Image and Workflow Library: ImagePlus MVS/ESA
Performance and Capacity Planning Benchmark

July 1997

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Preface

Have you ever wondered if your ImagePlus/MVS system was about to expand and run into a bottleneck of some kind? We wondered also, so we organized a benchmark to find out using TPNS and OmegaMon. This redbook contains the details of the results. We also included some tuning tips and we tell you how to apply this information to your situation.

This redbook was written for system consultants, architects, planners, database administrators, system programmers, and technical support people who need to make capacity and performance recommendations about ImagePlus/MVS.

Relevant data from our benchmark runs is included. Some knowledge of ImagePlus/MVS, DB2, and MVS is assumed.

The Team That Wrote This Redbook

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

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IBM ImagePlus Development
IBM S/390 Platform Evaluation Test
Comments Welcome

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  - For IBM Intranet users http://w3.itso.ibm.com
- Send us a note at the following address:
  redbook@vnet.ibm.com
Chapter 1. Introduction to ImagePlus MVS/ESA

Most office information today is kept on paper. With image processing, you can convert this information into an electronic form for online processing. Document images are stored, retrieved, distributed, and processed just as paper documents are. But you enjoy increased efficiency and productivity because the time taken to retrieve documents is reduced from hours or even days to just seconds. In addition, you can achieve:

- Improved client and customer service
- Improved decision making
- Reduced clerical support and storage costs
- Improved management control
- Improved data security

By offering a fundamental reshaping of the way business documents are handled, image processing represents the next step in the evolution of office automation.

When a document is scanned into the system, it is immediately available to all the users in the system for concurrent access. You can scan logos, signatures, photographs, and other nonkeyable objects (both color and black and white) that you could not previously store online. The document image contains every element that appears on the original document, including text and graphics, signatures, notes, and drawings.

1.1 What is ImagePlus MVS/ESA?

The IBM SAA ImagePlus MVS/ESA system is a large-scale IBM system solution for converting a paper-based storage and retrieval system to a computer-based system. It brings industrial strength image processing to System/390 environments by using ImagePlus workstations. The ImagePlus system provides the components needed to add high-volume image processing to multiple areas of your enterprise. It utilizes DB2 and CICS, providing the application integrity and availability of the S/390 environment to the imaging system. An IMS version is also available.

It combines the advantages of operating in a Local Area Network (LAN) environment with the powerful processing capabilities of the System/390 mainframe environment. ImagePlus/MVS is capable of connecting over a thousand users at local and remote settings, while supporting the processing of tens of thousands of document images. This can be a competitive advantage for your enterprise.

ImagePlus/MVS protects your investment through use of strategic hardware and software. It is designed utilizing standard image architectures and protocols. It provides you with capabilities for growth, both at a central site and (with IODM/2) at remote sites in a LAN environment. ImagePlus/MVS has application programming interfaces (APIs) that allow you to have seamless integration with your line-of-business applications.
1.1.1 Capabilities

As an operational imaging system, ImagePlus/MVS has the following functions:

- Document capture process (scan a hard-copy document).
- High capacity storage (store an image of the document).
- Register the document in a folder (index the document).
- Retrieve/display/print an image of the document.
- Workflow management (route and distribute for processing).
- Document manipulation and processing.
- Document export and fax support.
- Remote and distributed processing.

It also has the following features:

- Fast response for an image display request
- Page flip time of less than one second
- The ability to compare pages and to display a full page on the window
- Automatic and manual routing of images to users
- Fast and easy-to-use ad hoc scanning facilities, and batch and high-speed capture for large volumes of documents
- Ability to print documents
- Limited editing facilities (such as adding or deleting a page)
- Faxing in and out

1.1.2 Components

The IBM SAA ImagePlus MVS/ESA system consists of these major components:

- IBM ImagePlus software:
  - Folder Application Facility (IPFAF)
  - Object Distribution Manager (IODM)
  - Object Access Method (OAM)
- Optical Storage Subsystem Products (OSSP)
- Image workstations

1.1.2.1 ImagePlus/MVS Software

The ImagePlus/MVS software components are as follows:

- IBM SAA ImagePlus Object Distribution Manager MVS/ESA (IODM -- object routing server):
  
The IODM provides basic routing services for object movement. Upon receipt of requests from the Folder Application Facility, it communicates with image workstations to capture incoming documents and to forward documents for viewing, printing, or processing. Storage and retrieval requests are coordinated utilizing the Object Access Method. In a multi-site environment, SNA LU6.2 protocols are used to communicate with remote IODM nodes.

- IBM SAA ImagePlus Folder Application Facility MVS/ESA (IPFAF -- index server):
  
  Application Programming Interface (IPFAF API):
  
  - Document Services API
  - Folder and Document Management API
Batch API

Folder and Workflow Application (IPFAF)

IPFAF provides functions necessary to manage image-based applications in two basic categories: folder management and workflow management. Folder management allows captured images to be grouped into a logical construct called a folder, analogous to a manila file folder used for paper. The workflow management includes routing of image documents to various work queues, distribution for processing by users, tracking of work backlogs and assignments, and redirection of work in process to other users if necessary. IPFAF maintains indexes of every object in the system and authorizes all requests for storage and retrieval.

IBM MVS/DFP Object Access Method (OAM -- object storage server):

The OAM, which provides object storage management functions, is a component of MVS/DFP (also comes with DFSMS/MVS). OAM builds on the concepts and functions of Data Facility Storage Management Subsystem (DFSMS). It uses DB2 as the database manager for object directories, for configuration knowledge of the OSSP, and for objects while they are stored on magnetic DASD. DB2 also provides logging and recovery functions to maintain the integrity of stored data. The OAM manages movement of objects between magnetic and optical storage.

IBM SAA ImagePlus Object Distribution Manager MVS/ESA/2 (IODM/2)

IBM SAA ImagePlus Capture Facility (ICPF)

IBM SAA ImagePlus Intelligent Forms Facility/2 (IPFO):

IBM SAA ImagePlus Intelligent Forms Assist/2 (IPFA)

FaxRouter/2 High-performance Facsimile Solution Version 2.0

1.1.2.2 Optical Storage Subsystem

The Optical Storage Subsystem Products (OSSP) provide storage for a large number of objects with relatively infrequent retrieval rates. They consist of optical libraries and drives and are based on write once optical storage technology. The OSSP are controlled by the OAM component of MVS/DFP. Over 2500000 scanned images at 50 KB per page can be stored in one library unit.

Here is a set of optical storage subsystem products:

- IBM 3995 Optical Library Dataserver Products

1.1.2.3 Image Workstations

The user workstations are personal computers with one of the following software products:

- IBM ImagePlus Workstation Program/2 (IWPM for OS/2). Any display unit supported by OS/2 Presentation Manager works for ImagePlus/MVS.
- IBM ImagePlus Workstation Program V2.2 for Windows NT
- IBM ImagePlus Workstation Program/DOS for Windows (IWPM/DOS for Windows)

The workstations have two sessions. An LU2 session communicates with IPFAF through a CICS-3270 interface to convey user commands, and an LU6.2 session displays the images from IODM.
Chapter 2. Description of Our Scenarios

Here we introduce the project and the environment, and describe the benchmark scenarios we ran to simulate this environment.

2.1 Purpose of This Project

The customers we have worked with find that ImagePlus/MVS quickly becomes a critical part of their business. As the customers are increasing their use of ImagePlus/MVS and also their dependence on it, we begin to ask how much work the ImagePlus/MVS system can handle.

The purpose of this project is to take a large machine and see how many ImagePlus/MVS transactions the system can handle. We want to understand if there is a bottleneck in the foreseeable future.

The project also allows us to see how much resource the ImagePlus/MVS system uses when it is driven hard.

This chapter describes the scenarios we used to run the benchmarks.

2.2 A Typical IBM SAA ImagePlus MVS/ESA Customer

In setting up our scenarios, we considered our experience with typical ImagePlus/MVS customers. The customer will normally be a large enterprise with paper intensive processes. Two examples are insurance companies and financial institutions. We often found that the paper processes are handled at more than one site, so its ability to store centrally but distribute the paper to many different sites is an advantage.

Often there is a requirement to process the paper centrally at a head office, or distributed service centers, but be able to view the state of a customer's folder, and possibly images themselves, from different sites (call centers or branches, for example).

The customer will probably have a number of applications running on an MVS/ESA system, so IPFAF's ability to integrate with these applications (such as performing validation by checking current databases) is key to the implementation.

ImagePlus/MVS uses standard IBM architectures (SNA, DB2, CICS or IMS), so our typical customer would normally have experience with these systems and their own applications that make use of them. This chapter describes how we designed our scenarios to fit this typical customer.

2.3 Our Business Scenario

The business scenario is based on our experience of customers that use ImagePlus in a live environment. IPFAF provides a structure of tables to deliver a piece of work to the correct queue at the correct priority to ensure that the business commitments for any particular item of work are met.
2.4 Our TPNS Scripts

We have three basic TPNS scripts representing various types of transactions. These are:

- Index and scan
- Getwork and windup loop
- Workflow functions

We chose our scripts to reflect a realistic workload for a customer, and also to allow us to exercise the active IPFAF tables. We made the scripts as flexible as possible so that we could change the workload characteristics to meet our needs.

Parameters are available in the TPNS scripts to allow us to change the percentages of users performing these individual scripts, the pattern of work within the script, and the time spent waiting after finishing a script. We can also change the think time.

2.4.1 Index and Scan

This script simulates the process of indexing and scanning documents into the ImagePlus system. It can either store documents into a folder without routing the documents, or store documents into a folder and also place the document in routing for subsequent working. The first part of the script indexes the document. This is performed by an IPFAF ADOC to index the document into a folder with no routing, or an IPFAF ADOR command to index the document into a folder and also route the document for subsequent work. When this transaction is complete, IPFAF produces a TEMPID. This is a temporary document ID that the ImagePlus/MVS system uses to identify the document when scanning. The second half of the script uses this TEMPID to store the document into IODM.

This script performs an ADOR or ADOC transaction within IPFAF. It enters the command “ADOR fldr,formnum” or “ADOC fldr,formnum,” choosing randomly the folderid and formnum from a list of valid ones. At the add and route window or add window, it presses Enter to generate a TEMPID. Once the TEMPID has been received, the script switches to the LU6.2 session established with IODM and stores a document. Once the store operation is complete, the script returns to the main menu by pressing PF12. After waiting a certain time, the script restarts the operation.

We have four kinds of documents that we can store:

<table>
<thead>
<tr>
<th>Document type</th>
<th>Document size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiny</td>
<td>4043 bytes</td>
</tr>
<tr>
<td>Small</td>
<td>11 892 bytes</td>
</tr>
<tr>
<td>Medium</td>
<td>40 184 bytes</td>
</tr>
<tr>
<td>Large</td>
<td>113 678 bytes</td>
</tr>
</tbody>
</table>

We can change the ratio of ADORs to ADOCs, and the percentages of tiny, small, medium, and large documents that are stored during the storage process. The time spent waiting after a complete script is also modifiable by parameters.
2.4.2 Getwork and Windup Loop

This script simulates an end user who is working the documents that have been placed into routing by the indexing and scanning scripts. A user typically performs an IPFAF Getwork transaction to ask for the highest priority document in the workflow system that this user is authorized to work. Having performed this, the user can do whatever business transaction is required by the item of work and, on returning to IPFAF, perform an IPFAF Windup transaction to complete the work. When performing a Windup, a user either drops the document (no further work is required the document is filed) or reroutes the document (further work is required by another user). It chooses option 1 from the main menu. When the getwork list window is shown, it sometimes chooses option 1 to display the history of the document and returns to the getwork list window by pressing PF12. It optionally chooses to display the folder contents. It does this by pressing PF3 and entering FLDR in the command line on the main menu. It returns to the main menu by pressing PF3 and chooses option 1 again to return to the getwork list window. The user then performs a windup by pressing PF10 on the getwork list window. In the windup window, the script chooses either to drop the document by entering option 7, or reroute the work by choosing option 5. When the reroute or drop is complete, the script presses PF12 twice to return to the main menu. The script then waits for an optional period of time before choosing option “1” again to restart the script.

We can modify the percentage of getworks after which the user displays the history, the percentage of time a user lists the folder contents, and the percentage of time a person does a reroute versus a drop action at windup. We can also change the time a script waits after completing a cycle.

2.4.3 Workflow Function

The workflow functions simulate a supervisor checking the status of work in a queue. The function chooses option 7 from the main menu followed by option 6 from the workflow functions window. It then randomly chooses a unit code, enters it on the window, and presses Enter to display the information. The script pages forward if other pages are available and uses PF12 twice to return to the main menu.

By using TPNS parameters, we can combine these scripts in different ways to allow us to simulate a real-life workload. See Chapter 4, “Information from the Benchmarks” on page 17 for the results.

2.5 Setting Up the IPFAF Databases

There are two areas where the IPFAF databases need to be set up. First, we need to define a routing scheme in the IPFAF static configuration tables. Second, we need to load the folder and object tables with a realistic number of documents.

We also want to be able to change these values to see if they affect resource utilization. This section describes how we can use these tables to simulate our business scenarios.
2.5.1 The Static Tables

To produce a realistic benchmark reflecting the environment of a true high end user of IPFAF, we feel it is important to customize the IPFAF databases to reflect a typical user. To do this, we set up a routing scheme to simulate the system load that a live user experiences.

The tables we customized are:
- Customer table (ENTTUCDX)
- Form Number table (ENTTTFRM)
- RLOB/Transaction Type table (EYPTWRTT)
- Unit Code table (ENTTWUNT)
- Valid Unit/RCODE Queue Definition table (EYPTWURC)
- User Profile Table (ENTTTUPR)
- User Assignment table (EYPTWEAS)

Figure 1 shows the relationship of these tables.

We started with some basic assumptions. First, we decided that we want a maximum of 1000 queues. There is a rule of thumb which states that there is one queue for each user in the system (this number may vary depending upon the application). We, therefore, decided to start with a user base of 1000.

Then, we decided to use the sample customer table provided with the sample data for IPFAF to allow us to validate our FOLDERIDs and to provide us with our line three data. We, therefore, populated the sample customer table with 100,000 rows of valid folderids. These are randomly generated 12 character fields. Region and location are used for USERPRM1 and USERPRM2 and we use the same values as in the sample data (EAS and WES for USERPRM1 and 6, 7, or 8 for USERPRM2).
In our company, we chose five Routing Line of Businesses (RLOBS), and within each RLOB we have 100 Transaction Types (TTypes). So our form number table consists of 1000 randomly generated six-digit form numbers with an RLOB and TType randomly chosen from our list.

We decided to have 18 UNIT codes and 55 route codes in each of these units. To generate the RLOB/TType table, we associate an RCODE from a random selection of 55 valid RCODEs with each possible RLOB/TRANTYPE/USERPRM1 combination. The USERPRM1 field is provided by the sample Customer Data exit from the sample Customer table. The category of work is randomly chosen from three possible Categories of Work (C1, C2, or C3).

One row in the UNIT code table is generated for every possible USERPRM1, USERPRM2, and category of work combination. This gives us our eighteen possible Unit Codes (2*3*3=18).

EYPTWURC is generated by simply having an entry for every possible UNIT and route code combination. Eighteen unit codes times 55 route codes gives us the total possible of 990 queues.

The naming convention for our user IDs is three characters followed by three numbers. Users who have the same PRIMUNIT have the same first three characters; we then simply use subsequent numbers. We begin with 55 users per unit code. Our first unit code has users ABC001 through ABC055, and the eighteenth Unit Code has users RST001 through RST055. If we want to increase our number of users, we simply increase the number of users per unit code.

The User Assignment table describes those queues that a user is authorized to work. We chose to have users assigned to 10 route codes within their PRIMUNIT value. Thus, we have 10 entries per user for a total of 9900 entries.

### 2.5.2 Folder and Object Tables

Since one of our TPNS scripts is an Index and Scan scenario, we use this TPNS script to populate the Folder and Workflow tables. We decided to add 500,000 objects randomly inserted into our 100,000 possible folders. In reality, we are limited by access to machine time so we created only 50,000 objects.

### 2.5.3 Our Use of ImagePlus Terminology

The terms used in IPFAF workflow tables are not necessarily intuitive. This is how most of our customers use the terms within IPFAF:

<table>
<thead>
<tr>
<th>Term</th>
<th>Our definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>FormNum</td>
<td>The characteristics of the document that has been scanned. This includes storage management and routing characteristics. From the columns RLOB and TranType, we determined what initial routing to perform on the document.</td>
</tr>
<tr>
<td>RLOB</td>
<td>Routing Line of Business. We use this to denote a business section that is dealing with this document. Examples of what these might be are branches, service centers handling life insurance, service centers handling pensions, call centers, insurance claims. In our example, we have five such business sections.</td>
</tr>
</tbody>
</table>
TranType  This is the type of work that needs to be performed on this document (for example, initial claim form, life insurance application, medical report). Within each RLOB, we have 100 different TranTypes.

Userprm1/2  These fields are provided by user exits within the IPFAF. Typically, they supply the characteristics of a particular customer. For example, if there are five district service centers that handle claims for a subset of customers, this field is used to ensure that a claim for a particular customer is handled by the correct service center.

Catwork  This field is simply used to normalize the tables. It is a link between the RLOB/TranType table and the Unit Code table to ensure that a particular piece of work goes to the correct unit.

RCODE  The routing code is used along with unit code to define the queue that the work is placed on. Typically, it describes a skill level of the type of user that can handle this kind of work.

Unit Code  Used with RCODE to define the queue. This is usually used to describe a group within the business. To take the example of a number of district service centers within a company, each center has its own unique unit code, but all of them might have the same Rcodes because they all handle the same work.
Chapter 3. Hardware and Software Environment

This chapter describes the environment in which the benchmarks were run, along with a description of those tasks we performed to customize the system.

3.1 Hardware

The following sections contain the hardware (processor and DASD configurations) that we used.

3.1.1 Processor

The processor we were running on is an ES/9000 9021 model 982 with 776M of central storage and 1.5GB of expanded storage. TPNS was running on another processor so the machine we were running on was dedicated to our ImagePlus software.

TPNS was running on a 9672 RX4 in LPAR mode. The machine was configured so that we had half of the RX4. Here is a picture of the configuration.

![Figure 2. The Benchmark Hardware Configuration](image)

3.1.2 DASD

All of our databases were resident on eight strings of DASD. Each string consisted of 20 volumes of 3390 spindles connected to cached 3990 controllers. See Section 3.3, “Setting Up DB2” on page 12 for a description of how we allocated our datasets across these volumes.

**Note:** There is no optical storage or tape subsystem involved in this benchmark.
3.2 Software

The ImagePlus components and key subsystem components used in this benchmark are:

- ImagePlus IPFAF V2.2 with Folder Work Application feature V2.2.1
- ImagePlus IODM V2.2
- CICS/ESA V4.1
- DB2 V4.1
- DFSMS/MVS V1.3.1
- LE/370 1.7
- TPNS 3.4

Additional system software can be found in Appendix D, “Software Products and Service Levels” on page 85.

3.3 Setting Up DB2

Based on our experience with customers who use ImagePlus/MVS, we had certain ideas about how we wanted to configure DB2 to provide us with the most efficient use of the DB2 subsystem. We decided, however, to start with the system as provided, so our initial setup was limited to dataset placement. The changes we made can be found in Chapter 6, “Tuning Tips” on page 29.

We had a total of 160 volumes available to us for the DB2 tables. These volumes were evenly distributed over eight strings to reduce I/O contention:

- IPFAF FWA had 16 volumes
- IPFAF API had 16 volumes
- IODM had 16 volumes
- OAM had 20 volumes (2 per OAM storage group)
- DB2 had 4 logs of 800 cylinder each

To control the placements of the DB2 datasets, we had each DB2 object (table, index, and so on) reside in its own DB2 storage group. We determined which volumes each STOGROUP was able to use. We ensured that, for any table, any indexes were on a different volume from the data. We ensured as much as possible that any active table was on a pack of its own.

The buffer pool settings were initially:

- BP0 2000 4K blocks
- BP1 2000 4K blocks
- BP32K 500 4K blocks

Generally, we used BP0 for our data and BP1 for the indices. BP32K was used for the OAM 32K tables.

We made some changes to ZPARMS to reflect the situation at a known ImagePlus/MVS site. We did this so that we did not experience problems with these parameters later. The ZPARMS settings we used are in Section A.1, “ZPARMS” on page 33.

The RCT that we started our tests with are in Section A.2, “Original RCT for IODM” on page 37. Discussion of changes that we made to the RCT are in Chapter 6, “Tuning Tips” on page 29.
3.4 Setting Up CICS

The CICS system we used had previously been used to support only a small number of users. We needed to change this to support up to 1000 users.

For the LU2 sessions, we simply changed CICS to support auto-install so that any number of 3270s could be active. For the LU6.2 sessions, we defined all 1000 users that might be logging on. The reason for this is that the IODM to IWPM/2 communications is initiated by the host. If there is no CICS definition for the workstation, we cannot perform the OINT transaction. We have experience with customers who do use auto-install for their LU6.2 communication. However, so that the connection gets defined to CICS, it has been necessary to write an OS/2 program that uses APPC to initiate the conversation. Once the workstation has been auto-installed, IODM can initialize the workstation.

We found that defining this large number of workstations caused CICS to take some time to initialize, and it also used a large amount of storage. Since we had two IODMs, we could allocate 500 workstation definitions to each IODM (even LU numbers in one region and odd numbers in the other). This alleviated our initialization delay.

We did not spend much time configuring CICS. Some benefit might be gained by tuning CICS to better support ImagePlus/MVS. The SITs that we used for our CICS regions can be found in Appendix B, “CICS SIT Tables and SYSIN Definitions for IODM and IPFAR” on page 63.

3.5 Setting Up IPFAR and IODM

More than one large customer has had to split their IPFAR or IODM (or both) regions into multiple CICS regions to overcome restrictions on how much processor capacity one CICS region can use. We questioned whether we needed to split IPFAR and IODM, and came to the conclusion that IPFAR used more than one processor in our complex, and that IODM needed close to one processor. We, therefore, decided to use two IPFAR regions and two IODM regions, both accessing exactly the same tables.

3.5.1 Splitting IPFAR and IODM

To run two IPFAR systems and two IODM systems all accessing the same DB2 tables, we needed to update the IPFAR API and the IODM configuration tables. FWA is unaffected since all communication with IODM is performed by the API.

For the API, the affected table is the symbolic name table (EYPTSYM). This table contains a list of all the IODMs that the IPFAR region can talk to, plus cross references between the logical name (symbolic name) and the true CICS ID for the link. We therefore added a new IODM to this table. For the format of the table, look at the IPFAR API V2R2 System Programmer’s Guide, SC31-7524.

IODM contains three tables that are affected by this change:

- Front-end Application System Configuration table (IDFSIDTB), in which we needed to tell IODM that more than one IPFAR might be talking to it.

- System Configuration table (IDOSIDTB) that describes to each IODM its own characteristics.
• System Parameter table (IDPARMTB) that tells IODM what parameters to use.

We added the new IPFAF to IDFSIDTB, the new IODM to IDOSIDTB, and the new IODM to IDPARMTB. For the format of these tables, see the ImagePlus IODM V2R2 System Programmer’s Guide, SC31-7535.

3.5.2 Some Key Tables

Here is a partial listing of the key tables we used in this configuration.

-- FRONT-END APPLICATION SYSTEM CONFIGURATION TABLE
SELECT * FROM EKCDB2.IDFSIDTB;

---------+---------+---------+---------+---------+---------+---------+---SSYSID SCICSID FMSSTAT FMSTYPE ODMIFLV MODDATE ... FAFD S C 0220 1995-11-27 13.08.47 IBMUSREFAF2 FAF2 S C 0220 1997-01-28 11.05.15 IMAGE4

-- SYSTEM CONFIGURATION TABLE
SELECT * FROM EKCDB2.IDOSIDTB;

---------+---------+---------+---------+---------+---------+---------+---TSYSID TCICSID QUESTAT SENQSTAT MAXQTASK ... ODMD 2 2 5 0 0220 HODM2 ODM2 2 2 5 0 0220 H

-- SYSTEM PARAMETER TABLE
SELECT * FROM EKCDB2.IDPARMTB;

---------+---------+---------+---------+---------+---------+---------+---OSYSID OCICSID STRELOWF GUESLOWF SECEXITF CHKDIGIT CBUFSIZE SCRBLA---------+---------+---------+---------+---------+---------+---------+---ODMD ODMDNNNN 31581

-- SYMBOLIC NAME TABLE
SELECT * FROM EYPDB2.EYPSYMB;

---------+---------+---------+---------+---------+---------+---------+---SYMBCNT SYMBVAL---------+---------+---------+---------+---------+---------+---------+---2 ODMDODMD 1ODM2ODM2 1

3.5.3 LU 6.2 Connections and Definitions

The LU 6.2 sessions and connections are defined to each CICS region. Here are the definitions we used in this benchmark.

* * IODM region LU 6.2 definitions

* ***********************************************
* Define connection and session to FAFD region *
* ***********************************************
* DEFINE CONN(FAFD) GROUP(ODMLU62)
  NETNAME(CICSFAFD) ACCESSMETHOD(VTAM)
  PROTOCOL(APPC) SINGLESESS(NO)
  DASTREAM(USER) RECORDFORMAT(U)
  AUTOCONNECT(YES) INSERVICE(YES)
ATTACHSEC (LOCAL)

DEFINE SESS (FAFD) GROUP (ODMLU62)
  CONNECTION (FAFD) MODENAME (ISCLU62)
  PROTOCOL (APPC) MAXIMUM (8, 4)
  SENDSIZE (4096) RECEIVESIZE (4096)
  OPERSECURITY (1)
  SESSPRIORITY (0)
  AUTOCONNECT (YES) BUILDCHAIN (YES)
  USERAREALEN (0) IOAREALEN (0)
  RELREQ (NO) DISCREQ (NO)

DEFINE CONN (FAF2) GROUP (ODMLU62)
  NETNAME (CICSFAF2) ACCESSMETHOD (VTAM)
  PROTOCOL (APPC) SINGLESESS (NO)
  DATASTREAM (USER) RECORDFORMAT (U)
  AUTOCONNECT (YES) INSERVICE (YES)
  ATTACHSEC (LOCAL)

DEFINE SESS (FAF2) GROUP (ODMLU62)
  CONNECTION (FAF2) MODENAME (ISCLU62)
  PROTOCOL (APPC) MAXIMUM (8, 4)
  SENDSIZE (4096) RECEIVESIZE (4096)
  OPERSECURITY (1)
  SESSPRIORITY (0)
  AUTOCONNECT (YES) BUILDCHAIN (YES)
  USERAREALEN (0) IOAREALEN (0)
  RELREQ (NO) DISCREQ (NO)

* Define connection and session to FAF2 region

* Define connection and session to ODMD region

DEFINE CONN (ODMD) GROUP (FAFLU62)
  NETNAME (CICSODMD) ACCESSMETHOD (VTAM)
  PROTOCOL (APPC) SINGLESESS (NO)
  DATASTREAM (USER) RECORDFORMAT (U)
  AUTOCONNECT (YES) INSERVICE (YES)
  ATTACHSEC (LOCAL)

DEFINE SESS (ODMD) GROUP (FAFLU62)
  CONNECTION (ODMD) MODENAME (ISCLU62)
  PROTOCOL (APPC) MAXIMUM (8, 4)
  SENDSIZE (4096) RECEIVESIZE (4096)
  SESSPRIORITY (0)
  AUTOCONNECT (YES) BUILDCHAIN (YES)
  USERAREALEN (0) IOAREALEN (0)
  RELREQ (NO) DISCREQ (NO)

* Define connection and session to ODM2 region

***********************************************************************
Chapter 3. Hardware and Software Environment
When IPFAF displays a document, there are two possible IODMs. One IODM owns the workstation, whose responsibility it is to send the image to IWPM/2. The other IODM owns the object and retrieves it from OAM.

In a display operation, IPFAF sends the display request to the workstation-owning IODM, which looks at which IODM owns the object. If it is the owner, it simply retrieves the object and sends it to the workstation. However, if the object is owned by another IODM, the workstation-owning IODM communicates with the object-owning IODM, asking it to retrieve the object. When it receives the object, it sends it to the workstation.

We wanted to avoid the communication between the IODMs for three reasons. First, the transaction figures that we gathered were inflated by a number of cross-IODM transactions. Second, the resource utilization included extra transactions that might not actually occur in a customer system. Third, the process of setting up the cross-region communication while still using one database causes restrictions on naming conventions of your symbolic names.

We therefore had to decide how to allow the use of two IODMs. Our decision was this: since we are only using one OAM, whichever IODM IPFAF thinks owns the object does so. This is because, in fact, both IODMs can access the object. We, therefore, decided to use the Disperse Display exit (EKCCDDTE) to change the data stream passed to IODM to identify the object-owning IODM as whichever IODM the transaction happens to be running in. When only one OAM is being used, this is a perfectly satisfactory solution. The code we used for EKCCDDTE is in Appendix C, “IODM Exit: EKCCDDTE” on page 69.
Chapter 4. Information from the Benchmarks

This chapter contains the results of our benchmarks. We describe three runs that capture the information we were looking for. Run 1 exemplified the current environment of a known large customer. Run 2 was to see the result of increasing the number of indexing and scanning operations. Run 3 was to test the effect of increasing the number of queues per user.

See Chapter 5, “How to Use This Information” on page 23 for a more detailed description of the contents of the scripts for each run.

4.1 Conclusions

Our major conclusion from these runs was that DB2 was never the limiting factor in the system. We ran out of processor resource before DB2 seemed to be under stress. With a well-tuned DB2 system on the processor we were running on, the indication was that significantly more than the 100 ImagePlus/MVS transactions per second we achieved were within the capabilities of the system.

We also showed how sensitive the system is to the application design. A different transaction mix causes different resource utilizations. More important, the design of the system (number of queues per user) can significantly affect the processor utilization of an ImagePlus/MVS system. See Chapter 5, “How to Use This Information” on page 23 for more on interpreting the results.

Note: These results are specific to our environment and need to be used with extreme care when extrapolating to a live environment. See Section 4.5, “Caveats” on page 22 for elements of this test that may differ from your situation.

4.1.1 Response Time Figures

For each run, we gathered response time statistics using TPNS. We used these response times to ensure that we were providing a reasonable service level agreement in a live production environment.

The response times as measured by TPNS include all LU2 and LU6.2 transactions.

The response times may not reflect true user responses since, although TPNS was running on a different machine, it was a machine in the same sysplex so we experienced no network delays. It is, however, a reasonable guide to response times.

The LU6.2 responses were also not subject to network delays. There is also a secondary concern in that it measures only the response involved in sending or receiving the image. For scanning, the scan time is not involved. It is just the time from initiating a store document to the time the successfully stored response is received at the workstation. For a display, no processing time is allowed for in the response time. For a small image, the perceived response time includes the overhead of decompressing the image and displaying it at the workstation. For a large document, perceived user response may actually be lower than those quoted since IWPM/2 displays the first page when it receives it.
This means that the first page may actually be displayed before the entire object is received, giving user perceived response actually faster than TPNS measures.

4.1.2 CPU Utilization

The figures we quote from RMF give the percentage of CPU used by the various different components of ImagePlus/MVS. The processor we were running on was an ES/9000 9021 model 982. This complex has a total of eight processors. The percentage figures given by RMF are a percentage of a single processor, so the numbers quoted come to more than 100% CPU utilization.

To interpret these numbers and relate them to your processor, you need to use the Large System Performance Reference, SC28-1187, which quotes the internal throughput ratios for IBM and other manufacturers’ systems.

Note that the CPU figures we quote are simply for the subsystems that ImagePlus uses. In any MVS system, there is an overhead of processor that is used by systems functions. This overhead is termed a “Capture Ratio.” To understand how much CPU the entire system would use, you need to factor in your customer’s capture ratio. In our case the capture ratio varied for the different runs, but was generally 75%. It is worth checking with the capacity planners at your customer before using a figure of 75%.

4.2 Run 1

The purpose of this run was to drive the system hard in a work delivery intensive environment. The profile we set out to simulate is a system that is used primarily for delivering work to users who process that work quickly and then drop the work and ask for more work. We, therefore, set our TPNS parameters to have more users in the getwork/windup script than in the other two.

The parameters we set in TPNS were:

- 75% of our users were getwork/windup users.
- 20% of our users were Indexers/Scanners.
- 5% of the users were supervisors checking queues.
- 20% of the time that users did a getwork, they looked at the history of the document.
- 40% of the time that users did a getwork, they listed the contents for that folder.
- 90% of the time the getwork users did a windup, they dropped the document. They rerouted the other 10%.
- The time waited after the end of the script before restarting was:
  - Getwork users - 30 Seconds
  - Indexers - 90 seconds
  - Supervisors - 10 seconds

The tables below show the number of CICS transactions that we ran during a half hour period and the CPU utilization that those transactions resulted in. For more information on how these transaction relate to actual end user interactions, please see Chapter 5, “How to Use This Information” on page 23.
The objective of this run was to see how many transactions we were able to drive through an ImagePlus system. The only part of the system that constrained us was the amount of available CPU. We thought it significant that over 100 CICS transaction could be run through the system. We observed no bottlenecks during this run. Had we had more CPU available, we feel we could have run significantly more transactions.

Table 1. Transaction Profile

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Number Performed during Half-Hour Period</th>
<th>Number Performed per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>$AO0</td>
<td>86</td>
<td>0.05</td>
</tr>
<tr>
<td>$AR0</td>
<td>9408</td>
<td>5.23</td>
</tr>
<tr>
<td>$GT0</td>
<td>4703</td>
<td>2.61</td>
</tr>
<tr>
<td>$GW0</td>
<td>44633</td>
<td>24.80</td>
</tr>
<tr>
<td>$LC0</td>
<td>10558</td>
<td>5.87</td>
</tr>
<tr>
<td>$MN0</td>
<td>32774</td>
<td>18.21</td>
</tr>
<tr>
<td>$QD0</td>
<td>2606</td>
<td>1.45</td>
</tr>
<tr>
<td>$WU0</td>
<td>42145</td>
<td>23.41</td>
</tr>
<tr>
<td>DISD</td>
<td>18429</td>
<td>10.24</td>
</tr>
<tr>
<td>ER00</td>
<td>4747</td>
<td>2.64</td>
</tr>
<tr>
<td>STAH</td>
<td>4746</td>
<td>2.64</td>
</tr>
<tr>
<td>STOR</td>
<td>4747</td>
<td>2.64</td>
</tr>
<tr>
<td>TMPC</td>
<td>4742</td>
<td>2.63</td>
</tr>
<tr>
<td>Totals</td>
<td>184324</td>
<td>102.40</td>
</tr>
</tbody>
</table>

The figures above show only the components used by ImagePlus. You must add your customer's capture ratio to give the true amount of CPU required by the entire system including MVS overhead. As mentioned above, our capture ratio was approximately 75% (that is we only captured 75% of the overall system utilization; the rest is system overhead).

Note: The percentage figures given by RMF are a percentage of a single processor, so the numbers quoted come to more than 100% CPU utilization.

Table 2. CPU Utilization by Component

<table>
<thead>
<tr>
<th>Component</th>
<th>%CPU Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPFAF 1</td>
<td>162.3</td>
</tr>
<tr>
<td>IPFAF 2</td>
<td>158.0</td>
</tr>
<tr>
<td>IODM 1</td>
<td>46.2</td>
</tr>
<tr>
<td>IODM 2</td>
<td>43.9</td>
</tr>
<tr>
<td>DB2</td>
<td>40.7</td>
</tr>
<tr>
<td>Total</td>
<td>451.10</td>
</tr>
</tbody>
</table>

Table 3. Response Times Measured by TPNS

<table>
<thead>
<tr>
<th>Average Response Time</th>
<th>Maximum Response Time</th>
<th>90th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.11</td>
<td>6.00</td>
<td>0.30</td>
</tr>
</tbody>
</table>
We used the response time statistics from TPNS to show that we were not actually hitting any bottlenecks. With a 90th percentile figure of three tenths (0.3) of a second, we feel that with a correctly tuned system you should be able to guarantee subsecond responses from the IPFAF system. Note that the actual time to decompress and view an image may be higher than this.

### 4.3 Run 2

For this run, we decided to have a higher percentage of indexers. This gave us a higher number of inserts into the object, event, and work detail tables at the same time that the getwork script is performing updates and deletes.

To increase the number of indexers, we reduced the time that indexers waited after finishing the script before restarting. We reduced the number from 90 seconds to 30 seconds.

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Number Performed during Half-Hour Period</th>
<th>Number Performed per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>$AO0</td>
<td>173</td>
<td>0.10</td>
</tr>
<tr>
<td>$AR0</td>
<td>15 725</td>
<td>8.74</td>
</tr>
<tr>
<td>$GT0</td>
<td>7840</td>
<td>4.36</td>
</tr>
<tr>
<td>$GW0</td>
<td>37 023</td>
<td>20.57</td>
</tr>
<tr>
<td>$LC0</td>
<td>8783</td>
<td>4.88</td>
</tr>
<tr>
<td>$MN0</td>
<td>33 551</td>
<td>18.64</td>
</tr>
<tr>
<td>$QD0</td>
<td>3608</td>
<td>2.00</td>
</tr>
<tr>
<td>$WU0</td>
<td>34 728</td>
<td>19.29</td>
</tr>
<tr>
<td>DISD</td>
<td>15 248</td>
<td>8.47</td>
</tr>
<tr>
<td>ER00</td>
<td>7927</td>
<td>4.40</td>
</tr>
<tr>
<td>STAH</td>
<td>7951</td>
<td>4.42</td>
</tr>
<tr>
<td>STOR</td>
<td>7927</td>
<td>4.40</td>
</tr>
<tr>
<td>TMPC</td>
<td>7929</td>
<td>4.41</td>
</tr>
<tr>
<td>Totals</td>
<td>188 413</td>
<td>104.67</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>%CPU Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPFAF 1</td>
<td>147.10</td>
</tr>
<tr>
<td>IPFAF 2</td>
<td>152.60</td>
</tr>
<tr>
<td>IODM 1</td>
<td>44.90</td>
</tr>
<tr>
<td>IODM 2</td>
<td>44.40</td>
</tr>
<tr>
<td>DB2</td>
<td>38.90</td>
</tr>
<tr>
<td>Total</td>
<td>427.90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average Response Time</th>
<th>Maximum Response Time</th>
<th>90th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>3.50</td>
<td>0.30</td>
</tr>
</tbody>
</table>
The figures that we measured here confirmed our view that the Getwork transaction is the most heavy user of CPU within the IPFAF system. However, if your users mainly use the ImagePlus system as an electronic file-cabinet rather than a work delivery system then you will find that the CPU requirements are lower than for a heavily workflow-biased system.

4.4 Run 3

We noticed during earlier runs that the resource utilization of the system seemed to be sensitive to the number of queues each user has. To test this theory, we increased the number of queues each user is assigned to 55 (from 24 in Run 1). All other parameters were left the same.

<table>
<thead>
<tr>
<th>Transaction ID</th>
<th>Number Performed during Half-Hour Period</th>
<th>Number Performed per Second</th>
</tr>
</thead>
<tbody>
<tr>
<td>$AO0</td>
<td>82</td>
<td>0.05</td>
</tr>
<tr>
<td>$AR0</td>
<td>7381</td>
<td>4.10</td>
</tr>
<tr>
<td>$GT0</td>
<td>3687</td>
<td>2.05</td>
</tr>
<tr>
<td>$GW0</td>
<td>38415</td>
<td>21.34</td>
</tr>
<tr>
<td>$LC0</td>
<td>8952</td>
<td>4.97</td>
</tr>
<tr>
<td>$MN0</td>
<td>28454</td>
<td>15.81</td>
</tr>
<tr>
<td>$QD0</td>
<td>2464</td>
<td>1.37</td>
</tr>
<tr>
<td>$WU0</td>
<td>35902</td>
<td>19.95</td>
</tr>
<tr>
<td>DISD</td>
<td>15631</td>
<td>8.68</td>
</tr>
<tr>
<td>ER00</td>
<td>3729</td>
<td>2.07</td>
</tr>
<tr>
<td>STAH</td>
<td>3729</td>
<td>2.07</td>
</tr>
<tr>
<td>STOR</td>
<td>3729</td>
<td>2.07</td>
</tr>
<tr>
<td>TMPC</td>
<td>3736</td>
<td>2.08</td>
</tr>
<tr>
<td>Totals</td>
<td>155891</td>
<td>86.61</td>
</tr>
</tbody>
</table>

To our surprise, the number of transactions per section was lower, yet the CPU utilization was higher (see Table 8). As you read, from the first two runs we came to the conclusion that Getwork is the transaction that requires the most CPU. This is because of the number of DB2 accesses it performs. In this run, we increased the number of queues that the Getwork transaction needs to search to define what piece of work is the highest priority for this user. Thus we increased the amount of DB2 accesses and therefore the amount of CPU required. See section 6.2, “Application Design” on page 30 for additional details.

<table>
<thead>
<tr>
<th>Component</th>
<th>%CPU Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPFAF 1</td>
<td>213.1</td>
</tr>
<tr>
<td>IPFAF 2</td>
<td>205.1</td>
</tr>
<tr>
<td>IODM 1</td>
<td>38.8</td>
</tr>
<tr>
<td>Total</td>
<td>530.20</td>
</tr>
</tbody>
</table>
Table 8 (Page 2 of 2). CPU Utilization by Component

<table>
<thead>
<tr>
<th>Component</th>
<th>%CPU Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>IODM 2</td>
<td>36.4</td>
</tr>
<tr>
<td>DB2</td>
<td>36.4</td>
</tr>
<tr>
<td>Total</td>
<td>530.20</td>
</tr>
</tbody>
</table>

Table 9. Response Times Measured by TPNS (in Seconds)

<table>
<thead>
<tr>
<th>Average Response Time</th>
<th>Maximum Response Time</th>
<th>90th Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.18</td>
<td>4.70</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Our conclusions from these runs are described in the next chapter.

4.5 Caveats

There are specific elements that make this different from the workload that an ImagePlus/MVS customer may experience. These include:

- We were working with small tables. The work detail table contained 50,000 rows, which may be similar to a live situation. However, the object table also contained only 50,000 records, which is unusually low.

  This has many effects on the way the system performs. With a large number of transactions accessing small tables, we can expect more contention as multiple transactions try to access the same part of the tables. On the other hand, scanning a small object table may take less resource than scanning a large table, and it may be that in our situation, all entries were in buffer pools, so we avoided I/O that is necessary on a larger table.

- We did not use optical or tape storage.

  We often find that the limitation on throughput in an ImagePlus/MVS system is how many mounts per hour an optical storage or tape subsystem can handle. We recommend that any optical or tape subsystem be configured to be able to easily handle the number of requests that it is likely to encounter.

  In our experience, it is difficult to estimate the number of mounts per hour that are requested from secondary or tertiary storage. An analysis of the number of accesses to filed documents does not reflect the actual requests to secondary storage. Once users have online access to this data, they continue to make requests for documents that have long been archived. We recommend that you expect significantly more requests than estimated from analyzing the current processes. You should also ensure that the solution you implement is flexible so that you can change the system to service these requests.

- Our workload profile was specific. We made some runs here to show how a change in workload can significantly affect the resource utilization of the system. Consider this when making any estimates based on these figures.
Chapter 5. How to Use This Information

This book documents our results from running certain transaction profiles. A live situation undoubtedly produces different profiles. This chapter describes the transaction flows for the TPNS scripts that we ran and points out some differences in the resource utilization for the different scripts. This should give some assistance in relating these figures to a real life situation. Note that capacity planning for any application is a process that needs to be undertaken with great care. Capacity is easy to underestimate, with resulting problems later on.

We avoid using "number of users" as a measurement, since it is not necessarily an accurate way to determine the likely resource utilization of a given application. The figures from Run 3 show how an apparently innocent change (the number of queues a user is assigned to) can have a dramatic effect on CPU utilization, independent of the number of users logged on. In the field, we have seen that predicting capacity based on the number of users can cause a significant underestimation of resources required.

We therefore recommend that you determine the workload mix that your application will generate. Although this cannot guarantee perfect planning, it provides a better estimate than working with the number of users.

To see what transactions the end user interactions actually generate, please see Chapter 2, “Description of Our Scenarios” on page 5.

5.1 Indexing and Scanning

A single TPNS script calls a number of actual CICS transactions. The following table shows which CICS transactions were performed for each indexing and scanning script we ran.

<table>
<thead>
<tr>
<th>Script Entry</th>
<th>IPFAF CICS Transactions</th>
<th>IODM CICS Transactions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADOR from Main Menu</td>
<td>$MN0</td>
<td></td>
<td>Reads the window and determines which transaction needs to be performed. Calls Customer Data Exit to determine validity of folderid. Determines routing info. Puts up Add and Route window.</td>
</tr>
<tr>
<td>Press Enter on the Add and Route window.</td>
<td>$AR0</td>
<td>STAH</td>
<td>Reads the Add and Route window. Rechecks routing, validates fields such as date as well as validating the RLOB/TRANTYPE combination. performs DEFOBJ API that starts IODM transaction and updates Scan Pending table with information about the TEMPID. Updates the Store Authorization table to inform IODM of pending scan.</td>
</tr>
</tbody>
</table>
Table 10 (Page 2 of 2). CICS Transactions for Each Indexing and Scanning Script

<table>
<thead>
<tr>
<th>Script Entry</th>
<th>IPAF CICS Transactions</th>
<th>IODM CICS Transactions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start scanning document at</td>
<td></td>
<td>TMPC</td>
<td>Checks the Store Authorization table to determine this is a valid TEMPID,</td>
</tr>
<tr>
<td>workstation.</td>
<td></td>
<td></td>
<td>passes relevant information to the workstation.</td>
</tr>
<tr>
<td>Store the document.</td>
<td></td>
<td>STOR</td>
<td>Stores the document in OAM, deletes entry from the Store Authorization table,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>starts the register transaction (ER00) in IPFAF.</td>
</tr>
<tr>
<td>ER00</td>
<td></td>
<td></td>
<td>Updates the Object and Event tables with the information from Scan Pending</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>table. Starts the $GT0 transaction to inform FWA that the document has been</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>scanned.</td>
</tr>
<tr>
<td>$GT0</td>
<td></td>
<td></td>
<td>Inserts a row in the Work Detail table for the recently scanned document.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Updates the event table with the relevant information.</td>
</tr>
</tbody>
</table>

From this table, we can see that one TPNS script results in seven actual CICS transactions. However, if we need to know how many documents we have actually stored, then the count of IODM STOR transactions will give us that figure. Using the figures from Run 1 (Table 1 on page 19) we can see from the number of STOR transactions that we have actually stored 4,747 documents in the half hour period of the run.

5.2 Getwork Windup Script

These are the figures for a getwork windup loop. See section 5.2, “Getwork Windup Script” for an explanation of a getwork.

Table 11. CICS Transactions for Each Getwork Windup Script

<table>
<thead>
<tr>
<th>Script Entry</th>
<th>IPAF CICS Transactions</th>
<th>IODM CICS Transactions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 from Main Menu</td>
<td>$MN0</td>
<td></td>
<td>Reads the window and determines which transaction needs to be performed.</td>
</tr>
<tr>
<td></td>
<td>$GW0</td>
<td></td>
<td>Determine the highest priority document for this user.</td>
</tr>
<tr>
<td></td>
<td>DISP</td>
<td></td>
<td>Display the document for the user.</td>
</tr>
<tr>
<td>Press PF10 on the Getwork</td>
<td>$GW0</td>
<td></td>
<td>Reads the window to determine what to do. Calls $WU0 to perform Windup.</td>
</tr>
<tr>
<td>List window.</td>
<td>$WU0</td>
<td></td>
<td>Writes the Windup window to ask the user what to do.</td>
</tr>
<tr>
<td>Choose option 7 from the</td>
<td>$WU0</td>
<td></td>
<td>Performs the drop.</td>
</tr>
<tr>
<td>windup window.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press PF12 to return to main</td>
<td>$WU0</td>
<td></td>
<td>Display the main menu window.</td>
</tr>
</tbody>
</table>

One getwork windup window also results in seven actual CICS transactions. If we again tie this to the statistics we gathered from run 1 (Table 1 on page 19) we can see that each getwork script performed by a user actually results in two
$GW0 transactions. Since we performed 44,633 $GW0 transactions in our half our period the users actually performed 22,316 Getwork scripts.

Please note that in a live system this ratio may change. For example, if a user performs a history view from the Getwork List screen then an extra three $GW0 transactions will be performed. If a user reroutes a document, then extra $WU0 transactions will be performed. Before using the above figures in a live situation, ensure that the users perform Getwork Windup as described in our script (see Chapter 2, “Description of Our Scenarios” on page 5 for details).

5.3 Workflow Functions Script

With an image system that provides a work delivery function such as ImagePlus/MVS, the role of the supervisor changes dramatically. When large quantities of paper arrive in an office, the supervisors will normally spend much time sorting the paper and handing out work to the processing clerks. With an ImagePlus/MVS system, this work has already been done by the indexing process.

The focus of the supervisor’s role therefore changes to ensure that outstanding work is being performed in a timely fashion. To do this, the supervisor can use the workflow screens of IPFAF to inspect the queues of work that is outstanding. This is what this script simulates.

<table>
<thead>
<tr>
<th>Script Entry</th>
<th>IPFAF CICS Transactions</th>
<th>IODM CICS Transactions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 7 from Main Menu</td>
<td>$MN0</td>
<td></td>
<td>Reads the window, determines which function is to be performed, writes the Workflow Functions window.</td>
</tr>
<tr>
<td>Choose option 6</td>
<td>$MN0</td>
<td></td>
<td>Reads the window, displays the Queue Information Selection window.</td>
</tr>
<tr>
<td>Enter a unit code and press Enter.</td>
<td>$QD0</td>
<td></td>
<td>Finds the work in that queue and displays the Queue Information window.</td>
</tr>
<tr>
<td>Press PF3 to return to main menu.</td>
<td>$QD0</td>
<td></td>
<td>Display the main menu window.</td>
</tr>
</tbody>
</table>

These figures show us that for each queue display there are actually 2 $QD0 transactions performed. Referring back to section Table 1 on page 19, since there were 2,464 $QD0 transactions, the script was actually performed 1,232 times.

5.4 An Approach to Capacity Planning

As we stated earlier in the chapter, we do not recommend using the number of users as a guide to capacity planning. In this section, we describe what data we feel is important to gather to produce an initial capacity plan and how to use that data.

As with all capacity planning, it is necessary to monitor the live system once it is running to ensure that assumptions that were made during the original estimates
are true, and that factors unique to your implementation are not affecting the amount of resource required.

5.4.1 Data to Gather

When creating your plan, we suggest you start with data from a high level design of your image system, such as:

- Number of documents to be stored into the system
- Percentage of these documents that are routed in the workflow
- Number of reroutes each document will experience on average
- Number of queues
- Number of queues each user has assigned on average
- When is indexing and scanning performed

From this data, you can begin your capacity plan.

Hint: Our experience with customers, as well as with this benchmark, shows that the most resource intensive transaction is the Getwork. One approach we have successfully used in the past is to estimate the number of Getworks that are performed in the system. See section 5.2, "Getwork Windup Script" on page 24 for an explanation of a Getwork. This figure gives you a good start on an initial capacity plan.

5.4.2 Applying This Data

Let's look at an example of how to apply the data you have gathered. We compare a sample system to our benchmark. Consider a proposed system that has the following characteristics:

- 50,000 documents are stored per day.
- 60% of all documents are placed in routing, the remaining documents are stored and not worked.
- 66% of all documents are worked once, and then dropped. The rest of the documents are worked twice on average.
- On average, each user has 24 queues to work.
- Most indexing and scanning is performed outside the working day.

From the preceding figures, we can see that stored documents cause 30,000 business getworks per day. Ten thousand of these documents are rerouted once, giving another 10,000 business getworks per day. Our total number of getworks per day is, therefore, 40,000.

If the working day in this environment is eight hours, we expect 5,000 business getworks per hour. We need to decide if there is a peak in the workload (the processor resource we need must cover our peak hour). Let us assume that the peak hour is double the normal workload. The peak hour, therefore, generates 10,000 business getworks.

From the figures from Table 11 on page 24, we can see that each business transaction causes two CICS $GW0 transactions. We can, therefore, expect 20,000 CICS $GW0 transaction during peak hour. From Table 1 on page 19, we can see that we performed 44,633 $GW0 transactions in a half-hour period, (that is, 89,000 $GW0 transactions in an hour).
Our proposed system of 20,000 transactions per hour is approximately one quarter of the number of transactions we performed in the benchmark. Therefore, we estimate that the Getwork transactions place a load of 110% of one processor on a 9021 model 982. (Remember that there are multiple processors in a sysplex). If we apply a capture ratio of 75% to this figure then the overall system load will be 147% of one processor on a 9021 model 982. For a different system, you can use the Large System Performance Reference, SC28-1187 to determine the effect on the processor you are running on.

During our first run, there were other transactions being performed (Add and Route, List Folder Contents, and Supervisor Functions). Although our scenario was biased toward an intensive Getwork situation, there are a number of these other transactions that are generated by the workload. Unless your environment is significantly different from ours (for example, a store and retrieve environment where no Getworks are performed at all), the figures we have generated should be close enough for a working capacity plan.

### 5.4.3 Changes from Previous Scenario

If your scenario is significantly different from ours, you may need to apply some factors to modify your estimates.

#### 5.4.3.1 More Indexing and Scanning

Consider an environment where scanning is performed during the day. In Run 2, we increased the number of Add and Route Scripts we performed. This gives us data to estimate how much processor resource the add and route script uses.

In Run 1, we performed 44,633 $GW0 transactions in a half-hour period. In Run 2, we performed 37,023 $GW0 transactions. The CPU utilization for Run 1 was 451%, and in Run 2 was 423%. We can normalize this data to see the result if we had performed the same number of Getworks in Run 2 as we did in Run 1. 423 divided by 37,023 and multiplied by 44,633 gives 510% CPU utilization. If we used the same workload profile, we would expect 451% utilization. The extra 60% utilization is, therefore, caused by the extra Add and Route transactions that we performed. In run 1, we performed 9,408 $AR0 transactions, while in Run 2 we performed 15,725. Since we have normalized the CPU utilization figures, we must do the same for the number of $AR0 transactions. So if we had been running at 510% CPU utilization, we could, therefore, perform 15,725 / 37,023 * 44,633 = 18,957 $AR0 transactions.

From the preceding figures, we can say that the extra 60% CPU utilization was caused by 18,957 - 9,408 $AR0 transactions (that is, 9,549 $AR0 transactions). From Table 10 on page 23, the number of $AR0 transactions for each Add and Route script is actually a one-to-one ratio. This means that 9,549 Add and Routes in a half-hour period (4,775 Add and Routes per hour) requires 60% of one processor in a 9021-982 complex.

Let’s apply these figures to our proposed system.

We are indexing and scanning 50,000 documents a day. If this is performed over our 8-hour day, on average we index and store 6,250 documents per hour. Allowing for a peak hour of double the average rate, we find that we index and scan 12,500 documents per hour. Since Run 1 already includes some Indexing and Scanning, we can say that 4,000 (one quarter of the actual measured transactions in our run multiplied by two for our peak hour) is already included in the figure of 110% CPU utilization. We need to calculate the processor
resource required for the extra Indexing and Scanning operations, which is 
12500 - 4000 = 8500. We must multiply the 60% by 8500 / 4775 = 1.7 which 
gives a figure of 107% CPU utilization.

In the scenario where we are scanning during the day and our peak hour is 
twice the average, we require an additional 107% of one processor on a 9021 
model 982. Applying our capture ratio of 75% gives us an overall figure of 
142.6%.

5.4.3.2 Different Number of Queues Per User
Run 3 shows us that if we increase the number of queues per user, the extra 
work that the Getwork transaction has to perform to determine the highest 
priority piece of work for a user increases the amount of processor resource 
required. Let's do some calculations to see the affect of this.

Consider the number of transactions per second we performed in runs 1 and 3. 
Run 1 performed 102.4 transactions per second and required 451% processor 
utilization (that is, 451 / 102.4 = 4.4% processor utilization per transaction per 
second).

Run 3 performed only 86.6 transactions per second but required 530% processor 
utilization. These figures give 530 / 86.6 = 6.1% processor utilization per 
transaction per second.

Let's apply this information to our sample system. If we change the number of 
queues per user from 24 queues to 55, we expect our processor utilization to 
increase from 110%. To calculate what the increase is, take the ratio of 
processor resource per transaction per second for Run 3 versus Run 1 (6.1 / 4.4 
= 1.4). We must multiply our 110% utilization by 1.4 to give us the resource we 
need. This gives a total utilization of 154% if we increase the number of queues 
from 24 to 55. Applying our capture ratio of 75% gives an overall processor 
requirement of 205.3% processor utilization.

If we decrease the number of queues per user, we expect the processor 
resource to decrease in proportion.

5.5 Caveats

The calculations we performed previously are based on the small number of 
runs we documented in Chapter 4, “Information from the Benchmarks” on 
page 17. We recommend that figures are monitored carefully on a live system 
during actual rollout to calculate the amount of processor resource you need in 
your environment.

The capture ration we are using was based on our experience. This varied 
across our runs, so you should take care to determine the correct figure to use 
in your environment.
Chapter 6. Tuning Tips

This chapter describes changes we made to the system that we either found necessary or thought might improve the resource utilization. Wherever possible, we quantify the benefits.

6.1 DB2 Changes

Here are some changes we made to the DB2 environment.

6.1.1 Single Threading Background Transactions

We found that single threading background transactions were not necessary, despite our previous experience with customers.

Our experience in live situations is that when a large number of transactions are accessing the active tables, timeouts can occur (particularly with indexes). This is a problem if the transaction that times out is one of the background register transactions (ER00 and $GT0). See Chapter 5, “How to Use This Information” on page 23 for more information on these transactions. The result is that an index scan operation has apparently worked successfully, but the document does not appear in the object table or work detail table.

Customers have created DB2 reports to warn them of this situation. They also try to eliminate this problem by single threading ER00. The sample RCT entry for ER00 also suggests this. This is the sample RCT entry from the *IPFAF API V2R2 System Programmer’s Guide, SC31-7524.*

```
ER00       DSNCRCT TYPE=ENTRY,
          PLAN=EYP0DF00,            X
          THRD=1,                   X
          THRDA=1,                  X
          THRDS=0,                  X
          TWAIT=YES,                X
          AUTH=(EYPCICS),           X
          TXID=ER00                 X
          PLAN NAME                  X
          MAX NBR IN A THREAD SET   X
          NBR OF ACTIVE THREAD      X
          NBR ACT THRDS AT          X
          TRAN TO WAIT FOR THREAD  X
          AUTHORIZATION GROUP ID    X
          TRANSACTION ID            X
```

Specifying THRDM=1 means that this transaction can use only one thread. The TWAIT=YES parameter means that the transaction waits for an available thread rather than going to the pool.

We originally started our runs with this RCT entry for ER00. See Section A.3, “Original RCT for IPFAF” on page 39. However, we found that we were limited in the number of scans per minute we could perform. If we tried to perform 600 scans/minute, this was 300 scans/minute for each of the IPFAF systems. To achieve this rate, we needed to perform 300 ER00 transaction per minute, or five ER00 transactions per second. Although five transactions per second is not high, when they are single threaded, each ER00 must have an elapsed time of .2 of a second for us to maintain the transaction rate. We wanted to scan more documents per minute than these limitations gave us, so we chose not to single thread ER00.
We decided to increase the number of threads available to ER00, and also to specify TWAITE=POOL so that the transaction went to the pool of threads if none were available. This is the RCT entry we used for the rest of our runs.

```
ER00  DSNCRCT TYPE=ENTRY, X
      PLAN=TPAOODF00, PLAN NAME X
      THRDM=20, MAX NBR IN A THREAD SET X
      THRDA=20, NBR OF ACTIVE THREAD X
      THRDS=10, NBR ACT THRDS AT X
      TWAITE=POOL, TRAN GO TO POOL FOR THRD X
      AUTH=(ENTCICS), AUTHORIZATION GROUP ID X
      TXID=ER00, TRANSACTION ID
```

Despite allowing several concurrent ER00 transactions to run, we never hit problems with ER00 timeouts.

The FWA "GOODTRAN" transaction $GT0 has a similar recommendation in the manual. We chose to allow more than one thread for this transaction.

### 6.1.2 Use of Packages

Much of the resource used by DB2 is used when opening and closing threads. We wanted to avoid this as much as possible, and to maximize the reuse of threads. To do this, we bound each DBRM into its own package, and then bound all packages into one plan so we only had one plan for our CICS regions. The bind jobs for creating this plan can be found in A.6, “DB2 Package and Plan for IODM and IPFAF” on page 58.

We also changed the RCT so that we only had one entry for all of our transactions to use the same threads rather than have threads of their own. The RCT we used can be found in A.4, “Final RCT for IODM” on page 49. We also specified the PURGEC parameter RELEAS DEALLOCATE rather than RELEASE COMMIT to keep threads open longer.

To decrease the amount of resource used for authorization checking, we granted public authorization to our plan; this also allowed us to specify CACHESIZE=0 since no cache is required for authorization checking.

To prevent lock contention, we changed the IODM and IPFAF tablespaces from LOCKSIZE=ANY to LOCKSIZE=PAGE and change the plans from REPEATABLE READ to CURSOR STABILITY.

The overall effect of this was a significant reduction in CPU utilization and a decrease in lock contention. During the periods of the runs we documented in Chapter 4, “Information from the Benchmarks” on page 17, we experienced no timeouts or deadlocks throughout any of the runs.

### 6.2 Application Design

The runs we performed showed us the importance of application design. Although we were unable to test the effects of all possible combinations, the most obvious effect was the change in number of queues per user. In Run 3, we ran exactly the same TPNS profile as Run 1, but we were only able to run at approximately 86 transactions/second. In Run 1, we ran at over 102 transactions
per second. While performing more transactions, we used less processor resource.

The only change between Run 1 and Run 3 was to increase the number of queues each user has assigned from 24 queues to 55 queues.

If we look at the way that IPFAF performs a getwork, the reason for this becomes clear. When a user performs a getwork, the first thing IPFAF does is to fetch the first row for that user from the User Assignment table (EYPTWEAS). It then retrieves rows from the Work Detail Table (EYPTWDET) to determine the highest priority item in that queue. When it has done this, it returns to the User Assignment table to find the next queue. If we have 24 queues, these SQL statements are performed 24 times; if we have 55, they are performed 55 times.

Our recommendation is to reassess the business design of your system. Wherever possible, keep the number of queues per user as small as possible.

There may be other aspects of design that affect the system. It is worth reviewing all of the application designing that a customer has done. Think through the effects on system resource, and test any changes before making them.

6.3 Preloading the Work Detail Table

Provided with the IPFAF API is a job to preload the Work Detail table EYPTWDET. This program is called EYPLWDET. The reason for this job is to reduce contention on one of the indexes on EYPTWDET. We found that with DB2 Version 4 the contention on indexes has been reduced considerably. We therefore found it unnecessary to run this preload program. In fact for one run we did actually run the preload job before we performed a run. Although the figures from this run are not published here, we did find that we used more processor resource, and were unable to run as many transaction after running the preload job.

Our recommendation for DB2 version 4 users would therefore be to use type 2 indexes, and to investigate the possibility of skipping the preload job on the Work Detail table.
Appendix A.  DB2 ZPARMS and RCTs

A.1 ZPARMS

These were the ZPARM values that we used. The changes that we made are described in the comments at the beginning of the listing.

```plaintext
//********************************************************************
//* JOB NAME = DSNTIJUZ */
//* DESCRIPITIVE NAME = INSTALLATION JOB STREAM */
//* LICENSED MATERIALS - PROPERTY OF IBM */
//* 5695-DB2 */
//* (C) COPYRIGHT 1982, 1995 IBM CORP. ALL RIGHTS RESERVED. */
//* STATUS = VERSION 4 */
//* FUNCTION = DSNZPARM AND DSNHDECP UPDATES */
//* PSEUOCODE = */
//* DSNTIZA STEP ASSEMBLE DSN6.... MACROS, CREATE DSNZPARM */
//* DSNTIZL STEP LINK EDIT DSNZPARM */
//* DSNTLOG STEP UPDATE PASSWORDS */
//* DSNTIZP STEP ASSEMBLE DSNHDECP DATA-ONLY LOAD MODULE */
//* DSNTIZEQ STEP LINK EDIT DSNHDECP LOAD MODULE */
//* DSNTIMQ STEP SMP/E PROCESSING FOR DSNHDECP */
//* Changes made for ImagePlus to reflect known working system */
//* 02/26/97 ADF CHANGED NUMLKTS=1000 TO NUMLKTS=5000, */
//* CHANGED NUMLKUS=10000 TO NUMLKUS=50000 */
//* CHANGED SRPPOOL=876 TO SRPPOOL=4000 */
//* CHANGED INBUFF=28 TO INBUFF=60 */
//* CHANGED OUTBUFF=400 TO OUTBUFF=4000 */
//* CHANGED WTHRSH=20 TO WTHRSH=256 */
//* CHANGED MAXRLBK=3483 TO MAXRLBK=60000 */
//* 03/06/97 CHANGED DLLFREQ=5 TO DLLFREQ=0 */
//* CHANGED PRIQTY=85 TO PRIQTY=500 */
//* CHANGED SEQQTY=5 TO SEQQTY=100 */
//* CHANGED LOGLOAD=50000 TO LOGLOAD=500000 */
//* Following changes made because move to packages put extra */
//* load on EDMPOOL */
//* 03/07/97 CHANGED EDMPOOL=34625 TO EDMPOOL=64625 */
//* 03/08/97 CHANGED EDMPOOL=64625 TO EDMPOOL=86625 */
//* CHANGED PRIQTY=500 TO PRIQTY=700 */
//********************************************************************
```

© Copyright IBM Corp. 1997
//SYSUT1 DD UNIT=SYSDA, SPACE=(800, (50,50), , , ROUND)
//SYSUT2 DD UNIT=SYSDA, SPACE=(800, (50,50), , , ROUND)
//SYSUT3 DD UNIT=SYSDA, SPACE=(800, (50,50), , , ROUND)
//SYSIN DD *

DSN6ENV
DSN6SPRM

MVS=XADSN6SPRM
RESTART, ALL,
ABEXP=YES,
ABIND=YES,
AUTH=YES,
AUTHCACH=1024,
BINDNV=BINDADD,
CATALOG=DSNDB1G,
CHGDC=NO,
DECIV3=NO,
DEFIXTP=2,
DEFILID=IBMUSER,
DSMAX=7000,
EDMPool=86625,
EDPROP=NO,
HOPAUTH=YES,
IRLMAUT=YES,
IRLMPAC=DBD11RLM,
IRLMSID=IR01,
IRLMWT=60,
IRLMSWT=300,
MAXRBLK=60000,
NUMLKTS=5000,
NUMLKUS=50000,
RECALL=YES,
RECALLD=120,
RGFCOLID=DSNRGCOL,
RGFDBNAME=DSNRGFDB,
RGFEDEDPL=NO,
RGFDEFLT=ACCEPT,
RGFESCPE=,
RGFULLQ=YES,
RGINSTL=NO,
RGFNMORT=DSN_REGISTER_OBJT,
RGFNPRT=DSN_REGISTER_APPL,
RRLOCK=NO,
SEQCACH=BYPASS,
SITETYP=LOCALSITE,
SRTPool=4000,
SYSADM=ANGELA,
SYSADM2=IBMUSER,
SYSOPR1=SYSOPR,
SYSOPR2=IBMUSR1,
UTIMOUT=6

DSN6ARVP

ALCUNIT=CYL,
ARCRTC=(1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15),
ARCWTOR=NO,
ARCPFX1=DB2LOG.DB1.ARCLG1,
ARCPFX2=DB2LOG.DB1.ARCLG2,
ARCRETN=60,
BLLKSIZE=28672,
CATALOG=YES,
COMPACT=NO,
PRIQTY=700,
PROTECT=NO,
QUIESCE=5,
SEQTY=100,
TSTAMP=YES,
UNIT=3390,
UNIT2=3390

DSN6LOGP
DEALLCT=(0),
INBUFF=60,
MAXARCH=500,
MAXRTU=2,
OUTBUFF=4000,
TWOACTV=YES,
TWOARCH=NO,
WRTHRSH=256

DSN6SYSP
AUDITST=NO,
CONDBAT=500,
CTHREAD=500,
DLDFFREQ=0,
IDBACK=500,
IDFORE=500,
LOGLOAD=500000,
MAXDBAT=500,
MON=YES,
MONSIZE=8192,
PCLOSET=5,
PCLOSEN=5,
RLF=NO,
RLF.tbl=37,
RLFERR=NOLIMIT,
RLFAUTH=SYSIRM,
ROUTCDE=(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15),
SMFACCT=(1),
SMFSTAT=YES,
STATIME=15,
STORMXAB=0,
STORPROC=,
STORTIME=180,
TRACSTR=NO,
TRACTBL=16

DSN6FAC
DDF=NO,
CTMSTAT=ACTIVE,
IDHTOIN=0,
RESYNC=2,
RLFRRD=NOLIMIT

DSN6GRP
DSHARE=YES,
GRPPNAME=DSNDB1G,
MEMBNNAME=DBD1

END

/*//*********************************************************************//* LINK EDIT THE NEW DSNZPARM MEMBER. PUT LOAD MODULE IN SDSNEXIT. */
/***************************************************************************/
//DSNZIZL EXEC PGM=IEWL,PARM='LIST,XREF,LET,RENT',
//COND=(4,LT)
//ADSNLOAD DD DISP=SHR,
//  DSN=DB2410.ADSNLOAD
//  DSN=DB2410.ADSNLOAD
//SYSPUNCH DD DSN=&&LOADSET(DSNTILMC),DISP=(OLD,DELETE)
INCLUDE SYSPUNCH(DSNTILMC)
INCLUDE ADSNLOAD(DSNZPARM)
INCLUDE ADSNLOAD(DSNAA)
ORDER DSNAA
ENTRY DSNZMSTR
NAME DSD1PRMC(R)
A.2 Original RCT for IODM

This is the original RCT that we started with for IODM.

*********************************************************************
* SAMPLE CICS RCT FOR OBJECT DISTRIBUTION MANAGER VERSION 2.2 *
* NOTE - X NEEDS TO BE CHANGED TO THE CORRECT SUFFIX *
* NOTE - XXXX NEEDS TO BE CHANGED TO THE CORRECT DB2 SUBSYSTEM NAME *
* ********************************************************************

DSNCRCT TYPE=INIT,SUFFIX=1,SUBID=DBD1,THRDMAX=100
DSNCRCT TYPE=POOL,THRD=80,THRDM=80,TWAIT=YES

***** CHANGE THE DISP TO DISD FOR USING THE EKCCDDE EXIT **********
DSNCRCT TYPE=ENTRY,TXID=DISP,PLAN=TPOPDISP,
X
ROLBE=NO,TWAIT=POOL,AUTH=(EKCCICS),
X
THRD=1,THRDA=1,THRDS=1

DSNCRCT TYPE=ENTRY,TXID=DISD,PLAN=TPOPDISP,

DSNCRCT TYPE=ENTRY,TXID=STAH,PLAN=TPOPSTAH,

DSNCRCT TYPE=ENTRY,TXID=(PRNT,RPRW),PLAN=TPOPPRTW,

DSNCRCT TYPE=ENTRY,TXID=(OQBK,ORBW),PLAN=CBRIDBS,

Appendix A. DB2 ZPARMS and RCTs
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00014300
DSNCRCT TYPE=ENTRY, TXID=DSCT, PLAN=TPOPDSCT, X00014400
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00014500

********************************************************************* 00014600
** RCT ENTRIES FOR OBJECT DISTRIBUTION MANAGER V2.1 ** 00014700
********************************************************************* 00014800
DSNCRCT TYPE=ENTRY, TXID=OTBL, PLAN=TPOPOTBL, X00014900
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00015000
DSNCRCT TYPE=ENTRY, TXID=ASND, PLAN=TPOPASND, X00015100
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00015200

********************************************************************* 00015300
** RCT ENTRIES FOR OBJECT DISTRIBUTION MANAGER V2.1.1 ** 00015400
********************************************************************* 00015500
DSNCRCT TYPE=ENTRY, TXID=SSTO, PLAN=TPOPSSTO, X00015600
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS), X00015700
THRD=3, THRA=3, THRS=0 00015800
DSNCRCT TYPE=ENTRY, TXID=SRET, PLAN=TPOPSRET, X00015900
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS), X00016000
THRD=3, THRA=3, THRS=0 00015160

********************************************************************* 00016200
** RCT ENTRIES FOR OBJECT DISTRIBUTION MANAGER V2.2 ** 00016300
********************************************************************* 00016400
DSNCRCT TYPE=ENTRY, TXID=OSCN, PLAN=TPOPOSCN, X00016500
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00016600
DSNCRCT TYPE=ENTRY, TXID=BEGB, PLAN=TPOPBEGB, X00016700
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00016800
DSNCRCT TYPE=ENTRY, TXID=SLST, PLAN=TPOPSLST, X00017000
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00017100
DSNCRCT TYPE=ENTRY, TXID=OINT, PLAN=TPOPOINT, X00017200
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00017300
DSNCRCT TYPE=ENTRY, TXID=OWMS, PLAN=TPOPOWMS, X00017400
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00017500

* 00017600
*=====================================================================*
** NEW RCT ENTRY FOR DB2 RETRY MODULE ** 00017700
*=====================================================================*
DSNCRCT TYPE=ENTRY, TXID=ORET, PLAN=TPOPORET, X00018000
ROLBE=NO, TWAIT=POOL, AUTH=(EKCCICS) 00019000

*=====================================================================*
** RCT ENTRIES FOR OBJECT DISTRIBUTION MANAGER V2.3 **
*=====================================================================*
A.3 Original RCT for IPFAF

This is the original RCT that we started with for IPFAF.

************************************************************************************
* * 00010003
* SAMPLE CICS RCT FOR FAF API V2.2 00030003
* * 00040003
* NOTE - XX NEEDS TO BE CHANGED TO THE CORRECT SUFFIX 00050003
* ?DB2SUB? NEEDS TO BE CHANGED TO THE DB2 00060003
* SUBSYSTEM ID 00070003
* EYPICS IS CURRENTLY THE AUTHID. CHANGE IT 00080003
* ACCORDING TO YOUR SYSTEM. 00090003
* * 00100003
* * 00110003
* * 00120003
* ************************************************************************************
* * 00160003
* TITLE 'DSNRCTR - FOR API' 00180003
* * 00190003
* PRINT NOGEN 00200003
* * 00210003
* * 00220003
* APPLICACTIONS 00240003
* NOTE: 00250003
* MAKE SURE (SUM OF THRDA < THRDMAX 2). 00260003
* TO PROTECT THREADS FOR REUSE: THRD > 0 AND THRDA > 0. 00270003
* TO QUEUE TRANS/TRAN GROUPS: THRD > 0 AND TWAIT=YES. 00280003
* CUSTOMIZE THE THRDM PARAMETER TO ALLOW FOR CONCURRENT 00290003
* TRANSACTIONS. 00300003
* CHANGE TWAIT=POOL IF DESIRED. 00310003
* ************************************************************************************
* DSNRCTR TYPE=INIT, 00330003
* SNAP=Y, 00340003
* SUBID=DBD1, DB2 SUBSYSTEM ID 00350003
* SUFFIX=30, SUFFIX ID X00360004
* THRDMAX=152 MAX NUMBER OF THREADS 00370004
* DSNRCTR TYPE=COMD, 00380004
* ROLLBE=NO, ROLLBACK AT DEADLOCK X00390005
* TWAIT=POOL OVERFLOW TO POOL X00400005
* DSNRCTR TYPE=POOL, 00410005
* PLAN=DSN8CC31, PLAN NAME FOR DB2 IVP X00420005
* THRDM=80, MAX NUMBER IN A THREAD SET X00430005
* THRDA=80, NUMBER OF ACTIVE THREAD X00440005
* TWAIT=YES WAIT FOR THREAD X00450005
* ************************************************************************************
* NOTE - THE FOLLOWING IS AN EM00 RCT MACRO ENTRY. 00480005
* THIS IS FOR TABLE SET 00. 00490005
* THE PLAN NAME CAN BE MODIFIED. 00500005
* ************************************************************************************
EM00 DSNCRCT TYPE=ENTRY, PLAN=TPAOMD00, PLAN NAME X00610003
THRM=1, MAX NBR IN A THREAD SET X00630003
THDA=1, NBR OF ACTIVE THREAD X00640003
THRD=0, NBR ACT THRDS AT X00650003
TWAIT=YES, TRAN TO WAIT FOR THREAD X00660003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X00670003
TXID=EM00 TRANSACTION ID 00680003
* 00690003
**********************************************************************
* NOTE - THE FOLLOWING IS AN EM01 RCT MACRO ENTRY. * 00700003
* THIS IS FOR TABLE SET 01. * 00710003
* THE PLAN NAME CAN BE MODIFIED. * 00720003
**********************************************************************
* 00740003
EM01 DSNCRCT TYPE=ENTRY, PLAN=TPAOMD01, PLAN NAME X00770003
THRM=1, MAX NBR IN A THREAD SET X00780003
THDA=1, NBR OF ACTIVE THREAD X00790003
THRD=0, NBR ACT THRDS AT X00800003
TWAIT=YES, TRAN TO WAIT FOR THREAD X00810003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X00820003
TXID=EM01 TRANSACTION ID 00830003
* 01740003
**********************************************************************
* NOTE - THE FOLLOWING IS AN ER00 RCT MACRO ENTRY. * 01750003
* THIS IS FOR TABLE SET 00. * 01760003
* THE PLAN NAME CAN BE MODIFIED. * 01770003
**********************************************************************
* 01790003
ER00 DSNCRCT TYPE=ENTRY, PLAN=TPAODF00, PLAN NAME X01810003
THRM=1, MAX NBR IN A THREAD SET X01820003
THDA=1, NBR OF ACTIVE THREAD X01830003
THRD=1, NBR ACT THRDS AT X01840003
TWAIT=YES, TRAN TO WAIT FOR THREAD X01850003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X01870003
TXID=ER00 TRANSACTION ID 01880003
* 01890003
**********************************************************************
* NOTE - THE FOLLOWING IS AN ER01 RCT MACRO ENTRY. * 01900003
* THIS IS FOR TABLE SET 01. * 01910003
* THE PLAN NAME CAN BE MODIFIED. * 01920003
**********************************************************************
* 01940003
ER01 DSNCRCT TYPE=ENTRY, PLAN=TPAODF01, PLAN NAME X01970003
THRM=1, MAX NBR IN A THREAD SET X01980003
THDA=1, NBR OF ACTIVE THREAD X01990003
THRD=0, NBR ACT THRDS AT X02000003
TWAIT=YES, TRAN TO WAIT FOR THREAD X02010003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X02020003
TXID=ER01 TRANSACTION ID 02030003
* 02040003
**********************************************************************
* NOTE - THE FOLLOWING IS AN EYDM RCT MACRO ENTRY. * 02050003
* THIS IS FOR ALL TABLE SETS. * 02060003
* THE PLAN NAME CAN BE MODIFIED. * 02070003
**********************************************************************
* 02080003
Appendix A. DB2 ZPARMS and RCTs
* THE PLAN NAME CAN BE MODIFIED.

UFPP DSNCRCT TYPE=ENTRY, PLAN=TPAIODM, PLAN NAME X03610003
THDM=1, MAX NBR IN A THREAD SET X03620003
THRA=1, NBR OF ACTIVE THREAD X03640003
THRS=0, NBR ACT THRS AT X03650003
TWAIT=YES, TRAN TO WAIT FOR THREAD X03660003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X03670003
TXID=UFPP TRANSACTION ID 03680003
* 03690003

UFST DSNCRCT TYPE=ENTRY, PLAN=TPAODF00, PLAN NAME X03760003
THDM=1, MAX NBR IN A THREAD SET X03780003
THRA=1, NBR OF ACTIVE THREAD X03790003
THRS=0, NBR ACT THRS AT X03800003
TWAIT=YES, TRAN TO WAIT FOR THREAD X03810003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X03820003
TXID=UFST TRANSACTION ID 03830003
* 03840003

UFRE DSNCRCT TYPE=ENTRY, PLAN=TPAZIMIG, PLAN NAME X03940003
THDM=1, MAX NBR IN A THREAD SET X03960003
THRA=1, NBR OF ACTIVE THREAD X03970003
THRS=0, NBR ACT THRS AT X03980003
TWAIT=YES, TRAN TO WAIT FOR THREAD X03990003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04000003
TXID=UFRE TRANSACTION ID 04010003
* 04020003

VER1 DSNCRCT TYPE=ENTRY, PLAN=TPAVER1, PLAN NAME X04100003
THDM=1, MAX NBR IN A THREAD SET X04120003
THRA=1, NBR OF ACTIVE THREAD X04130003
THRS=0, NBR ACT THRS AT X04140003
TWAIT=YES, TRAN TO WAIT FOR THREAD X04150003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04160003
The following 4 entries are new for FAF API V2.2.

**NOTE - THE FOLLOWING IS AN PSCH RCT MACRO ENTRY.**
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
**NOTE - THE FOLLOWING IS AN SNPA RCT MACRO ENTRY.**
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRDM PARAMETER TO ALLOW CONCURRENT TRANSACTIONS.

**NOTE - THE FOLLOWING IS AN SNPF RCT MACRO ENTRY.**
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRDM PARAMETER TO ALLOW CONCURRENT TRANSACTIONS.
TXID=SNPF TRANSACTION ID 04760003

* 04770003
* 04780003
********************************************************************** 04790003* NOTE - THE FOLLOWING IS AN EYSE RCT MACRO ENTRY. * 04800003* THIS IS FOR ALL TABLE SETS. * 04810003* THE PLAN NAME CAN BE MODIFIED. * 04820003* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRDM PARAMETER * 04830003* TO ALLOW CONCURRENT TRANSACTIONS. * 04840003********************************************************************** 04850003* 04860003
* 04870003

EYSE DSNCRCT TYPE=ENTRY,
    PLAN=TPAIODM2, PLAN NAME X04880003
    THRDM=3, MAX NBR IN A THREAD SET X04890003
    THRDA=3, NBR OF ACTIVE THREAD X04900003
    THDRS=0, NBR ACT THRS AT X04910003
    TWAIT=YES, TRAN TO WAIT FOR THREAD X04920003
    TROLBE=NO, DO NOT ROLLBACK IF DEADLOCK X04930003
    AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04940003
    TXID=EYSE TRANSACTION ID 04950003
* 04960003
* 04970003
********************************************************************** 04980003* SAMPLE CICS RCT FOR IPFAF 04990003* NOTE - ... AND DELETED DOCUMENTS 05000000
* 05010000

DSNCRCT TYPE=ENTRY,TXID=(SGON),TWAIT=POOL,
    THRDM=3, MAX NBR IN A THREAD SET X04700003
    THRDA=3, NBR OF ACTIVE THREAD X04710003
    THDRS=3, NBR ACT THRDS AT X04720003
    AUTH=(ENTCICS),PLAN=TPFSGON 00000000

DSNCRCT TYPE=ENTRY,TXID=(FAF),
    THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFFAF 00000000

DSNCRCT TYPE=ENTRY,TXID=(IFAF),
    THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFFIFAF 00000000

DSNCRCT TYPE=ENTRY,TXID=(SGOF),
    THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFFSGOF 00000000

DSNCRCT TYPE=ENTRY,TXID=(AFLD),
    THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFAFLD 00000000

DSNCRCT TYPE=ENTRY,TXID=(UFLD),
    THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFUFLD 00000000

DSNCRCT TYPE=ENTRY,TXID=(LFLD),
    THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFLFLD 00000000

DSNCRCT TYPE=ENTRY,TXID=(FNOT),
    THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFFNOT 00000000

DSNCRCT TYPE=ENTRY,TXID=(ANOT),
    X00000000

************************************************************************* 00000000
<table>
<thead>
<tr>
<th>TABLE SET</th>
<th>00</th>
<th>01</th>
</tr>
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<tbody>
<tr>
<td>PLAN=TPFANOT, TXID=(FLDR)</td>
<td>PLAN=TPFFLDR, TXID=(FLDR)</td>
<td>PLAN=TPFFLDR, TXID=(FLDR)</td>
</tr>
<tr>
<td>PLAN=TPFADOC, TXID=(ADOC)</td>
<td>PLAN=TPFFLDM, TXID=(ADOC)</td>
<td>PLAN=TPFFLDM, TXID=(ADOC)</td>
</tr>
<tr>
<td>PLAN=TPFCMN0, TXID=(FLDP)</td>
<td>PLAN=TPFFLDP, TXID=(FLDP)</td>
<td>PLAN=TPFFLDP, TXID=(FLDP)</td>
</tr>
<tr>
<td>PLAN=TPFCADOC, TXID=(ADOC)</td>
<td>PLAN=TPFFLDD, TXID=(ADOC)</td>
<td>PLAN=TPFFLDD, TXID=(ADOC)</td>
</tr>
<tr>
<td>PLAN=TPFCM0, TXID=(FLDD)</td>
<td>PLAN=TPFFLD, TXID=(FLDD)</td>
<td>PLAN=TPFFLD, TXID=(FLDD)</td>
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**TABLE SET 00**

<table>
<thead>
<tr>
<th>PLAN=TPFCMN0, TXID=(FLDP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TXID=$MN0, AUTH=(ENTCICS), PLAN=TPFADOC, TXID=(ADOC)</td>
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**TABLE SET 01**

<table>
<thead>
<tr>
<th>PLAN=TPFCMN1, TXID=(FLDP)</th>
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<tbody>
<tr>
<td>TXID=$MN1, AUTH=(ENTCICS), PLAN=TPFCDOC, TXID=(ADOC)</td>
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Appendix A. DB2 ZPARMS and RCTs 45
**TABLE SET 00**

<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=($MO1), X0000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCM01</td>
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* **IPFAF : RESOURCE CONTROL TABLE ENTRIES** *

* **WORKFLOW RELATED** *

<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=(ADOR), X0000000</th>
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<tbody>
<tr>
<td>THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFADOR</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=(GETW), X0000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFGETW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=(WDUP), X0000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFWDUP</td>
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</table>

<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=(ASGN), X0000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFASGN</td>
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</tbody>
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<table>
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<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=(HOLD), X0000000</th>
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<table>
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<th>DSNCRCT TYPE=ENTRY, TXID=(ROUT), X0000000</th>
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<td>THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFROUT</td>
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</thead>
<tbody>
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**TABLE SET 01**

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<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=($AD0), X0000000</th>
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<tbody>
<tr>
<td>PLAN=TPFCAR0, PLAN NAME X00760003</td>
</tr>
<tr>
<td>THRDM=10, MAX NBR IN A THREAD SET X00770003</td>
</tr>
<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), AUTHORIZATION GROUP ID X00820003</td>
</tr>
<tr>
<td>TXID=$AR0 TRANCTION ID 00830003</td>
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<table>
<thead>
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<th>DSNCRCT TYPE=ENTRY, TXID=($MD0), X0000000</th>
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</thead>
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<td>THRDM=10, MAX NBR IN A THREAD SET X00780003</td>
</tr>
<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), PLAN=TPFCMD0 X0000000</td>
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</table>

<table>
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<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), PLAN=TPFCGW0 X0000000</td>
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<table>
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<th>DSNCRCT TYPE=ENTRY, TXID=($WU0), X0000000</th>
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</thead>
<tbody>
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<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), PLAN=TPFCWU0 X0000000</td>
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<table>
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<th>DSNCRCT TYPE=ENTRY, TXID=($QD0), X0000000</th>
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</thead>
<tbody>
<tr>
<td>THRDM=10, MAX NBR IN A THREAD SET X00760003</td>
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<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), PLAN=TPFCQD0 X0000000</td>
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<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
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<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
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<tr>
<td>AUTH=(ENTCICS), PLAN=TPFDD0 X0000000</td>
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<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=($UA0), X0000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>THRDM=10, MAX NBR IN A THREAD SET X00760003</td>
</tr>
<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), PLAN=TPFUA0 X0000000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=($GT0), X0000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>THRDM=10, MAX NBR IN A THREAD SET X00780003</td>
</tr>
<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), PLAN=TPFGT0 X0000000</td>
</tr>
</tbody>
</table>

**TABLE SET 02**

<table>
<thead>
<tr>
<th>DSNCRCT TYPE=ENTRY, TXID=($AR1), X0000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAN=TPFCAR0, PLAN NAME X00760003</td>
</tr>
<tr>
<td>THRDM=10, MAX NBR IN A THREAD SET X00770003</td>
</tr>
<tr>
<td>THRDA=10, NBR OF ACTIVE THREAD X00790003</td>
</tr>
<tr>
<td>THRDS=10, NBR ACT THRODS AT X00800003</td>
</tr>
<tr>
<td>TWAIT=POOL, TRAN TO WAIT FOR THREAD X00810003</td>
</tr>
<tr>
<td>AUTH=(ENTCICS), AUTHORIZATION GROUP ID X00820003</td>
</tr>
<tr>
<td>TXID=$AR1 TRANCTION ID 00830003</td>
</tr>
</tbody>
</table>
Appendix A. DB2 ZPARMS and RCTs

THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCAR1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SAD1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCAD1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SMD1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCMD1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SGW1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCGW1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SOW1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCWU1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SQO1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCQD1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SDO1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCDD1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SUA1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCU1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SGT1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCGT1 0000000

IPFAF : RESOURCE CONTROL TABLE ENTRIES

* PREFETCH RELATED

DSNCRCT TYPE=ENTRY,TXID=(FAPM), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFFAPM 0000000

TABLE SET 00

DSNCRCT TYPE=ENTRY,TXID=(SPL0), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCPL0 0000000
DSNCRCT TYPE=ENTRY,TXID=(SPN0), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCPN0 0000000

TABLE SET 01

DSNCRCT TYPE=ENTRY,TXID=(SPL1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCPL1 0000000
DSNCRCT TYPE=ENTRY,TXID=(SPN1), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCPN1 0000000

HELP RELATED

DSNCRCT TYPE=ENTRY,TXID=(HP), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFCHP 0000000

LOB DRIVER RELATED

DSNCRCT TYPE=ENTRY,TXID=(LOB), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFLOB 0000000
DSNCRCT TYPE=ENTRY,TXID=(LOB2), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFLB2 0000000

INDEXING WORKSTATION INTERFACE RELATED

DSNCRCT TYPE=ENTRY,TXID=(AUTH), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFAUTH 0000000
DSNCRCT TYPE=ENTRY,TXID=(DFLT), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFDFT 0000000
DSNCRCT TYPE=ENTRY,TXID=(INDEX), X0000000
THRDM=1,THRDA=1,AUTH=(ENTCICS),PLAN=TPFINDX 0000000
DSNCRCT TYPE=ENTRY,TXID=(IBLK), X0000000
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFIBLK

******************************************************
ON LINE AUTO INDEXING PLAN
******************************************************
ATX0 DSNCRCT TYPE=ENTRY, TXID=(ATX0), X0000000
    THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=AUTOIX0
ATX1 DSNCRCT TYPE=ENTRY, TXID=(ATX1), X0000000
    THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=AUTOIX1
DSNCRCT TYPE=FINAL 04980003END 04990003
This is the final RCT used in IODM. It reflects the changes we made for Chapter 6, "Tuning Tips" on page 29.

DSNCRCT TYPE=INIT,SUFFIX=1,SUBID=DBD1,THRDMAX=100 00001000
PURGEC=0,55 00002000
DSNCRCT TYPE=COMD,AUTH=(SIGNID), 00003000
  THRDA=1,THRDM=1,TWAIT=YES 00004000
DSNCRCT TYPE=POOL,THRDA=48,THRDM=48,TWAIT=YES 00005000
* ************************************************* 00006000
DSNCRCT TYPE=ENTRY,PLAN=TPNSO, 00007000
  ROLBE=NO,TWAIT=POOL,AUTH=(EKCCICS), 00008000
  THRDM=50,THRDA=50,THRDS=50, 00009000
  TXID=(DISD,STAH,STOR,PRNT,RPRT,TMPC,PRTW, 00010000
  RPRW,OMWS,PREF,DPRF,DELE,CHGE,DELM,MODA, 00010500
  OIUP,COBJ,ORBK,ORBW,OQSV,OAOQM,OAOQC,DSCT, 00010200
  OTBL,ASND,SSTO,SRET,OSCN,BEGB,SLST,OINT, 00010300
  OWMS,ORET) 00010400
*====================================================================*
  00010500
* 00010600
DSNCRCT TYPE=FINAL 00010700
END 00010800
A.5 Final RCT for IPFAF

This is the RCT for IPFAF after the recommendations made in Chapter 6, “Tuning Tips” on page 29 had been made.

**********************************************************
* SAMPLE CICS RCT FOR FAF API V2.2 *
* NOTE - XX NEEDS TO BE CHANGED TO THE CORRECT SUFFIX *
* ?DB2SUB? NEEDS TO BE CHANGED TO THE DB2 SUBSYSTEM ID *
* EYPCICS IS CURRENTLY THE AUTHID. CHANGE IT ACCORDING TO YOUR SYSTEM. *
* TITLE 'DSNCRCT - FOR API'
* PRINT NOGEN
*
**********************************************************

APPROACHES

MAKE SURE (SUM OF THRDA < THRDMAX 2).

TO PROTECT THREADS FOR REUSE: THRDS > 0 AND THRDA > 0.

TO QUEUE TRANS/TRAN GROUPS: THRDS > 0 AND TWAIT=YES.

CUSTOMIZE THE THRDM PARAMETER TO ALLOW FOR CONCURRENT TRANSACTIONS.

CHANGE TWAIT=POOL IF DESIRED.

**********************************************************

DSNCRCT TYPE=INIT,

SNAP=Y,

SUBID=DBD1,

DB2 SUBSYSTEM ID

SUFFIX=30,

SUFFIX ID

ROLBE=NO,

ROLLBACK AT DEADLOCK

THRD=1,

ROLLBACK AT DEADLOCK

THRD=1,

ROLLBACK AT DEADLOCK

TWAIT=YES

OVERFLOW TO POOL

DSNCRCT TYPE=COMD,

ROLBE=NO,

ROLLBACK AT DEADLOCK

THRD=1,

ROLLBACK AT DEADLOCK

THRD=1,

ROLLBACK AT DEADLOCK

TWAIT=YES

OVERFLOW TO POOL

DSNCRCT TYPE=POOL,

PLAN=DSN8CC31,

PLAN NAME FOR DB2 IVP

THRD=27,

MAX NUMBER IN A THREAD SET

THRD=27,

NUMBER OF ACTIVE THREAD

TWAIT=YES

WAIT FOR THREAD

API RCT ENTRIES

**********************************************************
**Appendix A. DB2 ZPARMS and RCTs**

---

EM00  DSNCRCT  TYPE=ENTRY,
      PLAN=TPAOMD00,  PLAN NAME X00620003
      THRDM=1, MAX NBR IN A THREAD SET X00630003
      THRSA=1, NBR OF ACTIVE THREAD X00640003
      THRDS=1, NBR ACT THRDS AT X00650003
      TWAIT=YES, TRAN TO WAIT FOR THREAD X00660003
      AUTH=(ENTCICS), AUTHORIZATION GROUP ID X00670003
      TXID=EM00 TRANSACTION ID 00680003

---

EM01  DSNCRCT  TYPE=ENTRY,
      PLAN=TPAOMD01,  PLAN NAME X00770003
      THRDM=1, MAX NBR IN A THREAD SET X00780003
      THRSA=1, NBR OF ACTIVE THREAD X00790003
      THRDS=1, NBR ACT THRDS AT X00800003
      TWAIT=YES, TRAN TO WAIT FOR THREAD X00810003
      AUTH=(ENTCICS), AUTHORIZATION GROUP ID X00820003
      TXID=EM01 TRANSACTION ID 00830003

---

ER00  DSNCRCT  TYPE=ENTRY,
      PLAN=TPAODF00,  PLAN NAME X01820003
      THRDM=20, MAX NBR IN A THREAD SET X01830003
      THRSA=20, NBR OF ACTIVE THREAD X01840003
      THRDS=10, NBR ACT THRDS AT X01850003
      TWAIT=POOL, TRAN TO WAIT FOR THREAD X01860003
      AUTH=(ENTCICS), AUTHORIZATION GROUP ID X01870003
      TXID=ER00 TRANSACTION ID 01880003

---

ER01  DSNCRCT  TYPE=ENTRY,
      PLAN=TPAODF01,  PLAN NAME X01970003
      THRDM=1, MAX NBR IN A THREAD SET X01980003
      THRSA=1, NBR OF ACTIVE THREAD X01990003
      THRDS=0, NBR ACT THRDS AT X02000003
      TWAIT=YES, TRAN TO WAIT FOR THREAD X02010003
      AUTH=(ENTCICS), AUTHORIZATION GROUP ID X02020003
TXID=ER01  TRANSACTION ID  02030003
* 02940003
********************************************************************** 02950003* NOTE - THE FOLLOWING IS AN EYDM RCT MACRO ENTRY.  * 02960003* THIS IS FOR ALL TABLE SETS.  * 02970003* THE PLAN NAME CAN BE MODIFIED.  * 02980003********************************************************************** 02990003* 03000003
EYDM  DSMCRTC TYPE=ENTRY,  PLAN=TPAIDM,  PLAN NAME X03010003
THRM=1,  MAX NBR IN A THREAD SET X03020003
THRDA=1,  NBR OF ACTIVE THREAD X03030003
THRS=0,  NBR ACT THRS AT X03040003
TWAIT=YES,  TRAN TO WAIT FOR THREAD X03050003
AUTH=(ENTCICS),  AUTHORIZATION GROUP ID X03060003
TXID=EYDM  TRANSACTION ID  03070003
* 03080003
********************************************************************** 03090003* NOTE - THE FOLLOWING IS AN EYDT RCT MACRO ENTRY.  * 03100003* THIS IS FOR ALL TABLE SETS.  * 03110003* THE PLAN NAME CAN BE MODIFIED.  * 03120003********************************************************************** 03130003* 03140003
EYDT  DSMCRTC TYPE=ENTRY,  PLAN=TPAIDM,  PLAN NAME X03160003
THRM=1,  MAX NBR IN A THREAD SET X03170003
THRDA=1,  NBR OF ACTIVE THREAD X03190003
THRS=0,  NBR ACT THRS AT X03200003
TWAIT=YES,  TRAN TO WAIT FOR THREAD X03210003
AUTH=(ENTCICS),  AUTHORIZATION GROUP ID X03220003
TXID=EYDT  TRANSACTION ID  03230003
* 03240003
********************************************************************** 03250003* NOTE - THE FOLLOWING IS AN EYRT RCT MACRO ENTRY.  * 03260003* THIS IS FOR ALL TABLE SETS.  * 03270003* THE PLAN NAME CAN BE MODIFIED.  * 03280003********************************************************************** 03290003* 03300003
EYRT  DSMCRTC TYPE=ENTRY,  PLAN=TPAIDM,  PLAN NAME X03320003
THRM=1,  MAX NBR IN A THREAD SET X03330003
THRDA=1,  NBR OF ACTIVE THREAD X03340003
THRS=0,  NBR ACT THRS AT X03350003
TWAIT=YES,  TRAN TO WAIT FOR THREAD X03360003
AUTH=(ENTCICS),  AUTHORIZATION GROUP ID X03370003
TXID=EYRT  TRANSACTION ID  03380003
* 03390003
********************************************************************** 03400003* NOTE - THE FOLLOWING IS AN UFIM RCT MACRO ENTRY.  * 03410003* THIS IS FOR ALL TABLE SETS.  * 03420003* THE PLAN NAME CAN BE MODIFIED.  * 03430003********************************************************************** 03440003* 03450003
UFIM  DSMCRTC TYPE=ENTRY,  PLAN=TPAIDM,  PLAN NAME X03460003
THRM=1,  MAX NBR IN A THREAD SET X03480003
THRDA=1,  NBR OF ACTIVE THREAD X03490003
THRS=0,  NBR ACT THRS AT X03500003
TWAIT=YES,  TRAN TO WAIT FOR THREAD X03510003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X03520003
TXID=UFIM TRANSACTION ID 03530003
*
********************************************************************** 03550003
* NOTE - THE FOLLOWING IS AN UFPF RCT MACRO ENTRY. *
* THIS IS FOR ALL TABLE SETS. *
* THE PLAN NAME CAN BE MODIFIED. *
********************************************************************** 03590003
*
UFPF DSNCRCT TYPE=ENTRY,
PLAN=TPAIODM, PLAN NAME X03610003
THRM=1, MAX NBR IN A THREAD SET X03620003
THRA=1, NBR OF ACTIVE THREAD X03640003
THRS=0, NBR ACT THRS AT X03650003
TWAIT=YES, TRAN TO WAIT FOR THREAD X03660003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X03670003
TXID=UFPF TRANSACTION ID 03680003
*
********************************************************************** 03700003
* NOTE - THE FOLLOWING IS AN UFST RCT MACRO ENTRY. *
* THIS IS FOR ALL TABLE SETS. *
* THE PLAN NAME CAN BE MODIFIED. *
********************************************************************** 03740003
*
UFST DSNCRCT TYPE=ENTRY,
PLAN=TPAODF00, PLAN NAME X03760003
THRM=1, MAX NBR IN A THREAD SET X03770003
THRA=1, NBR OF ACTIVE THREAD X03790003
THRS=0, NBR ACT THRS AT X03800003
TWAIT=YES, TRAN TO WAIT FOR THREAD X03810003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X03820003
TXID=UFST TRANSACTION ID 03830003
*
********************************************************************** 03860003
* NOTE - THE FOLLOWING IS A UFRE RCT MACRO ENTRY. *
* THE PLAN NAME CAN BE MODIFIED. *
********************************************************************** 03900003
*
UFRE DSNCRCT TYPE=ENTRY,
PLAN=TPAZIMIG, PLAN NAME X03940003
THRM=1, MAX NBR IN A THREAD SET X03950003
THRA=1, NBR OF ACTIVE THREAD X03970003
THRS=0, NBR ACT THRS AT X03980003
TWAIT=YES, TRAN TO WAIT FOR THREAD X03990003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04000003
TXID=UFRE TRANSACTION ID 04010003
*
********************************************************************** 03930003
* NOTE - THE FOLLOWING IS A VER1 RCT MACRO ENTRY. *
********************************************************************** 04010003
*
VER1 DSNCRCT TYPE=ENTRY,
PLAN=TPAVER1, PLAN NAME X04110003
THRD=1, MAX NBR IN A THREAD SET X04120003
THRD=1, NBR OF ACTIVE THREAD X04130003
THRD=0, NBR ACT THRS AT X04140003
TWAIT=YES, TRAN TO WAIT FOR THREAD X04150003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04160003
TXID=VER1 TRANSACTION ID X04170003

* 04180003
* 04190003

**********************************************************************
* THE FOLLOWING 4 ENTRIES ARE NEW FOR FAF API V2.2
**********************************************************************

* 04200003
* 04210003
* 04220003
* 04230003

**********************************************************************
* NOTE - THE FOLLOWING IS AN PSCH RCT MACRO ENTRY.
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
**********************************************************************

* 04240003
* 04250003
* 04260003
* 04270003

PSCH DSNCRCT TYPE=ENTRY,
PLAN=TPAAPSCH, PLAN NAME X04300003
THRD=3, MAX NBR IN A THREAD SET X04310003
THRD=3, NBR OF ACTIVE THREAD X04320003
THRD=0, NBR ACT THRS AT X04330003
TWAIT=YES, TRAN TO WAIT FOR THREAD X04340003
ROBE=NO, DO NOT ROLLBACK IF DEADLOCK X04350003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04360003
TXID=(PSCH,EYPP) TRANSACTION ID X04370003

* 04380003
* 04390003
* 04400003

**********************************************************************
* NOTE - THE FOLLOWING IS AN SNPA RCT MACRO ENTRY.
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRM PARAMETER.
* TO ALLOW CONCURRENT TRANSACTIONS.
**********************************************************************

* 04410003
* 04420003
* 04430003
* 04440003
* 04450003
* 04460003
* 04470003
* 04480003

SNPA DSNCRCT TYPE=ENTRY,
PLAN=TPAASNPA, PLAN NAME X04400003
THRD=3, MAX NBR IN A THREAD SET X04410003
THRD=3, NBR OF ACTIVE THREAD X04420003
THRD=0, NBR ACT THRS AT X04430003
TWAIT=YES, TRAN TO WAIT FOR THREAD X04440003
ROBE=NO, DO NOT ROLLBACK IF DEADLOCK X04450003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04460003
TXID=SNPA TRANSACTION ID X04470003

* 04480003
* 04490003

**********************************************************************
* NOTE - THE FOLLOWING IS AN SNPF RCT MACRO ENTRY.
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRM PARAMETER.
* TO ALLOW CONCURRENT TRANSACTIONS.
**********************************************************************

* 04500003
* 04510003
* 04520003
* 04530003
* 04540003
* 04550003
* 04560003
* 04570003
* 04580003
* 04590003

SNPF DSNCRCT TYPE=ENTRY,
PLAN=TPAASNPF, PLAN NAME X04500003
THRD=3, MAX NBR IN A THREAD SET X04510003
THRD=3, NBR OF ACTIVE THREAD X04520003
THRD=0, NBR ACT THRS AT X04530003
TWAIT=YES, TRAN TO WAIT FOR THREAD X04540003
ROBE=NO, DO NOT ROLLBACK IF DEADLOCK X04550003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04560003
TXID=SNPF TRANSACTION ID X04570003

* 04580003
* 04590003

**********************************************************************
* NOTE - THE FOLLOWING IS AN SNPF RCT MACRO ENTRY.
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRM PARAMETER.
* TO ALLOW CONCURRENT TRANSACTIONS.
**********************************************************************

* 04600003
* 04610003
* 04620003
* 04630003
* 04640003
* 04650003
* 04660003
* 04670003

SNPF DSNCRCT TYPE=ENTRY,
PLAN=TPAASNPF, PLAN NAME X04600003

* 04680003
* 04690003

**********************************************************************
* NOTE - THE FOLLOWING IS AN SNPF RCT MACRO ENTRY.
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRM PARAMETER.
* TO ALLOW CONCURRENT TRANSACTIONS.
**********************************************************************

* 04700003
* 04710003

SNPF DSNCRCT TYPE=ENTRY,
PLAN=TPAASNPF, PLAN NAME X04700003

* 04710003
* 04720003

**********************************************************************
* NOTE - THE FOLLOWING IS AN SNPF RCT MACRO ENTRY.
* THIS IS FOR ALL TABLE SETS.
* THE PLAN NAME CAN BE MODIFIED.
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRM PARAMETER.
* TO ALLOW CONCURRENT TRANSACTIONS.
**********************************************************************

* 04730003
* 04740003

SNPF DSNCRCT TYPE=ENTRY,
PLAN=TPAASNPF, PLAN NAME X04730003

* 04740003
* 04750003
THRDM=3, MAX NBR IN A THREAD SET X04700003
THRSA=3, NBR OF ACTIVE THREAD X04710003
THROS=0, NBR ACT THRODS AT X04720003
TWAIT=YES, TRAN TO WAIT FOR THREAD X04730003
ROLBE=NO, DO NOT ROLLBACK IF DEADLOCK X04740003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04750003
TXID=SNPF TRANSACTION ID 04760003

**********************************************************************
* NOTE - THE FOLLOWING IS AN EYSE RCT MACRO ENTRY. *
* THIS IS FOR ALL TABLE SETS. *
* THE PLAN NAME CAN BE MODIFIED. *
* YOU MAY WANT TO CONSIDER CHANGING THE VALUE OF THE THRDM PARAMETER *
* TO ALLOW CONCURRENT TRANSACTIONS. *
**********************************************************************

EYSE  DSNCRCT TYPE=ENTRY, X04770003
PLAN=TPAIODM2, PLAN NAME X04780003
THRDM=3, MAX NBR IN A THREAD SET X04790003
THRSA=3, NBR OF ACTIVE THREAD X04800003
THROS=0, NBR ACT THRODS AT X04810003
TWAIT=YES, TRAN TO WAIT FOR THREAD X04820003
ROLBE=NO, DO NOT ROLLBACK IF DEADLOCK X04830003
AUTH=(ENTCICS), AUTHORIZATION GROUP ID X04840003
TXID=EYSE TRANSACTION ID 04850003

DSNCRCT TYPE=ENTRY,PLAN=TPNSO, X04870003
ROLBE=NO, AUTH=(ENTCICS), X04880003
THRDM=60, THRDA=80, THRDS=80, X04890003
TXID=(SGON,FAF,IPAF,SGOF,AFLD,UFLD,LFLD,FNOT,ANOT, X04900003
FLDR,FLDM,FLDP,FLDD,ADOC,$MNO,$SLF0,$SLC0,$SC0,$LN0, X04910003
$MF0,$SA00,$ME0,$SW0,$MO0,ADOR,GETW,NDUP,ASGN,HOLD, X04920003
ROUT,QUE,$VAR0,$SD0,$MD0,$GW0,$WU0,$QDO,$SDD0,$UA0, X04930003
$GT0,FAPM,$PL0,$PN0,$HP,LOB,LOB2,AUTH,DFLT,INDX) 04940003

DSNCRCT TYPE=ENTRY,TXID=($MN1), X04950003
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCMN1 04960003
DSNCRCT TYPE=ENTRY,TXID=($LF1), X04970003
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCLF1 04980003
DSNCRCT TYPE=ENTRY,TXID=($LC1), X04990003
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCLC1 05000003
DSNCRCT TYPE=ENTRY,TXID=($OC1), X05010003
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCOC1 05020003
DSNCRCT TYPE=ENTRY,TXID=($LN1), X05030003
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCLN1 05040003
DSNCRCT TYPE=ENTRY,TXID=($MF1), X05050003
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCMF1 05060003
DSNCRCT TYPE=ENTRY,TXID=($MO1), X05070003
THRDM=1, THRDA=1, AUTH=(ENTCICS), PLAN=TPFCMO1 05080003

**********************************************************************
* IPFAF : RESOURCE CONTROL TABLE ENTRIES *
* WORKFLOW RELATED *
**********************************************************************
******** TABLE SET 00 ********************
* DSNCRCT TYPE=ENTRY, TXID=(PL0), X
* THRD=1, THRA=1, AUTH=(ENTCICS), PLAN=TPFCPL0
* DSNCRCT TYPE=ENTRY, TXID=(PN0), X
* THRD=1, THRA=1, AUTH=(ENTCICS), PLAN=TPFCPN0
******** TABLE SET 01 ********************
DSNCRCT TYPE=ENTRY, TXID=(PL1), X
DSNCRCT TYPE=ENTRY, TXID=(PN1), X
DSNCRCT TYPE=ENTRY, TXID=(SHP), X
DSNCRCT TYPE=ENTRY, TXID=(LOB), X
DSNCRCT TYPE=ENTRY, TXID=(ATX0), X
DSNCRCT TYPE=ENTRY, TXID=(ATX1), X
DSNCRCT TYPE=FINAL
END

Appendix A. DB2 ZPARMS and RCTs

57
A.6 DB2 Package and Plan for IODM and IPFAF

This is the final DB2 packages and plan for IODM and IPFAF after the recommendations made in Chapter 6, “Tuning Tips” on page 29 had been made.

A.6.1 Sample: DB2 Package for IODM and IPFAF

```
//STEP1 EXEC PGM=IKJEFT01, DYNAMNBR=20, REGION=1024K
//DBRMLIB DD DSN=IMAGE2.API220.SEYPDBR1, DISP=SHR,
// VOL=SER=D83AE8, UNIT=SYSDA
// DD DSN=IMAGE2.API220.SEYPDBR3, DISP=SHR,
// VOL=SER=D83AE8, UNIT=SYSDA
// DD DSN=IMAGE2.FWA221.SENTDDBR1, DISP=SHR,
// VOL=SER=D83AE8, UNIT=SYSDA
// DD DSN=IMAGE2.ODM220.SEKCDBR1, DISP=SHR,
// VOL=SER=D83AE8, UNIT=SYSDA
// DD DSN=SYS1.CBRDBRM, DISP=SHR
// DD DSN=IMAGES.COMMON.DBRMLIB, DISP=SHR
// SYSTSPRT DD SYSOUT=* 00011400
// SYSPRINT DD SYSOUT=* 00011500
// SYSSDUMP DD SYSOUT=* 00011600
// SYSTIN DD * 00011700
DSN SYSTEM(DBD1) 00011806
BIND PACKAGE (TPNS) MEMBER (CBRHCAUD) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHCLDL) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHCLUD) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHCLMK) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHCLSG) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHCOMT) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHDIDIR) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHDOBJ) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHBLB) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHRIOBJ) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSBCC) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSBCN) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSBCT) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSBKV) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSOBJ) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSPPC) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSPCT) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSPDT) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSPD) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSPV) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHSPV ) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHUPDT) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHUPDV) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHUVOL) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRHWOBJ) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS00) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS05) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS10) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS15) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS20) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS25) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS30) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS35) EXPLAIN (YES) ENABLE (CICS)
BIND PACKAGE (TPNS) MEMBER (CBRISS40) EXPLAIN (YES) ENABLE (CICS)
```
A.6.2 Sample: DB2 Plan for IODM and IPFAF

//STEP1 EXEC PGM=IKJEFT01,DYNAMNBR=20,REGION=1024K
//SYSTSIN DD *
//SYSPRINT DD SYSOUT=* 00027000
//SYSTSPRT DD SYSOUT=* 00011400
//SYSSDUMP DD SYSOUT=* 00011500
//SYSSIN DD * 00011700
DSN SYSTEM(DBD1) 00011806
BIND PLAN(TPNSO) OWNER(TPNS) QUALIFIER(TPNS) - 00011900
PKLIST(TPNS.*) - 00011900
ACTION(REPLACE) ISOLATION(CS) RETAIN CACHESIZE(0) - 00012000
ACQUIRE(USE) RELEASE(DEALLOCATE) VALIDATE(BIND) EXPLAIN(YES) - 00012200
CURRENTDATA(NO) 00012200
RUN PROGRAM(DSNTIAD) PLAN(DSNTIA41) LIB('DB2410.RUNLIB.LOAD') 00018306
END 00018400
//SYSIN DD * 00018500
GRANT EXECUTE ON PLAN TPNSO TO PUBLIC; 00018606
/* 00027000
Appendix B. CICS SIT Tables and SYSIN Definitions for IODM and IPFAF

B.1 IODM SIT Table

The same SIT table is used both of IODM CICS regions. The overrides to each IODM CICS regions are shown in Section B.1.1, “ODMD CICS Region SYSIN” on page 64 and Section B.1.2, “ODM2 CICS Region SYSIN” on page 64.

********************************************************************* 00010017
* * 00020017
* SAMPLE CICS SIT FOR OBJECT DISTRIBUTION MANAGER V2.2 * 00030017
* * 00040017
* NOTE - XX NEEDS TO BE CHANGED TO THE CORRECT SUFFIX * 00050017
* * 00060017
* SOME PARAMETERS HAVE IODM SPECIFIC VALUES. THESE ARE THE ONES * 00060017
* MARKED WITH '***' BEFORE THE COMMENTS. * 00060017
* * 00060017
********************************************************************* 00070017
SIT10 TITLE 'DFHSIT10 - CICS SYSTEM INITIALIZATION TABLE' 00080017
* 00090000

DFHSIT TYPE=CSECT, 00100000
AKPFREQ=200, ACTIVITY KEYPOINTING 00110000
APPLID=IODM, APPLICATION NAME OF CICS SYSTEMX09000000
BMS=FULL,COLD,ALIGN,DDS, BASIC MAPPING SUPPORT X12000000
CICSSVC=218, TYPE 2 SVC(SPA) X14000000
DATFORM=MMDDYY, EXTERNAL DATE DISPLAY X16000000
DBP=1$, DYNAMIC BACKOUT PROGRAM X17000000
DBUFSZ=1024, BUFFER SIZE FOR DYN BACKOUT X18000000
DCT=90, *** TD AND IODM DESTINATIONS X20000000
DIP=NO, NO BATCH DATA INTERCHANGE X21000000
DLI=NO, NO DL/I SUPPORT X22000000
DUMP=YES, FULL DUMP X22000000
DUMPDS=AUTO, SWITH DUMPS AUTOMATICALLY X22000000
FCT=NO, *** VSAM FOR IODM BATCH PROCESSING X28000000
FLODSEE=", ALLOW LESS THAN 4 CHAR TRANIDS X28000000
FLODSTRT=", FREE FROM INPUT FOR BUILD-IN X28000000
GMLTEXT='YOU ARE CONNECTED TO OBJ DIST MGR CICS', X28010008
GRPLIST=ODM LIST, CSD GROUP LIST NAME X32000000
HP0=YES, HIGH PERFORMANCE OPTION X32000000
ICP=COLD, INTERVAL CONTROL PGM X32000000
ICV=100, INTERVAL CONTROL EXIT TIME-MS X32000000
ICVR=20000, RUNAWAY TASK TIME X33000000
ICVTSD=100, TERMINAL SCAN DELAY X35000000
ISC=YES, *** FOR REMOTE IODM AND FRONT-END X38000000
JCT=90, *** IODM JOURNALING X39010000
LGM narratives, VTAM LOGON DATA AVAILABLE X39010000
MCT=90, MONITOR CONTROL PGM X44000000
MGSLVL=1, PRINT START-UP MSGS X44000000
MSX=50, MAX NO. OF ALL CONCURRENT TASKS X45000000
PGCHAIN=X, BMS COMMAND - PAGE CHAINING X52000000
PGCOPY=C, - PAGE COPY X53000000
PGPURGE=T, - PAGE PURGE X54000000
PGRET=P, - PAGE RETRIEVAL X55000000

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PLTPI=19, *** LCB & MSG TABLE LOAD AT INIT X
PLTSD=9, *** SHUT DOWN IODM X
PRINT=P11, REQUEST KEY FOR 3270 PRINTOUT X60000000
RAPPOOL=3, FIXED RPL'S FIXED X61000000
RENTPGM=NOPROTECT, USE CICS-KEY STORAGE X
SEC=NO, NO RACF SUPPORT X26000000
SECPRFX=NO, NO PREFIX THE RESOURCE NAMES X26000000
SPOOL=YES, JES SPOOL SUPPORT X63000000
SRBSVC=215, X65000000
SRT=1$, DEFAULT SRT X65000000
START=AUTO, COLD OR WARM START X66000000
STGPROT=NO, NO STORAGE PROTECTION X
SUFFIX=90, *** SUFFIX FOR SIT X
SYSIDNT=ODMD, *** CICS SYSTEM ID X70000000
TCP=YES, TERMINAL CONTROL PROGRAM X72000000
TCT=NO, *** VTAM AND BTAM TERMINALS X74000000
TD=(6,3), BUFFER/STRINGS X74000000
TS=(COLD,8,3), BUFFERS,STRINGS X74000000
TST=NO, HAS TEMP STORAGE TABLE INCLUDED X84010000
TSMGSET=4, 4 MESSAGE SET ENTRIES X85000000
VTAM=YES, VTAM ACCESS METHOD IS USED X86000000
WKAREA=512, COMMON WORK AREA OF THE CSA X90000000
XLT=NO, NO TRANS LIST TABLE X92000000
XDC=NO, NO RACF FOR DCT ENTRIES X92000000
XJC=NO, NO RACF FOR JCT ENTRIES X92000000
XTST=NO, NO RACF FOR TST ENTRIES X92000000
DUMMY=DUMMY TO END MACRO 98000000
END DFHSITBA 99000000

B.1.1 ODMD CICS Region SYSIN
SIT=90,
GRPLIST=TPNSODMD, INCLUDE DLI SAMPLE PROGRAMS & TRANSACTIONS
APPLID=CICSOADM,
SYSIDNT=ODMD,
INITPARM=(DSN2STRT='1,DBD1'),
MXT=80,
EDSALIM=500M,
XRF=NO,
SPOOL=YES,
DUMP=NO,
SRBSVC=215,
CICSSVC=216,
AUXTR=OFF,
GMTXT='Welcome to Poughkeepsie Parallel Sysplex System (PET)
   IBM SAA ImagePlus Object Distribution Manager MVS/ESA V2.2
   * * * * T P N S Benchmark IODM Region #1  * * * *'*
.END

B.1.2 ODM2 CICS Region SYSIN
SIT=90,
GRPLIST=TPNSODM2, INCLUDE DLI SAMPLE PROGRAMS & TRANSACTIONS
APPLID=CICSOADM2,
SYSIDNT=ODM2,
INITPARM=(DSN2STRT='1,DBD1'),
MXT=80,
EDSALIM=500M,
XRF=NO,
SPOOL=YES,
DUMP=NO,
SRBSVC=215,
CICSSVC=216,
AUXTR=OFF,

GMTEXT=' Welcome to Poughkeepsie Parallel Sysplex System (PET)
IBM SAA ImagePlus Object Distribution Manager MVS/ESA V2.2
* * * * * T P N S Benchmark IODM Region #2   * * * * *'

.END
The same SIT table is used both of IPFAF CICS regions. The overrides to each IPFAF CICS regions are shown in Section B.2.1, “FAFD CICS Region SYSIN” on page 68 and Section B.2.2, “FAF2 CICS Region SYSIN” on page 68.

```
SIT70  TITLE 'DFHSIT70 - CICS SAMPLE SYSTEM INITIALIZATION TABLE' 00010011
         *********************************************************************************
         *                      *(00030001
         * MODULE NAME = ENTMSIT                                          *(00040001
         * DESCRIPITIVE NAME = ENTCICS SYSTEM INITIALIZATION TABLE FOR CICS v4 *(00050001
         * ?? STRINGS DESIGNED FOR GLOBAL CHANGES VIA AN EDITOR            *(00060001
         * ENTCICS CICS REGION NAME                                       *(00070001
         * ENTCICS CICS REGION NAME                                       *(00080001
         * ENTCICS CICS REGION NAME                                       *(00090001
         * ENTCICS CICS REGION NAME                                       *(00100001
         * ENTCICS CICS REGION NAME                                       *(00110001
         * Change ACTIVITY: *                                               *(00120001
         * $MOD(ENTMSIT),COMP(STARTER),PROD(CICS/ESA):                    *(00130001
         * PN= REASON REL YYMMDD HDXIII : REMARKS                         *(00140001
         * *********************************************************************************
         * DFHSIT TYPE=CSECT,                                               *(00160001
         * AIDI=30, DELAY BEFORE TAKE IS ATTEMPTED                          *(00170001
         * AIEXIT=DFHZATDX, AUTO-INSTALL USER PROGRAM                       *(00180001
         * AIQMAX=100, AUTO-INSTALL MAXIMUM                                 *(00190001
         * AIDDELAY=0, AUTO-INSTALL LOGOFF DELAY                             *(00200001
         * AIRDELAY=500, AUTO-INSTALL RESTART DELAY                         *(00210001
         * AKPFREQ=200, ACTIVITY KEYPOINTING NEEDED                         *(00220001
         * APPLID=icsafad, APPL NAME OF CICS SYSTEM                        *(00230001
         * AUXTR=OFF, AUXILIARY TRACE OFF                                   *(00240001
         * AUXTRSW=NO, NO AUTO SWITCH FOR AUX. TRACE                       *(00250001
         * BMS=(FULL,COLD,ALIGN,DDS), FULL BASIC MAPPING SUPPORT           *(00260001
         * CLSDSTP=NOTIFY, REQUEST VTAM NOTIFY FOR PASS                     *(00270001
         * CICSSVC=218, CICS TYPE 3 SVC                                    *(00280001
         * CSDACC=READWRITE, CSD access                                   *(00290001
         * CSDKUP=STATIC, Backuptype of CSD                                 *(00300001
         * CSDFRLOG=NO, Journal id. for CSD forw. recovX00410001            *(00310001
         * CSD/JID=NO, Journal id. for CSD auto. journX00420001             *(00320001
         * CSDSTRNO=2, CSD Number of strings                                *(00330001
         * CSDLSRNO=1, VSAM LSR pool number for CSD                       *(00340001
         * CSDREC0V=None, CSD recoverable file option                      *(00350001
         * DATFORM=MMDDYY, EXTERNAL DATE DISPLAY                            *(00360001
         * DNP=1$, DYNAMIC BACKOUT PROGRAM                                  *(00370001
         * DBUFSSZ=1024, BUFFER SIZE FOR DYN BACKOUT                       *(00380001
         * DCT=76, TD AND OTHER DESTINATIONS                               *(00390001
         * DFLTUSER=icsuser, DEFAULT USER                                  *(00400001
         * DIP=NO, NO BATCH DATA INTERCHANGE                               *(00410001
         * DLI=NO, NO DL/I SUPPORT                                         *(00420001
         * DUMP=NO, DUMP SELECTION                                         *(00430001
         * DUMPDS=Auto, AUTO CHOOSE DUMP DATASET                            *(00440001
         * DUMPSW=Next, NO AUTO SWITCH OF DUMP DATASET                     *(00450001
         * *********************************************************************************
```
Appendix B. CICS SIT Tables and SYSIN Definitions for IODM and IPFAF

DURETRY=30, RE-TRY SDUMPING FOR 30 SECONDS
DTRPGM=DFHDYP, DYNAMIC ROUTING PROGRAM
FCT=NO, SAMPLE VSAM FILE FILEA
GMTXT='Welcome to ImagePlus IPFAS Region',
GNTRAN=CESN, DEFAULT LOGON TRANSACTION
GRPLIST=FAPLST, CSD GROUP LIST
GTPTR=OFF, DISABLE GEN. TRACE FACILITY
ICP=COLD, COLD START INTERVAL CONTROL
ICV=1000, INTERVAL CONTROL EXIT TIME-MS
ICVR=20000, RUNAWAY TASK TIME
ICTSTD=0, TERMINAL SCAN DELAY
ISC=YES, NO INTERSYSTEM COMMUNICATION
JCT=70, DUAL EXTENT JOURNALING
JESDI=30, CEC FAILURE TIME DELAY
LGNMSG=YES, VTAM data available for appl
LPA=NO, NO CICS MANAGM MODULES FROM LPAX
MCT=NO, NO MONITORING
MN=OFF, NO MONITORING
MNPER=OFF, NO MONITORING
MNEC=OFF, NO MONITORING
MNVE=OFF, NO MONITORING
MSGCASE=MIXED, MIXED CASE MESSAGES
MSGLVL=1, PRINT START-UP MSGS
MXT=32, MAX NO. OF ALL CONCURRENT TASKS
NATLANG=E, NATIONAL LANGUAGE ENGLISH
PARMERR=INTERACT, ACTION ON PARAMETER ERRORS
PDI=30, DELAY BETWEEN HEARTBEAT & MSG
PGCHAIN=X/, BMS COMMAND - PAGE CHAINING
PGCOPY=C/, PAGE COPY
PGPURGE=T/, PAGE PURGE
PGRET=P/, PAGE RETRIEVAL
PLTP=17, PLT INITIALIZATION ENTRIES
PLTS=57, PLT SHUTDOWN ENTRIES
PRGDLAY=0, NO TERMINAL PAGE CLEAN UP
PRINT=PAI, REQUEST KEY FOR 3270 PRINTOUT
PRTYAGE=1, MULTIPLIER FOR TASK PRIORITY
PVDLAE=30, TIMEOUT VALUE FOR LUT TABLE
RENTPGM=PROTECT, RENTRANT PGM WRITE PROTECTION
RMTRAN=CSGM, XRF CAPABLE TERMINAL TRANSACTN
SEC=NO, RACF SUPPORT
SRBSVC=215, Default type 4 svc for hpo
STR=15, SYSTEM RECOVERY TABLE
START=AUTO, COLD START
STARTER=YES, ALLOWS $ IN SUFFIX
STGRCV=YES, STORAGE RECOVERY FUNCTION
STGPROT=YES, STORAGE PROTECTION
SUBTSK=0, EXTRA TCB'S REQUIRED
SUFFIX=70, STARTER SUFFIX
SYSINDT=FAFD, CICS SYSTEM IDENTIFIER
TAKEOVER=MANUAL, CONFIRMATION OF TAKEOVER REQD
TCP=YES, TERMINAL CONTROL PROGRAM
TCT=NO, VTAM TERMINALS ONLY
TD=(3,3), TRANSIENT DATA, 3 BUFS, 3 STRGS
INTR=ON, INTERNAL TRACE ON
TRTASBS=64, TRACE TABLE SIZE (KIBOYTES)
TS=(3,3), FULL TS (3 BUFFERS, 3 STRINGS)
TSMSET=4, 4 MESSAGE SET ENTRIES
TST=NO, NO TEMP STORAGE TABLE INCLUDED
VTAM=YES, INITIALIZE FOR VTAM
B.2.1 FAFD CICS Region SYSIN

SIT=70,
GRPLIST=TPNSFAFD, INCLUDE DLI SAMPLE PROGRAMS & TRANSACTIONS
APPLID=CICSFAFD,
SYSIDNT=FAFD,
INITPARM=(DSN2STRT='30, DBD1'),
MXT=80,
XRF=NO,
SPOOL=YES,
DUMP=NO,
SRBSVC=215,
CICSSVC=216,
AUXTR=OFF,
GMTEXT="Welcome to Poughkeepsie Parallel Sysplex System (PET)
IBM SAA ImagePlus Folder Application Facility MVS/ESA V2.2.1
* * * * * TPNS Benchmark Region #1 * * * * *
.

B.2.2 FAF2 CICS Region SYSIN

SIT=70,
GRPLIST=TPNSFAF2, INCLUDE DLI SAMPLE PROGRAMS & TRANSACTIONS
APPLID=CICSFASF2,
SYSIDNT=FAF2,
INITPARM=(DSN2STRT='30, DBD1'),
MXT=80,
XRF=NO,
SPOOL=YES,
DUMP=NO,
SRBSVC=215,
CICSSVC=216,
AUXTR=OFF,
GMTEXT="Welcome to Poughkeepsie Parallel Sysplex System (PET)
IBM SAA ImagePlus Folder Application Facility MVS/ESA V2.2.1
* * * * * TPNS Benchmark Region #2 * * * * *
.

END
Appendix C. IODM Exit: EKCCDDTE

The EKCCDDTE exit is enabled by installing PTF UN77405. The following sample program shows what we used for our configuration.

```
000100 IDENTIFICATION DIVISION.
000200 PROGRAM-ID. EKCCDDTE.
000300***************************************************************** 
00040000000500* MOD-NAME: EKCCDDTE
000500* DESCRIPTIVE-NAME: DISPERSE DISPLAY TRANSACTIONS EXIT
00060000000700* STATUS: VERSION 2 RELEASE 2.0
00080000000900* FUNCTION:
00090000001000* THIS EXIT WILL ENABLE THE USER TO DISPERSE THEIR DISPLAY
00100000001100* REQUESTS OVER MULTIPLE TRANSACTIONS.
00120000001300* OPERATION:
00140000001500* 1) RETRIEVE DISPLAY TRANSACTION FROM THE FRONT-END APPLICATION.
00160000001700* 2) EXTRACT THE DESIRED FIELDS FROM THE DISPLAY COMMAND.
00180000001900* 3) USE THE EXTRACTED FIELDS TO DETERMINE WHICH TRANSACTION
00200000002100* SHOULD BE ISSUED.
00220000002300* 4) REISSUE THE DISPLAY REQUEST USING THE NEW TRANSACTION ID.
00240000002500* RECOVERY OPERATION:
00260000002700* CICS ERRORS: WRITE OUT AN ERROR MESSAGE AND THE DISPLAY
00280000002900* COMMAND TO A TEMPORARY STORAGE QUEUE
00290000003100* CICS ABENDS: CICS WILL HANDLE ANY ABENDS
00300000003200* NOTE: THE USER CAN CHANGE HOW THIS EXIT HANDLES CICS
00310000003300* ERRORS AND CICS ABENDS. THE ERROR ROUTINE PROVIDED
00320000003400* IN THIS EXIT IS ONLY A SAMPLE.
00350000003600* NOTES:
00370000003800* * ALL TRANSACTION IDS GENERATED BY THIS EXIT MUST BE DEFINED
00390000004000* IN THE CICS PROGRAM CONTROL TABLE (PCT). IF YOU DO NOT
00410000004200* DEFINE THESE TRANSACTION IDS IN THE CICS PCT, A TRANSIDERR
00430000004400* WILL OCCUR ON THE CICS START COMMAND.
00450000004600* ALSO, EACH NEW TRANSACTION ID MUST HAVE AN ENTRY IN THE DB2
00470000004800* RESOURCE CONTROL TABLE (RCT) WITH AN ASSOCIATED DB2 PLAN.
00490000005000* THE CURRENT DB2 PLAN FOR DISP TRANSACTIONS IS EKCPDISP.
00500000005200* YOU MAY EITHER USE THIS PLAN, OR CREATE NEW ONES TO LIMIT
00510000005300* THE NUMBER OF DB2 THREADS PER TRANSACTION.
00540000005500* IF YOUR INSTALLATION IS USING A CUSTOM FRONT-END
00560000005700* APPLICATION, YOU MAY WANT TO CONSIDER CHANGING THE
00580000005900* TRANSACTION ID FOR THE DISPLAY COMMAND FROM THE FRONT-END
```
APPLICATION. THAT WILL ELIMINATE THE NEED FOR THIS EXIT. 

* SINCE THIS EXIT INTERCEPTS THE DISPLAY COMMAND BEFORE IT REACHES IODM, IODM CAN NOT HANDLE ANY ERRORS THAT OCCUR IN THIS EXIT. THEREFORE, THIS EXIT MUST HANDLE ALL ERROR SITUATIONS.

* SITUATIONS THAT OCCUR BEFORE THE DISPLAY COMMAND IS RESTARTED WITH THE NEW TRANSACTION ID. ONCE IODM GETS CONTROL, IT WILL HANDLE ANY ERROR SITUATIONS.

* THE FUNCTION OF THIS EXIT IS TO ALLOW THE USER TO HAVE MORE CONTROL OVER HOW IODM AND CICS PROCESS DISPLAY COMMANDS. HOWEVER, THE ULTIMATE GOAL OF THIS EXIT IS TO ENSURE THAT THE DISPLAY COMMAND DOES GET PROCESSED BY IODM. THEREFORE, IF AN ERROR OCCURS IN THIS EXIT OR YOU ARE UNABLE TO DETERMINE WHICH TRANSACTION TO START, YOU SHOULD ALWAYS HAVE A DEFAULT TRANSACTION WHICH YOU CAN USE TO PROCESS THE DISPLAY COMMAND.

THE ONLY TYPE OF ERROR THAT WOULD CAUSE YOU NOT TO USE THE DEFAULT TRANSACTION ID AND PROCESS THE DISPLAY COMMAND IS A CICS ERROR. IN THIS CASE YOU SHOULD PROBABLY LOG THE ERROR AND TERMINATE PROCESSING.

**===============================================================**

DEPENDENCIES:

* THE FRONT-END APPLICATION THAT IS BEING USED, AND WHETHER OR NOT THE RETURN TRANSACTION ID OPTION IS UTILIZED. REFER TO CHAPTER 9, "DISPLAYING OBJECTS", IN THE IODM APPLICATION PROGRAMMER'S GUIDE FOR MORE DETAILS ON THIS DEPENDENCY.

**===============================================================**

RESTRICTIONS:

* THIS EXIT SHOULD ONLY BE USED TO INTERCEPT DISPLAY COMMANDS COMING FROM THE FRONT-END APPLICATION. ALL OTHER IODM COMMANDS SHOULD BE PROCESSED IN THE NORMAL WAY.

**===============================================================**

CALLING INTERFACE:

* REFER TO CHAPTER 9, "DISPLAYING OBJECTS", IN THE IODM APPLICATION PROGRAMMER'S GUIDE FOR FRONT-END APPLICATIONS (SC31-7540-02) ON HOW TO ISSUE DISPLAY COMMANDS TO IODM FROM EITHER AN IMS OR CICS FRONT-END APPLICATION.

**===============================================================**

PARAMETERS:

* QUEUE - EKCCDDTE - USED TO LOG ANY ERRORS THAT OCCUR WHILE
THIS EXIT IS EXECUTING. THIS QUEUE IS EXECUTING. THIS QUEUE IS 01130000
JUST A SAMPLE. IF YOU DESIRE, YOU CAN CHANGE THE NAME OF THIS QUEUE OR THE METHOD THIS EXIT USES TO LOG ERROR MESSAGES.

CONTROL-BLOCKS:

INSTALLATION DEPENDENT

RETCODE (RETURN CODES):

INSTALLATION DEPENDENT

REACODE (REASON CODES):

INSTALLATION DEPENDENT

MESSAGES:

USR0001A - INDICATES THAT A CICS ERROR OCCURRED. THE MODULE THAT DETECTED THE ERROR ALONG WITH THE CICS EIBFM AND EIBRCE CODES ARE DISPLAYED IN THE MESSAGE. THIS IS JUST A SAMPLE MESSAGE. YOU CAN CHANGE THE MESSAGE ID OR THE CONTENT OF THE MESSAGE TO MEET YOUR NEEDS.

ABEND-CODES:

INSTALLATION DEPENDENT

SUBROUTINES:

INSTALLATION DEPENDENT

***END OF SPECIFICATIONS******************************************
017200********************************************************************
017200** WORKING-STORAGE SECTION.
017300 01 WORK-EYECATCHER.
017400017500 ** BEGINNING OF WS ******.
017600 05 WORK-WSBEGIN PIC X(29) VALUE 01750000
017700 05 WORK-MODNAME PIC X(08) VALUE 'EKCCDDT6'. 01770000
017800 05 WORK-MODVERS PIC X(04) VALUE 'V220'. 01780000
017900 05 WORK-WHENCOMP PIC X(20) VALUE SPACES. 01790000
0180000180000
018100********************************************************************
018100** GENERAL WORK AREA
018200* WORK-VARIABLES.
018300********************************************************************
018400 01 WORK-VARIABLES.
018500 05 WORK-EIBFN PIC X(02) VALUE SPACES. 01860000
018700 05 WORK-EIBRCODE PIC X(06) VALUE SPACES. 01870000
0188000189000
018900 05 WORK-GDS-LENGTH PIC S9(04) COMP VALUE 0. 01890000
019000 05 WORK-RTERMID PIC X(04) VALUE SPACES. 01900000
019100 05 WORK-TRANSID PIC X(04) VALUE SPACES. 01910000
019200 05 WORK-TRANSID PIC X(04) VALUE SPACES. 01920000
019300 05 WORK-QUEUE PIC X(08) VALUE 'EKCCDDT6'.01930000
019400 05 WORK-INDEX PIC S9(04) COMP VALUE 0. 01940000
0195000196000
019600 05 WORK-DISPLAY-RECEIVED-FLAG PIC X(01) VALUE 'N'. 01960000
019700 88 WORK-DISPLAY-RECEIVED VALUE 'Y'. 01970000
019800 88 WORK-DISPLAY-RECEIVED VALUE 'N'. 01980000
019900 05 WORK-FOUND-FLAG PIC X(01) VALUE 'N'. 01990000
020000 88 WORK-FOUND VALUE 'Y'. 02000000
020100 88 WORK-FOUND VALUE 'N'. 02010000
020200 05 WORK-FIXED-AREA PIC X(01) VALUE 'B'. 02020000
020300 88 WORK-BEGIN-OF-FIXED VALUE 'B'. 02030000
020400 88 WORK-END-OF-FIXED VALUE 'E'. 02040000
020500 05 WORK-OBJECT-LOCATION PIC X(01) VALUE 'L'. 02050000
020600 88 WORK-LOCAL-OBJECT VALUE 'L'. 02060000
020700 88 WORK-REMOTE-OBJECT VALUE 'R'. 02070000
020800 05 WORK-TSYSID-FLAG PIC X(01) VALUE 'N'. 02080000
020900 88 WORK-TSYSID SET VALUE 'Y'. 02090000
021000 88 WORK-TSYSID-SET VALUE 'N'. 02100000
021100 05 WORK-APUSERID-FLAG PIC X(01) VALUE 'N'. 02110000
021200 88 WORK-APUSERID-SET VALUE 'Y'. 02120000
021300 88 WORK-APUSERID-SET VALUE 'N'. 02130000
021400 05 WORK-UTERMD-FLAG PIC X(01) VALUE 'N'. 02140000
021500 88 WORK-UTERMD-SET VALUE 'Y'. 02150000
021600 88 WORK-UTERMD-SET VALUE 'N'. 02160000
021700 05 WORK-OBJDEFIN-FLAG PIC X(01) VALUE 'N'. 02170000
021800 88 WORK-OBJDEFIN-SET VALUE 'Y'. 02180000
021900 88 WORK-OBJDEFIN-SET VALUE 'N'. 02190000
022000 05 WORK-WKSTATID-FLAG PIC X(01) VALUE 'N'. 02200000
022100 88 WORK-WKSTATID-SET VALUE 'Y'. 02210000
022200 88 WORK-WKSTATID-SET VALUE 'N'. 02220000
022300022400
022400********************************************************************
022400** CONSTANT WORK AREA
022500* WORK-VARIABLES.
022600********************************************************************
022700 01 WORK-INDEX.
0228000229000
023000* THESE CONSTANT VARIABLES CONTAIN THE GDS IDENTIFIERS
OF IODM PARAMETERS AND GDS STRUCTURES. YOU CAN OBTAIN THE GDS IDS FOR IODM PARAMETERS IN THE IODM APPLICATION PROGRAMMER'S GUIDE FOR FRONT-END APPLICATIONS. */

05 CNST-TSYSID-GDS-ID PIC X(02) VALUE X'0005'.
05 CNST-OSYSID-GDS-ID PIC X(02) VALUE X'0006'.
05 CNST-OBJNAME-GDS-ID PIC X(02) VALUE X'0007'.
05 CNST-APUSERID-GDS-ID PIC X(02) VALUE X'000C'.
05 CNST-UTERMID-GDS-ID PIC X(02) VALUE X'000E'.
05 CNST-OBJDEFIN-GDS-ID PIC X(02) VALUE X'0014'.
05 CNST-COLLNAME-GDS-ID PIC X(02) VALUE X'003E'.
05 CNST-WKSTATID-GDS-ID PIC X(02) VALUE X'0045'.
05 CNST-OBJLIST-GDS-ID PIC X(02) VALUE X'00FC'.

/* THESE CONSTANT VARIABLES ARE SAMPLES ON HOW YOU CAN DISPERSE DISPLAY REQUESTS IN REGARDS TO USERS OR GROUPS OF USERS. THESE CONSTANTS ARE USER SPECIFIED. */

05 CNST-APUSERID-ACCOUNTING PIC X(08) VALUE 'ACCOUNT'.
05 CNST-APUSERID-RESEARCH PIC X(08) VALUE 'RESEARCH'.
05 CNST-APUSERID-ADMIN PIC X(08) VALUE 'ADMIN'.

/* THESE CONSTANT VARIABLES CONTAIN THE IDENTIFIERS OF THE NEW TRANSACTIONS THAT WILL BE USED TO REISSUE THE DISPLAY REQUEST. THESE CONSTANTS ARE USER SPECIFIED. */

05 CNST-TRANSID-ACCOUNTING PIC X(04) VALUE '????'.
05 CNST-TRANSID-RESEARCH PIC X(04) VALUE '????'.
05 CNST-TRANSID-ADMIN PIC X(04) VALUE '????'.
05 CNST-TRANSID-LOCAL PIC X(04) VALUE '????'.
05 CNST-TRANSID-REMOTE PIC X(04) VALUE '????'.
05 CNST-TRANSID-DASD PIC X(04) VALUE '????'.
05 CNST-TRANSID-LIBRARY PIC X(04) VALUE '????'.
05 CNST-TRANSID-SHELF PIC X(04) VALUE '????'.
05 CNST-TRANSID-DEFAULT PIC X(04) VALUE 'DISD'.

*****************************************************************
ERROR MESSAGE(S) WORK AREA
*****************************************************************

01 WORK-CICS-ERR-MSG.
05 FILLER PIC X(32) VALUE 'USR0001A CICS ERROR OCCURRED -- '.
05 FILLER PIC X(24) VALUE 'MODERR: EKCCDDE EIBFN: '.
05 WORK-DISPLAY-EIBFN PIC X(04) VALUE SPACES.
05 FILLER PIC X(11) VALUE ' EIBRCODE: '.
05 WORK-DISPLAY-EIBRCODE PIC X(12) VALUE SPACES.

*****************************************************************
HEX CONVERSION ROUTINE WORK AREA
*****************************************************************

01 WORK-HEX-CONVERSION-VARIABLES.

05 WORK-DIVIDEND PIC 9(09) COMP VALUE ZEROS.
05 WORK-DIVIDEND-CHAR REDEFINES WORK-DIVIDEND.
029000  10  FILLER    PIC X(02).          02900000
029100  10  WORK-DIVIDEND-CHAR-2-BYTES  PIC X(02).  02910000
029200  05  WORK-DIVISOR     PIC 9(04) COMP VALUE ZEROS. 02920000
029300  05  WORK-QUOTIENT    PIC 9(04) COMP VALUE ZEROS. 02930000
029400  05  WORK-REMAINDER    PIC 9(04) COMP VALUE ZEROS. 02940000
029500  05  WORK-NUM-HALFWORDS PIC 9(09) COMP VALUE ZEROS. 02950000
029600  05  WORK-HEX-FIELD-SUB PIC 9(09) COMP VALUE ZEROS. 02960000
029700  05  WORK-HALFWORD-SUB  PIC 9(09) COMP VALUE ZEROS. 02970000
029800  05  WORK-HEX-TABLE.   02980000
029900  10  FILLER    PIC X(16) VALUE 02990000
030000  '0123456789ABCDEF'.          03000000
030100  05  FILLER REDEFINES WORK-HEX-TABLE. 03010000
030200  10  WORK-HEX-VALUE     PIC X(01) 03020000
030300        OCCURS 16 TIMES.      03030000
030400  05  WORK-HEX-FIELD.   03040000
030500  10  WORK-HEX-NUMBER    PIC X(01) 03050000
030600        OCCURS 16 TIMES.      03060000
030700  05  WORK-FIELD-TO-CONV. 03070000
030800  10  WORK-HALFWORD-TO-CONV PIC X(02) 03080000
030900        OCCURS 4 TIMES.      03090000
031000
031100*****************************************************************
031200 01 WORK-EXTRACT-PROCESS-VARIABLES. 03110000
031300*****************************************************************
031400 01 WORK-EXTRACT-PROCESS-VARIABLES. 03140000
031500 01 WORK-EXTRACT-PROCESS-VARIABLES. 03150000
031600ICTURE LIST AREA FIELDS. */ 03160000
031700  05  WORK-TSYSID-VALUE  PIC X(04) VALUE SPACES. 03170000
031800  05  WORK-AUSERID-VALUE  PIC X(08) VALUE SPACES. 03180000
031900  05  WORK-UTERMID-VALUE  PIC X(08) VALUE SPACES. 03190000
032000  05  WORK-WKSTATID-VALUE  PIC X(08) VALUE SPACES. 03200000
032100  05  WORK-OBJDEFIN-VALUE  PIC S9(04) COMP VALUE 0. 03210000
032200*****************************************************************
032300  05  WORK-MAX-OBJECTS  PIC S9(04) COMP VALUE 15. 03230000
032400  05  WORK-OSSID.           03240000
032500  10  WORK-OSSID-VALUE     PIC S9(04) COMP VALUE 0. 03250000
032600  10  WORK-OSSID-VALUE     PIC X(04) VALUE SPACES 03260000
032700        OCCURS 15 TIMES.       03270000
032800  05  WORK-OBJNAME.        03280000
032900  10  WORK-OBJNAME-VALUE   PIC S9(04) COMP VALUE 0. 03290000
033000  10  WORK-OBJNAME-VALUE   PIC X(40) VALUE SPACES 03300000
033100        OCCURS 15 TIMES.       03310000
033200  05  WORK-COLLNAME.       03320000
033300  10  WORK-COLLNAME-VALUE  PIC S9(04) COMP VALUE 0. 03330000
033400  10  WORK-COLLNAME-VALUE  PIC X(44) VALUE SPACES 03340000
033500        OCCURS 15 TIMES.       03350000
033600*****************************************************************
033700  05  WORK-EXTRACT-GDS-ID  PIC X(02) VALUE SPACES. 03370000
033800  05  WORK-EXTRACT-VALUE  PIC X(128) VALUE SPACES. 03380000
033900  05  WORK-EXTRACT-CHAR-REDEF REDEFINES WORK-EXTRACT-VALUE. 03390000
034000  10  WORK-EXTRACT-CHAR-VALUE  PIC X(08). 03400000
034100  10  FILLER    PIC X(120). 03410000
034200  05  WORK-EXTRACT-CHAR-REDEF REDEFINES WORK-EXTRACT-VALUE. 03420000
034300  10  WORK-EXTRACT-CHAR-VALUE  PIC S9(04) COMP. 03430000
034400  10  FILLER    PIC X(126). 03440000
034500
034600*****************************************************************
034700 01 GDS WORK AREAS 03470000
034800*****************************************************************
034900 01 GDS-PARAMETER PIC X(04).
035000 01 GDS-PARM-REDEF REDEFINES GDS-PARAMETER.
035200 05 GDS-ID PIC X(02).
035300 05 GDS-PARM-LENGTH PIC S9(04) COMP.
035400 01 GDS-VARIABLES.
035600 05 GDS-INDEX PIC S9(04) COMP.
035700 01 GDS-BUFFER.
035900 05 GDS-CMDCODE PIC X(04).
036000 05 GDS-CMD-LENGTH PIC S9(09) COMP.
036100 05 FILLER PIC X(04).
036200 05 GDS-PARAMETERS PIC X(1788).
036300 036400 036500 01 WORK-ENDOFWS PIC X(23) VALUE '****** END OF WS ******'.
036600 036700 036800* END OF WORKING STORAGE
036900 EJECT
037000 LINKAGE SECTION.
037100 PROCEDURE DIVISION.
037200* PREPARE MODULE FOR PROCESSING. */
037300 PERFORM 200-INIT THRU 200-INIT-EXIT.
037400* RETRIEVE DISPLAY COMMAND FROM THE FRONT-END APPLICATION. */
037500 PERFORM 300-RETRIEVE-COMMAND THRU 300-RETRIEVE-COMMAND-EXIT.
037600* EXTRACT SPECIFIED FIELDS FROM THE DISPLAY COMMAND. */
037700 PERFORM 400-EXTRACT-FIELDS THRU 400-EXTRACT-FIELDS-EXIT.
037800* DETERMINE WHICH NEW TRANSACTION TO USE. */
037900 PERFORM 500-GENERATE-TRAN THRU 500-GENERATE-TRAN-EXIT.
038000* REISSUE THE DISPLAY COMMAND USING THE NEW TRANSACTION. */
038100 PERFORM 600-START-DISPLAY THRU 600-START-DISPLAY-EXIT.
038200* TERMINATE PROCESSING. */
038300 PERFORM 900-RETURN-EXIT.
040800 EXIT.
040900 EJECT
041000
041100
041200 200-INIT.
041300/* THIS PARAGRAPH WILL CONTAIN ANY MODULE PREPARATION STEPS. */
041400
041500/* ALL CICS ERRORS WILL BE PROCESSED IN PARAGRAPH
041600*/ 800-CICS-ERROR. */
041700 EXEC CICS HANDLE CONDITION
041800 ERROR (800-CICS-ERROR)
041900 END-EXEC.
042000
042100 MOVE WHEN-COMPIL ED TO WORK-WHENCOMP.
042200
042300 200-INIT-EXIT.
042400 EXIT.
042500
042600 300-RETRIEVE-COMMAND.
042700/* THIS PARAGRAPH WILL RETRIEVE THE DISPLAY COMMAND AND THE
042800*/ RETURN TRANSACTION ID FROM THE FRONT-END APPLICATION. */
042900
043000*/ SET THE MAXIMUM LENGTH ALLOWED FOR THE GDS DATA. */
043100 MOVE LENGTH OF GDS-BUFFER TO WORK-GDS-LENGTH.
043200
043300*/ IF YOUR INSTALLATION IS USING IPFAF/API CICS, USE THE
043400*/ FOLLOWING RETRIEVE COMMAND AND DELETE THE OTHER TWO RETRIEVE
043500*/ COMMANDS IN THIS PARAGRAPH. */
043600 EXEC CICS RETRIEVE
043700 INTO (GDS-BUFFER)
043800 LENGTH (WORK-GDS-LENGTH)
043900 RTRANSID (WORK-RTRANSID)
044000 END-EXEC.
044100
044200 SET FLAG TO INDICATE THAT THE DISPLAY COMMAND
044300 WAS RETRIEVED. */
044400 SET WORK-DISPLAY-RECEIVED TO TRUE.
044500
044600 300-RETRIEVE-COMMAND-EXIT.
044700 EXIT.
044800
044900 400-EXTRACT-FIELDS.
045000/* THIS PARAGRAPH WILL EXTRACT ALL THE REQUIRED INFORMATION
045100 FROM THE DISPLAY COMMAND TO PROPERLY DETERMINE WHICH
045200 TRANSACTION SHOULD BE USED TO RESTART THE DISPLAY COMMAND
045300 REQUEST. */
045400
045500 /* EXTRACT TSYSID FIELD FROM DISPLAY COMMAND. */
045600 MOVE CNST-TSYSID-GDS-ID TO WORK-EXTRACT-GDS-ID.
045700 PERFORM 410-EXTRACT-FIXED-FIELD THRU
045800 410-EXTRACT-FIXED-FIELD-EXIT.
045900 IF WORK-FOUND THEN
046000 MOVE WORK-EXTRACT-CHAR-VALUE TO WORK-TSYSID-VALUE
046100 SET WORK-TSYSID-SET TO TRUE
046200 END-IF.
046300
046400 /* EXTRACT THE OBJECT LIST AREA FIELDS FROM THE DISPLAY
046500 COMMAND. */
046600 PERFORM 420-EXTRACT-OBJECT-FIELDS THRU
055200 420-EXTRACT-OBJECT-FIELDS-EXIT.
055300
055400/* VALIDATE THE FIELDS EXTRACTED FROM THE DISPLAY COMMAND. */
055500* PERFORM 430-VALIDATE-FIELDS THRU 430-VALIDATE-FIELDS-EXIT.
055600*
055700
055800 400-EXTRACT-FIELDS-EXIT.
055900 EXIT.
056000
056100 410-EXTRACT-FIXED-FIELD.
056200/* THIS PARAGRAPH WILL EXTRACT THE PARAMETER VALUE FOR THE ...
056300* SPECIFIED FIELD FROM THE DISPLAY GDS DATA. IF THE FIELD ...
056400* IS NOT PRESENT IN THE GDS DATA, THE NOT-FOUND FLAG WILL ...
056500* BE SET TO TRUE AFTER THIS PARAGRAPH TERMINATES. THIS ...
056600* PARAGRAPH WILL ONLY SEARCH IN THE FIXED LIST AREA OF THE ...
056700* DISPLAY COMMAND FOR THE SPECIFIED PARAMETER. */
056800
056900/* INITIALIZE FLAGS AND DATA AREA. */
057000 SET WORK-NOT-FOUND TO TRUE.
057100 SET WORK-BEGIN-OF-FIXED TO TRUE.
057200 INITIALIZE WORK-EXTRACT-VALUE.
057300
057400/* INITIALIZE THE GDS INDEX TO 13 TO BY-PASS THE 12 BYTE ...
057500* GDS COMMAND HEADER INFORMATION. */
057600 MOVE 13 TO GDS-INDEX.
057700
057800/* PARSE THROUGH THE DISPLAY COMMAND UNTIL THE SPECIFIED ...
057900* FIELD IS FOUND, END OF THE FIXED LIST AREA FOR THE DISPLAY ...
058000* COMMAND IS REACHED, OR THE END OF THE DISPLAY COMMAND ...
058100* IS ENCOUNTERED. */
058200 PERFORM 
058300 UNTIL (WORK-FOUND OR WORK-END-OF-FIXED OR (GDS-INDEX >= WORK-GDS-LENGTH))
058400 WORK-FOUND OR WORK-END-OF-FIXED OR (GDS-INDEX >= WORK-GDS-LENGTH)
058500
058600
058700/* GET NEXT GDS ID AND PARAMETER LENGTH. */
058800 MOVE GDS-BUFFER(GDS-INDEX:4) TO GDS-PARAMETER
058900
059000/* DETERMINE IF THE CURRENT PARAMETER IS THE SPECIFIED ...
059100* PARAMETER OR THE START OF THE OBJECT LIST AREA. */
059200 EVALUATE GDS-ID
059300 WHEN WORK-EXTRACT-GDS-ID
059400
059500/* ADVANCE INDEX TO START OF PARAMETER DATA AREA, ...
059600* EXTRACT THE PARAMETER VALUE, AND SET FOUND FLAG ...
059700* TO TRUE. */
059800 ADD 4 TO GDS-INDEX
059900 MOVE GDS-BUFFER(GDS-INDEX:GDS-PARM-LENGTH) TO WORK-EXTRACT-VALUE(1:GDS-PARM-LENGTH)
060000 WORK-EXTRACT-VALUE(1:GDS-PARM-LENGTH)
060100 SET WORK-FOUND TO TRUE
060200 SET WORK-FOUND TO TRUE
060300 WHEN CNST-OBJLIST-GDS-ID
060400
060500/* THE FIELD WAS NOT FOUND. SET END OF FIXED ...
060600* AREA TO TRUE. */
060700 SET WORK-END-OF-FIXED TO TRUE
060800
060900 WHEN OTHER
061000
ADVANCE TO NEXT PARAMETER. */  
COMPUTE GDS-INDEX = GDS-INDEX + GDS-PARM-LENGTH + 4  
END-EVALUATE  
END-PERFORM.  
410-EXTRACT-FIXED-FIELD-EXIT.  
EXIT.  
420-EXTRACT-OBJECT-FIELDS.  
THIS PARAGRAPH WILL EXTRACT ALL OF THE OBJECT LIST AREA AND USE A SEPARATE COUNTER TO KEEP TRACK OF HOW MANY TIMES A PARAMETER WAS FOUND IN THE GDS DATA. */  
INITIALIZE THE GDS INDEX TO 13 TO BY-PASS THE 12 BYTE GDS COMMAND HEADER INFORMATION. */  
MOVE 13 TO GDS-INDEX.  
PARSE THROUGH THE DISPLAY COMMAND UNTIL THE END OF THE DISPLAY COMMAND IS ENCOUNTERED. */  
PERFORM UNTIL (GDS-INDEX >= WORK-GDS-LENGTH)  
GET NEXT GDS ID AND PARAMETER LENGTH. */  
MOVE GDS-BUFFER(GDS-INDEX:4) TO GDS-PARAMETER  
CHECK TO SEE IF THE PARAMETER IS ONE THAT SHOULD BE SAVED. IF NOT, GO TO THE NEXT PARAMETER IN THE GDS DATA. */  
EVALUATE GDS-ID  
WHEN CNST-OSYSID-GDS-ID  
IF MAXIMUM NUMBER OF OBJECTS IS NOT REACHED, ADVANCE INDEX TO START OF PARAMETER DATA AREA, INCREMENT THE OSYSID COUNTER, AND EXTRACT THE DATA. */  
IF (WORK-OSYSID-COUNT < WORK-MAX-OBJECTS) THEN  
ADD 4 TO GDS-INDEX  
ADD 1 TO WORK-OSYSID-COUNT  
MOVE GDS-BUFFER(GDS-INDEX:GDS-PARM-LENGTH) TO WORK-OSYSID-VALUE(WORK-OSYSID-COUNT)  
IF WORK-TSYSID-SET  
MOVE WORK-TSYSID-VALUE TO GDS-BUFFER(GDS-INDEX:GDS-PARM-LENGTH)  
ELSE  
COMPUTE GDS-INDEX = GDS-INDEX + GDS-PARM-LENGTH + 4  
END-IF  
WHEN OTHER  
ADVANCE TO NEXT PARAMETER. */  
COMPUTE GDS-INDEX = GDS-INDEX + GDS-PARM-LENGTH + 4  
END-EVALUATE
FIELD       VARIABLE
--------       ----------------------
TSYSID        WORK-TSYSID-SET
OSYSID        *WORK-OSYSID-VALUE
OBJNAME       *WORK-OBJNAME-VALUE
CROSSREF      WORK-OBJNAME-VALUE
APUSERID      WORK-APUSERID-SET
UTERMIN       WORK-UTERMIN-SET
OBJDEFIN      WORK-OBJDEFIN-SET
**COLLNAME    *WORK-COLLNAME-VALUE
**WKSTATID    WORK-WKSTATID-SET
WORK-WKSTATID

* THIS IS BECAUSE IPFAF 1.2 DOES NOT SUPPLY THE COLLNAME FIELD ON THE DISPLAY COMMAND.
** IF YOUR FRONT-END APPLICATION IS IPFAF 1.2, THESE FIELDS WILL NOT BE CONTAINED IN THE DISPLAY COMMAND.
** IF YOUR FRONT-END APPLICATION IS IPFAF 1.2, THESE FIELDS WILL NOT BE CONTAINED IN THE DISPLAY COMMAND.

THE CODE IN THIS PARAGRAPH IS STRICTLY INSTALLATION DEPENDENT. */

074300* /* IF ANY REMOTE IODM PROCESSING IS INVOLVED IN THIS DISPLAY COMMAND, REMOTE IODM PROCESSING INVOLVES ANY OBJECTS THAT ARE STORED AT A REMOTE IODM OR THE OBJECTS INVOLVED IN THE DISPLAY COMMAND WILL BE Displayed AT A WORKSTATION ON A REMOTE IODM. */
074500 PERFORM VARYING WORK-INDEX FROM 1 BY 1 UNTIL ((WORK-INDEX > WORK-OSYSID-COUNT) OR...
IF TSYSID DOESN'T EQUAL OSYSID, IODM REMOTE PROCESSING IS INVOLVED. IF (WORK-TSYSID-VALUE NOT = WORK-OSYSID-VALUE(WORK-INDEX)) SET WORK-REMOTE-OBJECT TO TRUE.

END-IF END-PERFORM.

430-VALIDATE-FIELDS-EXIT.

EXIT.

500-GENERATE-TRAN.

THIS PARAGRAPH WILL BE USED TO DETERMINE WHAT THE NEW TRANSACTION ID VALUE WILL BE. THIS TRANSACTION ID CAN BE DETERMINED BY USING THE PARAMETERS EXTRACTED FROM THE GDS DATA FOR THE DISPLAY COMMAND.

DATA FOR THE DISPLAY COMMAND. */

END-IF END-PERFORM.

VALIDATE-FIELDS-EXIT.

EXIT.

500-GENERATE-TRAN.

THIS PARAGRAPH WILL BE USED TO DETERMINE WHAT THE NEW TRANSACTION ID VALUE WILL BE. THIS TRANSACTION ID CAN BE DETERMINED BY USING THE PARAMETERS EXTRACTED FROM THE GDS DATA FOR THE DISPLAY COMMAND.

DATA FOR THE DISPLAY COMMAND. */

END-IF END-PERFORM.

430-VALIDATE-FIELDS-EXIT.

EXIT.

500-GENERATE-TRAN.

THIS PARAGRAPH WILL BE USED TO DETERMINE WHAT THE NEW TRANSACTION ID VALUE WILL BE. THIS TRANSACTION ID CAN BE DETERMINED BY USING THE PARAMETERS EXTRACTED FROM THE GDS DATA FOR THE DISPLAY COMMAND.

DATA FOR THE DISPLAY COMMAND. */

END-IF END-PERFORM.

430-VALIDATE-FIELDS-EXIT.

EXIT.
**NOTE TO PROGRAMMER**

- **A.** If your front-end application runs in an IMS region and you use a return transaction ID, use the CICS START command associated with IPFAS/API IMS.
- **B.** If your front-end application runs in a CICS region and you use a return transaction ID, use the CICS START command associated with IPFAS/API CICS.
- **C.** If your front-end application runs in either an IMS or CICS region and you do not use a return transaction ID, use the CICS START command associated with IPFAS 1.2.

---

### Appendix C. IODM Exit: EKCCDDTE

- **Move EIBFN to WORK-EIBFN.**
- **Move EIBRCODE to WORK-EIBRCODE.**
- **Move EIBFN to WORK-FIELD-TO-CONV.**
- **Move EIBRCODE to WORK-FIELD-TO-CONV.**
- **Perform 810-HEX-CONVERSION THRU 810-HEX-CONVERSION-EXIT.**
- **Move WORK-HEX-FIELD to WORK-DISPLAY-EIBFN.**
- **Move WORK-HEX-FIELD to WORK-DISPLAY-EIBRCODE.**
- **To ensure that only one invocation of this exit is logging error messages to the temporary storage queue at a time,**
ENQUEUE ON THE QUEUE NAME WHILE YOU ARE WRITING TO THE QUEUE AND ISSUE A DEQUEUE REQUEST WHEN YOU ARE FINISHED WRITING TO THE QUEUE.

EXEC CICS ENQ
    RESOURCE (WORK-QUEUE)
    LENGTH (LENGTH OF WORK-QUEUE)
END-EXEC.

EXEC CICS WRITEQ TS
    QUEUE (WORK-QUEUE)
    FROM (WORK-CICS-ERR-MSG)
    LENGTH (LENGTH OF WORK-CICS-ERR-MSG)
END-EXEC.

EXEC CICS DEQ
    RESOURCE (WORK-QUEUE)
    LENGTH (LENGTH OF WORK-QUEUE)
END-EXEC.

EXEC CICS WRITEQ TS
    QUEUE (WORK-CICS-ERR-MSG)
    FROM (GDS-BUFFER)
    LENGTH (WORK-GDS-LENGTH)
END-EXEC.

PERFORM 900-RETURN THRU 900-RETURN-EXIT.

INITIALIZE WORK-HEX-FIELD.
MOVE 1 TO WORK-HEX-FIELD-SUB.

PERFORM 08100000 VARYING WORK-HALFWORD-SUB FROM 1 BY 1 UNTIL (WORK-HALFWORD-SUB > WORK-NUM-HALFWORDS)

MOVE WORK-HALFWORD-TO-CONV(WORK-HALFWORD-SUB) TO WORK-DIVIDEND-CHAR-2-BYTES
MOVE 4096 TO WORK-DIVISOR

THE FOLLOWING LOOP WILL CONVERT ONE HEXADECIMAL NUMBER INTO DISPLAYABLE CHARACTERS.
CHARACTER AT A TIME. */
PERFORM 4 TIMES

DETERMINE THE VALUE OF THE HEXADECIMAL CHARACTER
AND MOVE THE VALUE TO THE DISPLAYABLE CHARACTER
ARRAY. */
DIVIDE WORK-DIVIDEND BY WORK-DIVISOR
GIVING WORK-QUOTIENT
REMAINDER WORK-REMAINDER
MOVE WORK-HEX-VALUE (WORK-QUOTIENT + 1) TO
WORK-HEX-NUMBER (WORK-HEX-FIELD-SUB)

PREPARE VARIABLES TO CONVERT NEXT HEXADECIMAL CHARACTER. *
ADD 1 TO WORK-HEX-FIELD-SUB
DIVIDE 16 INTO WORK-DIVISOR
MOVE WORK-REMAINDER TO WORK-DIVIDEND
END-PERFORM.

EXEC CICS RETURN END-EXEC. GOBACK.
Appendix D. Software Products and Service Levels

In this section, we list the core software products we used for our benchmark at the sysplex. For additional information regarding the environment, please consult the OS/390 Parallel Sysplex Test Report, GC28-1963.

D.1 Core Sysplex Software Products Installed

Some of our core sysplex software products are elements or features of OS/390, and some are not.

D.1.1 Core OS/390 Elements and Features Installed

The following figure lists those elements and features of OS/390 that we consider to be part of our core.

<table>
<thead>
<tr>
<th>FMID</th>
<th>Element or Feature</th>
<th>Release</th>
<th>Base Service Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDZ11C0</td>
<td>DFSMS</td>
<td>OS/390 R3</td>
<td>GA level</td>
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<tr>
<td>JDZ11CB</td>
<td>DFSMS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Note: Included in these FMIDs are DFSMSdfp, DFSMSdss, DFSMShsm, and DFSMSrmm.</td>
<td></td>
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<tr>
<td>HCS6031</td>
<td>HCD</td>
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<td>HIO1104</td>
<td>IOCP</td>
<td></td>
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</tr>
<tr>
<td>HJE6603</td>
<td>JES2</td>
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<td></td>
</tr>
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<td>HJS6603</td>
<td>JES3</td>
<td></td>
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</tr>
<tr>
<td>HBB6603</td>
<td>MVS Base Control Program (BCP)</td>
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<tr>
<td>HRF2230</td>
<td>RACF (part of the OS/390 Security Server)</td>
<td></td>
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<tr>
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<td>RMF</td>
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<td>VTAM</td>
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<td></td>
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</tbody>
</table>

D.1.2 Other Core Sysplex Software Products Installed

The following figure lists core products that are not elements or features of OS/390.

<table>
<thead>
<tr>
<th>FMID</th>
<th>Product</th>
<th>Version/Release</th>
<th>Base Service Level</th>
</tr>
</thead>
<tbody>
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</table>
The following are additional APARs and PTFs we installed for CICSPlex SM and CICSVR above the SMC9630 base service level:

Table 14 (Page 2 of 2). Other Core Software Products Installed

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<td>HLR2120</td>
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<td>V1/R2</td>
<td>SMC9630 + selected APARs and PTFs (listed in Table 15 on page 86)</td>
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<td>HCCV300</td>
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<td>JDB4416</td>
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<td>HIR2101</td>
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The following are additional APARs and PTFs we installed for CICSPlex SM and CICSVR above the SMC9630 base service level:

Table 15. APARs/PTFs for CICSPlex SM and CICSVR

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<thead>
<tr>
<th>Product</th>
<th>APAR or PTF</th>
<th>Number</th>
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<tr>
<td>CICSPlex SM</td>
<td>APARs</td>
<td>PN83198 PN89301 PN89809 PN89855 PN90219 PN90759 PN92552 PN92673 PN92690 PN92700 PN92784 PQ00374 PQ01072 PQ02522</td>
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<td>UN94970 UN95800 UN96733 UN96735 UN97002 UN97048 UN97133 UN97138 UN97241 UN99633 UN99643 UQ00486 UQ00860 UQ01084 UQ01148 UQ01910</td>
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<tr>
<td>CICSVR</td>
<td>PTFs</td>
<td>UN93076 UN93690 UN93692 UN93827</td>
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## D.2 Additional OS/390 Elements and Features Installed

The following additional elements and features are all part of OS/390 R3, and service is at GA level:

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<td>JBD6202</td>
<td>BDT SNA NJE</td>
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<tr>
<td>HDZ11SE</td>
<td>DFSMS/MVS NETWORK FILE SYSTEM--CLIENT</td>
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<td>SOFTCOPY PRINT SOLUTION AND FONTS:</td>
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<td>BOOKMASTER</td>
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<td>JSRI413</td>
<td>DOCUMENT COMPOSITION FACILITY</td>
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### Table 16. Additional OS/390 Elements and Features Installed

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<td>HFX1112</td>
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### D.3 Other Sysplex Software Products Installed

These are installed products that are not elements or features of OS/390:

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<td>HGA1311</td>
<td>GAM MVS/ESA OPT</td>
<td>V1/R3.1</td>
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Appendix E. Special Notices

This publication is intended to help people who support ImagePlus MVS/ESA to do capacity planning for their system. Some tuning tips are also included. The information in this publication is not intended as the specification of any programming interfaces that are provided by ImagePlus MVS/ESA. See the PUBLICATIONS section of the IBM Programming Announcement for ImagePlus MVS/ESA for more information about what publications are considered to be product documentation.

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Appendix F. Related Publications

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

F.1 International Technical Support Organization Publications

For information on ordering these ITSO publications see “How to Get ITSO Redbooks” on page 95.

- IBM SAA ImagePlus MVS/ESA Document Capture Implementation, GG24-4080
- International Standards -- A Document Imaging Review, GG24-2544

F.2 Redbooks on CD-ROMs

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F.3 Other Publications

These publications are also relevant as further information sources:

- OS/390 Parallel Sysplex Test Report, GC28-1963 (orderable only as part of SK2T-6700. This is a full specification of the environment used for this redbook.)
- ImagePlus MVS/ESA V2R2 General Information Manual, GC31-7537
- ImagePlus MVS/ESA V2R2 Planning Guide, GC31-7538
- ImagePlus MVS/ESA V2R2 Library Guide, GC31-7539
- ImagePlus MVS/ESA V2R2 Master Glossary and Index, GC31-7555
- ImagePlus MVS/ESA V2R2 Installation Guide, SC31-7567
- ImagePlus MVS/ESA V2R2 STAF User's Guide, SC31-7568
- ImagePlus MVS/ESA V2R2 Migration Guide, GG22-2005
- FaxRouter/2 V2.0 ImagePlus MVS/ESA Integration Guide, SC31-6742
- Large Systems Performance Reference, SC28-1187
How to Get ITSO Redbooks

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

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