICS Log Messages after CEMT SET UOW BACKOUT

As you can see, when CICS does the backout, it sends messages with all of the information about updates to recoverable resources within this UOW.

In this case the CECI transaction was writing a record with key '474747474747474' (key length 15) in the EMPACTDB file.

This information is useful for correcting the changes made to the file owned by the region that was cold started (PAA0 in our case).

We issue the SET CONNECTION(PAA0) NOTPENDING command to clear the pending condition. Figure 106 shows the messages that appear in the log of PAA1 region after we issue CEMT SET CONNECTION(PAA0) NOTPENDING.

```
DFHRM0127 08/06/96 15:41:23 SCSCPAA1 Clear pending issued. The connection
to the remote system has been set NOTPENDING. Original failure
date 08/06/96 failure time 15:10:53 remote system SCSCPAA0
transaction CECI task number 00000134 terminal 006C user
CICSUSER network UOW
X'1910'/USIBMSC.SC02006C/X'474A6A5AAD620001' local UOW
X'AD474A6A5AAD6202'.
```

Figure 106. CICS Log Messages after SET CONNECTION(PAA0) NOTPENDING

5.2.5 Documentation on Resynchronization Failures

For more information about resynchronization failures, see the *CICS Intercommunication Guide* and the *CICS Recovery and Restart Guide*.

For more information about the CIND transaction and the CEMT commands, see *CICS Supplied Transactions*.

Chapter 6. Retained Locks

When a lock is first acquired, it is referred to as an *active lock*. An example of an active lock is a lock acquired when a transaction does a get for update against a recoverable VSAM RLS data set. This lock remains active until completion of the UOW. An active lock is released if the UOW completes successfully. An active lock is converted into a *retained lock* if the UOW is shunted, or if CICS TS or SMSVSAM fails, and then only if the associated backout processing is unsuccessful. A UOW can be shunted if it fails during the in-doubt period, if a backout fails, or if a commit fails. Locks cannot be retained if a transaction completes successfully.

Converting active locks to retained locks protects data integrity and ensures that new requests for locks owned by a failed UOW do not wait but are instead rejected with the LOCKED response.

A UOW is a sequence of processing actions that must be completed before any of the individual actions performed by a transaction can be regarded as committed. Once changes are committed, they become durable and are not backed out in the event of a subsequent failure of the task or system. A UOW is completed when a transaction takes a syncpoint. In a CICSplex environment, the UOW is generally distributed over two or more CICS systems and is referred to as a *distributed unit of work*.

In this chapter, we use the term UOW to mean a *local UOW*, that is, that part of a distributed UOW that relates to resources on the local system. When we want to indicate a distributed UOW, we use that term explicitly. CICS TS commands and messages return information about local UOWs. There is a unique *unit of work identifier (uowid)* for every local UOW.

The local UOWs that make up a distributed UOW share a common *network UOWid (netuowid)*, a 27-character string containing the LU6.2 name for the UOW within the network. You can assemble information about a distributed UOW by matching the networkwide UOW identifier against the networkwide identifiers of local UOWs on other connected systems. The netuowid is established when the first UOW in a distributed UOW is created and is then passed as part of the LU6.2 protocol to other CICS regions as other components of the distributed UOW are created.

6.1 In-doubt Failure

The concept of in-doubt periods and their associated problems is neither well understood nor well documented. In-doubt failures can occur only in distributed UOWs. Figure 107 on page 140 shows syncpoint flows in a simple distributed UOW, illustrating in-doubt processing and the associated terminology. The flows are generated in CICS as a result of either an implicit or explicit syncpoint command.

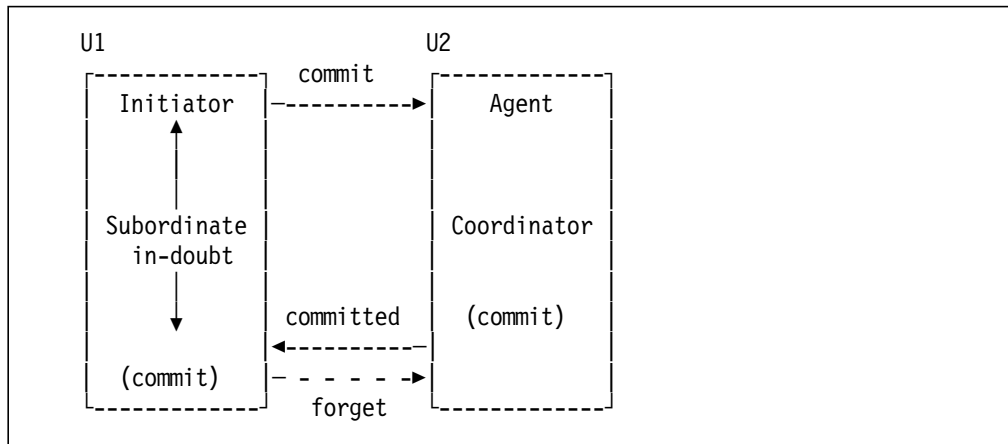


Figure 107. Simple Syncpoint Flow

Local UOW U1 initiates syncpoint activity by asking U2 to *commit* the updates. U1 is referred to as the *initiator*. Local UOW U2, known as an *agent*, receives the commit request, commits the changes, and responds with *committed*. U1 then commits its changes and the distributed UOW is complete. U2 retains recovery information about its changes until U1 advises it, using a *forget* flow, that the information can be discarded.

Between the *commit* and *committed* flow, U1 is in-doubt in that it does not know whether U2 has committed or backed out its changes; U2 is not in-doubt. The local UOW that is not in-doubt, U2, is the *coordinator* because it coordinates the commitment of resources in both systems. The local UOW that is in-doubt, U1, is called the *subordinate* because it has to obey the decision to commit or back out taken by its coordinator. An in-doubt failure occurs in U1 if contact is lost with U2 in the period during which U1 is in-doubt.

In a distributed UOW, the initiator can have more than one directly connected agent. The initiator must inform each of its agents that a syncpoint is being taken. It does this by sending a "prepare to commit" request to all of its agents except the last. The *last agent* is the agent that is told to "commit" instead of "prepare to commit". In our simple example, U2 is the last and only agent.

For more extensive coverage of in-doubt failures, refer to the *CICS Intercommunication Guide*.

CICS/ESA releases before CICS TS do not provide a solution to the in-doubt problem. An in-doubt UOW would fail, making the decision to commit or back out on the basis of the option specified for the INDOUBT attribute in the transaction definition. When connection to the failed system is reestablished, CICS/ESA compares saved unit-of-recovery descriptors and reports to the CSMT log with a series of DFHZN210n messages. These messages indicate whether or not unilateral decisions taken by the two systems matched and provide the basis for any manual corrective action.

The recommendation for systems before CICS TS is to confine all recoverable resource updates to a single, local UOW. Hence the reason for a single FOR in a CICSplex, before the introduction of CICS TS.

CICS TS introduces the recovery manager, a domain whose purpose is to ensure the integrity and consistency of resources both within a single system and distributed over interconnected systems. Recoverable resource types

include databases, files, temporary storage, and transient data. We concentrate on VSAM files in this discussion. The recovery manager converts to retained all active locks held against all recoverable resources updated by the UOW, if it detects an in-doubt failure.

6.1.1 Impact of Retained Locks

Any records that are locked are unavailable for update and for reading with integrity. Other UOWs that attempt an update to, or a read with integrity of, a record that has a retained lock receive the LOCKED response. A decision can then be made, under program control, to terminate the task or to wait. Waiting is not recommended because there is no way of determining how long a lock will be held.

6.1.2 Prevention of Lock Retention As a Result of In-doubt Failure

Retained locks as a result of in-doubt failures cannot be prevented unless you define the transaction with WAIT(YES) and the time interval specified by WAITTIME expires, or with WAIT(NO). In either case, CICS TS takes an action based on the option specified by the ACTION attribute in the transaction definition, ensuring that no locks are retained.

The possibility of an in-doubt failure occurring can be minimized by:

- Correct shut-down procedures (see 5.1, “CICS Abnormal Termination” on page 95)
- Limiting the number of partners in distributed UOWs. CICS TS supports full data integrity, provided certain criteria are met, but at the expense of locked resources
- Having short-lived UOWs with short path lengths, thus reducing the time they are in the system

6.1.3 Recovery of Locks Retained As a Result of In-doubt Failure

You can decide to wait for recovery following an in-doubt failure by specifying WAIT(YES) plus WAITTIME of 0, or a duration long enough to allow the failed system to be restarted. After the system is restarted, any in-flight updates are backed out or committed during the resynchronization process, the decision being made by the coordinator system.

Whether you wait for resynchronization or force the UOW to end represents a tradeoff between the data integrity and data availability of the system.

6.1.4 Examples of In-doubt Failures with Retained Locks

We discuss several UOW types to further illustrate the activity associated with in-doubt processing. Our CICSplex test environment is used to illustrate each UOW.

You can create an in-doubt failure, using the IBM-supplied CIND transaction, as explained in 6.1.4.3, “Multiple CICS TS Systems Using Record Level Sharing” on page 143.

6.1.4.1 Single CICS TS System Using Record Level Sharing

Figure 108 illustrates a failure of a transaction updating recoverable resources in PAA1. The transaction is routed by PTA1 to PAA1 where it updates a VSAM RLS data set.

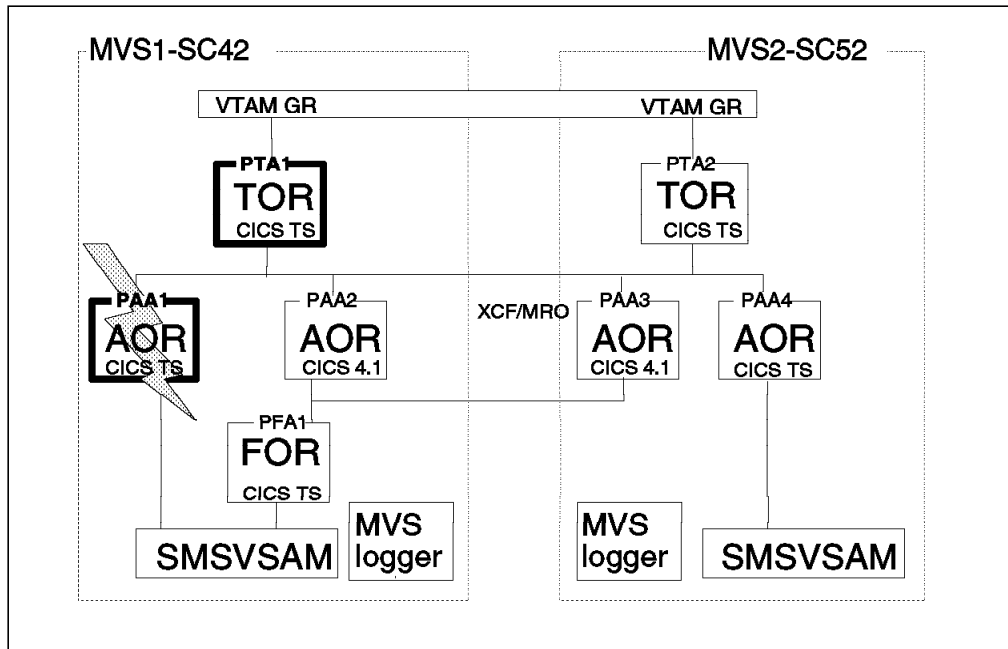


Figure 108. Single CICS TS System Using Record Level Sharing

CICS TS accesses VSAM RLS data sets through an access control block (ACB), and thus the data sets are considered local to PAA1. No distributed UOWs are involved, so an in-doubt failure cannot occur for this UOW.

6.1.4.2 Single CICS TS System Not Using Record Level Sharing

Figure 109 on page 143 illustrates a failure in PFA1 while updating recoverable resources. The incoming transaction is routed from PTA1 to PAA2, which then function ships file requests to FOR PFA1.

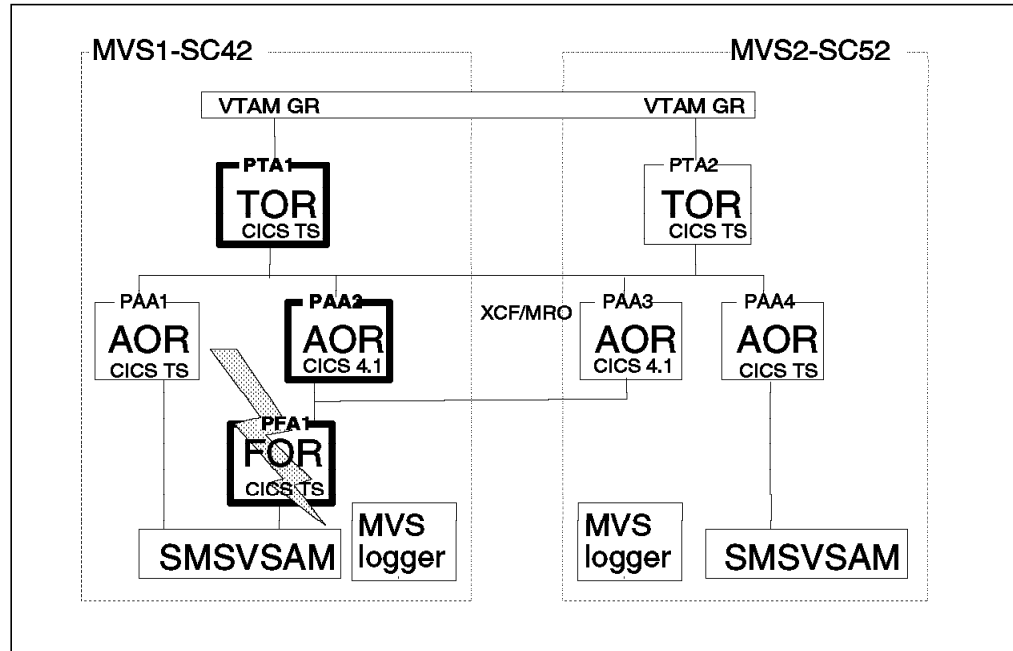


Figure 109. Single CICS TS System Not Using Record Level Sharing

An in-doubt failure cannot occur in PAA2 because all updates are confined to the UOW local to PFA1.

6.1.4.3 Multiple CICS TS Systems Using Record Level Sharing

Figure 110 shows a transaction routed from PTA1 failing in-doubt in PAA1.

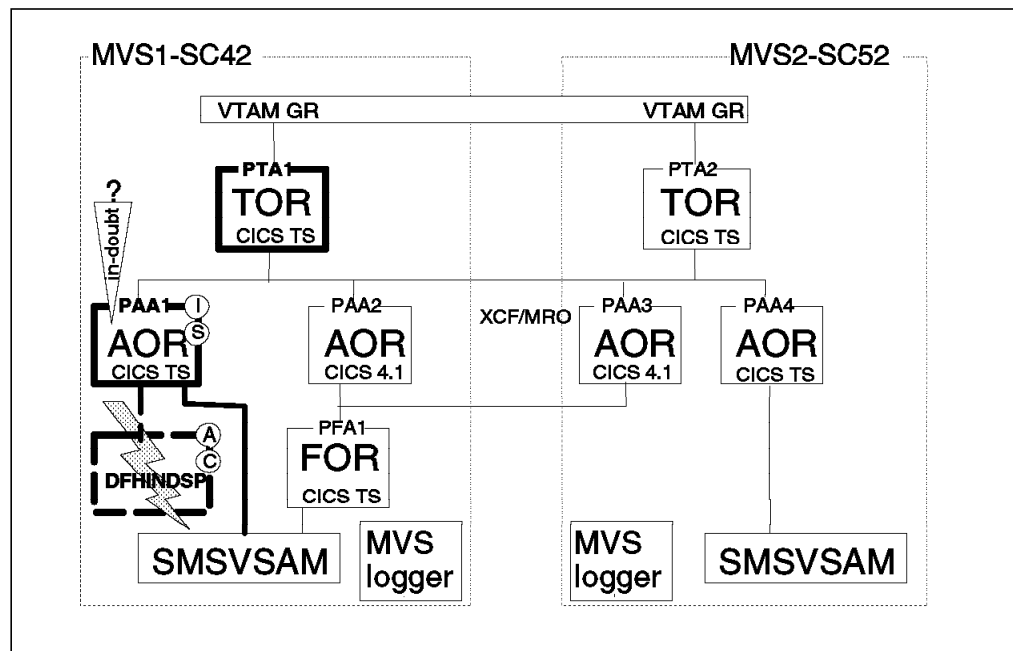


Figure 110. Multiple CICS TS Systems Using Record Level Sharing. (I = initiator; A = agent; C = coordinator; S = subordinate)

In this example, we provide a simulated in-doubt failure in a multiregion CICS TS environment with VSAM RLS, using the IBM-supplied CIND transaction, referred to as the *in-doubt testing tool*. CIND provides, for testing purposes, a way of changing a UOW so that it is distributed and of causing a failure during syncpoint

processing in the in-doubt window. For detailed information about the CIND transaction, see *CICS Supplied Transactions*.

Figure 110 on page 143 shows the simulated environment. The owners of recoverable resources are PAA1 and the CIND-simulated resource owning region, DFHINDSP. We use CECI in this example to create a transaction that fails in-doubt in PAA1 due to a simulated link failure between PAA1 and DFHINDSP. The transaction resource definition for CECI specifies WAIT(YES), resulting in the shunting of the UOW. DFHINDSP is the syncpoint coordinator.

Figure 126 on page 154 shows the messages generated in this case. View them in conjunction with working through the example.

To illustrate the in-doubt failure scenario, we use the following sequence of events:

- 1** Use CEMT to place CECI in transaction class DFHTCIND.
- 2** Initiate CIND processing.
- 3** Use CECI to add a record to the HOTEL1 data set.
- 4** Use CECI to take a SYNCPOINT.
- 5** Use CEMT to show the use of INQUIRE commands to obtain UOW information.
- 6** Use VSAM RLS SHCDS list commands to get information about SMSVSAM recovery related to online applications and spheres accessed in RLS mode.
- 7** Use CIND to simulate the coordinator CICS TS system, DFHINDSP, reconnecting to PAA1.
- 8** Terminate CIND processing.

- 1 Use CEMT to place CECI in transaction class DFHTCIND (Figure 111).

```
SET TRAN(CECI) TCL(DFHTCIND)
STATUS: RESULTS - OVERTYPE TO MODIFY
Tra(CECI) Pri( 001 ) Pro(DFHECIP ) Tc1( DFHTCIND ) Ena Pur NORMAL
Prf(DFHCICST) Uda Bel Iso Bac Wai Ind(000000)

RESPONSE: NORMAL
PF 1 HELP 3 END 5 VAR 7 SBH 8 SFH 9 MSG 10 SB 11 SF

SYSID=PAA1 APPLID=SCSCPAA1
TIME: 20.47.17 DATE: 08.08.96
```

Figure 111. Place CECI in DFHTCIND Transaction Class

- 2 Initiate CIND processing.

We initialize the in-doubt test tool by issuing the CIND ON command, which results in the following confirmation message:

```
DFHIN1001 08/08/96 20:48:47 SCSCPAA1 045C CICSUSER The indoubt tool is now
active for DFHTCIND tranclass transactions.
```

3 Use CECI to add a record to the HOTEL1 data set (Figure 112 on page 146).

```
WRITE FILE(HOTEL1) FROM(&A) RIDFLD(&B)
STATUS: COMMAND EXECUTION COMPLETE NAME=
EXEC CICS WRITE File( 'HOTEL1 ' )
  ◀ Sysid() ▶
  From( '1111111111.....*..%000000%..' )
  ◀ Length( +00030 ) ▶
  RIDfld( '1111111111' )
  ◀ Keylength() ▶
  ◀ RBa | RRn ▶
  ◀ Massinsert ▶
  ◀ Nosuspend ▶

RESPONSE: NORMAL EIBRESP=+0000000000 EIBRESP2=+0000000000
PF 1 HELP 2 HEX 3 END 4 EIB 5 VAR 6 USER 7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 112. Add a Record to the HOTEL1 Data Set

The response of NORMAL indicates that we have successfully added a record to the HOTEL1 data set, using the function provided by the CECI transaction.

4 Use CECI to take a SYNCPOINT (Figure 113).

```
SYNCPOINT
STATUS: ABOUT TO EXECUTE COMMAND NAME=
EXEC CICS Syncpoint
  ◀ Rollback ▶

DFHAC2201 20:52:21 SCSCPA1 Transaction CECI has lost contact with its
coordinator system during syncpoint processing and has abended with code
ASP1. The unit of work is shunted until contact is restored.
```

Figure 113. Issue an Explicit Syncpoint Request

The CECI task in PAA1 explicitly requests syncpoint. The coordinator of the syncpoint is the simulated remote CICS TS system DFHINDSP. Because CECI has lost contact with DFHINDSP during the in-doubt window, it is abnormally terminated and the UOW shunted, as shown in Figure 113. CECI is terminated abnormally.

5 Use CEMT to show the use of INQUIRE commands to obtain UOW information:

- INQ UOW

Figure 114 shows the results of a CEMT INQ UOW command seeking information about current UOWs. The UOW associated with CECI in region PAA1 has *in-doubt shunted* status due to a connection failure in the link with DFHINDSP.

```

INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AD49EBA7794C1203) Inf Act Tra(CFQR) Tas(0000019)
  Age(00012948) Use(CICSUSER)
  Uow(AD49EBC00D6B0E01) Inf Act Tra(CSNC) Tas(0000020)
  Age(00012923) Use(CICSUSER)
  Uow(AD49EBC7C0B8C202) Inf Act Tra(CONL) Tas(0000024)
  Age(00012915) Use(CICSUSER)
  Uow(AD49EBCA76885C06) Inf Act Tra(CSSY) Tas(0000028)
  Age(00012912) Use(CICSUSER)
  Uow(AD49EBCADE73E803) Inf Act Tra(COIO) Tas(0000029)
  Age(00012911) Use(CICSUSER)
  Uow(AD49EBCCC0692800) Inf Act Tra(COIE) Tas(0000030)
  Age(00012909) Use(CICSUSER)
  Uow(AD4A07864D784000) Inf Act Tra(CSNE) Tas(0000023)
  Age(00005467) Use(CICSUSER)
Uow(AD4A1AC8E0B1D403) Ind Shu Tra(CECI) Tas(0010803)
Age(00000187) Ter(045A) Netn(SJA2045A) Use(CICSUSER) Con Lin(DFHINDSP)
  Uow(AD4A1BE4984FF002) Inf Act Tra(CEMT) Tas(0010804)
  Age(00000000) Ter(045A) Netn(SJA2045A) Use(CICSUSER)

                                SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL                                TIME: 20.55.18 DATE: 08.08.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF

```

Figure 114. CEMT INQUIRE UOW

Figure 115 on page 148 shows the detail information for the in-doubt UOW. The information can be obtained by positioning the cursor next to the required UOW and pressing Enter.

```

CEMT I UOW
RESULT - OVERTYPE TO MODIFY
  Uow(AD4A1AC8E0B1D403)
  Uowstate( Indoubt )
  Waitstate(Shunted)
  Transid(CECI)
  Taskid(0010803)
  Age(00000312)
  Termid(045A)
  Netname(SJA2045A)
  Userid(CICSUSER)
  Waitcause(Connection)
  Link(DFHINDSP)
  Sysid()
  Netuowid(..USIBMSC.SJA2045Aç.H\M...)

                                     SYSID=PAA1 APPLID=SCSCPAA1
TIME: 20.57.19 DATE: 08.08.96
PF 1 HELP 2 HEX 3 END          5 VAR          7 SBH 8 SFH          10 SB 11 SF

```

Figure 115. CEMT INQUIRE UOW Detailed Display

- INQ UOWENQ

This command is used to display information about enqueues used by CICS TS to lock recoverable resources other than VSAM RLS records.

Non-RLS recoverable resources are not involved in our example.

- INQ UOWLINK

Figure 116 on page 149 shows the connections involved in the UOW in our example. The display tells us the name of the remote system (DFHINDSP) and that DFHINDSP is the coordinator in the two-phase commit process.


```

CEMT INQ UOWLINK
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow1(01C805EF) Uow(AD4A1AC8E0B1D403) Con Lin(DFHINDSP)
Coo Net(..USIBMSC.SJA2045Aç.H\M...)
Uow1(02230332) Uow(AD4A1BE4984FF002) Rmi Lin(INDTTRUE)
Unk Rmiq(.....) Net(..USIBMSC.SJA2045Aç.Uq|0...)

RESPONSE: NORMAL
PF 1 HELP 3 END 5 VAR 7 SBH 8 SFH 9 MSG 10 SB 11 SF
SYSID=PAA1 APPLID=SCSCPAA1
TIME: 20.58.30 DATE: 08.08.96

```

Figure 116. CEMT INQUIRE UOWLINK Display

- INQ DSN

The INQUIRE DSNAME command (Figure 117) provides detailed information about the status of data sets managed by CICS TS. In this example we see that our data set, CICSDSW.VSAMU.HOTEL1, is available for use as far as CICS TS can determine and that one or more retained locks are associated with it.

```

INQ DSN(CICSDSW.VSAMU.HOTEL1)
STATUS: RESULTS - OVERTYPE TO MODIFY
Dsn(CICSDSW.VSAMU.HOTEL1 ) Vsa
Fil(0001) Val Bas Fwd Fr1(00) Ava Ret Unq

RESPONSE: NORMAL
PF 1 HELP 3 END 5 VAR 7 SBH 8 SFH 9 MSG 10 SB 11 SF
SYSID=PAA1 APPLID=SCSCPAA1
TIME: 21.02.35 DATE: 08.08.96

```

Figure 117. CEMT INQUIRE DSN Display

- INQ UOWDSNF

This command shows those data sets that have UOW failures associated with them (see Figure 118).

```

INQ UOWDSNF
STATUS: RESULTS
Dsn(CICSDSW.VSAMU.HOTEL1                ) Con
  Uow(AD4A1AC8E0B1D403)                Net(DFHINDSP) R1s

RESPONSE: NORMAL                                SYSID=PAA1 APPLID=SCSCPAA1
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
TIME: 21.03.33 DATE: 08.08.96

```

Figure 118. Display of Data Sets with Failed UOWs

Note that the UOWDSNF view command in CICSplex SM (Figure 119 on page 151) shows shunted UOWs. To get the associated data set names from this view, you have to go to each of the UOWDSNFD detail views.

```

08AUG1996 21:06:17 ----- INFORMATION DISPLAY -----
COMMAND ==>                                     SCROLL ==> PAGE
CURR WIN ==> 1          ALT WIN ==>
W1 =UOWDSNF=====SCSPLEX==SCSPLEX==08AUG1996==21:06:17====CPSM=====2
CMD Unit of Work Id  CICS      Cause      Reason      RLS      SysId N
----- System-- -----
AD4A083FE1493E04 SCSCPTA1 CONNECTION NOTAPPLIC NOTRLS PAA4 N
AD4A1AC8E0B1D403 SCSCPAA1 CONNECTION NOTAPPLIC RLS N

F1=HELP      F2=SPLIT     F3=END       F4=RETURN    F5=RFIND     F6=RCHANGE
F7=UP        F8=DOWN      F9=SWAP      F10=LEFT    F11=RIGHT    F12=RETRIEVE

```

Figure 119. CICSplex SM UOWDSNF Display

6 Use VSAM RLS SHCDS list commands to get information about SMSVSAM recovery related to online applications and spheres accessed in RLS mode.

The SHCDSs contain the information required for DFSMS/MVS 1.3 to continue processing if a failure occurs.

Figure 120 shows the JCL that was used to obtain the data.

```

//SHCDSPH JOB (999,POK),'CICS510',CLASS=A,MSGCLASS=T,
//          NOTIFY=&SYSUID
//* //SHCDS
//          EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN   DD *
SHCDS LISTSUBSYS(SCSCPAA1)
SHCDS LISTSUBSYSDS(SCSCPAA1)
SHCDS LISTDS(CICDSW.VSAMU.HOTEL1)
SHCDS LISTRECOVERY(CICDSW.VSAMU.HOTEL1)
/*

```

Figure 120. SHCDS Sample JCL

- LISTSUBSYS

The output from the LISTSUBSYS command (Figure 121 on page 152) for subsystem SCSCPAA1 shows that there is one retained lock.

```

SHCDS LISTSUBSYS(SCSCPAA1)
----- LISTING FROM SHCDS ----- IDC3H03
-----
SUBSYSTEM NAME      STATUS      RECOVERY      LOCKS      LOCKS      LOCKS
NEEDED             HELD         WAITING       RETAINED
-----
SCSCPAA1           ONLINE--ACTIVE  YES           0           0           0           1
DATA SETS IN LOST LOCKS-----
DATA SETS IN NON-RLS UPDATE STATE--
TRANSACTION COUNT-----
IDC00011 FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0

```

Figure 121. SHCDS LISTSUBSYS Output

- LISTSUBSYSDDS

The output from the LISTSUBSYSDDS command (Figure 122) for subsystem SCSCPAA1 shows that the retained lock is associated with the CICSDSW.VSAMU.HOTEL1 data set, and data associated with the retained lock is held in the coupling facility cache structure named CACHECICS.

```

SHCDS LISTSUBSYSDDS(SCSCPAA1)
----- LISTING FROM SHCDS ----- IDC3H04
-----
SUBSYSTEM NAME---- SCSCPAA1      SUBSYSTEM STATUS---ONLINE--ACTIVE
-----
DATA SET NAME /      RETAINED  LOST      LOCKS      RECOVERY      NON-RLS      PERMIT
CACHE  STRUCTURE  LOCKS     LOCKS     BOUND        REQUIRED      UPDATE      FIRST
-----  -----  -----  -----  -----  -----  -----  TIME
-----
CICSDSW.VSAMU.HOTEL1
CACHECICS             YES       NO        NO         NO           NO          NO
CICSDSW.VSAMV.COMPOSDB
CICS_CACHE           NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.DEPSUMDB
CACHECICS             NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.EMPACTDB
CACHECICS             NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.HOTEL1
CICS_CACHE           NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.INVENTOR
CACHECIC              NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.ITEMACT
CACHECIC              NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.ITEMMAST
CACHECICS             NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.LABOPSDB
CACHECICS             NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.PRODCONT
CACHECIC              NO        NO        NO         NO           NO          NO
CICSDSW.VSAMV.VENDOR
CICS_CACHE           NO        NO        NO         NO           NO          NO
IDC00011 FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0

```

Figure 122. SHCDS LISTSUBSYSDDS Output

- LISTDS

The output from the LISTDS command (Figure 123) for data set CICSDSW.VSAMU.HOTEL1 gives detailed information about the data set.

```

SHCDS LISTDS(CICSDSW.VSAMU.HOTEL1)
----- LISTING FROM SHCDS ----- IDC3H02
-----
DATA SET NAME----CICSDSW.VSAMU.HOTEL1
CACHE STRUCTURE---CACHECICS
RETAINED LOCKS-----YES      NON-RLS UPDATE PERMITTED-----NO
LOST LOCKS-----NO          PERMIT FIRST TIME-----NO
LOCKS NOT BOUND-----NO      FORWARD RECOVERY REQUIRED-----NO
RECOVERABLE-----YES
-----
SHARING SUBSYSTEM STATUS
SUBSYSTEM  SUBSYSTEM  RETAINED  LOST  NON-RLS
NAME       STATUS     LOCKS     LOCKS UPDATE
-----  -----  -----  -----  -----
SCSCPAA1  ONLINE--ACTIVE  YES      NO      NO
IDC00011 FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0

```

Figure 123. SHCDS LISTDS Output

- LISTRECOVERY

The output from the LISTRECOVERY command (Figure 124) for data set CICSDSW.VSAMU.HOTEL1 gives detailed recovery information for the data set.

```

SHCDS LISTRECOVERY(CICSDSW.VSAMU.HOTEL1)
----- LISTING FROM SHCDS ----- IDC5H05
-----
DATA SET NAME                RETAINED  LOST      LOCKS     NON-RLS  PERMIT
                             LOCKS     LOCKS     NOT       UPDATE   FIRST TIME
                             -----  -----  BOUND    REQUIRED  SWITCH
CICSDSW.VSAMU.HOTEL1        YES       NO        NO        NO       NO
-----
                SHARING SUBSYSTEM STATUS
SUBSYSTEM  SUBSYSTEM  RETAINED  LOST  NON-RLS  UPDATE
NAME       STATUS     LOCKS    LOCKS  PERMITTED
-----
SCSCPAA1  ONLINE--ACTIVE  YES     NO     NO
IDC00011 FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0

```

Figure 124. SHCDS LISTRECOVERY Output

In this example of the SHCDS commands, we use information gathered from our inquiries against the CICS TS subsystems. If online access to the CICS TS subsystems is not available, it is still possible to analyze retained locks. Use the SHCDS commands as follows:

1. LISTSUBSYS(ALL) to show all retained locks in all subsystems
2. LISTSUBSYSDS(subsystem_name) where subsystem_name has been identified by the LISTSUBSYS(ALL) command
3. LISTDS(base_cluster_name) where base_cluster_name has been identified by the LISTSUBSYSDS(subsystem_name) command.

7 Use CIND to simulate the coordinator CICS TS system, DFHINDSP, reconnecting to PAA1. Figure 125 shows the system response to this request.

- CIND RESYNC BACKOUT

The recovery manager unshunts the UOW that was previously shunted by CIND. The resulting DFHRM0109 message confirms that our attempt was successful and that the UOW has been forcibly backed out.

```

DFHIN1007 08/08/96 21:08:17 SCSCPAA1 045A CICSUSER Initiation of
resynchronization for units of work awaiting coordinator DFHINDSP is now
complete.

```

Figure 125. CIND RESYNC BACKOUT Display

8 Terminate CIND processing.

We terminate use of the in-doubt test tool by issuing the CIND OFF command, receiving the following confirmation:

```

DFHIN1004 08/08/96 21:08:50 SCSCPAA1 045C CICSUSER The indoubt tool is no
longer active for DFHTCIND tranclass transactions.

```

The messages shown in Figure 126 on page 154 are written to one or more of the CICS TS TD queues (CSMT or CSFL) or to the system console as a result of our in-doubt failure example.

```

2
DFHIN1001 08/08/96 20:48:47 SCSCPA1 045A CICSUSER The indoubt tool is now active for DFHTCIND tranclass transactions.
DFHIN1009 08/08/96 20:50:16 SCSCPA1 The indoubt tool has added coordinator link DFHINDSP to UOW X'AD4A1AC8E0B1D403' for
transaction CECI task number 0803.

4
DFHRM0106 08/08/96 20:52:06 SCSCPA1 Intersystem session failure. Resource updates will not be committed or backed out
until session recovery. Failure date 08/08/96 failure time 20:52:06 remote system DFHINDSP transaction CECI
task number 00010803 terminal 045A user CICSUSER network UOW X'1910'/USIBMSC.SJA2045A/X'4A1AC8E0B1D40001'
local UOW X'AD4A1AC8E0B1D403'.
DFHIN1010 08/08/96 20:52:06 SCSCPA1 Coordinator DFHINDSP is not available. The indoubt tool has caused RM domain to
shunt UOW X'AD4A1AC8E0B1D403' for transaction CECI task number 0803.
DFHAC2231 08/08/96 20:52:21 SCSCPA1 Transaction CECI running program DFHECIP term 045A has lost contact with its
coordinator system during syncpoint and has abended with code ASP1. The unit of work is shunted until contact
is restored.

7
DFHRM0109 08/08/96 21:08:17 SCSCPA1 Intersystem session recovery. Suspended resource updates now being backed out.
Original failure date 08/08/96 failure time 20:52:06 remote system DFHINDSP transaction CECI task number
00010803 terminal 045A user CICSUSER network UOW X'1910'/USIBMSC.SJA2045A/X'4A1AC8E0B1D40001' local UOW
X'AD4A1AC8E0B1D403'.
DFHIN1012 08/08/96 21:08:17 SCSCPA1 The indoubt tool is resynchronizing UOW X'AD4A1AC8E0B1D403' for transaction CECI
task number 0803. DFHINDSP coordinator UOW status is backout. Recovery manager UOW status is backout.
DFHIN1007 08/08/96 21:08:17 SCSCPA1 045A CICSUSER Initiation of resynchronization for units of work awaiting
coordinator DFHINDSP is now complete.

8
DFHIN1004 08/08/96 21:08:50 SCSCPA1 045A CICSUSER The indoubt tool is no longer active for DFHTCIND tranclass
transactions.

```

Figure 126. Messages Associated with RLS Example of an In-doubt Failure

6.1.4.4 Multiple CICS TS Systems Using MRO Links

Figure 127 shows multiple CICS TS systems using MRO links. The distributed UOW is updating recoverable resources in PAA1 and PAA4. A transaction fails in-doubt in PAA1 due to a failure associated with PAA4 during syncpoint processing.

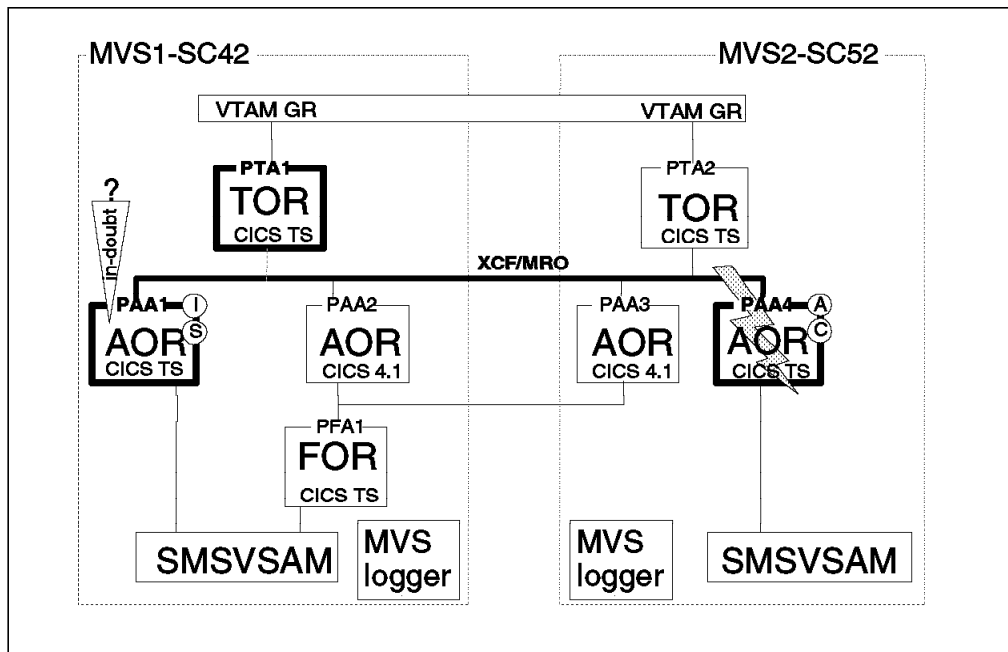


Figure 127. Multiple CICS TS Systems Using MRO Links. (I = initiator; A = agent; C = coordinator; S = subordinate)

CICS TS fully supports two-phase commit processing for all recoverable resources. There is no possibility of unwanted integrity exposures because of failure during the in-doubt period.

Action taken at the time of failure is determined by the options specified for the WAIT, WAITTIME, and ACTION attributes on the transaction definition in PAA1.

Specification of WAIT(YES) and WAITTIME(00,00,00) results in the UOW being shunted, to be resolved when PAA4 is restarted and connectivity is reestablished with PAA1. Specification of WAIT(YES) and WAITTIME(DD,HH,MM) results in the UOW being shunted, to be resolved when the initial failure is resolved or when DD,HH,MM expires, whichever comes first. If the initial failure is resolved, the shunted UOW is resolved according to the direction (commit or backout) it receives from the coordinator PAA4. If WAIT(NO) is specified or if DD,HH,MM expires, the UOW completes according to the value specified in the ACTION parameter.

The selection of the attribute values in the transaction definition represents a tradeoff between data integrity and data access.

In this example, we start with a UOW distributed across PAA1 and PAA4. The associated local UOWs have failed in-doubt in both systems.

Figure 126 on page 154 shows the messages generated in this case. View them in conjunction with working through the example.

To illustrate this in-doubt failure scenario, we use the following sequence of events:

- 1** Verify existence of shunted UOWs in PAA1 and PAA4.
- 2** Cause link between PAA1 and PAA4 to fail.
- 3** Use CIND RESYNC BACKOUT.
- 4** Redisplay UOW status.
- 5** Issue CEMT SET CONNECTION(PAA4) BACKOUT in PAA1.
- 6** Display UOW status in PAA1.
- 7** Reestablish the link between PAA1 and PAA4.

1 Verify existence of shunted UOWs in PAA1 and PAA4.

Figure 128 and Figure 129 show the in-doubt UOWs using CEMT in each CICS TS region. Figure 130 on page 157 and Figure 131 on page 157 show the in-doubt UOWs as seen by CICSplex SM. The CICSplex SM views show the common netuowid for each UOW in the distributed UOW.

```
INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AD4FFC3C81C40005) Inf Act Tra(CFQR) Tas(0000018)
  Age(00003239) Use(CICSUSER)
  Uow(AD4FFC86C1017205) Inf Act Tra(CONL) Tas(0000025)
  Age(00003161) Use(CICSUSER)
  Uow(AD4FFC88F2812803) Inf Act Tra(CSSY) Tas(0000029)
  Age(00003159) Use(CICSUSER)
  Uow(AD4FFC89649E7802) Inf Act Tra(COIO) Tas(0000030)
  Age(00003159) Use(CICSUSER)
  Uow(AD4FFC8B6FBDA604) Inf Act Tra(COIE) Tas(0000031)
  Age(00003156) Use(CICSUSER)
  Uow(AD4FFEE18FDB3A00) Inf Act Tra(CSNE) Tas(0000022)
  Age(00002529) Use(CICSUSER)
  Uow(AD50000221840205) Inf Act Tra(CSNC) Tas(0000053)
  Age(00002227) Use(CICSUSER)
  Uow(AD50003321F56003) Inf Act Tra(CEMT) Tas(0000085)
  Age(00002175) Ter(045A) Netn(SJA2045A) Use(CICSUSER)
Uow(AD5006A9B9223404) Ind Shu Tra(CSMI) Tas(0001417)
Age(00000358) Ter(E11 ) Netn(SCSCPAA1) Use(CICSUSER) Con Lin(DFHINDSP)

                                     SYSID=PAA4 APPLID=SCSCPAA4
RESPONSE: NORMAL                               TIME: 13.59.35 DATE: 08.13.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 128. CEMT Display of Shunted UOW in PAA4

```
INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AD4FFC08F00CAC06) Inf Act Tra(CFQR) Tas(0000019)
  Age(00003408) Use(CICSUSER)
  Uow(AD4FFC193E1E7A06) Inf Act Tra(CSSY) Tas(0000031)
  Age(00003391) Use(CICSUSER)
  Uow(AD4FFC22CD25A601) Inf Act Tra(COIO) Tas(0000032)
  Age(00003381) Use(CICSUSER)
  Uow(AD4FFC23EA7ACC02) Inf Act Tra(COIE) Tas(0000033)
  Age(00003379) Use(CICSUSER)
Uow(AD50007598C5E206) Ind Shu Tra(CECI) Tas(0000329)
Age(00000473) Ter(045D) Netn(SJA2045D) Use(CICSUSER) Con Lin(SCSCPAA4)
  Uow(AD5004BA70672602) Inf Act Tra(CONL) Tas(0000026)
  Age(00001074) Use(CICSUSER)
  Uow(AD50068C489AA803) Inf Act Tra(CSNC) Tas(0000333)
  Age(00000586) Use(CICSUSER)
  Uow(AD50069DA934EE01) Inf Act Tra(CSNE) Tas(0000023)
  Age(00000567) Use(CICSUSER)
  Uow(AD5008BB38245805) Inf Act Tra(CEMT) Tas(0001006)
  Age(00000000) Ter(045D) Netn(SJA2045D) Use(CICSUSER)

                                     SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL                               TIME: 14.01.36 DATE: 08.13.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 129. CEMT Display of Shunted UOW in PAA1


```

13AUG1996 14:04:57 ----- INFORMATION DISPLAY -----
COMMAND ==> SCROLL ==> PAGE
CURR WIN ==> 1 ALT WIN ==>
W1 =UOWORKS==UOWORKD==SCSPLEX==SCSPLEX==13AUG1996==14:04:41====CPSM=====1
UOW ID..... AD50007598C5E206
CICS System..... SCSCPAA1
Net UOW ID..... 1910 USIBMSC.SJA2045D 50007598C5E2 0001
Task ID..... 329
Start Term ID..... 045D
Start Trans ID..... CECI
Start User ID..... CICSUSER
State..... N/A
Wait State..... SHUNTED
Wait Cause..... CONNECTION
Age of Wait..... 00:11:06
Netname Causing Wait SJA2045D
Wait System ID..... PAA4

1=HELP F2=SPLIT F3=END F4=RETURN F5=RFIND F6=RCHANGE
7=UP F8=DOWN F9=SWAP F10=LEFT F11=RIGHT F12=RETRIEVE

```

Figure 130. CICSplex SM Detail Display of Shunted UOW in PAA1

```

13AUG1996 14:07:41 ----- INFORMATION DISPLAY -----
COMMAND ==> SCROLL ==> PAGE
CURR WIN ==> 1 ALT WIN ==>
W1 =UOWORKS==UOWORKD==SCSPLEX==SCSPLEX==13AUG1996==14:04:41====CPSM=====1
UOW ID..... AD50006A9B9223404
CICS System..... SCSCPAA4
Net UOW ID..... 1910 USIBMSC.SJA2045D 50007598C5E2 0001
Task ID..... 1417
Start Term ID..... E11
Start Trans ID..... CSMI
Start User ID..... CICSUSER
State..... N/A
Wait State..... SHUNTED
Wait Cause..... CONNECTION
Age of Wait..... 00:11:06
Netname Causing Wait SCSCPAA1
Wait System ID.....

1=HELP F2=SPLIT F3=END F4=RETURN F5=RFIND F6=RCHANGE
7=UP F8=DOWN F9=SWAP F10=LEFT F11=RIGHT F12=RETRIEVE

```

Figure 131. CICSplex SM Detail Display of Shunted UOW in PAA4

2 Cause link between PAA1 and PAA4 to fail.

We cause failure of the connection between PAA1 and PAA4 by changing the IRC status to closed (Figure 132 on page 158).

```

13AUG1996 14:10:10 ----- INFORMATION DISPLAY -----
COMMAND ==> SCROLL ==> PAGE
CURR WIN ==> 1 ALT WIN ==>
▶W1 =CICSRGNS=CICSRGND=SCSPLEX==SCSPLEX==13AUG1996==14:10:10====CPSPM=====1
CICS System.... SCSCPAA1 Start Date... 13AUG1996 CICS Status.. ACTIVE
CICS Release... 0510 Start Time... 13:04:05 Monitor Stat. ON
Job Name..... SCSCPAA1 Totl CPU..... 00:01:20.2 Recordng Stat OFF
VTAM Applid.... SCSCPAA1 Totl Page In. 0 Dump Status.. SYSDUMP
Location..... SC42 Totl Page Out 0 Trace Status. SYSTEMON
CICS Sysid.... PAA1 Totl SIO Cnt. 2900 AUXTrace Stat AUXSTOP
AKP..... 1000 Totl Real Stg 21380 LRT Perf Freq 00:00:00
MRO Batch..... 1 Current Tasks 4 External Sec. NOSECURITY
Priority Aging.. 1 Trn Iso1 Stat INACTIVE Startup Stat. WARMSTART
Runaway Time... 20000 RPL Reopens.. 0 AIn Ena Stat. ENABLED
Scan Delay.... 100 VTAM ACB..... OPEN PRSS Delay... 00:00:00
Xit Wait Time.. 1000 Times Max RPL 14 AIn Pgrm Nme. DFHZATDX
Library Loads.. 388 Max RPL Postd 1 AIn Curr Req. 0
Tot Load Time.. 00:00:00 VTAM SOS Cnt. 0 AutoIns Max.. 100
Cur Load Wait.. 0 VTAM Dyn Open 0 Prgm AIn Exit DFHPGADX
Tot Load Wait.. 7 XRF Status... NOTAPPLI Cat AIn Prgm. CTLMODIFY
Max Load Wait.. 1 IRC Status... CLOSED Dyn Route Pgm DFHDYP
Cnt Max Wait... 7 CMD Protect.. NOCMDPROT Storage Prot. INACTIVE
Tot Wait Time.. 00:03:42 RentProg Prot NOREENTPR TskRec ConvSt CONVERSE
Dflt Remote Sys N/A SOS Status... NOTSOS ShutDown Tran CESD

1=HELP F2=SPLIT F3=END F4=RETURN F5=RFIND F6=RCHANGE
7=UP F8=DOWN F9=SWAP F10=LEFT F11=RIGHT F12=RETRIEVE

```

Figure 132. CICSplex SM Detail Display Confirming That the IRC Is Closed

3 CIND RESYNC BACKOUT

We use the in-doubt test tool to create our example of a failed distributed UOW. By issuing a CIND RESYNC BACKOUT command, we simulate coordinator system DFHINDSP reconnecting to PAA4:

```
DFHIN1007 08/13/96 14:16:01 SCSCPAA4 045A CICSUSER Initiation of
resynchronization for units of work awaiting coordinator DFHINDSP is now
complete.
```

4 Redisplay UOW status. Figure 133 on page 159 shows that the UOW in PAA4 is now in a backout wait state. The recovery manager has backed out the previous change and is waiting for a forget flow from PAA1 (Figure 134 on page 159).

```

INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AD4FFC3C81C40005) Inf Act Tra(CFQR) Tas(0000018)
  Age(00004332) Use(CICSUSER)
  Uow(AD4FFC86C1017205) Inf Act Tra(CONL) Tas(0000025)
  Age(00004254) Use(CICSUSER)
  Uow(AD4FFC88F2812803) Inf Act Tra(CSSY) Tas(0000029)
  Age(00004252) Use(CICSUSER)
  Uow(AD4FFC89649E7802) Inf Act Tra(COIO) Tas(0000030)
  Age(00004252) Use(CICSUSER)
  Uow(AD4FFC8B6FBDA604) Inf Act Tra(COIE) Tas(0000031)
  Age(00004249) Use(CICSUSER)
  Uow(AD4FFEE18FDB3A00) Inf Act Tra(CSNE) Tas(0000022)
  Age(00003622) Use(CICSUSER)
  Uow(AD50000221840205) Inf Act Tra(CSNC) Tas(0000053)
  Age(00003320) Use(CICSUSER)
Uow(AD5006A9B9223404) Bac Wai Tra(CSMI) Tas(0001417)
Age(00000105) Ter(E11 ) Netn(SCSCPAA1) Use(CICSUSER) Wai
  Uow(AD500C6081CCD601) Inf Act Tra(CEMT) Tas(0001803)
  Age(00000000) Ter(045A) Netn(SJA2045A) Use(CICSUSER)

                                SYSID=PAA4 APPLID=SCSCPAA4
RESPONSE: NORMAL                                TIME: 14.17.50 DATE: 08.13.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF

```

Figure 133. Status of UOW in PAA4 after Resynchronization

```

INQ UOW
RESULT - OVERTYPE TO MODIFY
Uow(AD5006A9B9223404)
Uowstate( Backout )
Waitstate(Waiting)
  Transid(CSMI)
  Taskid(0001417)
  Age(00000105)
  Termid(E11)
  Netname(SCSCPAA1)
  Userid(CICSUSER)
Waitcause(Waitforget)
  Link()
  Sysid()
  Netuowid(..USIBMSC.SJA2045A&...ES...)

                                SYSID=PAA4 APPLID=SCSCPAA4
RESPONSE: NORMAL                                TIME: 14.18.19 DATE: 08.13.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF

```

Figure 134. Detail Status of UOW in PAA4 after Resynchronization

The UOW in PAA1 remains shunted (Figure 135 on page 160).

```

INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD4FFBFC62993A02) Inf Act Tra(CSSY) Tas(0000005)
Age(00004529) Use(CICSUSER)
Uow(AD4FFBFC62E64A05) Inf Act Tra(CSSY) Tas(0000006)
Age(00004529) Use(CICSUSER)
Uow(AD4FFBFC81BAB603) Inf Act Tra(CSTP) Tas(0000008)
Age(00004529) Use(CICSUSER)
Uow(AD4FFC08ED650204) Inf Act Tra(CFQS) Tas(0000018)
Age(00004516) Use(CICSUSER)
Uow(AD4FFC08F00CAC06) Inf Act Tra(CFQR) Tas(0000019)
Age(00004516) Use(CICSUSER)
Uow(AD4FFC193E1E7A06) Inf Act Tra(CSSY) Tas(0000031)
Age(00004499) Use(CICSUSER)
Uow(AD4FFC22CD25A601) Inf Act Tra(COIO) Tas(0000032)
Age(00004489) Use(CICSUSER)
Uow(AD4FFC23EA7ACC02) Inf Act Tra(COIE) Tas(0000033)
Age(00004488) Use(CICSUSER)
+ Uow(AD50007598C5E206) Ind Shu Tra(CECI) Tas(0000329)
Age(00001581) Ter(045D) Netn(SJA2045D) Use(CICSUSER) Con Lin(SCSCPAA4)

SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL TIME: 14.19.56 DATE: 08.13.96
PF 1 HELP 3 END 5 VAR 7 SBH 8 SFH 9 MSG 10 SB 11 SF

```

Figure 135. CEMT Display Showing the Unchanged Status of the Shunted UOW

5 Issue CEMT SET CONNECTION(PAA4) BACKOUT in PAA1 (Figure 136 on page 161).

This command forces the shunted UOW in PAA1 to back out, as shown in Figure 137 on page 162.

By forcing UOWs to complete, either by backing out or committing, the integrity of the data may be compromised. CICS TS writes various messages to the log, providing diagnostic information for use in correction of any situations where the forced resolution was in error. For example of these messages, see Figure 139 on page 163.

```
SET CONNECTION(PAA4) BACKOUT
STATUS: RESULTS - OVERTYPE TO MODIFY
Con(PAA4) Net(SCSCPAA4)    Ins Re1 Xm          Rec    NORMAL

                                                                    SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL          TIME: 14.24.16 DATE: 08.13.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 136. Forced Backout in PAA1

If we need to force the resolution of all UOWs that are in-doubt as the result of a connection failure, we use the SET CONNECTION command. BACKOUT, COMMIT, and FORCEUOW options of the SET CONNECTION command force decisions for any UOWs that are in-doubt due to a failure of the connection. The normal resynchronization process is partially overridden, but decisions taken are recorded and any data inconsistencies reported when the connection is next acquired.

Contrast this with the SET UOW command, which is applied to an individual UOW and works only if resynchronization is possible.

6 Display UOW status in PAA1.

```
INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD4FFBFC62993A02) Inf Act Tra(CSSY) Tas(0000005)
Age(00005382) Use(CICSUSER)
Uow(AD4FFBFC62E64A05) Inf Act Tra(CSSY) Tas(0000006)
Age(00005382) Use(CICSUSER)
Uow(AD4FFBFC81BAB603) Inf Act Tra(CSTP) Tas(0000008)
Age(00005382) Use(CICSUSER)
Uow(AD4FFC08ED650204) Inf Act Tra(CFQS) Tas(0000018)
Age(00005369) Use(CICSUSER)
Uow(AD4FFC08F00CAC06) Inf Act Tra(CFQR) Tas(0000019)
Age(00005369) Use(CICSUSER)
Uow(AD4FFC193E1E7A06) Inf Act Tra(CSSY) Tas(0000031)
Age(00005352) Use(CICSUSER)
Uow(AD4FFC22CD25A601) Inf Act Tra(COIO) Tas(0000032)
Age(00005342) Use(CICSUSER)
Uow(AD4FFC23EA7ACC02) Inf Act Tra(COIE) Tas(0000033)
Age(00005341) Use(CICSUSER)
+ Uow(AD50007598C5E206) Hba Wai Tra(CECI) Tas(0000329)
Age(00000593) Ter(045D) Netn(SJA2045D) Use(CICSUSER) Wai

SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL TIME: 14.32.09 DATE: 08.13.96
PF 1 HELP 3 END 5 VAR 7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 137. Result of Forced Backout in PAA1

7 Reestablish the link between PAA1 and PAA4 (Figure 138).

Message DFHRM0148 from PAA4 reports that all regions are again synchronized, even though the decisions to back out were taken independently.

```
SET IRC OPEN
STATUS: RESULTS - OVERTYPE TO MODIFY
Irc Ope NORMAL

SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL TIME: 15.34.50 DATE: 08.13.96
PF 1 HELP 3 END 5 VAR 7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 138. Opening the Link between PAA1 and PAA4

The messages shown in Figure 139 on page 163 are written to one or more of the CICS TS TD queues (CSMT or CSFL) or to the system console as a result of our second in-doubt failure example.

```

=====
SCSCPAA1 messages:
=====
5
DFHRM0105 08/13/96 14:24:15 SCSCPAA1 Intersystem session failure. Resource updates are being backed out. Local resources
may be out of sync with those on the remote system. Failure date 08/13/96 failure time 13:53:34 remote system
SCSCPAA4 transaction CECI task number 00000329 terminal 045D user CICSUSER network UOW
X'1910'/USIBMSC.SJA2045D/X'50007598C5E20001' local UOW X'AD50007598C5E206'.
DFHFC3004 08/13/96 14:24:16 SCSCPAA1 Record backed out because of the forced back out of an indoubt unit of work.
Diagnostic information follows in message DFHFC3010. The record was updated by unit of work
X'AD50007598C5E206' for file HOTEL1, base data set CICSOSW.VSAMU.HOTEL1
DFHFC3010 08/13/96 14:24:16 SCSCPAA1 Diagnostic information for unit of work X'AD50007598C5E206' and file HOTEL1. Update
was a write-add made by transaction CECI at terminal 045D under task number 00329. Key length 16, data length
30, base ESDS RBA X'00000000', record key X'FBF8F8F8F8F8F8F8F8F8F80000000000'

9
DFHRM0110 08/13/96 15:34:51 SCSCPAA1 Intersystem session recovery. Unit of work found to be synchronized. Original
failure date 08/13/96 failure time 13:53:34 remote system SCSCPAA4 transaction CECI task number 00000329
terminal 045D user CICSUSER network UOW X'1910'/USIBMSC.SJA2045D/X'50007598C5E20001' local UOW
X'AD50007598C5E206'.

=====
SCSCPAA4 messages:
=====
3
DFHRM0109 08/13/96 14:16:01 SCSCPAA4 Intersystem session recovery. Suspended resource updates now being backed out.
Original failure date 08/13/96 failure time 13:53:34 remote system DFHINDSP transaction CSMI task number
00001417 terminal E11 user CICSUSER network UOW X'1910'/USIBMSC.SJA2045D/X'50007598C5E20001' local UOW
X'AD5006A9B9223404'.
DFHIN1012 08/13/96 14:16:01 SCSCPAA4 The indoubt tool is resynchronizing UOW X'AD5006A9B9223404' for transaction CSMI
task number 1417. DFHINDSP coordinator UOW status is backout. Recovery manager UOW status is backout.
DFHIN1007 08/13/96 14:16:01 SCSCPAA4 045A CICSUSER Initiation of resynchronization for units of work awaiting
coordinator DFHINDSP is now complete.

9
DFHRM0148 08/13/96 15:34:51 SCSCPAA4 Intersystem session recovery. Resource updates are in sync. network UOW id
X'1910'/USIBMSC.SJA2045D/X'50007598C5E20001' remote system SCSCPAA1.

```

Figure 139. Messages Associated with an MRO Example of an In-doubt Failure

6.1.4.5 CICS TS and CICS/ESA Systems Using MRO Links

Figure 140 on page 164 shows CICS TS and CICS/ESA systems using MRO links. A distributed UOW is updating recoverable resources in PAA1, PAA2, and PAA4, and PAA2 fails during syncpoint processing. PAA1 is both the coordinator of PAA4 and a subordinate of PAA2.

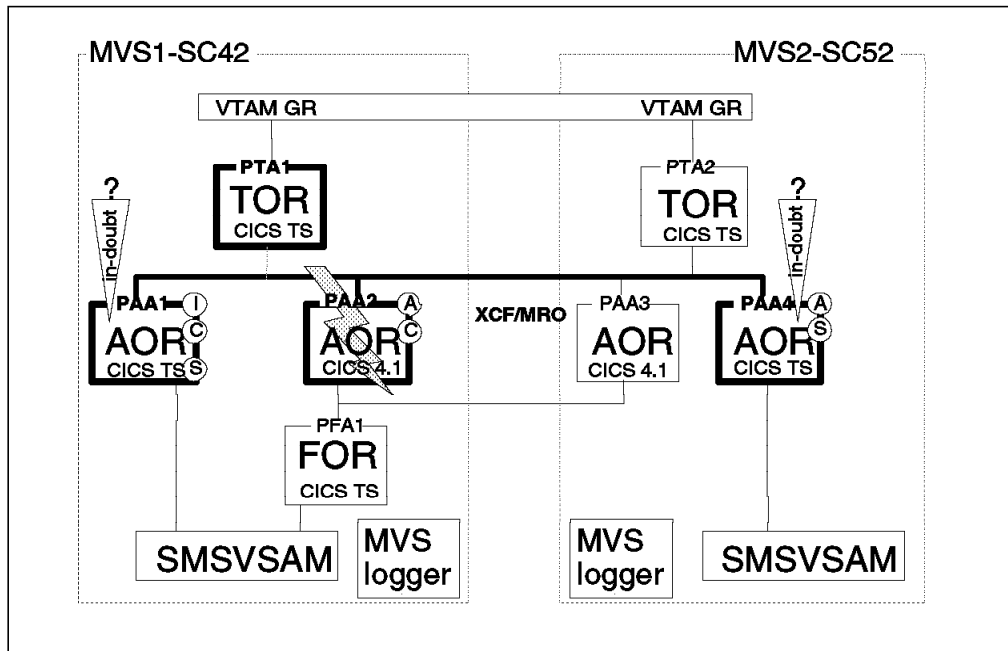


Figure 140. CICS TS and CICS/ESA Systems Using MRO Links. (I = initiator; A = agent; C = coordinator; S = subordinate)

CICS TS always makes a single CICS/ESA region the last agent in an MRO environment. Hence the CICS/ESA region is never in-doubt. The UOWs in PAA1 and PAA4 are actioned based on the parameter settings in PAA1 for the transaction, as described in 6.1.4.4, "Multiple CICS TS Systems Using MRO Links" on page 154.

A unilateral decision is taken if there is more than one CICS/ESA region in a distributed UOW. WAIT(NO) is forced for all UOWs in the distributed UOW. All UOWs are backed out, or all are committed, according to the value specified for the ACTION attribute on the transaction definition in PAA1 (for recoverable data sets, INDOUBT(BACKOUT) should always be specified).

6.1.4.6 Multiple CICS TS Systems Using ISC Links

Figure 141 on page 165 shows the CICS TS systems using ISC links. A task updating recoverable resources in PAA1 and PAA2 fails in-doubt in PAA1 because of a failure associated with PAA2 during syncpoint processing.

The possibility of failure during in-doubt processing is greater when ISC connections are involved because of the relatively longer processing times associated with the distributed UOWs.

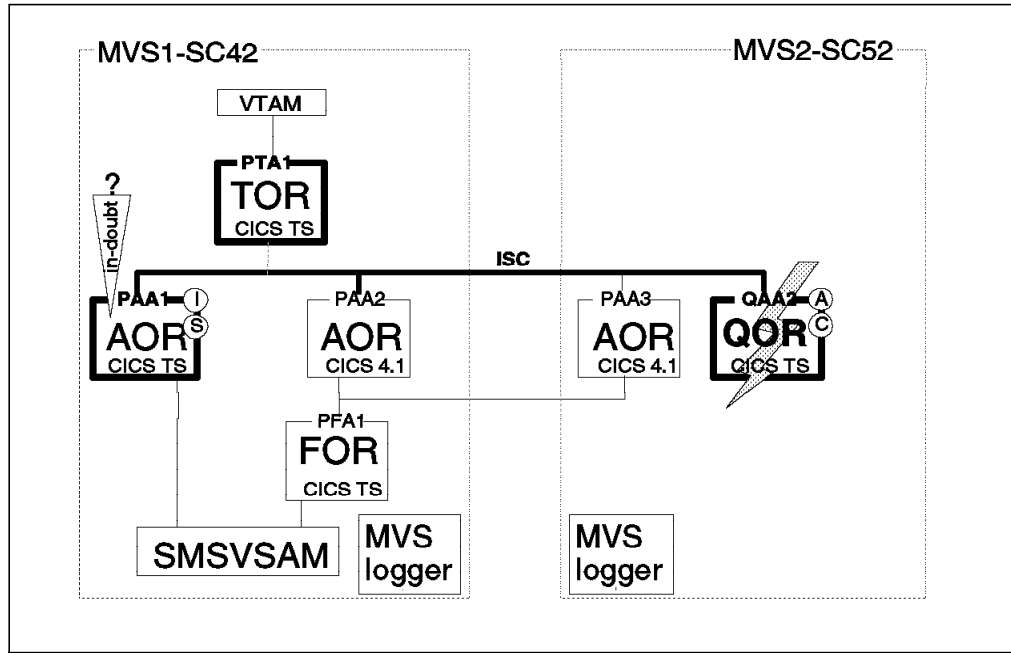


Figure 141. Multiple CICS TS Systems Using ISC Links. (I = initiator; A = agent; C = coordinator; S = subordinate)

The in-doubt support in this environment has the same level of function as that for MRO-connected CICS TS systems, as described in 6.1.4.4, “Multiple CICS TS Systems Using MRO Links” on page 154.

6.1.4.7 CICS TS and CICS/ESA Systems Using ISC Links

Figure 142 shows CICS TS and CICS/ESA systems using ISC links. A task updating recoverable resources in PAA1, PAA3, and QAA2 fails in-doubt because of a failure in PAA3 during syncpoint processing.

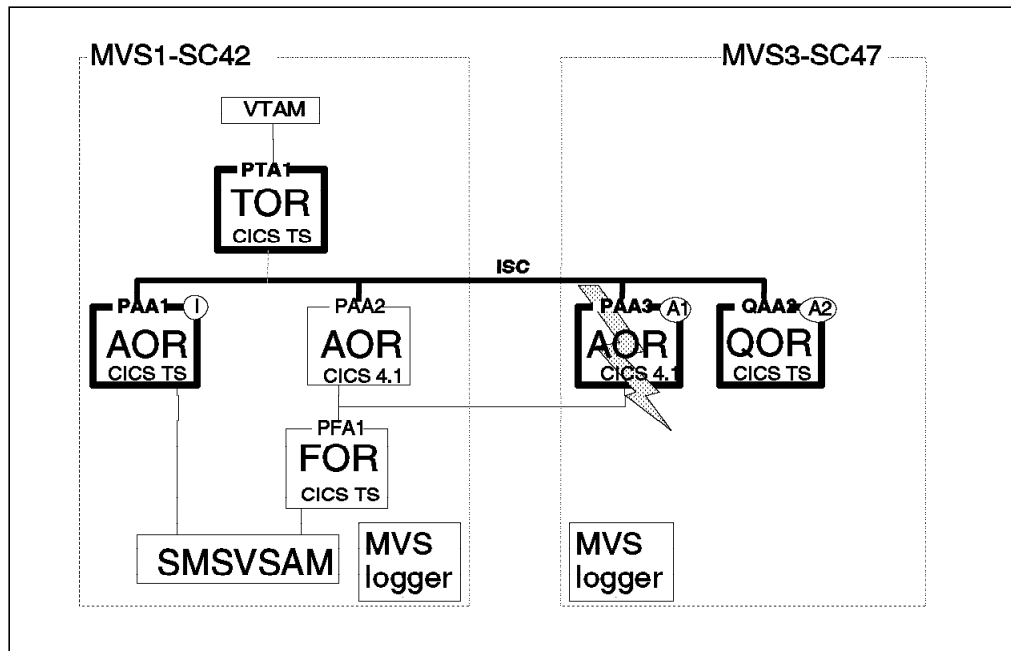


Figure 142. CICS TS and CICS/ESA Systems Using ISC Links. (I = initiator; A = agent; C = coordinator; S = subordinate)

The protocols used on the ISC connection do not provide a mechanism to specifically make the CICS/ESA system the last agent. If by chance PAA3 is the last agent, processing is the same as for MRO connections (see 6.1.4.5, "CICS TS and CICS/ESA Systems Using MRO Links" on page 163).

If QAA2 becomes the last agent, the UOWs in PAA1 and QAA2 are shunted, and PAA3, the CICS/ESA system, sees a session failure and backs out or commits according to the ACTION attribute specification for the transaction in PAA1. Resources on PAA1 and QAA2 are kept in sync, but resources on PAA3 may be out of sync.

6.1.4.8 CICS TS, VSAM RLS, and DB2 for MVS/ESA in a Parallel Sysplex

Figure 143 shows the CICS TS, VSAM RLS, and DB2 for MVS/ESA environment in a Parallel Sysplex and represents the most common VSAM RLS customer processing environment. There is full data sharing with integrity in this environment.

DB2 for MVS/ESA, along with any CICS TS region to which it is attached, uses the two-phase commit protocol to ensure that data integrity is maintained. The CICS TS region is the coordinator in the syncpoint process.

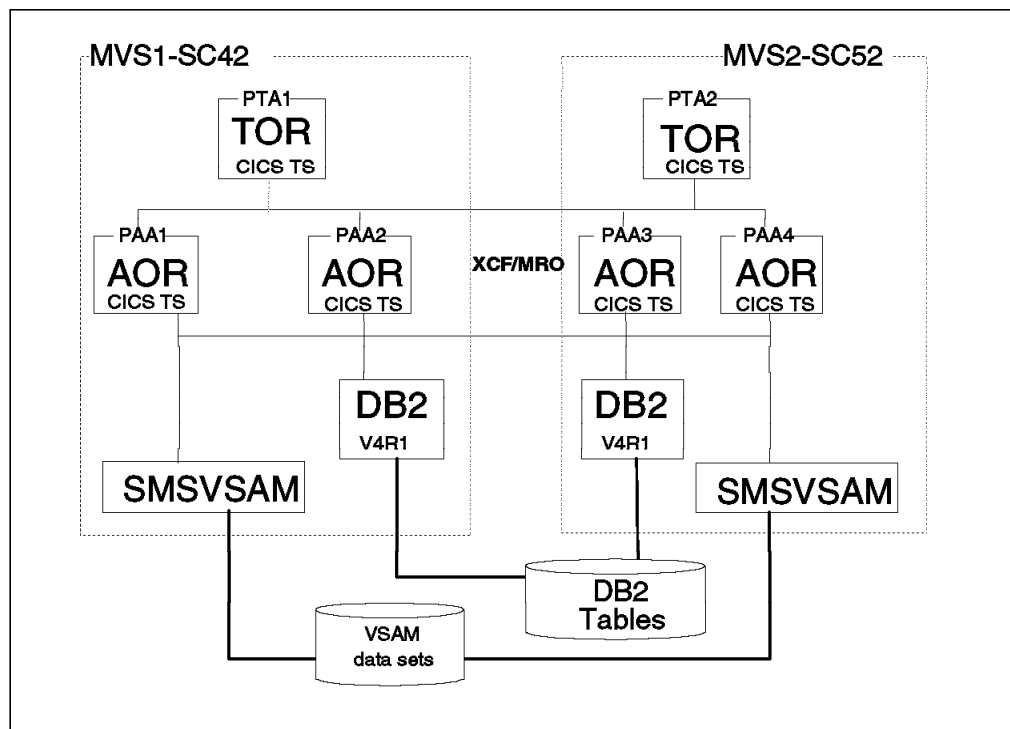


Figure 143. CICS TS, VSAM RLS, and DB2 for MVS/ESA in a Parallel Sysplex

A CICS TS region is never in-doubt as to whether to back out or commit any recoverable resources it owns when only DB2 for MVS/ESA and a single CICS TS AOR are involved. The two-phase commit protocol ensures that DB2 for MVS/ESA resources remain in synchronization with any CICS TS recoverable resources that are local to the CICS TS region.

DB2 for MVS/ESA can be in-doubt with respect to the CICS TS region. If a failure occurs while DB2 for MVS/ESA is in-doubt, DB2 for MVS/ESA retains the locks on its resources and waits until the connection to CICS TS is restored. It then

queries CICS TS to determine whether it should commit or back out its in-doubt changes.

If this scenario is extended to include a second resource manager, for example, a CICS TS QOR with recoverable temporary storage, there is no way, in CICS/ESA releases previous to CICS TS, that synchronization between all recoverable resources can be guaranteed in the event of a failure. CICS TS has an enhanced task-related user interface (TRUE) mechanism that can be enabled to support in-doubt wait. In our example, if PAA2 fails in-doubt and it has updated recoverable resources in PAA4 and the QOR, it requests DB2 for MVS/ESA to shunt its unresolved UOWs. Once the in-doubt failure is resolved, CICS TS advises DB2, and resynchronization occurs.

6.1.5 Documentation on In-doubt Failure

Detailed information about in-doubt failure and its causes can be found in Chapter 4 of the *CICS Release Guide*, in the *CICS Recovery and Restart Guide*, and in Chapter 29 of the *CICS Intercommunication Guide*. The CIND transaction is documented in Chapter 16 of the *CICS Supplied Transactions* manual. SHCDS commands are described in *DFSMS/MVS 1.3 Access Method Services for ICF*.

6.2 Backout Failure

If a transaction fails, either individually or as a result of CICS TS region failure, the CICS TS recovery manager uses system log data to back out any updates made by the current UOW. The backout processing could fail for any of the following reasons:

- I/O error
- Entry sequenced data set (ESDS) logical delete not performed
- Open error
- SMSVSAM server failure
- SMSVSAM server recycle during backout
- Coupling facility cache structure failure, including cache structure full
- DFSMSdss non-Backup While Open (BWO) backup in progress
- Data set full
- Nonunique alternate index full
- Deadlock detected
- Duplicate key error
- Error in CICS TS or VSAM code

6.2.1 Impact of Retained Locks Caused by Backout Failure

Locked records are unavailable for update and for reading with integrity. Other UOWs that attempt an update to, or a read with integrity of, a record that has a retained lock receive the LOCKED response. The exception handling code in the executing program can make a decision based on this response. Waiting is not recommended because there is no way of determining how long the records will remain locked.

6.2.2 Prevention of Retained Locks Caused by Backout Failure

Actions that can be taken to minimize or eliminate potential causes of backout failure are:

- I/O error
Use dual copy DASD.
- ESDS logical delete not performed
Ensure that logical delete exit XFCLDEL is correctly enabled.
- Open error
A data set is usually already open during dynamic backout, so the cause of this problem is most likely operational, for example, an operator has quiesced the data set. This error can also occur after a failure of the SMSVSAM server, if the server is still down when UOWs that were active at the time of the failure try to back out.
- SMSVSAM server failure
The probability of an SMSVSAM server failure is reduced if you have more than one coupling facility. Consider having a backup coupling facility.
- Coupling facility cache structure failure
You can insure against a cache structure failure by using at least two coupling facilities and defining each cache structure, within the cache set, on a different coupling facility.
- DFSMSdss non-BWO backup in progress
This problem does not occur provided non-BWO backups are not scheduled while a VSAM data set is being accessed in RLS mode.
- Data set full
Create effective operational procedures that ensure proper data set sizing initially and regular monitoring thereafter.
- Nonunique alternate index full
Create effective operational procedures that ensure proper index data set sizing initially and regular monitoring thereafter.
- Deadlock detected
This condition can only occur for VSAM data sets accessed in non-RLS mode.
- Duplicate key error
This condition can only occur for VSAM data sets accessed in non-RLS mode.
- Error in CICS TS or VSAM code
Perform regular software maintenance to reduce the possibility of this error occurring.

6.2.3 Recovery from Retained Locks Caused by Backout Failure

Recovery depends on the type of failure: For some failures (for example, an SMSVSAM failure), recovery is automatic; for others (for example, an I/O error), the data set must be taken offline.

- I/O error

The data set must be taken offline for repair (see section 3.3, “Physical I/O Failure on a VSAM Data Set” on page 35). You may decide to delay repair action if the impact of the I/O error is localized and the availability of the remainder of the data set is a higher requirement.

- ESDS logical delete not performed

You can recover by enabling a suitable XFCLDEL exit program and manually retrying the backout.

- Open error

The backout is automatically retried when the offending data set is unquiesced or when the SMSVSAM server is again available. Section 6.2.4, “Example of Retained Locks Caused by Backout Failures” on page 170 provides an example of a retained lock resulting from a backout failure due to a data set open error.

- SMSVSAM server failure

Backout is automatically retried when the SMSVSAM server again becomes available. In very exceptional circumstances, it may be necessary to issue a SET DSN(....) RETRY command to manually retry UOWs that were not retried when the server returned.

- Coupling facility cache structure failure

Backout is automatically retried when a cache again becomes available.

- DFSMSdss non-BWO backup in progress

The backout is retried automatically when the non-BWO backup completes.

- Data set full

You must take the data set offline to reallocate it with more space. You can then retry the backout manually. The process for recovering from a data set full condition is documented in the *CICS Recovery and Restart Guide*.

- Nonunique alternate index full

The data set must be taken offline for repair.

- Deadlock detected

This is a transient condition, and a manual retry should enable backout to complete successfully.

- Duplicate key error

This error can be resolved with IDCAMS by deleting the record with the duplicate key.

- Error in CICS TS or VSAM code

If this is a transient condition, a manual retry should enable backout to complete successfully. Otherwise you need further assistance from IBM to resolve the problem.

6.2.4 Example of Retained Locks Caused by Backout Failures

A backout failure caused by a data set not open problem can be simulated using CECI and CIND, the in-doubt test tool. In our example, the owners of recoverable resources are PAA1 and DFHINDSP, as shown in Figure 110 on page 143. HOTEL1 is a VSAM RLS data set local to the PAA1 AOR.

Figure 155 on page 178 shows the messages generated in this case. View them in conjunction with working through the example.

To illustrate the backout failure scenario, we use the following sequence of events:

- 1** Use CEMT to place CECI in transaction class DFHTCIND.
- 2** Initialize CIND processing.
- 3** Use CECI to add a record to the HOTEL1 data set.
- 4** Use CECI to take a SYNCPOINT.
- 5** Use CEMT to quiesce CICS_{DSW}.VSAMU.HOTEL1.
- 6** Use CEMT to verify that there is a shunted UOW.
- 7** Reestablish connection between PAA1 and DFHINDSP.
- 8** Use CEMT command to show UOW status.
- 9** Use CEMT to unquiesce our data set.
- 10** Use CEMT to verify that the previously shunted UOW no longer exists.
- 11** Terminate CIND processing.

- 1 Use CEMT to place CECI in transaction class DFHTCIND (Figure 144).

```
SET TRAN(CECI) TCL(DFHTCIND)
STATUS: RESULTS - OVERTYPE TO MODIFY
Tra(CECI) Pri( 001 ) Pro(DFHECIP ) Tc1( DFHTCIND ) Ena Pur NORMAL
Prf(DFHCICST) Uda Bel Iso Bac Wai Ind(000000)

RESPONSE: NORMAL
PF 1 HELP 3 END 5 VAR 7 SBH 8 SFH 9 MSG 10 SB 11 SF

SYSID=PAA1 APPLID=SCSCPAA1
TIME: 12.45.14 DATE: 08.09.96
```

Figure 144. Place CECI in DFHTCIND Transaction Class

- 2 Initialize CIND processing.

We initialize the in-doubt test tool by issuing the CIND ON command, which results in the following confirmation message:

```
DFHIN1001 08/09/96 12:46:21 SCSCPAA1 045C CICSUSER The indoubt tool is now
active for DFHTCIND tranclass transactions.
```

3 Use CECI to add a record to the HOTEL1 data set (Figure 145 on page 172).

```
WRITE FILE(HOTEL1) FROM(&A) RIDFLD(&B)
STATUS: COMMAND EXECUTION COMPLETE NAME=
EXEC CICS WRITE File( 'HOTEL1 ' )
  ◀ Sysid() ▶
  From( '1111111111.....*..%000000%..%' )
  ◀ Length( +00030 ) ▶
  RIDfld( '1111111111' )
  ◀ Keylength() ▶
  ◀ RBa | RRn ▶
  ◀ Massinsert ▶
  ◀ Nosuspend ▶

RESPONSE: NORMAL EIBRESP=+0000000000 EIBRESP2=+0000000000
PF 1 HELP 2 HEX 3 END 4 EIB 5 VAR 6 USER 7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 145. Update HOTEL1 File

Using the function provided by the CECI transaction, we have successfully added a record to the HOTEL1 data set.

4 Use CECI to take a SYNCPOINT (Figure 146 on page 173).

This command initiates syncpoint processing to commit the updates. However, it is not successful, as indicated by message DFHAC2201, because CECI has lost contact with DFHINDSP during the critical in-doubt period. DFHINDSP is the coordinator of the two-phase commit process.


```

SYNCPPOINT
STATUS: ABOUT TO EXECUTE COMMAND
EXEC CICS SYNcpoint
  ◀ Rollback ▶
NAME=

DFHAC2201 12:50:59 SCSCPAA1 Transaction CECI has lost contact with its
coordinator system during syncpoint processing and has abended with code
ASP1. The unit of work is shunted until contact is restored.

```

Figure 146. Issue an Explicit Syncpoint Request

5 Use CEMT to quiesce CICSDSW.VSAMU.HOTEL1 (Figure 147).

By quiescing the HOTEL1 data set, we create a scenario in which an attempted backout will fail. The immediate response from CEMT indicates QUIESCE is progressing and that a retained lock exists.

```

SET DSN(CICSDSW.VSAMU.HOTEL1) QUIESCE
STATUS: RESULTS - OVERTYPE TO MODIFY
Dsn(CICSDSW.VSAMU.HOTEL1) Vsa      BEING QUIESCED
  Fil(0001) Val Bas Fwd   Fr1(00) Ava   Ret Unq

RESPONSE: NORMAL
PF 1 HELP      3 END      5 VAR      7 SBH 8 SFH 9 MSG 10 SB 11 SF
SYSID=PAA1 APPLID=SCSCPAA1
TIME: 12.52.09 DATE: 08.09.96

```

Figure 147. CEMT QUIESCE of HOTEL1

By the time we display the data set status in CICSplex SM, the quiesce is complete and the existence of a retained lock is confirmed.

```

09AUG1996 12:54:07 ----- INFORMATION DISPLAY -----
COMMAND ==>                                     SCROLL ==> PAGE
CURR WIN ==> 1          ALT WIN ==>
W1 =DSNAMES==DSNAMED==SCSPLEX==SCSPLEX==24JUL1996==21:26:15====CPSM=====1
Dataset Name..... CICSDSW.VSAMU.HOTEL1
CICS System..... SCSCPAA1
Access Method..... VSAM
Availability..... AVAILABLE
Object Type..... BASE
Base Dataset..... CICSDSW.VSAMU.HOTEL1
File Count..... 1
Validity Check.... VALID
Backout Status.... N/A
Forward Rec Log... 0
Recovery Status... FWDRECOVABLE
Backup Type..... NOTAPPLIC
Recovery LogStream SCSCFWR.VSAMU
Lost Locks..... NOLOSTLOCKS
Quiesce State..... QUIESCED
Retained Locks.... RETAINED

F1=HELP      F2=SPLIT    F3=END      F4=RETURN   F5=RFIND    F6=RCHANGE
F7=UP        F8=DOWN     F9=SWAP     F10=LEFT    F11=RIGHT   F12=RETRIEVE

```

Figure 148. CICSplex SM Display of HOTEL1 Status

6 Use CEMT to verify that there is a shunted UOW (Figure 149).

```

INQ UOW SHU
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD4AF0D907314005) Ind Shu Tra(CECI) Tas(0000040)
Age(00000316) Ter(045D) Netn(SJA2045D) Use(CICSUSER) Con Lin(DFHINDSP)

RESPONSE: NORMAL
PF 1 HELP      3 END      5 VAR      7 SBH 8 SFH 9 MSG 10 SB 11 SF
SYSID=PAA1 APPLID=SCSCPAA1
TIME: 12.56.01 DATE: 08.09.96

```

Figure 149. CEMT Display of Shunted UOW

Figure 150 on page 175 and Figure 151 on page 175 illustrate the viewing of UOW information through CICSplex SM facilities. Note, in Figure 151 on page 175, the results from using the PF1 HELP key to show the meaning of, and possible values for, the CAUSE column in the UOWDSNF view.

```

09AUG1996 12:58:48 ----- INFORMATION DISPLAY -----
COMMAND ==>                                     SCROLL ==> PAGE
CURR WIN ==> 1          ALT WIN ==>
W1 =UOWORKS==UOWORKD==SCSPLEX==SCSPLEX==09AUG1996==12:58:12====CPSM=====1
  UOW ID.....                               AD4AF0D907314005
  CICS System.....                           SCSCPAA1
  Net UOW ID..... 1910 USIBMSC.SJA2045D 4AF0D9073140 0001
  Task ID.....                               40
  Start Term ID.....                          045D
  Start Trans ID.....                         CECI
  Start User ID.....                          CICSUSER
  State.....                                  N/A
  Wait State.....                             SHUNTED
  Wait Cause.....                             CONNECTION
  Age of Wait.....                            00:07:28
  Netname Causing Wait                        SJA2045D
  Wait System ID.....

```

Figure 150. CICSplex SM Detail Display of a Shunted UOW

```

09AUG1996 13:00:28 ----- INFORMATION DISPLAY -----
COMMAND ==>                                     SCROLL ==> PAGE
CURR WIN ==> 1          ALT WIN ==>
W1 =UOWDSNF=====SCSPLEX==SCSPLEX==09AUG1996==13:00:28====CPSM=====2
CMD Unit of Work Id  CICS  Cause      Reason          RLS  SysId Netid
---  -----  System--  -----  Access  -----
AD4AF0D907314005 SCSCPAA1 CONNECTION NOTAPPLIC RLS N/A
AD4A083FE1493E04 SCS  aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
] Help          Cause - UOWDSNF          Help ]
] Command ==>                                     Scroll ==> PAGE ]
] ----- ]
] Indicates which failed component caused the ]
] shunted unit of work to have retained locks for ]
] this data set. The valid values are: ]
] ]
] CACHE The cache structure, or connection to ]
] it, has failed. ]
] ]
] RLSSERVER The SMSVSAM server has failed. ]
] ]
] CONNECTION There is an intersystem connection ]
] error, which caused the unit of work ]
] to fail while in-doubt. ]
] ]
] F1=HELP F2=SPLIT F3=END F4=RETURN ]
] F5=RFIND F6=RCHANGE F7=UP F8=DOWN ]
] aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa

F1=HELP F2=SPLIT F3=END F4=RETURN F5=RFIND F6=RCHANGE
F7=UP F8=DOWN F9=SWAP F10=LEFT F11=RIGHT F12=RETRIEVE

```

Figure 151. CICSplex SM View of UOW Failure Associated with HOTEL1

7 Reestablish connection between PAA1 and DFHINDSP.

By issuing the CIND RESYNC BACKOUT command, we simulate the coordinator system DFHINDSP reconnecting to PAA1. The following message appears on the screen:

```
DFHIN1007 08/09/96 13:06:56 SCSCPAA1 045C CICSUSER Initiation of
resynchronization for units of work awaiting coordinator DFHINDSP is now
complete.
```

The CICS TS recovery manager unshunts the UOW that was previously shunted because of CIND processing. Backout is immediately retried but fails because HOTEL1 is not available.

8 Use CEMT command to show UOW status (Figure 152).

```
I UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AD4AED66B3449203) Inf Act Tra(COIO) Tas(0000030)
  Age(00002208) Use(CICSUSER)
  Uow(AD4AED67E3783200) Inf Act Tra(COIE) Tas(0000031)
  Age(00002207) Use(CICSUSER)
  Uow(AD4AEF2B1060DA03) Inf Act Tra(CSNE) Tas(0000026)
  Age(00001734) Use(CICSUSER)
Uow(AD4AF0D907314005) Bac Shu Tra(CECI) Tas(0000040)
Age(00000146) Ter(045D) Netn(SJA2045D) Use(CICSUSER) Dat
  Uow(AD4AF5A0E0000C03) Inf Act Tra(CEMT) Tas(0001571)
  Age(00000000) Ter(045D) Netn(SJA2045D) Use(CICSUSER)

                                SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL                TIME: 13.09.26 DATE: 08.09.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 152. UOW Status after Backout Failure

This screen confirms that the backout did not succeed and that it remains shunted (see also message DFHFC4701 in Figure 155 on page 178).

9 Use CEMT to unquiesce the data set (Figure 153 on page 177).

The backout is immediately retried once the data set is unquiesced. No messages are issued, provided the backout is successful.

```

SET DSN(CICSDSW.VSAMU.HOTEL1) UNQUIESCE
STATUS: RESULTS - OVERTYPE TO MODIFY
Dsn(CICSDSW.VSAMU.HOTEL1          ) Vsa      NORMAL
  Fil(0001) Val Bas Fwd      Fr1(00) Ava      Ret Unq

RESPONSE: NORMAL
PF 1 HELP      3 END      5 VAR      7 SBH 8 SFH 9 MSG 10 SB 11 SF
SYSID=PAA1 APPLID=SCSCPAA1
TIME: 13.12.00 DATE: 08.09.96

```

Figure 153. CEMT UNQUIESCE of HOTEL1

10 Use CEMT to verify that the previously shunted UOW no longer exists (Figure 154).

```

INQ UOW(AD4AFOD907314005)
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD4AFOD907314005)          NOT FOUND

RESPONSE: 1 ERROR
PF 1 HELP      3 END      5 VAR      7 SBH 8 SFH 9 MSG 10 SB 11 SF
SYSID=PAA1 APPLID=SCSCPAA1
TIME: 13.13.51 DATE: 08.09.96

```

Figure 154. Check for the Previously Shunted UOW

11 Terminate CIND processing.

The CIND OFF command terminates the use of the in-doubt test tool with the following confirmation:

DFHIN1004 08/09/96 13:14:27 SCSCPA1 045C CICSUSER The indoubt tool is no longer active for DFHTCIND tranclass transactions.

The messages shown shown in Figure 155 are written to one or more of CICS TS TD queues CSMT or CSFL or to the system console as a result of our backout failure example.

```
2
DFHIN1001 08/09/96 12:46:21 SCSCPA1 045D CICSUSER The indoubt tool is now active for DFHTCIND tranclass transactions.
DFHIN1009 08/09/96 12:47:59 SCSCPA1 The indoubt tool has added coordinator link DFHINDSP to UOW X'AD4AF0D907314005' for
transaction CECI task number 0040.

4
DFHRM0106 08/09/96 12:50:44 SCSCPA1 Intersystem session failure. Resource updates will not be committed or backed out
until session recovery. Failure date 08/09/96 failure time 12:50:44 remote system DFHINDSP transaction CECI
task number 00000040 terminal 045D user CICSUSER network UOW X'1910'/USIBMSC.SJA2045D/X'4AF0D9073140001'
local UOW X'AD4AF0D907314005'.
DFHIN1010 08/09/96 12:50:44 SCSCPA1 Coordinator DFHINDSP is not available. The indoubt tool has caused RM domain to
shunt UOW X'AD4AF0D907314005' for transaction CECI task number 0040.
DFHAC2231 08/09/96 12:50:59 SCSCPA1 Transaction CECI running program DFHECIP term 045D has lost contact with its
coordinator system during syncpoint and has abended with code ASPL. The unit of work is shunted until contact
is restored.

5
DFHFC6000 08/09/96 12:52:08 SCSCPA1 About to quiesce data set CICSDSW.VSAMU.HOTEL1
DFHFC0201 08/09/96 12:52:10 SCSCPA1 RLS file HOTEL1 has been deallocated. Module DFHFCRO.
DFHFC6027 08/09/96 12:52:11 SCSCPA1 VSAM RLS has been notified of the completion of CICS processing for a quiesce or
backup of data set CICSDSW.VSAMU.HOTEL1
DFHFC6001 08/09/96 12:52:11 SCSCPA1 Data set successfully quiesced by user. Data set CICSDSW.VSAMU.HOTEL1

7
DFHRM0109 08/09/96 13:06:56 SCSCPA1 Intersystem session recovery. Suspended resource updates now being backed out.
Original failure date 08/09/96 failure time 12:50:44 remote system DFHINDSP transaction CECI task number
00000040 terminal 045D user CICSUSER network UOW X'1910'/USIBMSC.SJA2045D/X'4AF0D9073140001' local UOW
X'AD4AF0D907314005'.
DFHIN1012 08/09/96 13:06:56 SCSCPA1 The indoubt tool is resynchronizing UOW X'AD4AF0D907314005' for transaction CECI
task number 0040. DFHINDSP coordinator UOW status is backout. Recovery manager UOW status is backout.
DFHIN1007 08/09/96 13:06:56 SCSCPA1 045D CICSUSER Initiation of resynchronization for units of work awaiting
coordinator DFHINDSP is now complete.
DFHFC0200 08/09/96 13:06:56 SCSCPA1 RLS file HOTEL1 has been allocated to data set CICSDSW.VSAMU.HOTEL1. Module
DFHFCRO.
DFHFC0201 08/09/96 13:07:04 SCSCPA1 RLS file HOTEL1 has been deallocated. Module DFHFCRO.
DFHFC4701 08/09/96 13:07:04 SCSCPA1 Backout failed for transaction CECI, VSAM file HOTEL1, unit of work
X'AD4AF0D907314005', task 00040, base CICSDSW.VSAMU.HOTEL1, path CICSDSW.VSAMU.HOTEL1, failure code X'FB'.

9
DFHFC6000 08/09/96 13:11:36 SCSCPA1 About to unquiesce data set CICSDSW.VSAMU.HOTEL1
DFHFC6001 08/09/96 13:11:36 SCSCPA1 Data set successfully unquiesced by user. Data set CICSDSW.VSAMU.HOTEL1
DFHFC0200 08/09/96 13:11:38 SCSCPA1 RLS file HOTEL1 has been allocated to data set CICSDSW.VSAMU.HOTEL1. Module
DFHFCRO.
DFHFC6000 08/09/96 13:11:59 SCSCPA1 About to unquiesce data set CICSDSW.VSAMU.HOTEL1
DFHFC6001 08/09/96 13:12:00 SCSCPA1 Data set successfully unquiesced by user. Data set CICSDSW.VSAMU.HOTEL1
```

Figure 155. Retained Lock Caused by Backout Failure

6.2.5 Documentation on Backout Failure

Detailed information about backout failure and its causes can be found in Chapter 4 of the *CICS Release Guide* and in the *CICS Recovery and Restart Guide*.

6.3 Retained Locks and Batch

Recoverable data sets opened by CICS TS in RLS mode can also be accessed concurrently by batch programs, provided the batch programs also open them in RLS mode and for read-only processing. Batch programs cannot update recoverable data sets in RLS mode. SMSVSAM prevents batch programs from opening a recoverable data set for update in RLS mode. Thus, to update a recoverable data set from a batch program, you must first ensure that the data set is quiesced in all CICS TS regions, so that the batch program can open the data set in non-RLS mode for update. To support this requirement, VSAM RLS provides a data set quiesce function and an unquiesce function.

The quiesce function enables you, with a single command, to close in an orderly manner throughout the sysplex any data sets that are open in RLS mode and to prevent the data sets from being opened in RLS mode while they are in the quiesced state. This function is required in a data sharing environment because many CICS TS regions can have the same data set open for update at the same time. Using the quiesce function, you can take a data set offline throughout the Parallel Sysplex to support switching between VSAM RLS and non-RLS access modes or to prevent data set access during forward recovery.

The invocation of the VSAM RLS quiesce function causes all CICS TS regions in the Parallel Sysplex to close any RLS ACBs that are open against a specified data set. After they have been closed under the quiesce function, data sets can be opened only in non-RLS mode. To reenabte quiesced data sets to be reopened in RLS mode, all open non-RLS ACBs must be closed and then the data sets must be unquiesced.

Note: The quiesce function cannot inform batch programs that have the data set open in RLS access mode about the quiesce request. If you have such programs, use the DFSMS SHCDS LIST subcommands to check whether any non-CICS TS jobs have ACBs open in RLS mode against the data set. For information about the SHCDS LIST subcommand, see *DFSMS/MVS Version 1 Release 3 Access Method Services for the Integrated Catalog Facility*.

If you have a requirement that CICS TS should maintain read-only access to recoverable data sets during the batch window, the only recommended procedure is this:

1. Resolve retained locks.
2. Quiesce the data sets.
3. Redefine the files as non-RLS and read-only in all relevant CICS TS systems. At present, this requires reinstalling the file definitions.
4. Open the non-RLS read-only files in CICS TS.
5. Concurrently, run batch non-RLS.

When batch finishes:

1. Close the read-only non-RLS files in CICS TS.
2. Reinstall the file definitions in CICS TS as RLS and update.
3. Unquiesce the data sets.
4. Open the files in CICS TS, or let the incoming transactions cause their opening.
5. Resume normal running.

In practice, you would also have to take data set copies for integrity purposes, but we omit these steps for simplicity. (Data set copies are, after all, required regardless of whether or not CICS TS uses RLS).

Note: To avoid the problem of not being able to update a recoverable data set in non-RLS mode, you might be tempted to consider switching the data set from recoverable to nonrecoverable. Note that this switching is not recommended and will NOT work.

6.3.1 Impact of Retained Locks on Batch Processing

You cannot do batch updates of recoverable data sets if they have retained locks. The recommended way of making data sets available for batch programs is to quiesce these data sets. Quiescing a data set sets the quiesce flag in the ICF catalog so that the data set can be opened in non-RLS mode only. However, even if a data set has been quiesced, you still cannot open it for update in non-RLS access mode if SMSVSAM is holding retained locks against the data set. The locks are needed to preserve data integrity; they protect changes that are waiting to be either committed or backed out.

6.3.2 Preventing Retained Locks from Affecting Batch Processing

You can use the external CICS interface (EXCI) to allow batch programs to update, with integrity, VSAM RLS files owned by CICS TS. Because of the performance overhead of using the EXCI, use it only for limited access to crucial data that cannot be made unavailable to the CICS TS regions. For more information about the EXCI, see *CICS External CICS Interface*.

Another option is to convert existing batch programs to run as CICS TS transactions.

For very specific requirements, you may decide that it is acceptable to define data sets as nonrecoverable. These data sets can be read and updated by both CICS TS and batch jobs.

6.3.3 Recovery from Retained Locks That Affect Batch Processing

Batch updating of VSAM data sets that have retained RLS locks can take place by either resolving or overriding the locks.

6.3.3.1 Resolving Retained Locks

CICS TS provides a suite of sample application programs that help you to automate your procedures for ensuring that your data sets are in a suitable state to run your non-RLS VSAM batch jobs.

Three of the programs are coordinating programs that use CICS distributed program link (DPL) commands to run programs on a set of nominated CICS regions. Three sample transactions (BAT1, BAT2 and BAT3) help you deal with any retained locks in three stages by:

- Disabling all transactions that are using the data sets you need for batch jobs (BAT1)
- Identifying existing retained locks and attempting to resolve them without loss of data integrity (BAT2)
- Forcing the release of locks that cannot be resolved, with possible loss of data integrity (BAT3).

BAT1, BAT2, and BAT3, used in conjunction with CICS TS master terminal commands and VSAM SHCDS commands, enable you to eliminate retained locks before batch update processing. You can use the sample programs unmodified, or you can use them as a basis for writing your own programs.

Before attempting to run your batch jobs, you should ensure that no retained locks are held for the data sets and no files are open against the data sets in RLS mode. The sample programs, using the INQUIRE DSNAME, INQUIRE

UOWDSNFAIL, and SET DSNAME SPI commands, help you deal with any retained locks. When you have successfully dealt with the retained locks, you can quiesce the data sets to the RLS ACBs, using the SPI or CEMT commands.

Here is a summary of the CICS TS sample application programs:

DFH0BAT1 is invoked by transaction BAT1 in the CICS TS region selected as the coordinator and controls the disabling of specified transactions. It reads two extrapartition TD queues: BATX for the codes of transactions to be disabled, and BATA for the applids of the target CICS TS regions.

DFH0BAT1 then issues DPL requests to DFH0BAT4 in each of the target regions to disable the named transactions. Any errors returned by each DFH0BAT4 are displayed using basic mapping support (BMS) mapset DFH0BM1.

DFH0BAT2 is invoked by transaction BAT2 in the CICS TS region selected as the coordinator and controls the gathering of retained lock information for the specified data sets. It reads two extrapartition TD queues: BATD for the names of data sets, and BATA for the applids of the target CICS TS regions.

For each data set, DFH0BAT2 issues a DPL request to DFH0BAT7, in each target CICS TS region, to retry backout failures associated with the data set. When the DPL requests to DFH0BAT7 for a data set are completed, the program issues DPL requests to DFH0BAT5 to gather remaining retained lock information from each of the target CICS TS regions for the same data set. The retained lock information from DFH0BAT5 invocations is received in temporary storage queue DFH0BQ2 and is displayed using BMS mapset DFH0BM2.

This process of issuing DPL requests to DFH0BAT7 and DFH0BAT5 is repeated for each of the data set names obtained from BATD.

DFH0BAT3 is invoked by transaction BAT3 in the CICS TS region chosen to be the coordinator region. It initiates the forced backout of any in-doubt UOWs and the forced release of retained locks, for specified data sets. It reads two extrapartition TD queues: BATD for the names of data sets and BATA for the applids of the target CICS TS regions.

For each data set, DFH0BAT3 issues a DPL request to DFH0BAT6, in each target CICS TS region, to force the backout of in-doubt UOWs associated with the data set. When the DPL requests to DFH0BAT6 for a data set are completed, the program issues DPL requests to DFH0BAT8 to force the release of retained locks in each target region for the same data set. Messages from the DFH0BAT6 and DFH0BAT8 invocations are displayed using BMS mapset DFH0BM3.

This process of issuing DPL requests to DFH0BAT6 and DFH0BAT8 is repeated for each of the data set names obtained from BATD.

DFH0BAT4 is linked to by a DPL request from DFH0BAT1 to disable specified transactions.

DFH0BAT5 is linked to by a DPL request from DFH0BAT2 to gather and return retained lock information to its caller.

DFH0BAT6 is linked to by a DPL request from DFH0BAT3 to force the backout of in-doubt UOWs.

DFH0BAT7 is linked to by a DPL request from DFH0BAT2 to retry any backout failures.

DFH0BAT8 is linked to by a DPL request from DFH0BAT3 to force the release of retained locks.

The resource definitions for the sample programs are supplied in the CICS System Definition (CSD) group DFH\$BAT. Add this group to one of the group lists you use at CICS TS startup on a cold start, or install the group while CICS TS is running, using the CEDA install command.

The three coordinating programs require input from extrapartition TD queues. These TD queues provide the parameters the sample programs need. The TD queues and the information in them are:

BATA The applids of the CICS TS regions involved in the quiesce operation
BATX The transaction ids of any transactions that are to be disabled
BATD The data set names that are to be quiesced

To prepare these BATA, BATX, and BATD extrapartition queues and the control information, follow these steps:

1. Define the sequential data sets for the TD queues as fixed block data sets with an 80-byte block size. You can define these either in the CSD (the preferred method) or in the destination control table (DCT).
 - If you define the queues in the CSD, specify the data set names for dynamic allocation. You do not need DD statements in the startup JCL. As a consequence of dynamic allocation, when a TD queue is closed, the underlying data set is deallocated, so it can then be modified by, say, a TSO editor. Therefore data sets can be modified without having to bring down CICS TS.
 - If you define the queues in the DCT, you must include the necessary DD statements for ddnames BATA, BATX, and BATD in the CICS TS startup JCL. Therefore you have to bring down CICS before the data sets can be modified.
2. Use the TSO editor to enter the data into the data sets before they are dynamically allocated when the TD queues are opened.

Note: These definitions and TD queues need only be available to the CICS TS region you select to be the coordinator. They do not have to be defined to the target CICS TS regions. The queue names are coded in the programs, but you can change them if you want to use names that conform to your own naming conventions.

For more information about the sample programs, see the comments in the prolog of each of the programs. Source code can be found in the CTS110.CICS510.SDFHSAMP library.

6.3.3.2 Overriding Retained Locks

In certain situations where a recoverable data set you require has retained locks held against it, you may have to allow non-RLS update processing to occur, at the risk of loss of data integrity. If your processing only adds records to the data sets, there is no integrity exposure. Any processing that updates existing records has the potential to cause loss of integrity. For example, an online system cannot be restarted to perform the required backouts after a failure. It

might be necessary still to run critical non-RLS batch work, knowing that SMSVSAM recovery cannot be first resolved.

DFSMS provides the SHCDS subcommand PERMITNONRLSUPDATE to enable you to run a non-RLS batch program even though there are retained locks. CICS TS ensures that, if this command has been used, there will be no automatic backout during retries, thus preventing the unpredictable results that could occur if backouts were applied to data modified by a batch program. The XFCBOVER global user exit program is invoked. This has a default action not to allow retries of backouts to UOWs that had retained locks when the batch non-RLS updates occurred. Diagnostic information is provided to help you determine whether the batch job did affect a particular record, and to correct the data if appropriate. You can see an example of this in Section 6.3.5, “Example: Overriding Retained Locks” on page 192.

Note that neither CICS TS nor VSAM knows whether the non-RLS program changed any of the locked records, only that it had the potential to do so!

6.3.4 Example: Resolving Retained Locks

We create a scenario in our sysplex, shown in Figure 156 on page 184, that has an in-doubt UOW in PAA1 and in PAA4. We use the in-doubt test tool and CECI, as described in Section 6.1.4.3, “Multiple CICS TS Systems Using Record Level Sharing” on page 143.

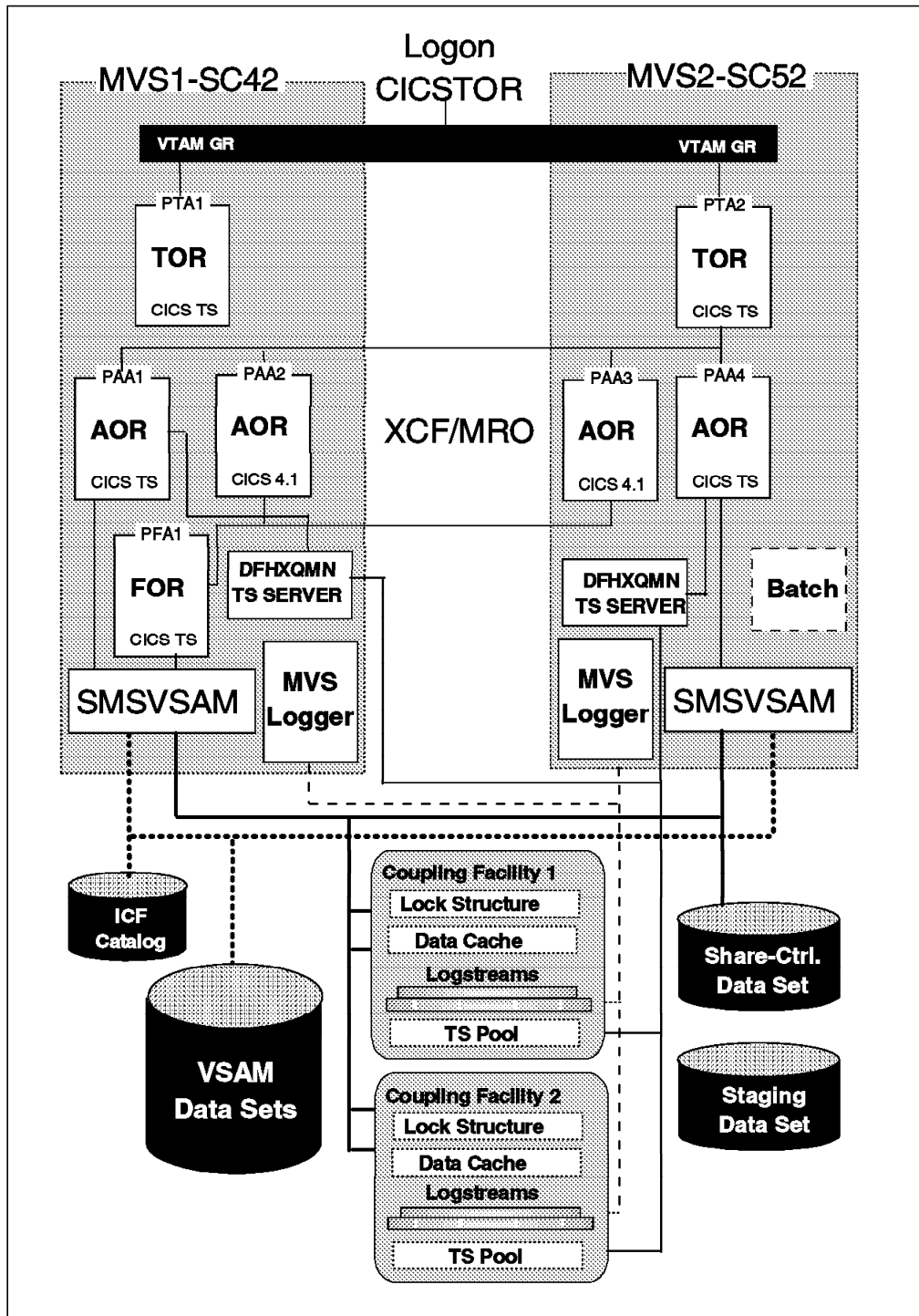


Figure 156. Our Sysplex

Preparation for running the sample programs in our sysplex requires the initialization of TD queues as follows:

- Applids SCSCPAA1 and SCSCPAA4 stored in the BATA queue
- Data set name CICSDSW.VSAMU.HOTEL1 stored in the BATD queue
- All transactions that could run in PAA1 or PAA4 stored in the BATX queue

Note that for the purposes of this exercise we set up an MRO link between PAA1 and PAA4. The TOR would normally be the coordinating region from which the

BATn transactions are run, in which case the required connections should be in place.

Figure 166 on page 191 shows the messages generated by this example. View them conjunction with working through the example.

To illustrate the batch scenario, we use the following sequence of events.

1 Establish retained locks in PAA1 and PAA4 using procedure similar to that used in 6.1.4.3, “Multiple CICS TS Systems Using Record Level Sharing” on page 143.

2 Verify the existence of retained locks.

3 Run the BAT1 transaction.

4 Run the BAT2 transaction.

5 Run the BAT3 transaction.

1 Establish retained locks in PAA1 and PAA4 using procedure similar to that used in Section 6.1.4.3, "Multiple CICS TS Systems Using Record Level Sharing" on page 143.

2 Verify the existence of retained locks (Figure 157, Figure 158 on page 187, Figure 159 on page 187, Figure 160 on page 188).

```
I UOW SHU
STATUS: RESULTS - OVERTYPE TO MODIFY
  Uow(AD4276755C8F7600) Ind Shu Tra(CECI) Tas(0000036)
    Age(00000027) Ter(045C) Netn(SJA2045C) Use(CICSUSER) Con Lin(DFHINDSP)

                                     SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL                      TIME: 18.59.56 DATE: 08.02.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 157. Show Retained Lock in PAA1, Using CEMT

```

I UOW SHU
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD4277786149405) Ind Shu Tra(CECI) Tas(0000035)
Age(00000023) Ter(045A) Netn(SJA2045A) Use(CICSUSER) Con Lin(DFHINDSP)

                                                                    SYSID=PAA4 APPLID=SCSCPAA4
RESPONSE: NORMAL                                                    TIME: 19.04.09 DATE: 08.02.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF

```

Figure 158. Show Retained Lock in PAA4, Using CEMT

```

02AUG1996 19:05:40 ----- INFORMATION DISPLAY -----
COMMAND ==>                                     SCROLL ==> PAGE
CURR WIN ==> 1          ALT WIN ==>
W1 =UOWDSNF=====SCSPLEX==SCSPLEX==02AUG1996==19:05:38====CPSM=====2
CMD Unit of Work Id CICS Cause Reason RLS SysId Netid
----- System-- ----- Access -----
AD4276755C8F7600 SCSCPAA1 CONNECTION NOTAPPLIC RLS N/A
AD4277786149405 SCSCPAA4 CONNECTION NOTAPPLIC RLS N/A

```

Figure 159. Show Retained Locks, Using CICSplex SM

```

02AUG1996 19:08:30 ----- INFORMATION DISPLAY -----
COMMAND ==> SCROLL ==> PAGE
CURR WIN ==> 1 ALT WIN ==>
W1 =UOWORKS==UOWORKD==SCSPLEX==SCSPLEX==02AUG1996==19:08:13====CPSM=====1
UOW ID..... AD4277786149405
CICS System..... SCSCPAA4
Net UOW ID..... 1910 USIBMSC.SJA2045A 42777861494 0001
Task ID..... 35
Start Term ID..... 045A
Start Trans ID..... CECI
Start User ID..... CICSUSER
State..... N/A
Wait State..... SHUNTED
Wait Cause..... CONNECTION
Age of Wait..... 00:04:27
Netname Causing Wait SJA2045A
Wait System ID.....

```

Figure 160. Show Specific Detail of the Failed UOW in PAA4, Using CICSplex SM

3 Run the BAT1 transaction (Figure 161).

BAT1 coordinates the disabling of the transactions, named in the BATX extrapartition TD queue, in those CICS TS regions named in the BATA extrapartition TD queue.

```

All transactions successfully disabled

```

Figure 161. Screen Response from a Successful Execution of BAT1

4 Run the BAT2 transaction (Figure 162 on page 189).

BAT2 coordinates the gathering of retained lock information for all data sets named in the BATD extrapartition TD queue and defined to the CICS TS regions named in the BATA extrapartition TD queue. Existing retained locks are retried and are only reported on if the retry fails.

```
BAM21      Batch Enabling Sample - Inquire Retained Locks      Applid SCSCPAA1

Screen 0001 of 0001 for data set CICSDSW.VSAMU.HOTEL1

This screen displays retained locks information for a data set.
It also shows any errors that occurred gathering this.
Press F8 for next screen.
Press F4 for next data set.

System Cause      Reason      Recommended Action
SCSCPAA1 CONNECTION      Start connection from SCSCPAA1 to DFHINDSP
SCSCPAA4 CONNECTION      Start connection from SCSCPAA4 to DFHINDSP

F3=Exit  F4=Next data set  F8=Next screen  F12=Cancel
```

Figure 162. Status of Retained Locks

The recommended action for each retained lock reported by BAT2 should be initiated, if practical, and the BAT2 transaction rerun.

5 Run the BAT3 transaction (Figure 163, Figure 164 on page 190, Figure 165 on page 190).

BAT3 coordinates the forcible release of retained locks associated with the CICS TS regions named in the BATA extrapartition TD queue for those data sets named in the BATD extrapartition TD queue. It resolves in-doubt UOWs for a given data set, by forcibly backing them out and releasing the retained locks.

```
BAM31      Batch Enabling Sample - Force Retained Locks      Applid SCSCPAA1

      **** WARNING ****

      THIS PROGRAM MAY CAUSE LOSS OF DATA INTEGRITY
```

Figure 163. BAT3 Warning Message

1 Establish retained locks in PAA1 and PAA4, using a procedure similar to that used in Section 6.1.4, “Examples of In-doubt Failures with Retained Locks” on page 141.

2 Verify the existence of retained locks (Figure 167).

```
INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AD4AED66B3449203) Inf Act Tra(COIO) Tas(0000030)
  Age(00003669) Use(CICSUSER)
Uow(AD4AED67E3783200) Inf Act Tra(COIE) Tas(0000031)
  Age(00003668) Use(CICSUSER)
Uow(AD4AEF2B1060DA03) Inf Act Tra(CSNE) Tas(0000026)
  Age(00003195) Use(CICSUSER)
Uow(AD4AFA6BDF5B4A00) Ind Shu Tra(CECI) Tas(0002626)
Age(00000106) Ter(045D) Netn(SJA2045D) Use(CICSUSER) Con Lin(DFHINDSP)
Uow(AD4AFB12506C4600) Inf Act Tra(CEMT) Tas(0002839)
  Age(00000000) Ter(045D) Netn(SJA2045D) Use(CICSUSER)

RESPONSE: NORMAL                                SYSID=PAA1 APPLID=SCSCPAA1
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
TIME: 13.33.45 DATE: 08.09.96
```

Figure 167. Verify Existence of Retained Locks

3 Use the CEMT command to quiesce the data set (Figure 168).

```
SET DSN(CICSDSW.VSAMU.HOTEL1) QUIESCE
STATUS: RESULTS - OVERTYPE TO MODIFY
Dsn(CICSDSW.VSAMU.HOTEL1) ) Vsa NORMAL
  Fil(0001) Val Bas Fwd Fr1(00) Ava Ret Qui

RESPONSE: NORMAL                                SYSID=PAA1 APPLID=SCSCPAA1
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
TIME: 13.41.23 DATE: 08.09.96
```

Figure 168. Quiesce the Data Set

4 Use the DFSMS/MVS 1.3 SHCDS PERMITNONRLSUPDATE command to override retained locks. Figure 169 on page 194 shows the JCL that was used to issue the command:

```
//SHCDSPH JOB (999,POK),'CICS510',CLASS=A,MSGCLASS=T,
//          NOTIFY=&SYSUID
//          EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN    DD *
SHCDS LISTDS(CICSDSW.VSAMU.HOTEL1)
SHCDS PERMITNONRLSUPDATE
/*
```

Figure 169. SHCDS Sample JCL for PERMITNONRLSUPDATE

The output from the PERMITNONRLSUPDATE command, shown in Figure 170, confirms that a non-RLS update is now permitted for the CICSDSW.VSAMU.HOTEL1 data set even though it has retained locks.

```
IDCAMS SYSTEM SERVICES                                TIME: 14:03:41    08/09/96    PAGE    1

SHCDS LISTDS(CICSDSW.VSAMU.HOTEL1)
----- LISTING FROM SHCDS ----- IDC5H02
-----
DATA SET NAME---CICSDSW.VSAMU.HOTEL1
CACHE STRUCTURE---CICS_CACHE
RETAINED LOCKS-----YES  NON-RLS UPDATE PERMITTED-----YES
LOST LOCKS-----NO      PERMIT FIRST TIME-----YES
LOCKS NOT BOUND-----NO  FORWARD RECOVERY REQUIRED-----NO
RECOVERABLE-----YES

          SHARING SUBSYSTEM STATUS
SUBSYSTEM  SUBSYSTEM  RETAINED  LOST  NON-RLS UPDATE
NAME       STATUS     LOCKS     LOCKS  PERMITTED
-----
SCSCPA1    ONLINE--ACTIVE  YES      NO     YES
IDC00011  FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0

SHCDS PERMITNONRLSUPDATE(CICSDSW.VSAMU.HOTEL1)
IDC01885I NON-RLS UPDATE PERMITTED FOR CICSDSW.VSAMU.HOTEL1
IDC00011  FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
```

Figure 170. SHCDS PERMITNONRLSUPDATE Output

5 Use the CEMT command to unquiesce the data set (Figure 171 on page 195).

We unquiesce the data set to again make it available for VSAM RLS processing with CICS TS. In real life, there would have been batch update jobs between steps 4 and 5 in this example.

```
SET DSN(CICSDSW.VSAMU.HOTEL1) UNQUIESCE
STATUS: RESULTS - OVERTYPE TO MODIFY
Dsn(CICSDSW.VSAMU.HOTEL1          ) Vsa      NORMAL
  Fil(0001) Val Bas Fwd      Fr1(00) Ava      Ret Unq

                                     SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL                      TIME: 14.11.41 DATE: 08.09.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 171. Make Data Set Available to PAA1

6 Use the CEMT command to check UOW status (Figure 172 on page 196).

```
INQ UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
+ Uow(AD4AED5EED220E04) Inf Act Tra(CFQR) Tas(0000019)
  Age(00006033) Use(CICSUSER)
  Uow(AD4AED5F62682004) Inf Act Tra(CSNC) Tas(0000020)
  Age(00006033) Use(CICSUSER)
  Uow(AD4AED647D2C4C06) Inf Act Tra(CONL) Tas(0000025)
  Age(00006027) Use(CICSUSER)
  Uow(AD4AED66682F8C04) Inf Act Tra(CSSY) Tas(0000029)
  Age(00006025) Use(CICSUSER)
  Uow(AD4AED66B3449203) Inf Act Tra(COIO) Tas(0000030)
  Age(00006025) Use(CICSUSER)
  Uow(AD4AED67E3783200) Inf Act Tra(COIE) Tas(0000031)
  Age(00006024) Use(CICSUSER)
  Uow(AD4AEF2B1060DA03) Inf Act Tra(CSNE) Tas(0000026)
  Age(00005551) Use(CICSUSER)
Uow(AD4AFA6BDF5B4A00) Ind Shu Tra(CECI) Tas(0002626)
Age(00002461) Ter(045D) Netn(SJA2045D) Use(CICSUSER) Con Lin(DFHINDSP)
  Uow(AD4AFCC44F30F601) Inf Act Tra(CEMT) Tas(0003299)
  Age(00001900) Ter(045D) Netn(SJA2045D) Use(CICSUSER)

                                SYSID=PAA1 APPLID=SCSCPAA1
RESPONSE: NORMAL                                TIME: 14.13.01 DATE: 08.09.96
PF 1 HELP          3 END          5 VAR          7 SBH 8 SFH 9 MSG 10 SB 11 SF
```

Figure 172. Verify Existence of Retained Lock

7 Use the in-doubt test tool to force backout processing (Figure 173).

We issue the CIND RESYNC BACKOUT command to initiate resynchronization processing and hence the unshunting of the previously shunted UOW.

```
DFHIN1007 08/09/96 14:15:14 SCSCPAA1 045A CICSUSER Initiation of
resynchronization for units of work awaiting coordinator DFHINDSP is now
complete.
```

Figure 173. Force Retry of Backout: CIND RESYNC BACKOUT

8 Use the CEMT command to check UOW status.

The display in Figure 174 on page 197 confirms that our UOW is no longer shunted. We see from message DFHFC3001 in Figure 175 on page 197 that the UOW was not backed out. CICS TS knows that the data set has been processed in batch after existing retained locks were forcibly released. CICS TS does not know whether the data in the record was updated during the batch processing. Therefore the backout is prevented, and diagnostic information is provided in message DFHFC3010 so that corrective action can be taken if required.


```

INQ UOW(AD4AFA6BDF5B4A00)
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD4AFA6BDF5B4A00)                                NOT FOUND

RESPONSE: 1 ERROR
PF 1 HELP      3 END      5 VAR      7 SBH 8 SFH 9 MSG 10 SB 11 SF

SYSID=PAA1 APPLID=SCSCPAA1
TIME: 14.21.51 DATE: 08.09.96

```

Figure 174. Confirmation That Shunted UOW No Longer Exists

The messages shown in Figure 175 are written to one or more of CICS TS TD queues CSMT or CSFL or to the system console as a result of this equence.

```

3
DFHFC6000 08/09/96 13:41:18 SCSCPAA1 About to quiesce data set CICSDSW.VSAMU.HOTEL1
DFHFC0201 08/09/96 13:41:18 SCSCPAA1 RLS file HOTEL1 has been deallocated. Module DFHFCRO.
DFHFC6027 08/09/96 13:41:19 SCSCPAA1 VSAM RLS has been notified of the completion of CICS processing for a quiesce or
backup of data set CICSDSW.VSAMU.HOTEL1
DFHFC6001 08/09/96 13:41:19 SCSCPAA1 Data set successfully quiesced by user. Data set CICSDSW.VSAMU.HOTEL1
DFHFC6000 08/09/96 13:41:23 SCSCPAA1 About to quiesce data set CICSDSW.VSAMU.HOTEL1
DFHFC6001 08/09/96 13:41:23 SCSCPAA1 Data set successfully quiesced by user. Data set CICSDSW.VSAMU.HOTEL1

5
DFHFC6000 08/09/96 14:11:37 SCSCPAA1 About to unquiesce data set CICSDSW.VSAMU.HOTEL1
DFHFC6001 08/09/96 14:11:37 SCSCPAA1 Data set successfully unquiesced by user. Data set CICSDSW.VSAMU.HOTEL1
DFHFC6000 08/09/96 14:11:41 SCSCPAA1 About to unquiesce data set CICSDSW.VSAMU.HOTEL1
DFHFC6001 08/09/96 14:11:41 SCSCPAA1 Data set successfully unquiesced by user. Data set CICSDSW.VSAMU.HOTEL1

7
DFHRM0109 08/09/96 14:15:14 SCSCPAA1 Intersystem session recovery. Suspended resource updates now being backed out.
Original failure date 08/09/96 failure time 13:31:57 remote system DFHINDSP transaction CECI task number
00002626 terminal 045D user CICSUSER network UOW X'1910'USIBMSC.SJA2045D/X'4AFA6BDF5B4A0001' local UOW
X'AD4AFA6BDF5B4A000'.
DFHIN1012 08/09/96 14:15:14 SCSCPAA1 The indoubt tool is resynchronizing UOW X'AD4AFA6BDF5B4A000' for transaction CECI
task number 2626. DFHINDSP coordinator UOW status is backout. Recovery manager UOW status is backout.
DFHIN1007 08/09/96 14:15:14 SCSCPAA1 045D CICSUSER Initiation of resynchronization for units of work awaiting
coordinator DFHINDSP is now complete.
DFHFC0200 08/09/96 14:15:14 SCSCPAA1 RLS file HOTEL1 has been allocated to data set CICSDSW.VSAMU.HOTEL1. Module
DFHFCRO.
DFHFC3001 08/09/96 14:15:17 SCSCPAA1 Record not backed out because it may have been overridden by a non-RLS batch job.
Diagnostic information follows in message DFHFC3010. The record was updated by unit of work
X'AD4AFA6BDF5B4A000' for file HOTEL1, base data set CICSDSW.VSAMU.HOTEL1
DFHFC3010 08/09/96 14:15:17 SCSCPAA1 Diagnostic information for unit of work X'AD4AFA6BDF5B4A000' and file HOTEL1. Update
was a write-add made by transaction CECI at terminal 045D under task number 02626. Key length 16, data length
30, base ESDS RBA X'0000000000', record key X'F2F2F2F2F2F2F2F2F2F2F20000000000'

```

Figure 175. Messages Associated with Use of PERMITNONRLSUPDATE

6.3.6 Documentation on Retained Locks and Batch

Detailed information about retained locks and their impact on batch processing can be found in the *CICS Release Guide* and in Chapter 15 of the *CICS Recovery and Restart Guide*. Chapter 13 of the *CICS Operations and Utility Guide* describes the batch-enabling sample programs. SHCDS commands are described in *DFSMS/MVS 1.3 Access Method Services for ICF*.

6.4 Commit Failure

A commit failure occurs during the commit stage of a UOW, either following the prepare phase of two-phase commit or following the backout of the UOW. The failure is most likely caused by the unavailability of the SMSVSAM server at the time that file control is attempting to release the RLS locks.

6.4.1 Impact

The UOW has not completed, and the commit must be retried successfully before the recovery manager can forget about the UOW.

6.4.2 Prevention

Commit failures cannot be prevented.

6.4.3 Recovery

The commit is automatically retried when the SMSVSAM server is again available.

6.4.4 Documentation on Commit Failure

More information about commit failures can be found in the *CICS Release Guide* and the *CICS Recovery and Restart Guide*.

6.5 Orphan Locks

An orphan lock is an RLS lock that is held by VSAM RLS but unknown to any CICS TS system. It can occur if a CICS TS region acquires an RLS lock from VSAM but then fails before logging it.

6.5.1 Impact

Records associated with orphan locks cannot have been updated, therefore they have no impact.

6.5.2 Prevention

Orphan locks cannot be prevented.

6.5.3 Recovery

CICS TS emergency restart performs CICS-RLS restart processing, during which orphan locks are eliminated.

6.5.4 Documentation on Orphan Locks

Orphan locks are documented in the *CICS Release Guide*.

Chapter 7. Forward Recovery with IBM CICS VSAM Recovery MVS/ESA

In this chapter we briefly describe how CICS VSAM Recovery MVS/ESA (CICSVR) can help you recover your VSAM data sets after loss or physical damage to your data. We emphasize recovery of VSAM data sets used by CICS TS in RLS access mode. Because the recovery capabilities of CICS have been widely extended and automated to a large extent, recovery-related functions, procedures, and products must be reviewed. The most obvious differences from earlier releases of CICS are the replacement of journals by the log streams maintained by the new CICS log manager together with the MVS system logger, as well as the new CICS recovery manager that provides compound UOW services.

7.1 CICSVR Benefits and Functions

In this section we review the benefits and functional components of CICSVR.

7.1.1 Benefits

CICSVR is a tool that recovers a VSAM sphere relatively quickly and easily. It is particularly useful when there is physical damage to a VSAM data set. It provides the following benefits:

- Together with the BWO feature of VSAM, CICSVR supports 24-hour availability of your VSAM data, and hence the availability of CICS.
- The ISPF dialog interface for CICSVR helps you reduce human error, should a recovery be necessary, as well as speed up the recovery preparation.
- The backout function of CICSVR supports earlier CICS releases to back out uncommitted data in case of a persistent error during dynamic transaction backout or emergency restart of CICS.

7.1.2 Functions

The major functions of CICSVR are its forward recovery capabilities, the backout function in support of earlier releases of CICS, archiving, and log stream copy. These functions can be invoked from a TSO screen via a set of ISPF panels.

7.1.2.1 Forward Recovery

The first step to recover a damaged VSAM sphere is to restore it to a known consistent state by using a backup copy of the data set you created earlier. Therefore you should plan to take backup copies on a regular base. The more recent your backup copy is, the less data the forward recovery program has to restore. With BWO this timeframe can be very short. To take full advantage of CICSVR recovery control, use DFSMSHsm to create your backup copies. CICSVR then automatically determines the most recent backup and logs needed to recover a data set and presents the data ready to use on the CICSVR ISPF dialog, before you submit a forward recovery.

Once the data set is restored to a consistent state, CICSVR forward recovery program DWWCO (with the RECOVER parameter) is used to apply copies of VSAM records written to the forward recovery log stream each time a transaction has made changes to a record from a given file. This is known as

applying “after images.” These after images are applied in the same sequence in which CICS transactions updated the data set. In CICS TS the after images are written to an MVS log stream by the MVS system logger controlled by the CICS log manager. This process differs essentially from earlier releases of CICS.

The journal control from earlier releases of CICS is redundant in CICS TS. For more information about the new logging mechanism in CICS TS, see the IBM Redbook entitled *CICS and VSAM Record Level Sharing: Implementation Guide*. For input CICSVR can use either a copy of a forward recovery log stream you created with the log stream copy function or the original MVS log stream.

7.1.2.2 Backout

After successful forward recovery, the data set may contain records that did not reach the committed state before it was corrupted. Therefore such uncommitted data must be backed out to preserve data integrity. In CICS TS backout of uncommitted data is normally performed automatically by the CICS recovery manager, after the recovered data set is made available again to CICS. The CICS recovery manager preserves all information necessary to perform the backout of a failed UOW, and of the uncommitted data, at a later point in time. This process is known as shunting a UOW. For example, should a persistent I/O error on a VSAM data set prevent dynamic transaction backout or emergency restart from completing successfully, the UOW associated with the failing transaction is shunted and can then be backed out later after the error is fixed. Therefore the backout function of CICSVR is not required for CICS TS.

To support earlier releases of CICS that have no mechanism like the CICS Recovery Manager of CICS TS, the backout function of CICSVR (program DWWCO with the BACKOUT parameter) can back out uncommitted data from a data set, after a successful forward recovery has been made.

7.1.2.3 Archiving

The archiving utility of CICSVR (program DWWAR) stores a summary of the information found on the CICS system log, in the recovery control data set (RCDS). This utility should not be necessary for forward recovery log information created from CICS TS regions, because you should keep log streams for general logs separate from the log streams for the system log. Another usage of the archive utility is to copy the log to a backup data set.

7.1.2.4 Log Stream Copy

The log stream copy utility of CICSVR (program DWWLC) copies a log stream to a user-defined backup data set (QSAM) and stores this information (for example, backup taken, time, data set name) in the RCDS. Such information can then be displayed and used from the CICSVR ISPF panels when a recovery has to be performed.

7.1.2.5 ISPF Front End

CICSVR provides a set of ISPF panels that support you in submitting a forward recovery or backout job (or both if necessary). For example, you can select a VSAM sphere for forward recovery, and you are then presented with the required backup copy for selection. Then, after specifying the recovery start and stop times, you can submit the generated recovery job.

7.1.3 Documentation

CICSVR is documented in the following manuals:

- *CICS Recovery and Restart Guide*
- *CICSVR Implementation Guide*
- *CICSVR Users Guide and Reference*
- In the *CICS Operations and Utility Guide*, you can find more information about log stream deletion and the DFHJUP utility.

7.2 Performing a Forward Recovery

In this section we provide a simple example of a forward recovery of a VSAM data set.

A forward recovery is required in the following error situations:

- An I/O error on the device where the data set resides.
- Physical damage of a data set, for example, through accidental erasure or head crash.
- Logical inconsistency among several related data sets, for example, caused by an application malfunction.

If you are still using FORs with backlevel CICS versions, a wrong heuristic decision taken in one of the FORs during synchpoint processing can also cause a logical inconsistency.

For the statements above it is assumed that the CICS techniques for automatic recovery at transaction backout time or during emergency restart have failed, because the error is persistent and therefore needs some manual intervention.

To simulate a CICS backout failure, we used CECI to write and update records on our test file, CVRTEST, the data set name of which is CICSDSW.VSAMU.TESTDB. The file is defined for RLS access mode, and the ICF catalog contains the following recovery related elements:

```
RLSDATA
LOG -----ALL RECOVERY REQUIRED --(NO)
VSAM QUIESCED -----(NO) RLS IN USE -----(YES)
LOGSTREAMID-----SCSCFWR.VSAMU
```

this data is extracted from the result of the TSO command
listc entry(CICSDSW.VSAMU.TESTDB) all
LOG(ALL) means backout and forward recovery logs are requested,
that also requires a name for forward recovery log stream (LOGSTREAMID)

While the file update is pending, we issue:

```
/F SCSCPFA1,'CEMT P SHUT IMMED NORESTART'
```

from the console. This CEMT command shuts down a CICS region immediately; NORESTART inhibits the region from being restarted by ARM. The result is similar to a cancel command for earlier releases of CICS. So CICS has no time to back out an in-flight UOW, which it would have done on a normal shutdown.

Next we merely delete the data set. Then, restarting CICS, we receive the messages in Figure 176 on page 204. Because the system initialization table parameter was not altered, (START=AUTO), the restart was “emergency.”

```
DFHRM0201 SCSCPFA1 1 backout-failed and 0 commit-failed UOWs were reconstructed.
DFHFC6028 SCSCPFA1 File Control RLS quiesce system transaction CFQS has started.
DFHFC6028 SCSCPFA1 File Control RLS quiesce system transaction CFQR has started.
DFHFC0952 SCSCPFA1 Dynamic allocation of RLS file CVRTEST failed. Return code X'0004',X'1708' in
module DFHFCRO.
DFHFC0955 SCSCPFA1 Associated data set is CICSDSW.VSAMU.TESTDB. Module DFHFCRO.
DFHFC4701 SCSCPFA1 SCSCPFA1 Backout failed for transaction CECI, VSAM file CVRTEST,
UNIT OF WORK X'AD38149471A05406', task 00045, base CICSDSW.VSAMU.TESTDB,
path CICSDSW.VSAMU.TESTDB, failure code X'FB'.
```

Figure 176. CICS Messages during Emergency Restart

CICS cannot back out our in-flight transaction CECI because the data set is corrupted. CICS then issues a quiesce transaction CFQS, which, together with the corresponding receiver transaction, CFQR, controls propagation of the quiesce request for the data set throughout the sysplex, so that the damaged data set is no longer used by any CICS region. Another important item to note is UOW (X'AD38149471A05406') in the last message in Figure 176. This UOW has failed to back out and therefore is shunted.

Logging on to the CICS region (SCSCPFA1), you can see that CICS has shunted the UOW, and the UOW state is “backout failed” (see Figure 177).

```
CEMT I UOW
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD3828AB70ECE406) Inf Act Tra(CSSY) Tas(0000005)
Age(00002361) Use(CICSUSER)
Uow(AD3828AB711D1C06) etc...

Uow(AD38149471A05406) Bac Shu Tra(CECI) Tas(0000045)
Age(00006652) Ter(033D) Netn(SJA2033D) Use(CICSUSER) Dat
```

Figure 177. All UOW Display

A shortcut would be to directly ask for shunted UOWs (see Figure 178).

```
CEMT I UOW SH
STATUS: RESULTS - OVERTYPE TO MODIFY
Uow(AD38149471A05406) Bac Shu Tra(CECI) Tas(0000045)
Age(00006953) Ter(033D) Netn(SJA2033D) Use(CICSUSER) Dat
```

Figure 178. Shunted UOW Display

We initialize the VSAM data set, using the AMS utility IDCAMS (delete, define cluster), and then submit the job shown in Figure 179 on page 205 to do the forward recovery.


```

//FWRECOV JOB (999,POK), 'CVR', CLASS=A,MSGCLASS=T,
//          NOTIFY=&SYSUID
//*-----
//* RUN FORWARD RECOVERY WITH MVS LOGSTREAM
//*-----
//CICSVR   EXEC PGM=DWWCO
//STEPLIB DD DSN=DWW.CICSVR23.SDWWLOAD,DISP=SHR
//DWWMSG   DD SYSOUT=*
//DWWDUMP  DD SYSOUT=*
//DWWPRINT DD SYSOUT=*
//DWWMSG   DD SYSOUT=*
//* 3 RCDS DATASETS
//DWWCON1 DD DSN=DWW.CICSVR23.DWWCON1,DISP=SHR
//DWWCON2 DD DSN=DWW.CICSVR23.DWWCON2,DISP=SHR
//DWWCON3 DD DSN=DWW.CICSVR23.DWWCON3,DISP=SHR
//*       DWWLOG NEEDED IF USING A LS-COPY FOR RECOVERY
//*DWWLOG  DD DSN=SCSCFWR.VSAMUBU.D96214,DISP=SHR
//DWWIN   DD *
//          RECOVER SPHERE(CICSDSW.VSAMU.TESTDB) -
//          STARTTIME(96:206/21:00:00)
//          MVSLOG NAME(SCSCFWR.VSAMU)
//*

```

Figure 179. JCL for Forward Recovery

Explanation of this forward recovery job:

- The respective CICSVR program is DWWCO.
- The data sets DWWCON1, DWWCON2, and DWWCON3 are CICSVR RCDSs, which you have to create during CICSVR installation. CICSVR stores here all information necessary for recovery of your VSAM spheres, for example:
 - Which spheres you have
 - The names of any backup copies of MVS log streams you created using the log stream copy utility of CICSVR
 - Date and time a data set has been recovered
- The DWWIN statement contains the control parameters for the job:
 - RECOVER SPHERE(CICSDSW.VSAMU.TESTDB) specifies that you want a forward recovery for the named sphere.
 - STARTTIME(96:206/21:00:00) is the earliest time from which you want CICSVR to pick up after images from the forward recovery log stream and rewrite the record to the data set. Records logged at an earlier time are ignored.

You may also specify a STOPTIME that tells CICSVR which is the latest record you want to be recovered. Specifying a STOPTIME might be necessary, for example, if you have to repair a logical inconsistency with another data set.

 - MVSLOG NAME(SCSCFWR.VSAMU) specifies the MVS log stream name that contains the forward recovery log records. Note that you specify the log stream name as you define it in the ICF catalog, not the actual data set name that the MVS system logger creates.

On successful completion, the forward recovery job will have created three reports. Before returning the recovered data set to CICS, you should examine these reports to make sure the data set is in the state you anticipate. The first report (Figure 180) shows the completion code and parameters you specified in the job.

```

CICSVR - CICS VSAM RECOVERY                                DATE : 96//07/25    TIME : 15:29:50    PAGE : 1

DWW0010I CICSVR is started at 96/07/25 15:29:52.

      RECOVER SPHERE(CICSDSW.VSAMU.TEST08) -
      STARTTIME(96:206/00:00:01) -
      STOPTIME(96:206/23:40:00)

      MVSLOG NAME(SCSCFWR.VSAMU)                                00950000
DWW0011I CICSVR processing complete. Maximum condition code is 0.
  
```

Figure 180. CICSVR Report 1

The second report contains two pages (Figure 181 and Figure 182 on page 207). The first page shows statistics about the log stream you specified. Note that the values shown for the log stream statistics refer to the entire log stream, including statistics of the after images for other data sets you might have directed to the same forward recovery log stream!

```

CICSVR - CICS VSAM RECOVERY                                DATE: 96/07/25    TIME: 15:30:08    PAGE: 1

MVS LOG STREAM STATISTICS:
-----
KEY TO FIELD IDENTIFIERS
-----
UPD-AFTER  UPDATE AFTER IMAGE
ADD-AFTER  ADD AFTER IMAGE
DEL-AFTER  DELETE AFTER IMAGE
DSNAME     DDNAME TO SPHERE AND PATH NAME
-----

```

| NAME OF MVS LOG STREAM | NO OF RECORDS PROCESSED | NO OF DSNAME | NO OF UPD-AFTER | NO OF ADD-AFTER | NO OF DEL-AFTER |
|------------------------|----------------------------|-----------------|--------------------|--------------------|--------------------|
| SCSCFWR.VSAMU | 26 | 6 | 4 | 14 | 2 |
| TOTAL | 26 | 6 | 4 | 14 | 2 |

Figure 181. Page 1 of CICSVR Report 2

The second page of this report shows values specific to the data set you are recovering.

```

CICSVR - CICS VSAM RECOVERY                                DATE: 96/07/25    TIME: 15:30:08    PAGE: 2

STATISTICS OF RECOVERED DATA SETS
-----
OBASE NAME OF RECOVERED DATA SET: CICSDSW.VSAMU.TESTDB
OBASE NAME OF ORIGINAL DATA SET:  CICSDSW.VSAMU.TESTDB
OTHE FOLLOWING ASSOCIATED PATHS ARE DEFINED IN THE VSAM CATALOG:
NO PATHS DEFINED.
OFIRST AND LAST RECORDS APPLIED:

RECORDS          DATE    TIME    TIME
                YY/DDD  HH:MM:SS  TYPE
-----
FIRST RECORD APPLIED 96/206  21:38:01  LOCAL
LAST RECORD APPLIED 96/206  22:42:02  LOCAL
-----

-NAME OF RECOVERED DATA SET: CICSDSW.VSAMU.TESTDB
0 :----- RECORDS FOUND ON THE LOG(S) -----: :---- CHANGE RECORDS APPLIED -----: :-- CHANGES
DATASET FCT ENTRY                                     :-----: :-- IGNORED
TYPE   NAME          DSNAME  UPD-AFTER  ADD-AFTER  DEL-AFTER  ADDS    UPDATES  DELETES  BY EXIT
-----
BASE   CVRTEST       1        0          6          0          6        0        0        0
BASE   CVRTEST       1        1          5          0          5        1        0        0
BASE   CVRTEST       1        2          2          1          0        0        0        0
BASE   CVRTEST       1        1          0          0          0        0        0        0
-----
TOTAL                4        4          13         1          11       1        0        0
-----
0
-----
OVERALL TOTAL        4        4          13         1          11       1        0        0
-----
0
-----
GRAND TOTAL          4        4          13         1          11       1        0        0
-----

```

Figure 182. Page 2 of CICSVR Report 2

The third report informs you about any activities performed in the CICSVR user exits. You can provide your own logic for recovery in these exits, such as skipping specific records. Because we are not using any exits, this report is not very meaningful. See the *CICSVR Implementation Guide* for more information about the exits, and the *CICSVR User's Guide and Reference* for an explanation of the reports.

After forward recovery there might be uncommitted records that have to be backed out. For earlier CICS releases, this would be the next job step (using the BACKOUT parameter of CICSVR). With CICS TS, however, CICS does the backout. For our test case, remember we had UOW (AD38149471A05406), which had failed to back out (Bac) and therefore was shunted (Shu), and the failure (or wait cause) was caused by a data set error (Dat). To find out the data set name, you inquire on the failed UOWs, using the CEMT I UOWDSNF command. Figure 183 shows the command display.

```

CEMT I DSN(CICSDSW.VSAMU.TESTDB)
STATUS: RESULTS - OVERTYPE TO MODIFY
Dsn(CICSDSW.VSAMU.TESTDB          ) Vsa      NORMAL
Fil(0001) Val Bas Fwd      Fr1(00) Ava      Ret Unq

```

Figure 183. CEMT Data Set Name Display

The inquired data set has retained locks. Because this data set is the one that caused the UOW to be shunted, you can now retry the UOW and thus complete the backout by issuing the RETRY as shown on Figure 184 on page 208.

```

SET DSN(CICSDSW.VSAMU.TESTDB) RETRY
STATUS: RESULTS - OVERTYPE TO MODIFY
Dsn(CICSDSW.VSAMU.TESTDB          ) Vsa      NORMAL
  Fil(0001) Val Bas Fwd      Fr1(00) Ava      Ret Unq

```

Figure 184. CEMT SET with RETRY Option

7.3 CICSVR ISPF Interface

The CICSVR front end is a set of ISPF panels that simplify the recovery task for VSAM data sets. These are the main options of the CUA-compliant ISPF interface of CICSVR:

1. List of VSAM spheres. Option 1 lists the VSAM spheres that are registered in the RCDS. You can select one or more spheres and issue an action against it from the action bar.
2. List of archived logs. Option 2 lists the logs that are registered in the RCDS whenever you copy a log to an archive data set using the CICSVR archive utility. This option is intended to support the journals of earlier releases of CICS.
3. List of copied log streams. Option 3 gives you a list of log stream names referring to log streams that you copied to archive data sets by using the log stream copy utility.
4. List of registered log of logs. Option 4 gives you a list of the "log of logs" registered in the RCDS. When you first use the CICSVR front end, you should select this option after having completed option 5 to update the JCL skeleton. You can use the Administration action on the log of logs list panel to register your log of logs from scratch. When you use the Utility action and select "scan all," which scans the log of logs selected and registers all of the VSAM spheres that are found on the log of logs. Only after this scan is option 1 useful, giving you a list of your VSAM spheres, one of which you may want to select for recovery.
5. JCL skeleton. Option 5 lets you tailor the JCL skeleton to your local standards and naming convention.

After successful installation of CICSVR and the ISPF front end, here are the steps to follow to customize and then use the product.

1. Select option 5 from the main panel to tailor your JCL. On the Edit panel you edit the JCL in member DWWUJOB in the DWW.ISPFILIB library.
2. Select option 4 and then the Administrate action. You are presented with the panel shown in Figure 185 on page 209.


```

Administrate Utilities List View Help
-----|-----
]_ 1. Scan all log of logs list Row 1 to 1 of 1
Command ==> |_
Select one or more log of logs, then select an action.

S Log of logs Last scan
S SCSCFWR.DFHLGLOG time (GMT) DD name
***** Bottom of data *****
- blank lines removed -

F1=Help F3=Exit F4=ListDet F5=Scan F6=Register F7=Bkwd

```

Figure 187. Log of Logs Scan Panel

The *Last scan time* in the panel should now show the time stamp of this scan.

- Exit (PFK3) and then select option 1 from the main menu. You are presented with the VSAM spheres that are now registered in the RCDS and ready for selection. Figure 188 shows that the data set we used for testing is selected. For the Utilities action, select option 2 to initiate a forward recovery for the selected sphere.

```

Administrate Utilities Tools List View Help
-----|-----
] 1. Complete recovery... F4 ] Row 1 to 20 of 21
Command ==> ] 2. Forward recover only... F5 ]
] 3. Backout only... F6 ]
Select one or more log of logs, then select an action.

S VSAM sphere Last time RLS RR
referenced flag on
- CICSDSW.VSAMU.CUSTOMER 96.213 19:10:21 Y
- CICSDSW.VSAMU.DATAENDB 96.213 19:10:21 Y
- CICSDSW.VSAMU.DEPSUMDB 96.213 21:02:21 Y
- CICSDSW.VSAMU.EMPACTDB 96.213 19:10:21 Y
- CICSDSW.VSAMU.HOTEL1 96.213 19:10:21 Y
- CICSDSW.VSAMU.INVENTOR 96.213 19:10:21 Y
- CICSDSW.VSAMU.ITEMACT 96.213 19:10:21 Y
- CICSDSW.VSAMU.PARTS 96.213 19:10:21 Y
S CICSDSW.VSAMU.TESTDB 96.213 19:10:21 Y
- CICSDSW.VSAMU.TRMNALDB 96.213 19:10:21 Y
- CICSDSW.VSAMU.VENDOR 96.213 19:10:21 Y
- CICSDSW.VSAMV.CUSTOMER 96.213 19:10:21 N
- CICSDSW.VSAMV.DATAENDB 96.213 19:10:21 N
- CICSDSW.VSAMV.DEPSUMDB 96.213 19:10:21 N
- CICSDSW.VSAMV.EMPACTDB 96.213 19:10:21 N
- CICSDSW.VSAMV.HOTEL1 96.213 19:10:21 N
- CICSDSW.VSAMV.INVENTOR 96.213 19:10:21 N
- CICSDSW.VSAMV.ITEMACT 96.213 19:10:21 N
- CICSDSW.VSAMV.PARTS 96.213 19:10:21 N
- CICSDSW.VSAMV.TRMNALDB 96.213 19:10:21 N
- CICSDSW.VSAMV.VENDOR 96.213 19:10:21 N
F1=Help F3=Exit F4=CompRec F5=FwdRec F6=Backout F7=Bkwd

```

Figure 188. Sphere Selection Panel

You are presented with a panel where you can enter additional parameters, for example, start and stop time for the forward recovery or a new name for the sphere you are about to recover.

Refer to the *CICS Recovery and Restart Guide* for more details.

7.4 Deleting Obsolete Log Records

In this section we describe the procedure to delete log records from the log stream data sets.

The CICS log manager automatically deletes log records that are no longer needed for backout or emergency restart from the log stream data set. This process is also known as *log tail deletion*. Actually you should have sized your coupling facility structure big enough for CICS system log streams (DFHLOG and DFHSHUNT), so that “spilling” of log streams to the log stream data sets occurs very rarely and the redundant log data is deleted from the coupling facility structure before the CICS log manager automatically writes it to a log stream data set (unless you specify SYSLOG=KEEP in the SIT).

However, automatic log tail deletion is not provided for your general logs, which consist of forward recovery logs, auto journals, and user journals. You must implement your own procedure that deletes redundant log data from the log stream data sets of general logs, to avoid the MVS system logger from reaching its inventory limit of 168 data sets per log stream. The MVS system logger issues message IXG257I when 90% of the log stream inventory is filled up. However, this event is not detected by CICS. Use your automation software to monitor occurrences of this message and initiate the log tail deletion procedure you have implemented.

Note: The limitation of 168 data sets per log stream has been removed by OS/390 Release 3.

To delete log streams and free the log stream data set DASD space, use the SUBSYS parameter in a DD statement for the log stream. For example:

```
//LOGSTRM DD DSN=PAYROL.FWRLG,          <==log stream name  
//          SUBSYS=(LOGR,DFHLG510,' T0=(1996/218,09:30)',DELETE)
```

will delete all log streams starting with the oldest that is found in the MVS system logger inventory, up to the log stream that was written on August 5, 1996, at 9:30 a.m.

We recommend, however, that you archive the log streams before they are deleted. If you need long-term data retention, you must copy the data from the log stream data set to alternative archive storage. The JCL shown in Figure 189 on page 212 is an example of how you can archive log streams before deletion.

```

//LSARCHV JOB (999,POK),'CVR',CLASS=A,MSGCLASS=T,
//          NOTIFY=&SYSUID,REGION=4096K
/**
/** This JOB catalogues a new archive dataset and then copies
/** the FW-recovery log stream on it (step COPYLS)
/** This copy is registered in DWWCON datasets to be used later
/** for a FW recovery
/**
/**          allocate the log save ds
//ALLOCLDS EXEC PGM=IEFBRI4
//SYSPRINT DD SYSOUT=*
//DWWCOPY1 DD DSN=SCSCFWR.VSAMUBU.D96218C1,
//          DISP=(NEW,CATLG,DELETE),UNIT=3390,VOL=SER=RES010,
//          SPACE=(CYL,(5,15)),DCB=(DSORG=PS)
/**DWWCOPY2 DD DSN=SCSCFWR.VSAMUBU.D96218C2,
/**          DISP=(NEW,CATLG,DELETE),UNIT=3390,VOL=SER=RES09,
/**          SPACE=(CYL,(5,15)),DCB=(DSORG=PS)
/**
/**          copy the log stream (CICSVR)
//COPYLS EXEC PGM=DWWLC
//STEPLIB DD DSN=DWW.CICSVR23.SDWWLOAD,DISP=SHR
//SYSUDUMP DD SYSOUT=*
//DWDUMP DD SYSOUT=*
//DWMMSG DD SYSOUT=*
//DWHPRINT DD SYSOUT=*
//DWWCOPY1 DD DSN=SCSCFWR.VSAMUBU.D96218C1,DISP=SHR
/**DWWCOPY2 DD DSN=SCSCFWR.VSAMUBU.D96218C2,DISP=SHR
//DWWCON1 DD DSN=DWW.CICSVR23.DWWCON1,DISP=SHR
//DWWCON2 DD DSN=DWW.CICSVR23.DWWCON2,DISP=SHR
//DWWCON3 DD DSN=DWW.CICSVR23.DWWCON3,DISP=SHR
//DWIN DD *
LOGSTREAMCOPY -
          NAME(SCSCFWR.VSAMU) -
          STARTTIME(96.210/00.00.01) -
          STOPTIME(96.218/22.00.00) -
          COPIES(1)
/**
/**          delete logtail only if COPYLS run ok
//DELTAI EXEC PGM=IEFBRI4,COND=(0,GT,COPYLS)
//LOGSTRM DD DSN=SCSCFWR.VSAMU,
//          SUBSYS=(LOGR,DFHLG510,
//          'FROM=OLDEST,TO=(1996/218,22:00),LOCAL',DELETE)
/**
/**          'FROM=(1996/210,00:01),TO=YOUNGEST,LOCAL',DELETE)

```

Figure 189. CICSVR Log Archive JCL

By specifying another DWWCOPYx data set (for example, DWWCOPY2), you can create a second or third (DWWCOPY3) copy of the log stream in one run. Specify COPIES(x) in the respective SYSIN parameter of the COPYLS step.

The CICSVR log stream copy function produces a report that shows the results of the copy (Figure 190).

```

CICSVR - CICS VSAM RECOVERY                                DATE : 96/08/05    TIME : 22:11:16    PAGE : 1

DWW1501I The MVS log stream copy utility is started at 96/08/05 22:11:18.
LOGSTREAMCOPY -
          NAME(SCSCFWR.VSAMU) -
          STARTTIME(96.200/00.00.01) -
          COPIES(1)

DWW1173I Command processing is complete. The maximum condition code is 0.

DWW1502I The MVS log stream copy utility is terminated. The maximum condition code is 0.

CICSVR - MVS LOG STREAM COPY UTILITY                      DATE : 96/08/05    TIME : 22:11:18    PAGE : 1

STATISTICS FROM THE MVS LOG STREAM COPY UTILITY
=====
MVS LOG STREAM NAME   : SCSCFWR.VSAMU
FIRST TIME GMT        : 96.211 16:00:07
LAST TIME GMT         : 96.218 23:11:14
FIRST TIME LOCAL      : 96.211 12:00:07
LAST TIME LOCAL       : 96.218 19:11:14
FIRST BLOCK NUMBER    :          92636799
LAST BLOCK NUMBER     :          92649346

```

Figure 190. CICSVR Log Stream Copy Report

A message related to the log stream deletion is not issued, unless the MVS system logger refuses to perform the requested function because of an error it detects. For example, if you incorrectly specify the log stream name as we did

in Figure 191 on page 213, the MVS system logger produces an error message, and the job ends with a JCL error. Specifying a wrong log stream name is a very common error. Keep in mind that the MVS system logger prefixes the log stream name with a high-level identifier ("CICS", in our case), if the log stream definition job requests it.

```
IXG504I  LOGGR SUBSYSTEM (LOGR) EXIT PROVIDED AN ERROR RETURN
DD=LOGSTRM  EXIT=DFHLG510  FUNCTION=ALLOCATION  RETCODE=00000004
IXG231I  IXGCONN REQUEST=CONNECT TO LOG STREAM CICS.SCSCFWR.VSAMU
-LOGCOPY DELTAIL          FLUSH      0      .00      .00      .00      .00      .0
COMPLETED FOR REQUESTOR LOGCOPY.  RETURN CODE: 00000008  REASON CODE:
0000080B  DIAG1: 00000008  DIAG2: 0000F801  DIAG3: 05030004  DIAG4:
05020010
IEF453I  LOGCOPY - JOB FAILED - JCL ERROR - TIME=20.06.38
```

Figure 191. Messages from Log Stream Not Found

The logger messages that start with the letters IXG, and a description of the return and reason codes can be found in the *MVS/ESA 5.2 MVS Programming: Assembler Services Reference*.

Chapter 8. CICS Shared Temporary Storage Failure

In this chapter we provide an overview of the CICS temporary storage (TS) data sharing server (which we refer to as the TS server) and describe three recovery scenarios that you may encounter in your environment:

1. Failure of the TS server
2. Failure of the coupling facility holding the TS server structure
3. Controlled move of TS queue pools to another coupling facility

Note that shared temporary storage data is not recoverable.

8.1 Overview of CICS Shared Temporary Storage

A comprehensive overview of the TS server is provided in the *CICS Release Guide*. In this section we explain the environment under which we ran the recovery scenarios.

TS data sharing allows your CICS applications to access recoverable TS queues from multiple CICS regions running on any MVS image within a Parallel Sysplex.

As in previous releases of CICS, you can provide multisystem access for recoverable queues within the sysplex by creating a QOR and function shipping TS requests from the AORs to the QOR.

You can also define a QOR that accesses shared TS queues so that previous releases of CICS can function ship TS requests for shared TS queues. In the configuration used for the recovery scenarios in this chapter, regions PAA1, PAA4, and PFA1 are CICS TS regions that access shared TS directly. Regions PAA2 and PAA3 are CICS/ESA 4.1 regions that function ship requests for shared TS queues to region PFA1. Application code need not be changed to access shared TS.

Shared TS queues are stored in a TS pool. Each TS pool corresponds to a coupling facility list structure defined in the CFRM policy. You need a TS server for each pool you use in the coupling facility. A TS server is needed on each MVS image that runs CICS regions that need to access shared TS queues. A CICS region can access more than one TS server concurrently.

With the addition of TS data sharing, there are now three kinds of TS queues. You can define your TS queues as:

- Local
- Remote
- Shared

All of these TS queues can be supported concurrently. To define a shared queue, you need a DFHTST TYPE=REMOTE and DFHTST TYPE=SHARED entry in your temporary storage table (TST). The TYPE=REMOTE entry specifies that TS requests with the queue names specified by the DATAID parameter should be routed to the system specified by the SYSIDNT parameter. To route these requests to a TS server requires a TYPE=SHARED entry with a matching SYSIDNT used in the TYPE=REMOTE entry. The TYPE=SHARED entry also

specifies a POOLNAME. This POOLNAME specifies which TS server is to be used for any TS requests for such queue names.

Note that if the SYSID parameter is specified on any TS API calls, this specification takes precedence over any TYPE=REMOTE definitions specified in the TST. Should the SYSID parameter used in such a call belong to a TS server, the TS request is sent to the TS server.

The TS server can replace any TS owning regions (TSORs) that would have been necessary to provide shared temporary storage for previous releases of CICS. Note that a TSOR is still needed if the TS queues are required to be recoverable.

For our scenarios we ran a TS server called C51TSS on MVS images SC42 and SC52. These servers controlled the pool TSQSPQA1 that used coupling facility structure DFHXQLS_TSQSPQA1. The following parameters were used for the initialization of the shared TS server:

```
*-- PRIMARY PARMS --*
POOLNAME=TSQSPQA1
FUNCTION=SERVER
STATSOPTIONS=NONE
ENDOFDAY=00:00
STATSINTERVAL=03:00
POOLSIZE=3M
MAXQUEUES=1000
```

See the *CICS System Definition Guide* for a description of all the initialization parameters.

The CFRM policy entry for the coupling facility structure was:

```
STRUCTURE NAME(DFHXQLS_TSQSPQA1)
SIZE(3000)
INITSIZE(1000)
PREFLIST(CF01,CF02)
REBUILDPERCENT(1)
```

Below we show the TSTs used for the CICS TS and CICS V4.1 regions. Table DFHTSTA1 uses shared TS for all TS queues whose names begin with the characters *SHR*. It routes these requests to the server with the POOLNAME TSQSPQA1. Table DFHTSTU1 function ships requests for these same names to the PFA1 region.

DFHTSTA1

```
DFHTST TYPE=INITIAL, *
    SUFFIX=A1
DFHTST TYPE=REMOTE,SYSIDNT=PQA1, *
    DATAID=SHR
DFHTST TYPE=SHARED,SYSIDNT=PQA1,POOL=TSQSPQA1
DFHTST TYPE=FINAL
END
```

DFHTSTU1

```
DFHTST TYPE=INITIAL, *
      SUFFIX=U1
DFHTST TYPE=REMOTE,SYSIDNT=PFA1, *
      DATAID=SHR
DFHTST TYPE=FINAL
END
```

8.2 Shared Temporary Storage Server Failure

A CICS region establishes a connection to a TS server when it first successfully references a shared TS queue. A successful connection is confirmed by the following message, issued by authorized cross-memory (AXM) services:

```
AXMSC0031I Connection to server DFHXQ.poolname has been opened.
```

You can use the TS server command, `DISPLAY CONNECTIONS`, to see which CICS systems on the MVS image where the TS server is running have connected to this server. For example, in this particular environment, the TS server on system SC52 shows that CICS region PAA4 is connected (see Figure 192).

```
F C51TSS,DISP CONNECTION
DFHXQ0351I Connection: Job SCSCPAA4 Appl SCSCPAA4 Idle 00:03:08
DFHXQ0352I Queue pool TSQSPQA1 total active connections: 1.
DFHXQ0303I DISPLAY command has been processed.
```

Figure 192. TS Server Connection Display

Once the connection is established, it is broken only by stopping the CICS region (or the TS server, of course). Hence the TS server `STOP` command completes only when all active connections have ended, that is, when any connected CICS regions have ended.

8.2.1 Impact

You can stop a TS server even if it has active connections to CICS regions by using the TS server `CANCEL` command, which reports that there are active connections and that the TS server has terminated (see Figure 193).

```
F C51TSS,CANCEL
DFHXQ0307I CANCEL command has been processed. Number of active
connections = 1.
DFHXQ0111I Shared TS queue server for pool TSQSPQA1 is terminating.
AXMSC0061I Server DFHXQ.TSQSPQA1 is now disabled for connections.
DFHXQ0461I Disconnected from CF structure DFHXQLS_TSQSPQA1.
DFHXQ0112I Shared TS queue server has terminated, return code 8,
reason code 307.
```

Figure 193. TS Server Termination Display

Any subsequent requests to shared TS queues from the previously connected CICS regions receive a SYSIDERR response to the API call they issued. This response is received if the TS server is unavailable for whatever reason, be it an operator-controlled event or a failure of some kind.

8.2.2 Prevention

There is no way of preventing a failure of the TS server.

You can however minimize the effects of a TS server failure by using CICSplex SM to manage your workload. For example, you can use the abend health function of the CICSplex SM workload manager to make the AORs that cannot access a TS server less likely to be selected to execute your transaction. This function would need your transaction to abend when it received a SYSIDERR response to an attempted access to a shared TS queue, so it may involve you in some application changes.

8.2.3 Recovery

The TS server cannot be controlled by the MVS ARM. Any restart of a failed TS server must be done by an operator or by automated operations.

8.2.4 Example

Figure 194 and Figure 195 on page 219 show part of the system log during a TS server failure and the output from an application running on a CICS system referencing shared TS queues. The application reports the time, type, queue name, and response that was received from the API call made.

The failure in the TS server was caused by cancelling the started task. Point **1** in both figures shows when the TS server stopped servicing TS requests. The TS server was restarted at point **2** shown in Figure 194, and point **3** is when the TS server was available again to handle requests.

Figure 195 on page 219 shows how applications can continue to execute even if the TS server is not available. In most applications, this is of limited benefit. Loss of access to temporary storage probably means loss of application function.

```

SC42  97089 21:12:31.51 CICSRS4  00000290  C C51TSS
SC42  97089 21:12:31.60 TSU05640 00000090  IEE301I C51TSS          CANCEL COMMAND ACCEPTED
SC42  97089 21:12:31.63 STC05763 00000090  AXMSC0061I Server DFHXQ.TSQSPQA1 is now disabled for connections. 1
SC42  97089 21:12:32.53 STC05763 00000090  IEF450I C51TSS C51TSS - ABEN=S222 U0000 REASON=00000000 241
                                     241 00000090          TIME=21.12.32
SC42  97089 21:12:32.61 STC05763 00000090  IEF352I ADDRESS SPACE UNAVAILABLE
SC42  97089 21:12:32.61 STC05763 00000090  $HASP395 C51TSS      ENDED

SC42  97089 21:13:00.81 CICSRS4  00000290  S C51TSS 2
SC42  97089 21:13:01.29 STC05766 00000090  IEF403I C51TSS - STARTED - TIME=21.13.01
SC42  97089 21:13:01.44 STC05766 00000090  DFHXQ0101I Shared TS queue server initialization is in progress.
SC42  97089 21:13:02.36 STC05766 00000090  DFHXQ0401I Connected to CF structure DFHXQLS_TSQSPQA1.
SC42  97089 21:13:02.36 STC05766 00000290  IXL014I IXLCONN REQUEST FOR STRUCTURE DFHXQLS_TSQSPQA1 WAS SUCCESSFUL.
                                     254
                                     254 00000090  JOBNAME: C51TSS ASID: 0101 CONNECTOR NAME: DFHXQCF_SC42
                                     254 00000090  CFNAME: CF01
SC42  97089 21:13:02.43 STC05766 00000090  AXMSC0051I Server DFHXQ.TSQSPQA1 is now enabled for connections.
SC42  97089 21:13:02.43 STC05755 00000090  AXMSC0031I Connection to server DFHXQ.TSQSPQA1 has been opened. 3
SC42  97089 21:13:02.44 STC05766 00000090  DFHXQ0102I Shared TS queue server for pool TSQSPQA1 is now active.

```

Figure 194. Temporary Storage Server Failure

| Time | Function | Queue Name | Response |
|----------------------|----------|----------------|--------------|
| 21:12:28 | WRITEQ | on TSQ SHRP190 | was NORMAL |
| 21:12:30 | READQ | on TSQ SHRP081 | was NORMAL |
| 21:12:30 | DELETEQ | on TSQ SHRP112 | was QIDERR |
| 21:12:30 | DELETEQ | on TSQ SHRP025 | was QIDERR |
| 21:12:30 | WRITEQ | on TSQ SHRP122 | was NORMAL |
| 21:12:30 | WRITEQ | on TSQ SHRP061 | was NORMAL |
| 21:12:31 | DELETEQ | on TSQ SHRP169 | was QIDERR |
| 21:12:31 | WRITEQ | on TSQ SHRP133 | was NORMAL |
| 21:12:32 | READQ | on TSQ SHRP051 | was SYSIDERR |
| 21:12:32 | DELETEQ | on TSQ SHRP045 | was SYSIDERR |
| 21:12:32 | WRITEQ | on TSQ SHRP066 | was SYSIDERR |
| and so on until..... | | | |
| 21:13:01 | READQ | on TSQ SHRP020 | was SYSIDERR |
| 21:13:02 | DELETEQ | on TSQ SHRP081 | was SYSIDERR |
| 21:13:02 | WRITEQ | on TSQ SHRP138 | was SYSIDERR |
| 21:13:02 | WRITEQ | on TSQ SHRP025 | was SYSIDERR |
| 21:13:02 | WRITEQ | on TSQ SHRP122 | was NORMAL |
| 21:13:03 | WRITEQ | on TSQ SHRP003 | was NORMAL |
| 21:13:04 | READQ | on TSQ SHRP133 | was NORMAL |
| 21:13:04 | WRITEQ | on TSQ SHRP051 | was NORMAL |
| 21:13:05 | READQ | on TSQ SHRP158 | was NORMAL |
| 21:13:05 | DELETEQ | on TSQ SHRP020 | was NORMAL |

Figure 195. Temporary Storage Server Failure: Application Responses

8.2.5 Documentation on Temporary Storage Server Failure

You can find additional information in the following manuals:

- *CICS Release Guide*
- *CICS System Definition Guide*
- *CICSplex SM Setup and Administration: Volume 2*

8.3 Failure of the Coupling Facility Holding the TS Server Structure

Connectivity to the coupling facility can be lost as a result of a path failure or loss of coupling facility power supply.

8.3.1 Impact

Because the shared TS server does not support the rebuild function for structures, if connectivity to the coupling facility holding the TS structure fails, the TS server that is connected to that structure also fails.

8.3.2 Prevention

Because the TS server does not support the rebuild function of coupling facility structures, there is no way of preventing the effect of a coupling facility failure. The TS server fails if connectivity to the coupling facility structure is lost.

8.3.3 Recovery

If the contents of the structure are preserved, the reestablishment of a connection to that coupling facility also reestablishes the shared TS queues that it holds. Should the coupling facility be lost for a significant time, the TS structure can be allocated on another coupling facility. This new structure is empty.

8.3.4 Example

Figure 196 on page 221 shows an example of the effect of a CF failure on a TS server. Because the CF holding the TS structure fails, the connected TS server fails too. To restart the TS server, you have to cause the reallocation of a new structure in another CF.

1 A display of structure DFHXQLS_TSQSPQA1 shows that it is currently allocated on CF01 and has two active connections. There are TS servers C51TSS running on both systems SC42 and SC52.

2 and **3** An error with the coupling facility is detected by the TS server and reported in message DFHXQ0441. MVS and CICS issue messages IXL158I and DFHLG0777 to indicate loss of connectivity to the coupling facility.

4 The TS server issues message DFHXQ0441, reporting a failed request to access the coupling facility structure. Reason code 0C1C0C06 indicates that connectivity to the coupling facility containing the list structure has been lost. The TS server terminates.

5 A display of the TS server structure shows that it remains allocated on CF01, but no systems are connected to CF01 and there are no connections to the structure.

6 A restart of the TS server (started task C51TSS) fails to connect to TS structure DFHXQLS_TSQSPQA1 for the same reason. Nothing has been done to restore a connection to this structure.

7 and **8** The SETXCF FORCE command is used to deallocate structure DFHXQLS_TSQSPQA1. The D XCF command shows that disconnect is in progress.

9 Another attempt to start TS server C51TSS is successful. Message IXL015I reports the allocation of the structure and why a particular CF was chosen. In this case, CF01 is marked as NO CONNECTIVITY.

Note the AXMSC0031I messages indicating that CICS regions have successfully connected to this TS server. As with the TS server failure scenario, CICS applications attempting to access shared TS queues while the TS server was unavailable would have received a SYSIDERR response.


```

15:57:46.19 INTERNAL 00000290 D XCF,STR,STRNM=DFHXQLS_TSQSPQA1 1
15:57:46.87 INTERNAL 00000090 IXC360I 15.57.46 DISPLAY XCF 392
      392 00000090 STRNAME: DFHXQLS_TSQSPQA1
      392 00000090 STATUS: ALLOCATED
      392 00000090 POLICY SIZE : 3000 K
      392 00000090 POLICY INITSIZE: 1000 K
      392 00000090 REBUILD PERCENT: 1
      392 00000090 PREFERENCE LIST: CF01 CF02
      392 00000090 EXCLUSION LIST IS EMPTY
      392 00000090
      392 00000090 ACTIVE STRUCTURE
      392 00000090 -----
      392 00000090 ALLOCATION TIME: 03/30/1997 20:53:41
      392 00000090 CFNAME : CF01
      392 00000090 COUPLING FACILITY: 009672.IBM.02.000000040104
      392 00000090 PARTITION: 1 CPCID: 00
      392 00000090 ACTUAL SIZE : 3072 K
      392 00000090 STORAGE INCREMENT SIZE: 256 K
      392 00000090 VERSION : AE705D63 71B0FC04
      392 00000090 DISPOSITION : KEEP
      392 00000090 ACCESS TIME : 0
      392 00000090 MAX CONNECTIONS: 32
      392 00000090 # CONNECTIONS : 2
      392 00000090
      392 00000090 CONNECTION NAME ID VERSION SYSNAME JOBNAME ASID STATE
      392 00000090 -----
      392 00000090 DFHXQCF_SC42 02 00020032 SC42 C51TSS 0065 ACTIVE
      392 00000090 DFHXQCF_SC52 01 00010064 SC52 C51TSS 005D ACTIVE

16:13:10.61 STC06863 00000090 +DFHXQ0441 CF structure DFHXQLS_TSQSPQA1 request failed, IXL158I
return code 12, reason code 0C1C0C06. 2
16:13:09.10 STC06294 00000090 *IXL158I PATH 04 IS NOW NOT-OPERATIONAL TO CUID: FFFB 504
504 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
504 00000090 PARTITION: 1 CPCID: 00
16:13:09.10 STC06294 00000090 *IXL158I PATH 44 IS NOW NOT-OPERATIONAL TO CUID: FFFB 505
505 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
505 00000090 PARTITION: 1 CPCID: 00
16:13:11.10 STC06863 00000090 +DFHLG0777 SCSCPAA1 508
508 00000090 A temporary error condition occurred during MVS logger operation
508 00000090 IXGWRITE for log stream SCSCPAA1.DFHLOG. MVS logger codes:
508 00000090 X'00000008', X'00000864'. 3
16:13:12.44 00000090 IXC518I SYSTEM SC42 NOT USING 516
516 00000090 COUPLING FACILITY 009672.IBM.02.000000040104
516 00000090 PARTITION: 1 CPCID: 00
516 00000090 NAMED CF01
516 00000090 REASON: CONNECTIVITY LOST.
516 00000090 REASON FLAG: 13300001.

16:13:13.26 STC06867 00000090 +DFHXQ0441 CF structure DFHXQLS_TSQSPQA1 request failed, IXL158I
return code 12, reason code 0C1C0C06.
16:13:17.60 STC06732 00000090 AXMSC0061I Server DFHXQ_TSQSPQA1 is now disabled for connections.
16:13:17.05 STC06732 00000090 DFHXQ0424 Connectivity has been lost to CF structure 518
16:13:22.16 STC06732 00000090 IEF450I C51TSS C51TSS - ABEND=S026 U0000 REASON=0E0D0101 524
524 00000090 TIME=16.13.22
16:13:22.35 STC06732 00000090 IEF404I C51TSS - ENDED - TIME=16.13.22
16:13:42.58 STC06863 00000090 +DFHLG0777 SCSCPAA1 535
535 00000090 A temporary error condition occurred during MVS logger operation
535 00000090 IXGWRITE for log stream SCSCPAA1.DFHLOG. MVS logger codes:
16:15:28.00 CICSRS4 00000290 D XCF,STR,STRNM=DFHXQLS_TSQSPQA1 5

```

Figure 196 (Part 1 of 3). Effect of Coupling Facility Failure on TS Server

```

16:15:28.41 CICSRS4 0000090 IXC360I 16.15.28 DISPLAY XCF 560
560 0000090 STRNAME: DFHXQLS_TSQSPQA1
560 0000090 STATUS: ALLOCATED
560 0000090 POLICY SIZE : 3000 K
560 0000090 POLICY INITSIZE: 1000 K
560 0000090 REBUILD PERCENT: 1
560 0000090 PREFERENCE LIST: CF01 CF02
560 0000090 EXCLUSION LIST IS EMPTY
560 0000090 ACTIVE STRUCTURE
560 0000090 -----
560 0000090 ALLOCATION TIME: 03/30/1997 20:53:41
560 0000090 CFNAME : CF01 NO SYSTEMS CONNECTED TO COUPLING FACILITY
560 0000090 COUPLING FACILITY: 009672.IBM.02.000000040104
560 0000090 PARTITION: 1 CPCID: 00
560 0000090 ACTUAL SIZE : N/A
560 0000090 STORAGE INCREMENT SIZE: 256 K
560 0000090 VERSION : AE705D63 71B0FC04
560 0000090 DISPOSITION : KEEP
560 0000090 ACCESS TIME : 0
560 0000090 MAX CONNECTIONS: 32
560 0000090 # CONNECTIONS : 0
16:17:11.04 CICSRS4 00000290 S C51TSS,SYSIDNT=PQA1 6
16:17:11.93 STC06944 00000090 $HASP373 C51TSS STARTED
16:17:11.96 STC06944 00000090 IEF403I C51TSS - STARTED - TIME=16.17.11
16:17:12.22 STC06944 00000090 DFHXQ0101I Shared TS queue server initialization is in progress.
16:17:12.73 STC06944 00000090 DFHXQ0403 Connection to CF structure DFHXQLS_TSQSPQA1 failed, IXLCONN
return code 12, reason code 02010C06.
16:17:12.73 STC06944 00000290 IXL013I IXLCONN REQUEST FOR STRUCTURE DFHXQLS_TSQSPQA1 FAILED. 577
16:17:12.75 STC06944 00000090 DFHXQ0112I Shared TS queue server has terminated, return code 8,
reason code 403.
577 0000090 JOBNAME: C51TSS ASID: 0061 CONNECTOR NAME: DFHXQCF_SC42
577 0000090 IXLCONN RETURN CODE: 0000000C, REASON CODE: 02010C06
16:21:50.74 CICSRS4 00000290 SETXCF FORCE,STR,STRNM=DFHXQLS_TSQSPQA1 7
16:21:51.06 CICSRS4 0000090 IXC353I THE SETXCF FORCE REQUEST FOR STRUCTURE 618
618 0000090 DFHXQLS_TSQSPQA1 WAS ACCEPTED:
618 0000090 REQUEST WILL BE PROCESSED ASYNCHRONOUSLY

16:22:30.01 CICSRS4 00000290 D XCF,STR,STRNM=DFHXQLS_TSQSPQA1 8
16:22:30.32 CICSRS4 0000090 IXC360I 16.22.30 DISPLAY XCF 621
621 0000090 STRNAME: DFHXQLS_TSQSPQA1
621 0000090 STATUS: ALLOCATED
621 0000090 POLICY SIZE : 3000 K
621 0000090 POLICY INITSIZE: 1000 K
621 0000090 REBUILD PERCENT: 1
621 0000090 PREFERENCE LIST: CF01 CF02
621 0000090 EXCLUSION LIST IS EMPTY
621 0000090 STRUCTURE IN TRANSITION
621 0000090 -----
621 0000090 REASON IN TRANSITION: CONNECT OR DISCONNECT IN PROGRESS
621 0000090 ALLOCATION TIME: 03/30/1997 20:53:41
621 0000090 CFNAME : CF01 NO SYSTEMS CONNECTED TO COUPLING FACILITY
621 0000090 COUPLING FACILITY: 009672.IBM.02.000000040104
621 0000090 PARTITION: 1 CPCID: 00
621 0000090 ACTUAL SIZE : N/A
621 0000090 STORAGE INCREMENT SIZE: 256 K
621 0000090 VERSION : AE705D63 71B0FC04

```

Figure 196 (Part 2 of 3). Effect of Coupling Facility Failure on TS Server

```

16:23:01.40 CICSRS4 00000290 S C51TSS,SYSIDNT=PQA1
16:23:03.23 STC06952 00000090 $HASP373 C51TSS  STARTED
16:23:03.26 STC06952 00000090 IEF403I C51TSS - STARTED - TIME=16.23.03
16:23:03.45 STC06952 00000090 DFHXQ0101I Shared TS queue server initialization is in progress.
16:23:07.03 STC06952 00000090 DFHXQ0401I Connected to CF structure DFHXQLS_TSQSPQA1.
16:23:07.03 STC06952 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE DFHXQLS_TSQSPQA1 WAS SUCCESSFUL.
643
643 00000090 JOBNAME: C51TSS ASID: 00FD CONNECTOR NAME: DFHXQCF_SC42
16:23:07.04 STC06952 00000090 DFHXQ0402I CF structure DFHXQLS_TSQSPQA1 was allocated by this
connection.
643 00000090 CFNAME: CF02
16:23:07.03 STC06952 00000290 IXL015I STRUCTURE ALLOCATION INFORMATION FOR 644
644 00000090 STRUCTURE DFHXQLS_TSQSPQA1, CONNECTOR NAME DFHXQCF_SC42
644 00000090 CFNAME ALLOCATION STATUS/FAILURE REASON
644 00000090 -----
644 00000090 CF02 STRUCTURE ALLOCATED
644 00000090 CF01 NO CONNECTIVITY
16:23:07.76 STC06952 00000090 AXMSC0051I Server DFHXQ.TSQSPQA1 is now enabled for connections.
16:23:07.77 STC06952 00000090 DFHXQ0102I Shared TS queue server for pool TSQSPQA1 is now active.
16:23:08.10 STC06863 00000090 AXMSC0031I Connection to server DFHXQ.TSQSPQA1 has been opened.
16:23:18.55 STC06867 00000090 AXMSC0031I Connection to server DFHXQ.TSQSPQA1 has been opened.

```

Figure 196 (Part 3 of 3). Effect of Coupling Facility Failure on TS Server

8.3.5 Documentation on Coupling Facility Failure

For more information about coupling facility failures, see the *CICS System Definition Guide*.

8.4 Controlled Move of Shared Temporary Storage Server Queue Pools

The TS server supports only nonrecoverable TS queues. It does not support the rebuilding of any coupling facility structures to which it connects. There is, however, a method of moving the contents of a structure from one coupling facility to another, so that you can preserve the structures if you want to remove a coupling facility from use to enable an upgrade, for example).

8.4.1 Impact

All TS servers using the pool to be moved must be closed down. Any requests to these servers result in SYSIDERR conditions.

8.4.2 Prevention

The impact of a controlled move is minimized by appropriate planning and scheduling, as is the impact of any planned unavailability.

8.4.3 Recovery

Restart the servers after successful completion of the pool move.

8.4.4 Example

A TS server queue pool move is documented fully in the *CICS System Definition Guide*. In brief, you must stop all TS servers connected to the coupling facility structure and run a TS server to UNLOAD the contents of the structure to a data set. Then redefine the structure on another coupling facility, and run a TS server to RELOAD the data from the data set to the new structure. Assuming that there is enough space to load the data, all TS queues that were available on the old coupling facility structure are available on the new structure.

Our example shows the steps to move a TS server queue pool. The numbered steps refer to Figure 197 on page 225.

1 The STOP command shows that there are active connections to this TS server. The server does not stop until these connections are released.

2 The CANCEL command shuts down the TS server, even if there are active connections.

3 Displaying the structure shows that it is still allocated on CF02, but that there are no connections to it. Note the preference list that specifies in which order XCF tries to allocate a new structure. Currently CF02 is preferred over CF01.

4 Task C51TSSUL is a TS server executing in FUNCTION=UNLOAD mode. Figure 198 on page 227 shows the initialization parameters output from this started task.

5 Once the contents of the coupling facility structure have been successfully unloaded to a data set, the structure currently in CF02 is deleted with this command:

```
SETXCF FORCE,STR,STRNM=DFHXQLS_TSQSPQA1
```

6 The CFRM policy that defines structure DFHXQLS_TSQSPQA1 is changed to alter the preference list. The changed policy is made active by using this command:

```
SETXCF START,POLICY,TYPE=CFRM,POLNAME=CFRM17
```

The display command that follows shows that structure DFHXQLS_TSQSPQA1 is no longer allocated, but when an allocation does occur, CF01 is tried first.

7 Task C51TSSRL is a TS server executing in FUNCTION=RELOAD mode. Figure 199 on page 228 shows the initialization parameters output from this started task. Because this task requires allocation of the DFHXQLS_TSQSPQA1 structure, the IXL015I message is issued showing where and why this particular structure was allocated.

The RELOAD job reports the number of TS queues and blocks of data successfully loaded in message DFHXQ0803I. This number matches the numbers reported in message DFHXQ0703I in **4** since the CF structure is large enough to contain all the data.

8 A display of the structure shows that it has been allocated in CF01 and that its size is 3072K.

9 The shared TS server is successfully restarted.

10 Message AXMSC0031I is issued to confirm successful connection to a CICS region. Attempts to connect while the server was unavailable would have resulted in a SYSIDERR response to the requesting transaction.

```

20:47:54.72 CICSRS4 00000290 F C51TSS,STOP 1
20:47:54.76 STC05750 00000090 DFHXQ0304I STOP command is waiting for connections to be closed.
Number of active connections = 1.

20:48:09.41 CICSRS4 00000290 F C51TSS,CANCEL 2
20:48:09.46 STC05750 00000090 DFHXQ0307I CANCEL command has been processed. Number of active
connections = 1.
20:48:09.46 STC05750 00000090 DFHXQ0111I Shared TS queue server for pool TSQSPQA1 is terminating.
20:48:09.49 STC05750 00000090 AXMSC0061I Server DFHXQ.TSQSPQA1 is now disabled for connections.
20:48:10.41 STC05750 00000090 DFHXQ0461I Disconnected from CF structure DFHXQLS_TSQSPQA1.
20:48:10.42 STC05750 00000090 DFHXQ0112I Shared TS queue server has terminated, return code 8,
reason code 307.
20:48:10.67 STC05750 00000090 IEF404I C51TSS - ENDED - TIME=20.48.10

20:49:00.71 CICSRS4 00000290 D XCF,STR,STRNM=DFHXQLS_TSQSPQA1 3
20:49:00.98 CICSRS4 00000090 IXC360I 20.49.00 DISPLAY XCF 116
116 00000090 STRNAME: DFHXQLS_TSQSPQA1
116 00000090 STATUS: ALLOCATED
116 00000090 POLICY SIZE : 3000 K
116 00000090 POLICY INITSIZE: 1000 K
116 00000090 REBUILD PERCENT: 1
116 00000090 PREFERENCE LIST: CF02 CF01
116 00000090 EXCLUSION LIST IS EMPTY
116 00000090
116 00000090 ACTIVE STRUCTURE
116 00000090 -----
116 00000090 ALLOCATION TIME: 03/30/1997 20:33:59
116 00000090 CFNAME : CF02
116 00000090 COUPLING FACILITY: 009672.IBM.02.000000040104
116 00000090 PARTITION: 1 CPCID: 01
116 00000090 ACTUAL SIZE : 3072 K
116 00000090 STORAGE INCREMENT SIZE: 256 K
116 00000090 VERSION : AE7058FC 00DAE401
116 00000090 DISPOSITION : KEEP
116 00000090 ACCESS TIME : 0
116 00000090 MAX CONNECTIONS: 32
116 00000090 # CONNECTIONS : 0

20:49:16.61 CICSRS4 00000290 S C51TSSUL 4
20:49:17.22 STC05760 00000090 $HASP373 C51TSSUL STARTED
20:49:17.25 STC05760 00000090 IEF403I C51TSSUL - STARTED - TIME=20.49.17
20:49:17.43 STC05760 00000090 DFHXQ0101I Shared TS queue server initialization is in progress.
20:49:17.47 STC05760 00000090 DFHXQ0701I Shared TS queue pool TSQSPQA1 is to be unloaded.
20:49:18.40 STC05760 00000090 DFHXQ0401I Connected to CF structure DFHXQLS_TSQSPQA1.
20:49:18.40 STC05760 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE DFHXQLS_TSQSPQA1 WAS SUCCESSFUL.
124
124 00000090 JOBNAME: C51TSSUL ASID: 00FF CONNECTOR NAME: DFHXQCF_SC42
124 00000090 CFNAME: CF01
20:49:19.87 STC05760 00000090 DFHXQ0461I Disconnected from CF structure DFHXQLS_TSQSPQA1.
20:49:19.88 STC05760 00000090 DFHXQ0702I Shared TS queue pool TSQSPQA1 has been successfully
unloaded.
20:49:19.88 STC05760 00000090 DFHXQ0703I Number of unloaded queues: 119. Blocks written: 10.
20:49:19.89 STC05760 00000090 DFHXQ0112I Shared TS queue server has terminated, return code 0,
reason code 0.
20:49:20.02 STC05760 00000090 IEF404I C51TSSUL - ENDED - TIME=20.49.20
20:49:20.03 STC05760 00000090 $HASP395 C51TSSUL ENDED

20:51:02.91 CICSRS4 00000290 SETXCF FORCE,STR,STRNM=DFHXQLS_TSQSPQA1 5
20:51:05.83 CICSRS4 00000090 IXC353I THE SETXCF FORCE REQUEST FOR STRUCTURE 138
138 00000090 DFHXQLS_TSQSPQA1 WAS COMPLETED:
138 00000090 STRUCTURE WAS DELETED

20:52:49.61 CICSRS4 00000290 SETXCF START,POLICY,TYPE=CFRM,POLNAME=CFRM17 6
20:52:49.73 CICSRS4 00000090 IXC511I START ADMINISTRATIVE POLICY CFRM17 FOR CFRM ACCEPTED
20:52:51.08 CICSRS4 00000090 IXC513I COMPLETED POLICY CHANGE FOR CFRM. 153
153 00000090 CFRM17 POLICY IS ACTIVE.

```

Figure 197 (Part 1 of 2). Temporary Storage Server Queue Pool Move

```

20:53:20.81 CICSRS4 00000290 D XCF,STR,STRNM=DFHXQLS_TSQSPQA1
20:53:21.06 CICSRS4 00000090 IXC360I 20.53.20 DISPLAY XCF 157
157 00000090 STRNAME: DFHXQLS_TSQSPQA1
157 00000090 STATUS: NOT ALLOCATED
157 00000090 POLICY SIZE : 3000 K
157 00000090 POLICY INITSIZE: 1000 K
157 00000090 REBUILD PERCENT: 1
157 00000090 PREFERENCE LIST: CF01 CF02
157 00000090 EXCLUSION LIST IS EMPTY
20:53:41.11 CICSRS4 00000290 S C51TSSRL 7
20:53:41.52 STC05762 00000090 $HASP373 C51TSSRL STARTED
20:53:41.54 STC05762 00000090 IEF403I C51TSSRL - STARTED - TIME=20.53.41
20:53:41.70 STC05762 00000090 DFHXQ0101I Shared TS queue server initialization is in progress.
20:53:41.74 STC05762 00000090 DFHXQ0801I Shared TS queue pool TSQSPQA1 is to be reloaded.
20:53:42.84 STC05762 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE DFHXQLS_TSQSPQA1 WAS SUCCESSFUL.
165
165 00000090 JOBNAME: C51TSSRL ASID: 00FF CONNECTOR NAME: DFHXQCF_SC42
20:53:42.84 STC05762 00000090 DFHXQ0401I Connected to CF structure DFHXQLS_TSQSPQA1.
20:53:42.85 STC05762 00000090 DFHXQ0402I CF structure DFHXQLS_TSQSPQA1 was allocated by this
connection.
165 00000090 CFNAME: CF01
20:53:42.84 STC05762 00000290 IXL015I STRUCTURE ALLOCATION INFORMATION FOR 166
166 00000090 STRUCTURE DFHXQLS_TSQSPQA1, CONNECTOR NAME DFHXQCF_SC42
166 00000090 CFNAME ALLOCATION STATUS/FAILURE REASON
166 00000090 -----
166 00000090 CF01 STRUCTURE ALLOCATED
166 00000090 CF02 PREFERRED CF ALREADY SELECTED
20:53:44.28 STC05762 00000090 DFHXQ0461I Disconnected from CF structure DFHXQLS_TSQSPQA1.
20:53:44.28 STC05762 00000090 DFHXQ0802I Shared TS queue pool TSQSPQA1 has been successfully
reloaded.
20:53:44.29 STC05762 00000090 DFHXQ0803I Queues reloaded: 119. Queues bypassed: 0. Blocks read:
10.
20:53:44.29 STC05762 00000090 DFHXQ0112I Shared TS queue server has terminated, return code 0,
reason code 0.
20:53:44.41 STC05762 00000090 0.28 14
20:53:44.42 STC05762 00000090 IEF404I C51TSSRL - ENDED - TIME=20.53.44
20:53:44.43 STC05762 00000090 $HASP395 C51TSSRL ENDED
20:54:38.01 CICSRS4 00000290 D XCF,STR,STRNM=DFHXQLS_TSQSPQA1 8
20:54:38.28 CICSRS4 00000090 IXC360I 20.54.38 DISPLAY XCF 181
181 00000090 STRNAME: DFHXQLS_TSQSPQA1
181 00000090 STATUS: ALLOCATED
181 00000090 POLICY SIZE : 3000 K
181 00000090 POLICY INITSIZE: 1000 K
181 00000090 REBUILD PERCENT: 1
181 00000090 PREFERENCE LIST: CF01 CF02
181 00000090 EXCLUSION LIST IS EMPTY
181 00000090 ACTIVE STRUCTURE
181 00000090 -----
181 00000090 ALLOCATION TIME: 03/30/1997 20:53:41
181 00000090 CFNAME : CF01
181 00000090 COUPLING FACILITY: 009672.IBM.02.000000040104
181 00000090 PARTITION: 1 CPCID: 00
181 00000090 ACTUAL SIZE : 3072 K
181 00000090 STORAGE INCREMENT SIZE: 256 K
181 00000090 VERSION : AE705D63 71B0FC04
181 00000090 DISPOSITION : KEEP
181 00000090 ACCESS TIME : 0
181 00000090 MAX CONNECTIONS: 32
181 00000090 # CONNECTIONS : 0
20:55:03.41 CICSRS4 00000290 S C51TSS,SYSIDNT=PQA1 9
20:55:03.62 STC05763 00000081 $HASP100 C51TSS ON STCINRDR
20:55:03.88 STC05763 00000090 $HASP373 C51TSS STARTED
20:55:03.91 STC05763 00000090 IEF403I C51TSS - STARTED - TIME=20.55.03
20:55:04.08 STC05763 00000090 DFHXQ0101I Shared TS queue server initialization is in progress.
20:55:05.05 STC05763 00000090 DFHXQ0401I Connected to CF structure DFHXQLS_TSQSPQA1.
20:55:05.05 STC05763 00000290 IXL014I IXLCONN REQUEST FOR STRUCTURE DFHXQLS_TSQSPQA1 WAS SUCCESSFUL.
188
188 00000090 JOBNAME: C51TSS ASID: 00FF CONNECTOR NAME: DFHXQCF_SC42
188 00000090 CFNAME: CF01
20:55:05.10 STC05763 00000090 AXMSC0051I Server DFHXQ.TSQSPQA1 is now enabled for connections.
20:55:05.11 STC05763 00000090 DFHXQ0102I Shared TS queue server for pool TSQSPQA1 is now active.
>>>>> connection by CICS
20:56:35.61 STC05755 00000090 AXMSC0031I Connection to server DFHXQ.TSQSPQA1 has been opened. 10

```

Figure 197 (Part 2 of 2). Temporary Storage Server Queue Pool Move

```

20.49.17.41 AXMPG0001I The main free area above 16M was at address 0731C000, size 65424K.
20.49.17.41 AXMPG0003I Storage page pool AXMPGANY created, address 0731C000, size 62032K.
20.49.17.42 AXMPG0002I The main free area below 16M was at address 008000, size 7940K.
20.49.17.42 AXMPG0003I Storage page pool AXMPGLOW created, address 008000, size 392K.
20.49.17.43 AXMOS0001I The main procedure entry point is DFHXQMN at address 07300000.
20.49.17.43 DFHXQ0101I Shared TS queue server initialization is in progress.
20.49.17.46 DFHXQ0201I Processing SYSIN FUNCTION=UNLOAD
20.49.17.46 DFHXQ0201I Processing SYSIN POOLNAME=TSQSPQA1
20.49.17.47 DFHXQ0701I Shared TS queue pool TSQSPQA1 is to be unloaded.
20.49.18.41 DFHXQ0401I Connected to CF structure DFHXQLS_TSQSPQA1.
20.49.18.91 DFHXQ0432I Queue pool statistics for CF structure DFHXQLS_TSQSPQA1:
20.49.18.91 Structure:  Size  Max size Elem size  Queues:  Current  Highest
20.49.18.91                3072K  3072K    256           119      119
20.49.18.91 Lists:      Total    In use  Max used  Control  Data
20.49.18.91                1003      3      3         3        0
20.49.18.91                100%     0%     0%        0%       0%
20.49.18.91 Entries:    Total    In use  Max used  Free  Min free
20.49.18.91                5085     119    119     4966    0
20.49.18.91                100%     2%     2%     98%     0%
20.49.18.91 Elements:  Total    In use  Max used  Free  Min free
20.49.18.91                4949     169    169     4780    0
20.49.18.91                100%     3%     3%     97%     0%
20.49.18.91 DFHXQ0431I Access statistics for CF structure DFHXQLS_TSQSPQA1:
20.49.18.91 Index:  Wrt Adjs  Writes  Reads  Deletes  Rereads  Read Adjs
20.49.18.91                0      0      120    0         0         0
20.49.18.91 Data:   Creates  Writes  Reads  Deletes  Rereads  Rewrites
20.49.18.91                0      0      0      0         0         0
20.49.18.91 Responses:  Asynch  Normal  Len err  Not fnd  Vers chk  List chk
20.49.18.91                120    122     0      1         0         1
20.49.18.91          List full  Str full  I/O err
20.49.18.91                0      0      0
20.49.19.87 DFHXQ0461I Disconnected from CF structure DFHXQLS_TSQSPQA1.
20.49.19.88 DFHXQ0702I Shared TS queue pool TSQSPQA1 has been successfully unloaded.
20.49.19.89 DFHXQ0703I Number of unloaded queues: 119. Blocks written: 10.
20.49.19.89 DFHXQ0112I Shared TS queue server has terminated, return code 0, reason code 0.
20.49.19.92 AXMPG0004I Usage statistics for storage page pool AXMPGANY:
20.49.19.92      Size  In Use  Max Used  Free  Min Free
20.49.19.92  62032K  0K      624K    62032K  61408K
20.49.19.92    100%   0%      1%     100%   99%
20.49.19.92      Gets  Frees  Retries  Fails
20.49.19.92        16   16      0        0
20.49.19.92 AXMPG0004I Usage statistics for storage page pool AXMPGLOW:
20.49.19.92      Size  In Use  Max Used  Free  Min Free
20.49.19.92   392K   0K      16K     392K   376K
20.49.19.92    100%   0%      4%     100%   96%
20.49.19.92      Gets  Frees  Retries  Fails
20.49.19.92         3   3        0        0

```

Figure 198. TS Server Unload

```

20.53.41.69 AXMPG0001I The main free area above 16M was at address 0731C000, size 65424K.
20.53.41.69 AXMPG0003I Storage page pool AXMPGANY created, address 0731C000, size 62032K.
20.53.41.69 AXMPG0002I The main free area below 16M was at address 008000, size 7940K.
20.53.41.69 AXMPG0003I Storage page pool AXMPGLOW created, address 008000, size 392K.
20.53.41.70 AXMOS0001I The main procedure entry point is DFHXQMN at address 07300000.
20.53.41.71 DFHXQ0101I Shared TS queue server initialization is in progress.
20.53.41.73 DFHXQ0201I Processing SYSIN FUNCTION=RELOAD
20.53.41.73 DFHXQ0201I Processing SYSIN POOLNAME=TSQSPQA1
20.53.41.73 DFHXQ0201I Processing SYSIN POOLSIZE=3M
20.53.41.75 DFHXQ0801I Shared TS queue pool TSQSPQA1 is to be reloaded.
20.53.42.85 DFHXQ0401I Connected to CF structure DFHXQLS_TSQSPQA1.
20.53.42.86 DFHXQ0402I CF structure DFHXQLS_TSQSPQA1 was allocated by this connection.
20.53.42.97 DFHXQ0432I Queue pool statistics for CF structure DFHXQLS_TSQSPQA1:
20.53.42.97 Structure:      Size  Max size Elem size  Queues:  Current  Highest
20.53.42.97              3072K  3072K    256      119     119
20.53.42.97 Lists:      Total  In use  Max used  Control  Data
20.53.42.97              1003    3        3        3        0
20.53.42.97              100%    0%      0%      0%      0%
20.53.42.97 Entries:    Total  In use  Max used  Free  Min free
20.53.42.97              5085   119    119     4966  4966
20.53.42.97              100%   2%     2%     98%   98%
20.53.42.97 Elements:  Total  In use  Max used  Free  Min free
20.53.42.97              4949   169    169     4780  4780
20.53.42.97              100%   3%     3%     97%   97%
20.53.42.97 DFHXQ0431I Access statistics for CF structure DFHXQLS_TSQSPQA1:
20.53.42.97 Index:      Wrt Adjs  Writes  Reads  Deletes  Rereads  Read Adjs
20.53.42.97              0        119    0      0        0        0
20.53.42.97 Data:      Creates  Writes  Reads  Deletes  Rereads  Rewrites
20.53.42.97              0        0      0      0        0        0
20.53.42.97 Responses: Asynch  Normal  Len err  Not fnd  Vers chk  List chk
20.53.42.97              0        125    0      0        0        1
20.53.42.97 List full  Str full  I/O err
20.53.42.97              0        0      0
20.53.44.28 DFHXQ0461I Disconnected from CF structure DFHXQLS_TSQSPQA1.
20.53.44.28 DFHXQ0802I Shared TS queue pool TSQSPQA1 has been successfully reloaded.
20.53.44.29 DFHXQ0803I Queues reloaded: 119. Queues bypassed: 0. Blocks read: 10.
20.53.44.30 DFHXQ0112I Shared TS queue server has terminated, return code 0, reason code 0.
20.53.44.33 AXMPG0004I Usage statistics for storage page pool AXMPGANY:
20.53.44.33      Size  In Use  Max Used  Free  Min Free
20.53.44.33      62032K  0K     624K    62032K  61408K
20.53.44.33      100%    0%     1%     100%   99%
20.53.44.33      Gets  Frees  Retries  Fails
20.53.44.33      16    16     0        0
20.53.44.33 AXMPG0004I Usage statistics for storage page pool AXMPGLOW:
20.53.44.33      Size  In Use  Max Used  Free  Min Free
20.53.44.33      392K  0K     16K     392K  376K
20.53.44.33      100%  0%     4%     100%  96%
20.53.44.33      Gets  Frees  Retries  Fails
20.53.44.33      3     3      0        0

```

Figure 199. TS Server Reload

8.4.5 Documentation on Controlled Move of TS Queue Pools

You can find detailed information on this process in the *CICS System Definition Guide*.

Appendix A. Special Notices

This publication is intended to help customers who are involved in implementing a VSAM record level sharing environment based on CICS Transaction Server for OS/390 Version 1 Release 1 and DFSMS/MVS Version 1 Release 3. The information in this publication is not intended as the specification of any programming interfaces that are provided by CICS Transaction Server for OS/390 Version 1 Release 1 or DFSMS/MVS Version 1 Release 3. See the PUBLICATIONS section of the IBM Programming Announcement for CICS Transaction Server for OS/390 Version 1 Release 1 and DFSMS/MVS Version 1 Release 3. for more information about what publications are considered to be product documentation.

This book refers to CICS. When the term "CICS" is used, it refers to Customer Information Control System, an element of the IBM CICS Transaction Server for OS/390 program product. It is also used to refer to the predecessor products, CICS/MVS and CICS/ESA. When the CICS Transaction Server is required, the reference is specifically to that product. Citations are to the CICS Transaction Server for OS/390 library. CICS/MVS and CICS/ESA users should use the corresponding books in those libraries. Please see *CICS Transaction Server for OS/390 Up and Running!*, GC33-1789, for more information.

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| IBM | IMS |
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Appendix B. Related Publications

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

B.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see "How to Get ITSO Redbooks" on page 235.

- *CICS and VSAM Record Level Sharing: Planning Guide*, SG24-4765
- *CICS and VSAM Record Level Sharing: Implementation Guide*, SG24-4766
- *CICS Workload Management Using CICSplex SM and the MVS/ESA Workload Manager*, GG24-4286
- *Planning for CICS Continuous Availability in an MVS/ESA Environment*, SG24-4593
- *OS/390 Parallel Sysplex Configuration Cookbook*, SG24-4706

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B.3 Other Publications

These publications are also relevant as further information sources:

- *CICS Installation Guide*, GC33-1681
- *CICS Intercommunication Guide*, SC33-1695
- *CICS Messages and Codes*, GC33-1694
- *CICS Operations and Utilities Guide*, SC33-1685
- *CICS Supplied Transactions*, SC33-1686
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- *CICS Release Guide*, GC33-1570
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- *CICS System Definition Guide*, SC33-1682
- *CICSplex System Manager for MVS/ESA Concepts and Planning*, GC33-0786

- *CICSplex System Manager for MVS/ESA Operations Reference*, SC33-0789
- *DFSMS/MVS Version 1 Release 3 Access Method Services for ICF*, SC26-4906-03
- *DFSMS/MVS Version 1 Release 3 DFSMSdfp Advanced Services*, SC26-4921-02
- *DFSMS/MVS Version 1 Release 3 DFSMSdfp Storage Administration Reference*, SC26-4920-03
- *DFSMS/MVS Version 1 Release 3 DFSMSdss Storage Administration Guide*, SC26-4930
- *DFSMS/MVS Version 1 Release 3 Macro Instructions for Data Sets*, SC26-4913
- *DFSMS/MVS Version 1 Release 3 Using Data Sets*, SC26-4922-02
- *DFSMS/MVS Version 1 Release 3 Planning for Installation*, SC26-4919-03
- *MVS/ESA SP V5 Setting Up a Sysplex*, GC28-1449
- *MVS/ESA Planning: Workload Management*, GC28-1493
- *MVS/ESA Programming: Assembler Services Guide*, GC28-1466
- *MVS/ESA Programming: Assembler Services Reference*, GC28-1474
- *OS/390 Release 3, MVS System Codes*, GC28-1780-02
- *OS/390 Release 3, MVS System Commands*, GC28-1781-02
- *OS/390 Release 3, MVS System Messages, Volume 1*, GC28-1784-02
- *OS/390 Release 3, MVS System Messages, Volume 2*, GC28-1785-02
- *OS/390 Release 3, MVS System Messages, Volume 3*, GC28-1786-02
- *OS/390 Release 3, MVS System Messages, Volume 4*, GC28-1787-02
- *OS/390 Release 3, MVS System Messages, Volume 5*, GC28-1788-02
- *MVS/DFP Version 3 Release 3 Planning Guide*, SC26-4561
- *CICSVR User's Guide and Reference*, SH19-6970
- *CICSVR Implementation Guide*, SH19-6971

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List of Abbreviations

| | | | |
|----------------|--|--------------|---|
| ACB | access control block | IRLM | IMS resource lock manager |
| AOR | application-owning region | ISC | intersystem communication |
| API | application programming interface | ISMF | Interactive Storage Management Facility |
| APPC | Application Program-to-Program Communication | KSIDS | key sequenced data set |
| ARM | automatic restart manager | MVS | multiple virtual storage |
| AXM | authorized cross-memory | OLTP | online transaction processing |
| BDAM | Basic Direct Access Method | PLTPI | program list table post initialization |
| BMP | batch message processing | POR | printer-owning region |
| BMS | basic mapping support | PTF | program temporary fix |
| BWO | backup while open | QOR | queue-owning region |
| CICS | Customer Information Control System | RCDS | recovery control data set |
| CICS TS | Customer Information Control System Transaction Server | RDO | resource definition online |
| CICSVR | CICS VSAM Recovery | RLS | record level sharing |
| CF | coupling facility | ROR | resource-owning region |
| CFRM | coupling facility resource management | RRDS | relative record data set |
| CSD | CICS system definition | SHCDS | sharing control data set |
| DB2 | DATABASE 2 | SIT | system initialization table |
| DBCTL | database control | SOS | short on storage |
| DBRC | database recovery control | SPI | system programming interface |
| DCT | destination control table | TCB | task control block |
| DOR | data-owning region | TD | transient data |
| ENF | event notification facility | TOR | terminal-owning region |
| EOV | end of volume | TPNS | teleprocessing network simulator |
| ESDS | entry sequenced data set | TRUE | task related user exit |
| EXCI | external CICS interface | TS | temporary storage |
| FOR | file-owning region | TSOR | temporary storage owning region |
| IBM | International Business Machines Corporation | TST | temporary storage table |
| ICF | Integrated Catalog Facility (VSAM catalog) | UOW | unit of work |
| ICFRU | Integrated Catalog Facility recovery utility | VSAM | Virtual Storage Access Method |
| IMS | Information Management System | XCF | cross-system coupling facility |
| | | XLN | exchange lognames |
| | | XPI | exit programming interface |

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