Usage Scenarios for Optimizing your IMS Recovery Solution Pack: Database Recovery Facility Experience

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Contents

Chapter 1. Usage scenarios for optimizing your IMS Recovery Solution Pack: IMS Database Recovery Facility experience

This document addresses some of the more common and useful ways to recover IMS™ databases by using IMS Recovery Solution Pack: IMS Database Recovery Facility (DRF).

DRF supports many different types of recoveries. Instructions for using DRF to perform the following types of recoveries are described in this document:

Recovering a database to the current time
> You can recover a database to the current time by restoring the database to the last valid image copy and processing any available change accumulations (CAs) and logs up to the point that DRF is run.

Validating recovery by using IMS HP Pointer Checker
> You can use IMS HP Pointer Checker to validate the recovery for any pointer errors.

Performing an incremental image copy of offline databases
> You can perform an incremental image copy (ICR) of an offline database. Taking an offline ICR is recommended for first-time DRF users.

Performing an incremental image copy of online databases to the current time or point-in-time
> You can perform an incremental image copy (ICR) of an online or allocated database. An ICR can be generated to the current or a point-in-time where the updates are being applied.

Using IMS Index Builder to rebuild indexes during recovery
> You can use DRF to run IMS Index Builder (IB) against HALDBs to rebuild the indexes.

In this topic:
- "Setting up a basic IMS Recovery Solution Pack: IMS Database Recovery Facility environment"
- "Tips and best practices" on page 4

Setting up a basic IMS Recovery Solution Pack: IMS Database Recovery Facility environment

Complete these step-by-step instructions to set up and run basic IMS Recovery Solution Pack: IMS Database Recovery Facility (DRF) for the usage scenarios.

Setting up the IMS Recovery Solution Pack

This section outlines the steps to install and customize the IMS Recovery Solution Pack according to your environment and then, begin running the tools and products that are included in this solution pack.

The IMS Recovery Solution Pack includes these products:
- IMS Database Recovery Facility (DRF)
- IMS Database Recovery Facility: Extended Functions (DRF-XF)
- IMS High Performance Change Accumulation Utility (HPCA)

- IMS High Performance Image Copy (HPIC)
- IMS Index Builder (IB)

You must also install IMS Tools Base for z/OS® so that you can save output reports from DRF, DRF-XF, HPIC, and IB in the DOMIMS Tools Knowledge Base (ITKB) repository.

Recommendation: Install and configure IMS High Performance Pointer Checker (HPPC) and High Performance DEDB Pointer Checker (DEDB PC) (a component of the IMS Fast Path Solution Pack for z/OS) on your system to take advantage of the additional integrated auxiliary utilities that are supported by DRF during and after recovery. For more information, see the topic "IMS Database Recovery Facility and the integrated auxiliary utilities" in the *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide*.

Installing IMS Recovery Solution Pack libraries

You must install the IMS Recovery Solution Pack load libraries by completing the instructions that are in the IMS Recovery Solution Pack program directory.

You must install the following IMS Recovery Solution Pack load libraries:

Load library	Description
your.hlq.SFRXLOAD	DRF and DRF-XF load library
your.hlq.SHPSLMD0	HPIC load library
your.hlq.SHPCLMD0	HPCA load library
your.hlq.SIIULMOD	IB load library
your.hlq.SFRXSAMP	Sample PROCs and JCLs

The SMP/E installation process for the IMS Recovery Solution Pack is documented in the *Program Directory for IMS(tm) Recovery Solution Pack for z/OS(r)*.

Installing required maintenance

Verify that the following APARs have been applied.. This document is based on recent enhancements that were made to IMS Recovery Solution Pack.

APAR PM14116
> This APAR includes enhancements to simplify the set up of the DRFPROC (recovery sort subordinate address space) and DRFIAX (IB/PR subordinate address space) procedures.

APAR PM08258 (UK60119), APAR PM12553 (UK60120), APAR PM16081 (UK60121)
> This APAR includes various enhancements to DRF/IB processing including the ability for IB to rebuild indexes for HALDBs.

APAR PM26171 (UK63154)
> This APAR includes updates to DRF sample JCL members.

APAR PM23052 (UK64046) & PM31377 (UK64652)
> This APAR provides IMS V12 support.

APAR PM17639 (UK64949) & PM28396 (UK63739)
> This APAR includes a new IC/ICR Report in DRF MAS output.

APAR PM32523
> This APAR includes fixes for processing HALDBs during time stamp and point-in-time recoveries introduced by PM12553.

APAR PM34613
> This APAR includes fixes for the FRXMAS procedure found in the IMS Recovery Solution Pack sample library.

Reviewing the IMS Recovery Solution Pack installation checklist

Review the IMS Recovery Solution Pack installation checklist member, which is located in *your.hlq*.SFRXSAMP(FRXCHECK), to verify that your environment is configured correctly for IMS Recovery Solution Pack.

Customizing the procedures and JCL members

Depending on which DRF tasks you are performing, you will need to customize the applicable procedures and JCLs.

Review the IMS Recovery Solution Pack sample library, which is named *your.hlq*.SFRXSAMP. This sample library contains all of the relevant procedures and JCL that is required to set up and run DRF with utilities on your system, including DEDB PC, HPPC, IB, and HPIC. To customize the members, follow the instructions that are provided in each sample member.

The following lists the sample members that are used in this scenarios document.

FRXDRFZZ
> This configuration file is required for DRF. Make a copy of *your.hlq*.SFRXSAMP(FRXDRFZZ) and customize it for your environment.

FRXBPECF
> This configuration file is required for BPE. Make a copy of *your.hlq*.SFRXSAMP(FRXBPECF) and customize it for your environment.

FRXFOI
> This configuration file is required for TOSI. Make a copy of *your.hlq*.SFRXSAMP(FRXFOI) and customize it for your environment.

FRXITKB
> This configuration file is required for copying compatible DRF and utility reports to ITKB. Make a copy of *your.hlq*.SFRXSAMP(FRXITKB) and customize it for your environment.

DRFMAS procedure
> This procedure is used to allocate the DRF MAS. Make a copy of *your.hlq*.SFRXSAMP(FRXMAS) and customize it for your environment.

DRFPROC procedure
> This procedure is used to allocate the DRF subordinate address spaces. Make a copy of *your.hlq*.SFRXSAMP(FRXJCLSB) and customize it by adding the name of your DRF load library. For example:

```
//FRXJCLSB PROC
//*
//STEP1    EXEC PGM=FRXSDR00,
//       PARM='DRF,BPECFG=FRXBPECF',REGION=0M,TIME=1440
//STEPLIB  DD DISP=SHR,DSN=your.hlq.SFRXLOAD
//SYSUDUMP DD  SYSOUT=*
```

DRFIAX procedure
> This DRF UAS procedure is used to allocate the IB and DFSPREC0 address spaces. Make a copy of *your.hlq*.SFRXSAMP(FRXJCLIP) and customize it by adding the name of your DRF load library. For example:

```
//FRXJCLIP PROC
//*
//STEP1    EXEC PGM=FRXSDR10,
//         PARM='DRF,BPECFG=FRXBPECF',REGION=0M,TIME=1440
//STEPLIB  DD DISP=SHR,DSN=your.hlq.SFRXLOAD
//SYSUDUMP DD  SYSOUT=*
```

FRXPATH0 and FRXPATHZ procedures

These procedures are required to run HPPC for a full function database or DEDB PC for a fast path database. Make a copy of *your.hlq.*SFRXSAMP(FRXPATH0) and *your.hlq.*SFRXSAMP(FRXPATHZ) in a system PROCLIB that is concatenated in the JES system PROCLIB, and customize them for your environment.

DRF batch job

This sample batch job runs DRF. Make a copy of *your.hlq.*SFRXSAMP(FRXDRF) and customize it for your environment.

Tips and best practices

This section provides tips to run the IMS Recovery Solution Pack smoothly.

Dynamic allocation of RECONs

To ensure that DRF recovers the correct set of data, use dynamic allocation of RECONs as opposed to explicitly specifying the RECON data sets in the DRF JCL and procedures.

RACF® authority

If insufficient authority was granted to the user ID that submits the DRF job, RACF permission failures can occur when data sets are created and accessed. These data sets are required by DRF to perform recovery in the master address space and all subordinate address spaces, including the utility address space for IMS Index Builder (IB UAS). The IB UAS can initiate one or more sort subordinate address spaces (IBSS). For more information about the rules for assigning security to the IBSS, see the *IMS Index Builder for z/OS User's Guide*.

In addition, when specifying the DRFHLQ= option in the REPORT() parameter, confirm with your system administrator that the 1- to 8-character high-level qualifier has the proper authority to allocate and catalog DRF report data sets on your system.

Hard coding JCL statements for databases that are being recovered

The IMS Database Recovery Facility master address space JCL cannot contain any hard-coded database data sets. This restriction applies to any step in the JCL, regardless of the usage. Because IMS Database Recovery Facility dynamically allocates the database data sets for recovery in the subordinate address space, dynamic allocation will fail if any of the subsequent steps have these same data sets allocated by DD statements in the MAS. This restriction is a z/OS restriction.

Chapter 2. Recover the database to the current time

This scenario documents how to recover a database to the current time by restoring the database to the last valid image copy and processing any available change accumulations (CAs) and logs up to the point that DRF is run. To recover a database to the current time, the database is deleted and then reallocated with the image copy and any updates from the CAs and logs.

In this topic:
- "Creating and running a DRF job"
- "Reviewing the output" on page 6

Creating and running a DRF job

Perform the following steps to set up and create a DRF job to recover a database to the current time.

Before you begin
- To perform a DRF recovery, you must have IMS Database Recovery Facility (DRF) installed. For more information, see *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide*.
- You must take your databases offline by issuing the /DBR command for DRF to delete the production databases and redefine them.
- Complete the tasks in sample member FRXITKB.

Procedure
1. Install and configure the required DRF load libraries and utilities. For more information, see "Installing IMS Recovery Solution Pack libraries" on page 2
2. Customize the procedures and JCL found in the sample library (SFRXSAMP(FRXDRF)).

   Modify or update the following sets of procedures and JCL:

   FRXBPECF
   > Sample configuration file for BPE.

   FRXDRFZZ
   > Sample configuration file for DRF.

   FRXJCLSB
   > Sample DRF subordinate address space procedure.

   FRXMAS
   > Sample DRF master address space procedure.

   FRXDRF
   > Sample batch job to run DRF.

3. Customize the FRXDRF JCL to run DRF recovery.

   Make a copy of the *your.hlq*.SFRXSAMP(FRXDRF) JCL.

   The following example shows modified DRF JCL to run a DRF recovery:

```
a//DRF      EXEC FRXMAS,DRFMBR=ZZ
//SYSIN DD *
 REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
 SORTPARM(ASPREF(AS))
```

```
                    DBDSL101(DISP(NEW))
                    ᵇOUTPUT(PRO)
                    ᶜADD DB(DHVNTZ02) DBATRB(DBDSL(101))
                    START ERROR(CONT)
                    //
```

Notes:

    a. When you run DRF, the FRXMAS procedure is invoked. DRFMBR=ZZ references the FRXDRFZZ configuration file for DRF.

    b. A combination of OUTPUT(PRO) and DISP(NEW) causes DRF to delete and redefine the production database data sets during recovery to the current time.

    c. The database name is DHVNTZ02 (HIDAM/VSAM). You can specify one or more databases to recover.

4. Submit the DRF job.

What to do next

After you submit your DRF batch job, wait until the job finishes and review the output.

Reviewing the output

This section shows an example of the output from a standard DRF recovery to the current time recovery job. Review the output to help you understand the results of running DRF.

```
D A T A B A S E   R E C O V E R Y   F A C I L I T Y   C O M M A N D S / C O N T R O L   S T A T E M E N T S


FRD7201I  REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
FRD7201I  SORTPARM(ASPREF(AS))
FRD7201I  DBDSL101(DISP(NEW))
FRD7201I  OUTPUT(PRO)
FRD7201I  ADD DB(DHVNTZ02) DBATRB(DBDSL(101))
FRD7201I  START ERROR(CONT)



D A T A B A S E   R E C O V E R Y   F A C I L I T Y   S U M M A R Y   R E P O R T


Database   DD/Area   DSID     --------- Records Read ---------   Records Subord.  STC  Final
Name       Name               IC        CA         LOG           Written Reg Name #    Status

DHVNTZ02   HIDAM     1         49        0          1501          49 AS068801   689 Delete / define complete
DHVNTZ02   HIDAM2    2         49        0          0             49 AS068802   690 Delete / define complete
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY          Date: 02/12/2011 Time: 23:15   Page: 2


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   U T I L I T Y   R E P O R T


Database   DDN       Database Data Set Name                IC   PC/DP IB   PR   Utility Final Status
------------------------------------------------------------------------------------------------------------
DHVNTZ02   HIDAM     IMSTESTL.DHVNTZ02.FKXXI01E            N/A  N/A   N/A  N/A
DHVNTZ02   HIDAM2    IMSTESTL.DHVNTZ02.FKXXI02E            N/A  N/A   N/A  N/A

Final Return (RC) and Reason (RSN) Codes


---IC---    ---PC---    ---DP---    ---IB---    ---PR---    ---LIU--
RC   RSN    RC   RSN    RC   RSN    RC   RSN    RC   RSN    RC   RSN

N/A  N/A    N/A  N/A    N/A  N/A    N/A  N/A    N/A  N/A    N/A  N/A
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY          Date: 02/12/2011 Time: 23:15    Page: 3


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   D A T A   S E T   I / O   R E P O R T

Recover to point: Not Specified

Image Copy Data Set Name                         Volume    IC DS    IC     --------------- Time Stamp Range ----------------
```

```
---------.---------.---------.---------.-----   Serial   Read Count  Type          1st Record                 Last Record

IMSVS.DHVNTZ02.HIDAM.IC.IC225745                222222         49    STD
IMSVS.DHVNTZ02.HIDAM2.IC.IC225745               222222         49    STD

Change Accum Data Set Name                      Volume   CA DS                 --------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count                     1st Record                 Last Record

No data available for this type data set

Log Data Set Name                               Volume   Log DS      IMS       --------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count  SYSID           1st Record                 Last Record

IMSVS.RLDSP.IMS1.D11043.T2305207.V00            000000          0    IMS1      2011.043 23:05:20.752699 -02011.043 23:05:55.264546
  Prilog: 2011.043 23:02:53.600000
IMSVS.RLDSP.IMS1.D11043.T2302536.V00            000000       1489    IMS1      2011.043 23:02:53.600000 -02011.043 23:03:37.030997
  Prilog: 2011.043 23:02:53.600000
IMSVS.RLDSP.IMS1.D11043.T2304155.V00            000000          0    IMS1      2011.043 23:04:15.544239 -02011.043 23:05:20.752699
  Prilog: 2011.043 23:02:53.600000
IMSVS.RLDSP.IMS1.D11043.T2303370.V00            000000         12    IMS1      2011.043 23:03:37.030997 -02011.043 23:04:15.544239
  Prilog: 2011.043 23:02:53.600000
```

Chapter 3. Validating recovery by using IMS HP Pointer Checker

The DRF recovery of the database to the current time job is validated for any pointer errors by using IMS HP Pointer Checker (HPPC).

In this topic:
* "Creating and running a DRF job"
* "Reviewing the output" on page 10

Creating and running a DRF job

Perform the following steps to create and run a DRF job to validate the recovery by using HPPC.

Before you begin

* To validate the recovery, you must have IMS Database Recovery Facility (DRF) and IMS High Performance Pointer Checker for z/OS (HPPC) installed. For more information, see *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide* and *IMS High Performance Pointer Checker for z/OS User's Guide*.
* Complete the tasks in sample member FRXITKB.

Procedure

1. Install and configure the required DRF load libraries and utilities. For more information, see "Installing IMS Recovery Solution Pack libraries" on page 2
2. Customize the procedures and JCL found in the sample library (SFRXSAMP(FRXDRF)).

   Modify or update the following sets of procedures and JCL:

   FRXBPECF
   > Sample configuration file for BPE.

   FRXDRFZZ
   > Sample configuration file for DRF.

   FRXPATH0 and FRXPATHZ
   > Required procedures to run HPPC or DEDB PC.
   >
   > **Important:** Specify a REGION= value with sufficient storage on the EXEC statement.

   FRXJCLSB
   > Sample DRF subordinate address space procedure.

   FRXMAS
   > Sample DRF master address space procedure. You must include the name of your HPPC LOADLIB in the STEPLIB.

   FRXDRF
   > Sample batch job to run DRF.

3. Add the PC() keyword to the DRF ADD statement.

   To call and run HPPC from a DRF job, you must include a new DRF keyword called PC() in your DRF ADD statement. When you include the PC() keyword

in the DRF ADD statement, you are telling DRF to run HPPC (for full-function databases) and DEDB PC (for Fast Path databases). You can include other optional keywords in the PC() statement. However, for this scenario, we will keep the standard defaults.

4. Customize the FRXDRF JCL to run DRF/PC recovery.

   Make a copy of the *your.hlq*.SFRXSAMP(FRXDRF) JCL.

   The following example shows modified DRF JCL to run a DRF/PC recovery:

```
ª//DRF      EXEC FRXMAS,DRFMBR=ZZ
//SYSIN DD *
 REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
 SORTPARM(ASPREF(AS))
 DBDSL101(DISP(NEW))
 ᵇOUTPUT(PRO)
 ᶜADD DB(DHVNTZ02,DEDBJN23) PC() -
   DBATRB(DBDSL(101))
 START ERROR(CONT)
//
```

   Notes:

   a. When you run DRF, the FRXMAS procedure is invoked. DRFMBR=ZZ references the FRXDRFZZ configuration file for DRF.

   b. A combination of OUTPUT(PRO) and DISP(NEW) causes DRF to delete and redefine the production database data sets during recovery to the current time.

   c. DHVNTZ02 (HIDAM/VSAM) is a full-function database and DEDBJN23 is a Fast Path database with eight areas. You can specify one or more databases to recover.

5. Submit the DRF job.

Reviewing the output

This section describes the important parts of the completed DRF output job to help you understand what exactly happened.

The DRF Utility Report is generated when any auxiliary utility is started by using DRF, for example PC(). It lists the final return code from the operation performed on any of the databases recovered by DRF including the final reason codes from each auxiliary utility.

The following example shows the output from a DRF/PC recovery job.

```
D A T A B A S E   R E C O V E R Y   F A C I L I T Y   C O M M A N D S / C O N T R O L   S T A T E M E N T S

FRD7201I  REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
FRD7201I  SORTPARM(ASPREF(AS))
FRD7201I  DBDSL101(DISP(NEW))
FRD7201I  OUTPUT(PRO)
FRD7201I  ADD DB(DHVNTZ02,DEDBJN23) PC() -
FRD7201I      DBATRB(DBDSL(101))
FRD7201I  START ERROR(CONT)


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   S U M M A R Y   R E P O R T

Database   DD/Area    DSID     --------- Records Read ---------   Records Subord.  STC  Final
Name       Name                    IC        CA        LOG       Written Reg Name  #    Status

DEDBJN23   DB23AR0    1           180         0        104           180 AS069201  694  Delete / define complete
DEDBJN23   DB23AR1    2            21         0        104            21 AS069202  695  Delete / define complete
DEDBJN23   DB23AR2    3           147         0          0           147 AS069203  696  Delete / define complete
DEDBJN23   DB23AR3    4           147         0          0           147 AS069201  694  Delete / define complete
DEDBJN23   DB23AR4    5           231         0          0           231 AS069202  695  Delete / define complete
```

```
DEDBJN23  DB23AR5    6         99        0         0        99 AS069203  696 Delete / define complete
DEDBJN23  DB23AR6    7        165        0         0       165 AS069201  694 Delete / define complete
DEDBJN23  DB23AR7    8         21        0         0        21 AS069202  695 Delete / define complete
DHVNTZ02  HIDAM      1         49        0      1501        49 AS069203  696 Delete / define complete
DHVNTZ02  HIDAM2     2         49        0         0        49 AS069201  694 Delete / define complete
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY      Date: 02/13/2011 Time: 00:04    Page: 2
```

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   U T I L I T Y   R E P O R T

```
Database  DDN       Database Data Set Name                  IC  PC/DP IB   PR  Utility Final Status
-------------------------------------------------------------------------------------------------------
DEDBJN23  DB23AR0   IMSTESTL.DB23AR0                        N/A  00   N/A  N/A
DEDBJN23  DB23AR1   IMSTESTL.DB23AR1                        N/A  00   N/A  N/A
DEDBJN23  DB23AR2   IMSTESTL.DB23AR2                        N/A  00   N/A  N/A
DEDBJN23  DB23AR3   IMSTESTL.DB23AR3                        N/A  00   N/A  N/A
DEDBJN23  DB23AR4   IMSTESTL.DB23AR4                        N/A  00   N/A  N/A
DEDBJN23  DB23AR5   IMSTESTL.DB23AR5                        N/A  00   N/A  N/A
DEDBJN23  DB23AR6   IMSTESTL.DB23AR6                        N/A  00   N/A  N/A
DEDBJN23  DB23AR7   IMSTESTL.DB23AR7                        N/A  00   N/A  N/A
DHVNTZ02  HIDAM     IMSTESTL.DHVNTZ02.FKXXI01E              N/A  00   N/A  N/A
DHVNTZ02  HIDAM2    IMSTESTL.DHVNTZ02.FKXXI02E              N/A  00   N/A  N/A
```

Final Return (RC) and Reason (RSN) Codes

```
---IC---    ---PC---    ---DP---    ---IB---    ---PR---    ---LIU--
RC   RSN    RC   RSN    RC   RSN    RC   RSN    RC   RSN    RC   RSN

N/A  N/A    00   00     00   00     N/A  N/A    N/A  N/A    N/A  N/A
```
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY   Date: 02/13/2011 Time: 00:04   Page: 3

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   D A T A   S E T   I / O   R E P O R T

Recover to point: Not Specified

```
Image Copy Data Set Name                       Volume   IC DS       IC    --------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count  Type      1st Record              Last Record

IMSVS.DEDBJN23.DB23AR1.IC.IC225831             222222        21      STD
IMSVS.DEDBJN23.DB23AR2.IC.IC225832             222222       147      STD
IMSVS.DEDBJN23.DB23AR0.IC.IC225831             222222       180      STD
IMSVS.DEDBJN23.DB23AR5.IC.IC225832             222222        99      STD
IMSVS.DEDBJN23.DB23AR3.IC.IC225832             222222       147      STD
IMSVS.DEDBJN23.DB23AR4.IC.IC225832             222222       231      STD
IMSVS.DEDBJN23.DB23AR7.IC.IC225832             222222        21      STD
IMSVS.DEDBJN23.DB23AR6.IC.IC225832             222222       165      STD
IMSVS.DHVNTZ02.HIDAM.IC.IC225745               222222        49      STD
IMSVS.DHVNTZ02.HIDAM2.IC.IC225745              222222        49      STD

Change Accum Data Set Name                     Volume   CA DS       --------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count      1st Record              Last Record

No data available for this type data set

Log Data Set Name                              Volume   Log DS      IMS   --------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count  SYSID     1st Record              Last Record

IMSVS.RLDSP.IMS1.D11043.T2305207.V00           000000        10     IMS1  2011.043 23:05:20.752699 -02011.043 23:05:55.264546
 Prilog: 2011.043 23:02:53.600000
IMSVS.RLDSP.IMS1.D11043.T2302536.V00           000000      1489     IMS1  2011.043 23:02:53.600000 -02011.043 23:03:37.030997
 Prilog: 2011.043 23:02:53.600000
IMSVS.RLDSP.IMS1.D11043.T2304155.V00           000000       204     IMS1  2011.043 23:04:15.544239 -02011.043 23:05:20.752699
 Prilog: 2011.043 23:02:53.600000
IMSVS.RLDSP.IMS1.D11043.T2303370.V00           000000        12     IMS1  2011.043 23:03:37.030997 -02011.043 23:04:15.544239
 Prilog: 2011.043 23:02:53.600000
```

Chapter 4. Taking an incremental image copy of offline databases

This scenario describes how to recover offline databases by taking an incremental image copy (ICR). Taking an offline ICR is useful in situations when your databases are offline and you want to produce a new image copy that contains only the information that was updated since the last image copy was taken without performing a full recovery.

In this topic:

Identifying the databases to perform incremental image copy

Before taking an incremental image copy (ICR), you must first identify which databases to perform an ICR.

Before you begin

If this is your first time running DRF, take your databases offline by issuing a /DBR command to ensure that all updates are committed and all logs are archived before running ICR.

About this task

If you have attempted ICR with DRF and would like to perform a point-in-time ICR where your databases are online, see Chapter 5, "Taking an incremental image copy of an online database to the current time or point-in-time," on page 19.

Procedure

To list and identify which databases to take an ICR of, run either a LIST.RECON or LIST.HISTORY job.
A LIST.RECON job displays the RECON's current status and a formatted display of all records it contains. A LIST.HISTORY job provides a history-of-activity listing for DBDSs or DEDB areas. For more information, see the *IMS Database Recovery Control (DBRC) Guide and Reference*.
In the following examples, an ICR is being performed on a HIDAM/VSAM database named DHVNTZ02 with two database data sets: DHVNTZ02.FKXXI01E and DHVNTZ02.FKXXI02E.

Example: LIST.RECON job

In this example, a LIST.RECON job is being run to get a detailed DBRC report of DHVNTZ02.

```
//LISTRCON  EXEC PGM=DSPURX00,COND=EVEN
//SYSPRINT DD SYSOUT=*
//RECON1    DD  DSN=IMSTESTL.IMS.RECON1,DISP=SHR
```

```
//RECON2   DD  DSN=IMSTESTL.IMS.RECON2,DISP=SHR
//RECON3   DD  DSN=IMSTESTL.IMS.RECON3,DISP=SHR
//SYSIN    DD *
  LIST.RECON
/*
```

Example: LIST.HISTORY job

In this example, a LIST.HISTORY job is being run to get a detailed DBRC
report of DHVNTZ02.

```
//LISTRCON  EXEC PGM=DSPURX00,COND=EVEN
//SYSPRINT DD SYSOUT=*
//RECON1   DD  DSN=IMSTESTL.IMS.RECON1,DISP=SHR
//RECON2   DD  DSN=IMSTESTL.IMS.RECON2,DISP=SHR
//RECON3   DD  DSN=IMSTESTL.IMS.RECON3,DISP=SHR
//SYSIN    DD *
  LIST.HISTORY DBD(DHVNTZ02)
/*
```

Example: Output

The following is an example of the output from the LIST.HISTORY or
LIST.RECON job:

```
-----------------------------------------------------------------------
DB
  DBD=DHVNTZ02              IRLMID=*NULL        DMB#=2        TYPE=IMS
-----------------------------------------------------------------------
DBDS
  DSN=DHVNTZ02.FKXXI01E                                       TYPE=IMS
  DBD=DHVNTZ02  DDN=HIDAM    DSID=001 DBORG=HIDAM  DSORG=VSAM
  CAGRP=**NULL**  GENMAX=2    IC AVAIL=0     IC USED=1     DSSN=00000001
  NOREUSE        RECOVPD=0
  DEFLTJCL=**NULL**  ICJCL=ICJCL    OICJCL=OICJCL    RECOVJCL=RECOVJCL
  RECVJCL=ICRCVJCL
  FLAGS:                           COUNTERS:
    IC NEEDED      =OFF
    RECOV NEEDED   =OFF
    RECEIVE NEEDED =OFF            EEQE COUNT             =0
-----------------------------------------------------------------------
IMAGE
  RUN    = 11.043 22:57:46.7         *  RECORD COUNT =49
  STOP   = 00.000 00:00:00.0            BATCH      USID=0000000001

  IC1
  DSN=IMSVS.DHVNTZ02.HIDAM.IC.IC225745          FILE SEQ=0001
  UNIT=SYSDA                        VOLS DEF=0001 VOLS USED=0001
                                   VOLSER=222222
-----------------------------------------------------------------------
DBDS
  DSN=DHVNTZ02.FKXXI02E                                       TYPE=IMS
  DBD=DHVNTZ02  DDN=HIDAM2   DSID=002 DBORG=HIDAM  DSORG=VSAM
  CAGRP=**NULL**  GENMAX=2    IC AVAIL=0     IC USED=1     DSSN=00000000
  NOREUSE        RECOVPD=0
  DEFLTJCL=**NULL**  ICJCL=ICJCL    OICJCL=OICJCL    RECOVJCL=RECOVJCL
  RECVJCL=ICRCVJCL
  FLAGS:                           COUNTERS:
    IC NEEDED      =OFF
    RECOV NEEDED   =OFF
    RECEIVE NEEDED =OFF            EEQE COUNT             =0
-----------------------------------------------------------------------
IMAGE
  RUN    = 11.043 22:57:47.6         *  RECORD COUNT =49
  STOP   = 00.000 00:00:00.0            BATCH      USID=0000000001

  IC1
  DSN=IMSVS.DHVNTZ02.HIDAM2.IC.IC225745         FILE SEQ=0001
  UNIT=SYSDA                        VOLS DEF=0001 VOLS USED=0001
                                   VOLSER=222222
```

Creating and running a DRF job

Perform the following steps to create and run a DRF job that produces an incremental image copy (ICR).

Before you begin

- To perform a DRF ICR, you must have IMS Database Recovery Facility (DRF) and IMS High Performance Image Copy (HPIC) installed. For more information, see *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide* and *IMS High Performance Pointer Checker for z/OS User's Guide*.
- Complete the tasks in sample member FRXITKB.

Procedure

1. Install and configure the required DRF load libraries and utilities. For more information, see "Installing IMS Recovery Solution Pack libraries" on page 2

2. Customize the procedures and JCL found in the sample library (SFRXSAMP(FRXDRF)).

   Modify or update the following procedures and JCL:

   FRXBPECF
   　　　Sample configuration file for BPE.

   FRXDRFZZ
   　　　Sample configuration file for DRF.

   FRXJCLSB
   　　　Sample DRF subordinate address space procedure.

   FRXMAS
   　　　Sample DRF master address space procedure. You must include the name of your HPIC LOADLIB in the STEPLIB.

   FRXDRF
   　　　Sample batch job to run DRF.

3. Customize the FRXDRF JCL to run DRF ICR.

   Make a copy of the *your.hlq*.SFRXSAMP(FRXDRF) JCL.

   The following example shows modified JCL to run a DRF ICR:

```
a//DRF      EXEC FRXMAS,DRFMBR=ZZ
//SYSIN DD *
 REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
 SORTPARM(ASPREF(AS))
 DBDSL101(DISP(NEW))
bOUTPUT(ICR)
 cADD DB(DHVNTZ02) DBATRB(DBDSL(101)) -
 dIC (COMP(Y),-
 COMPRTN(FABJCMP3),-
      DSNTYPE(BASIC),-
      ICHLQ(TEMP.IC),-
      ICNMRULE(Y),-
      UNIT(SYSDA),-
      SPACE(CYL,1,1,RLSE))
 START ERROR(CONT)
//
```

   Notes:

   a. When you run DRF, the FRXMAS procedure is invoked. DRFMBR=ZZ references the FRXDRFZZ configuration file for DRF.

b. For more information about how to explicitly instruct DRF to generate an ICR, see the "Environmental control statements" topic in *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide*.

c. The database name DHVNTZ02 (HIDAM/VSAM) is used by the ICR process in the ADD DB() parameter. You can specify one or more databases to take an ICR.

d. You can customize the IC keywords to your specifications. For more information, see the "Integrated auxiliary utility parameters for IMS High Performance Image Copy" topic in *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide*. In this case, the output ICR is compressed by using the FABJCMP3 routine, and the output IC data set name follows the ICNMRULE naming convention (*ichlq*.IC*n*.*dbdname*.*ddname*.D*yyddd*.T*hhmmss*).

4. Submit the DRF job.

Reviewing the output

This section describes the important parts of the DRF ICR output. Review the output to help you understand the results of running this job.

The DRF IC/ICR output report lists the output copies that were that were generated by HPIC through DRF. Notice that the ICRs generated by DRF are registered to DBRC as batch image copies because the specified database was not allocated and offline.

The following example shows the output from a sample DRF ICR job.

```
D A T A B A S E   R E C O V E R Y   F A C I L I T Y   C O M M A N D S / C O N T R O L   S T A T E M E N T S

FRD7201I  REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
FRD7201I  SORTPARM(ASPREF(AS))
FRD7201I  DBDSL101(DISP(NEW))
FRD7201I  OUTPUT(ICR)
FRD7201I  ADD DB(DHVNTZ02) DBATRB(DBDSL(101)) -
FRD7201I      IC (COMP(Y),-
FRD7201I          COMPRTN(FABJCMP3),-
FRD7201I          DSNTYPE(BASIC),-
FRD7201I          ICHLQ(TEMP.IC),-
FRD7201I          ICNMRULE(Y),-
FRD7201I          UNIT(SYSDA),-
FRD7201I          SPACE(CYL,1,1,RLSE))
FRD7201I  START ERROR(CONT)

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   S U M M A R Y   R E P O R T

Database  DD/Area   DSID     --------- Records Read ---------   Records Subord.  STC  Final
Name      Name                   IC        CA        LOG        Written Reg Name #    Status

DHVNTZ02  HIDAM     1             49         0       1501            49 AS069901  700  Delete / define complete
DHVNTZ02  HIDAM2    2             49         0          0            49 AS069902  701  Delete / define complete
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY        Date: 02/13/2011 Time: 00:50    Page: 2

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   U T I L I T Y   R E P O R T

Database  DDN      Database Data Set Name                        IC   PC/DP IB   PR   Utility Final Status
-------------------------------------------------------------------------------------------------------------
DHVNTZ02  HIDAM    IMSTESTL.DHVNTZ02.FKXXI01E                    00   N/A   N/A  N/A
DHVNTZ02  HIDAM2   IMSTESTL.DHVNTZ02.FKXXI02E                    00   N/A   N/A  N/A

Final Return (RC) and Reason (RSN) Codes

---IC---     ---PC---     ---DP---     ---IB---     ---PR---     ---LIU--
RC   RSN     RC   RSN     RC   RSN     RC   RSN     RC   RSN     RC   RSN

00   00      N/A  N/A     N/A  N/A     N/A  N/A     N/A  N/A     N/A  N/A

FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY        Date: 02/13/2011 Time: 00:50    Page: 2

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   I C / I C R   O U T P U T   R E P O R T
```

```
Database DD/Area  IC / ICR Data Set Name                    Compr   Volume File  IC   IC                         Compr Compr
Name     Name     --------.--------.--------.--------.------- Count   Serial Seq.  Type Time                       Ratio Routine
DHVNTZ02 HIDAM    TEMP.IC.IC1.DHVNTZ02.HIDAM.D11044.T005017      48 333333 00001 Bat. 11.044 00:50:21.6     -0800  10.1 FABJCMP3
DHVNTZ02 HIDAM2   TEMP.IC.IC1.DHVNTZ02.HIDAM2.D11044.T005017     48 000000 00001 Bat. 11.044 00:50:21.6     -0800   7.6 FABJCMP3
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY        Date: 02/13/2011 Time: 00:50   Page: 4

NOTIFY.IC    DBD(DHVNTZ02)  DDN(HIDAM  )
   RUNTIME('2011.044 00:50:21.6 -08:00')
   BATCH
   ICDSN(TEMP.IC.IC1.DHVNTZ02.HIDAM.D11044.T005017)
   FILESEQ(0001) UNIT(3390)
   VOLLIST(333333 )
   RECDCT(0000000049)
DSP0203I  COMMAND COMPLETED WITH CONDITION CODE 00
NOTIFY.IC    DBD(DHVNTZ02)  DDN(HIDAM2 )
   RUNTIME('2011.044 0:50:21.6 -08:00')
   BATCH
   ICDSN(TEMP.IC.IC1.DHVNTZ02.HIDAM2.D11044.T005017)
   FILESEQ(0001) UNIT(3390)
   VOLLIST(000000 )
   RECDCT(0000000049)
DSP0203I  COMMAND COMPLETED WITH CONDITION CODE 00
```

Common errors and problems

You might encounter error messages B37 or E37 due to the output IC running out
of space. To resolve this problem, increase the space allocation size for the output
IC by using the SPACE= keyword.

Optional: Verifying the ICR in DBRC

You can verify that the ICR created by DRF was registered in DRBC as a batch
image copy.

Procedure

To verify the ICR in DBRC:
1. Run the same LIST.RECON or LIST.HISTORY job setup that you ran in
   "Identifying the databases to perform incremental image copy" on page 13.
2. Locate the database you chose to ICR in your RECON output job: DHVNTZ02.
   For example:

```
-------------------------------------------------------------------
DB
  DBD=DHVNTZ02                    IRLMID=*NULL        DMB#=2       TYPE=IMS
-------------------------------------------------------------------
DBDS
  DSN=DHVNTZ02.FKXXI01E                                           TYPE=IMS
  DBD=DHVNTZ02  DDN=HIDAM     DSID=001 DBORG=HIDAM  DSORG=VSAM
  CAGRP=**NULL**  GENMAX=2    IC AVAIL=0     IC USED=1    DSSN=00000001
  NOREUSE         RECOVPD=0
  DEFLTJCL=**NULL**  ICJCL=ICJCL     OICJCL=OICJCL     RECOVJCL=RECOVJCL
  RECVJCL=ICRCVJCL
  FLAGS:                           COUNTERS:
    IC NEEDED      =OFF
    RECOV NEEDED   =OFF
    RECEIVE NEEDED =OFF              EEQE COUNT             =0
-------------------------------------------------------------------
IMAGE
  RUN    = 11.043 22:57:46.7          *  RECORD COUNT =49
  STOP   = 00.000 00:00:00.0             BATCH      USID=0000000001

  IC1
    DSN=IMSVS.DHVNTZ02.HIDAM.IC.IC225745          FILE SEQ=0001
    UNIT=SYSDA                         VOLS DEF=0001 VOLS USED=0001
```

```
                                                  VOLSER=222222
            IMAGE
              RUN    = 11.044 00:50:21.6               *   RECORD COUNT =49
              STOP   = 00.000 00:00:00.0                   BATCH     USID=000000000

             IC1
              DSN=TEMP.IC.IC1.DHVNTZ02.HIDAM.D11044.T005017    FILE SEQ=0001
              UNIT=3390                            VOLS DEF=0001 VOLS USED=0001
                                                  VOLSER=333333
            ------------------------------------------------------------------------
             DBDS
              DSN=DHVNTZ02.FKXXI02E                                       TYPE=IMS
              DBD=DHVNTZ02  DDN=HIDAM2   DSID=002 DBORG=HIDAM  DSORG=VSAM
              CAGRP=**NULL**  GENMAX=2      IC AVAIL=0     IC USED=1    DSSN=00000000
              NOREUSE          RECOVPD=0
              DEFLTJCL=**NULL**  ICJCL=ICJCL    OICJCL=OICJCL    RECOVJCL=RECOVJCL
              RECVJCL=ICRCVJCL
              FLAGS:                            COUNTERS:
                IC NEEDED     =OFF
                RECOV NEEDED  =OFF
                RECEIVE NEEDED =OFF               EEQE COUNT            =0
            ------------------------------------------------------------------------
            IMAGE
              RUN    = 11.043 22:57:47.6               *   RECORD COUNT =49
              STOP   = 00.000 00:00:00.0                   BATCH     USID=0000000001

             IC1
              DSN=IMSVS.DHVNTZ02.HIDAM2.IC.IC225745          FILE SEQ=0001
              UNIT=SYSDA                          VOLS DEF=0001 VOLS USED=0001
                                                  VOLSER=222222
            IMAGE
              RUN    = 11.044 00:50:21.6               *   RECORD COUNT =49
              STOP   = 00.000 00:00:00.0                   BATCH     USID=0000000002

             IC1
              DSN=TEMP.IC.IC1.DHVNTZ02.HIDAM2.D11044.T005017   FILE SEQ=0001
              UNIT=3390                            VOLS DEF=0001 VOLS USED=0001
                                                  VOLSER=000000
```

Next steps

If the ICR was successfully created by DRF, it is now registered to DBRC as a
BATCH image copy, and you are now able to bring your databases online and
continue running updates. All future updates (logs and CAs) start from the newly
created ICR. If you perform another ICR or standard recovery, DRF uses the
previous image copy (in this scenario, it is the ICR) and uses any archived logs or
change accumulation data sets as input.

Chapter 5. Taking an incremental image copy of an online database to the current time or point-in-time

This scenario describes how to recover an online database to the current time or to a point in time by taking an incremental image copy (ICR). Taking an online ICR is useful in situations when you do not want to bring your databases offline, but still want to create an ICR.

The ICR process is flexible, providing the ability to generate ICRs to the current time or the point-in-time where updates are being applied.

In this topic:
* "Identify the databases to perform incremental image copy"
* "Creating and running your DRF job" on page 20
* "Reviewing the output" on page 22
* "Common errors and problems" on page 23
* "Optional: Verifying the ICR in DBRC" on page 23
* "Next steps" on page 24

Identify the databases to perform incremental image copy

Before taking an incremental image copy (ICR), you must first identify which databases to perform an ICR.

About this task

* If you would like to perform an ICR where your databases are offline, see Chapter 4, "Taking an incremental image copy of offline databases," on page 13.
* IMS V10 or later provides greater time precision for the ICR output than earlier versions.

Procedure

To list and identify which databases to take an ICR of, run either a LIST.RECON or LIST.HISTORY job. Running these jobs is helpful when you want to select and define a specific time to perform ICR in your DRF job.

A LIST.RECON job displays the RECON's current status and a formatted display of all records it contains. A LIST.HISTORY job provides a history-of-activity listing for DBDSs or DEDB areas. For more information, see the *IMS Database Recovery Control (DBRC) Guide and Reference*.

In the following examples, an ICR is being performed on a HIDAM/VSAM database named DHVNTZ02.

Example: LIST.RECON job

In this example, a LIST.RECON job is being run to get a detailed DBRC report of DHVNTZ02.

```
//LISTRCON  EXEC PGM=DSPURX00,COND=EVEN
//SYSPRINT DD SYSOUT=*
//RECON1    DD  DSN=IMSTESTL.IMS.RECON1,DISP=SHR
//RECON2    DD  DSN=IMSTESTL.IMS.RECON2,DISP=SHR
```

```
//RECON3   DD  DSN=IMSTESTL.IMS.RECON3,DISP=SHR
//SYSIN    DD *
  LIST.RECON
/*
```

Example: LIST.HISTORY job

In this example, a LIST.HISTORY job is being run to get a detailed DBRC report of DHVNTZ02.

```
//LISTRCON  EXEC PGM=DSPURX00,COND=EVEN
//SYSPRINT DD SYSOUT=*
//RECON1    DD  DSN=IMSTESTL.IMS.RECON1,DISP=SHR
//RECON2    DD  DSN=IMSTESTL.IMS.RECON2,DISP=SHR
//RECON3    DD  DSN=IMSTESTL.IMS.RECON3,DISP=SHR
//SYSIN     DD *
  LIST.HISTORY DBD(DHVNTZ02)
/*
```

Example: Output

The following is an example of the output from the LIST.HISTORY or LIST.RECON job:

```
+---------------------------------------------------------
|Timeline for DBDS: DHVNTZ02 HIDAM
|                      USID=00000003   AUTHORIZED=00000003
|                    RECEIVE=00000000        HARD=00000003
+-Time------------+Events----+---+--+--------------------
|                 |IC        |   |  |
|                 |REORG     |   |  |US|Subsystem
|                 |RECOV     |CA |ID|Logs and Allocs
+----------------+----------+---+--+--------------------
11.044 14:03:25.0  B                1
11.044 14:09:14.4                       IMS1
11.044 14:10:00.4                  2 A
11.044 14:10:01.5                  | s
11.044 14:10:59.5                  | s
11.044 14:12:15.0                  | s
11.044 14:12:56.2                  2 D
11.044 14:12:56.7                  | s
11.044 18:24:41.8                  3 A
11.044 18:24:42.8                  | s
11.044 18:25:37.5                  | s
11.044 18:27:19.3                  | s
+----------------+----------+---+--+--------------------

+---------------------------------------------------------
|Timeline for DBDS: DHVNTZ02 HIDAM2
|                      USID=00000003   AUTHORIZED=00000003
|                    RECEIVE=00000000        HARD=00000003
+-Time------------+Events----+---+--+--------------------
|                 |IC        |   |  |
|                 |REORG     |   |  |US|Subsystem
|                 |RECOV     |CA |ID|Logs and Allocs
+----------------+----------+---+--+--------------------
11.044 14:03:26.8  B                1
+----------------+----------+---+--+--------------------
```

Creating and running your DRF job

Perform the following steps to create and run a DRF job that produces an incremental image copy (ICR) of an online database

Before you begin

Important: Because the database is allocated, the result of the ICR might be a concurrent image copy or fuzzy image copy that can contain committed and

uncommitted log updates. For more information, see *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide.*

- To perform a DRF ICR, you must have IMS Database Recovery Facility (DRF) and IMS High Performance Image Copy (HPIC) installed. For more information, see *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide* and *IMS High Performance Pointer Checker for z/OS User's Guide.*
- Complete the tasks in sample member FRXITKB.

About this task

This scenario uses the time "11.044 18:25:37.5," which was extracted from the RECON that has updates being processed.

Procedure

1. Install and configure the required DRF load libraries and utilities. For more information, see "Installing IMS Recovery Solution Pack libraries" on page 2
2. Customize the procedures and JCL found in the sample library (SFRXSAMP(FRXDRF)).

   Modify or update the following sets of procedures and JCL:

   FRXBPECF
   Sample configuration file for BPE.

   FRXDRFZZ
   Sample configuration file for DRF.

   FRXJCLSB
   Sample DRF subordinate address space procedure.

   FRXMAS
   Sample DRF master address space procedure. You must include the name of your HPIC LOADLIB in the STEPLIB.

   FRXDRF
   Sample batch job to run DRF.

3. Customize the FRXDRF JCL to run DRF ICR.

   Make a copy of the IMSTOOL.IRSP11.SFRXSAMP(FRXDRF) JCL.

   The following example shows modified DRF ICR JCL in which an ICR is being taken with the database allocated:

```
ª//DRF       EXEC FRXMAS,DRFMBR=ZZ
//SYSIN DD *
 REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
 SORTPARM(ASPREF(AS))
 DBDSL101(DISP(NEW))
ᵇOUTPUT(ICR)
 ᶜADD DB(DHVNTZ02) DBATRB(DBDSL(101)) -
 ᵈIC (COMP(Y),-
 COMPRTN(FABJCMP3),-
      DSNTYPE(BASIC),-
      ICHLQ(TEMP.IC),-
      ICNMRULE(Y),-
      UNIT(SYSDA),-
      SPACE(CYL,1,1,RLSE))
 ᵉSTART ERROR(CONT) RCVTIME('11.044 18:25:37.5')
//
```

   Notes:
   a. When you run DRF, the FRXMAS procedure is invoked. DRFMBR=ZZ references the FRXDRFZZ configuration file for DRF.

b. To explicitly instruct DRF to take an ICR, see the "Environmental control statements" section in the *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide*.

c. The database name DHVNTZ02 (HIDAM/VSAM), which is identified in step 1 on page 21, is used to take an ICR by using the ADD DB() parameter. You can specify one or more databases take an ICR of.

d. You can customize the IC keywords to your specifications. For more information, see the "Environmental control statements" section in the *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide*. In this case, the output ICR is compressed by using the FABJCMP3 routine, and the output IC data set name follows the ICNMRULE naming convention (*ichlq*.IC*n*.*dbdname*.*ddname*.D*yyddd*.T*hhmmss*).

e. Specifying RCVTIME() is optional. If you want to run ICR to current time, you do not need to include this parameter because DRF automatically calls HPIC to generate concurrent and fuzzy ICs for the allocated databases that are specified in the ADD DB() statement. However, if you want to generate a point-in-time ICR that is not the current time, you must input the specific time by using RCVTIME(). In this scenario, the chosen time was inserted.

4. Submit the DRF job.

Reviewing the output

This section describes the important parts of the DRF ICR output. Review the output to help you understand the results of running this job.

The following example shows the output from a sample DRF ICR job. One of the ICRs that was generated was a CIC or concurrent image copy and was successfully registered to DBRC as a CIC image copy because the database was allocated and had updates.

```
D A T A B A S E   R E C O V E R Y   F A C I L I T Y   C O M M A N D S / C O N T R O L   S T A T E M E N T S

FRD7201I   REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
FRD7201I   SORTPARM(ASPREF(AS))
FRD7201I   DBDSL101(DISP(NEW))
FRD7201I   OUTPUT(ICR)
FRD7201I   ADD DB(DHVNTZ02) DBATRB(DBDSL(101)) -
FRD7201I       IC (COMP(Y),-
FRD7201I           COMPRTN(FABJCMP3),-
FRD7201I           DSNTYPE(BASIC),-
FRD7201I           ICHLQ(TEMP.IC),-
FRD7201I           ICNMRULE(Y),-
FRD7201I           UNIT(SYSDA),-
FRD7201I           SPACE(CYL,1,1,RLSE))
FRD7201I   START ERROR(CONT) RCVTIME('11.044 18:25:37.5')

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   S U M M A R Y   R E P O R T

Database  DD/Area   DSID       --------- Records Read ---------   Records Subord.  STC  Final
Name      Name                    IC        CA        LOG        Written Reg Name  #    Status

DHVNTZ02  HIDAM     1             49         0       3001            0 AS013901   140 No errors encountered
DHVNTZ02  HIDAM2    2             49         0          0            0 AS013902   141 No errors encountered
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY      Date: 02/13/2011 Time: 18:39   Page: 2

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   U T I L I T Y   R E P O R T

Database   DDN       Database Data Set Name                      IC   PC/DP IB   PR   Utility Final Status
----------------------------------------------------------------------------------------------------------
DHVNTZ02   HIDAM     IMSTESTL.DHVNTZ02.FKXXI01E                  00   N/A   N/A  N/A
DHVNTZ02   HIDAM2    IMSTESTL.DHVNTZ02.FKXXI02E                  00   N/A   N/A  N/A

Final Return (RC) and Reason (RSN) Codes

---IC---    ---PC---    ---DP---     ---IB---     ---PR---    ---LIU--
RC   RSN    RC   RSN    RC   RSN    RC   RSN     RC   RSN    RC   RSN
```

```
00   00    N/A N/A    N/A N/A    N/A N/A    N/A N/A    N/A N/A
```

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   I C / I C R   O U T P U T   R E P O R T

Database Name	DD/Area Name	IC / ICR Data Set Name	Compr Count	Volume Serial	File Seq.	IC Type	IC Time		Compr Ratio	Compr Routine
DHVNTZ02	HIDAM	TEMP.IC.IC1.DHVNTZ02.HIDAM.D11044.T183934	48	222222	00001	Con.	11.044 18:25:37.5	-0800	10.1	FABJCMP3
DHVNTZ02	HIDAM2	TEMP.IC.IC1.DHVNTZ02.HIDAM2.D11044.T183934	48	333333	00001	Bat.	11.044 18:25:37.5	-0800	7.6	FABJCMP3

D A T A B A S E   R E C O V E R Y   F A C I L I T Y   D A T A   S E T   I / O   R E P O R T

Recover to point: 2011.044 18:25:37.500000

Image Copy Data Set Name	Volume Serial	IC DS Read Count	IC Type	Time Stamp Range 1st Record	Last Record
IMSVS.DHVNTZ02.HIDAM2.IC.IC140323	222222	49	STD		
IMSVS.DHVNTZ02.HIDAM.IC.IC140323	222222	49	STD		

```
NOTIFY.IC   DBD(DHVNTZ02) DDN(HIDAM  )
   RUNTIME('2011.044 18:25:37.5 -08:00')
   STOPTIME('2011.044 18:25:37.5 -08:00')
   CIC
   ICDSN(TEMP.IC.IC1.DHVNTZ02.HIDAM.D11044.T183934)
   FILESEQ(0001) UNIT(3390)
   VOLLIST(222222 )
   RECDCT(0000000049)
DSP0203I  COMMAND COMPLETED WITH CONDITION CODE 00
NOTIFY.IC   DBD(DHVNTZ02) DDN(HIDAM2 )
   RUNTIME('2011.044 18:25:37.5 -08:00')
   BATCH
   ICDSN(TEMP.IC.IC1.DHVNTZ02.HIDAM2.D11044.T183934)
   FILESEQ(0001) UNIT(3390)
   VOLLIST(333333 )
   RECDCT(0000000049)
DSP0203I  COMMAND COMPLETED WITH CONDITION CODE 00
```

Common errors and problems

You might encounter error messages B37 or E37 due to the output IC running out of space. To resolve this problem, increase the space allocation size for the output IC by using the SPACE= keyword.

Optional: Verifying the ICR in DBRC

You can verify that the ICR created by DRF was registered in DRBC as a concurrent image copy.

Procedure

To verify the ICR in DBRC:

1. Run the same LIST.RECON or LIST.HISTORY job setup that you ran in "Identify the databases to perform incremental image copy" on page 19.
2. Locate the database you chose to ICR in your RECON output job: DHVNTZ02.

   For example:

   ```
   -----------------------------------------------------------------------
    DB
     DBD=DHVNTZ02                IRLMID=*NULL        DMB#=2        TYPE=IMS
   -----------------------------------------------------------------------
    DBDS
     DSN=DHVNTZ02.FKXXI01E                                        TYPE=IMS
     DBD=DHVNTZ02  DDN=HIDAM     DSID=001 DBORG=HIDAM  DSORG=VSAM
     CAGRP=**NULL**  GENMAX=2     IC AVAIL=0    IC USED=1     DSSN=00000001
     NOREUSE         RECOVPD=0
   ```

```
                    DEFLTJCL=**NULL**  ICJCL=ICJCL     OICJCL=OICJCL     RECOVJCL=RECOVJCL
                    RECVJCL=ICRCVJCL
                    FLAGS:                            COUNTERS:
                      IC NEEDED      =OFF
                      RECOV NEEDED   =OFF
                      RECEIVE NEEDED =OFF             EEQE COUNT              =0
                    -------------------------------------------------------------------------
                     IMAGE
                     RUN     = 11.044 14:03:25.0           *  RECORD COUNT =49
                     STOP    = 00.000 00:00:00.0              BATCH     USID=0000000001

                     IC1
                     DSN=IMSVS.DHVNTZ02.HIDAM.IC.IC140323          FILE SEQ=0001
                     UNIT=SYSDA                     VOLS DEF=0001 VOLS USED=0001
                                                    VOLSER=222222
                     IMAGE
                     RUN     = 11.044 18:25:37.5           *  RECORD COUNT =49
                     STOP    = 11.044 18:25:37.5              CONCUR    USID=0000000003

                     IC1
                     DSN=TEMP.IC.IC1.DHVNTZ02.HIDAM.D11044.T183934   FILE SEQ=0001
                     UNIT=3390                      VOLS DEF=0001 VOLS USED=0001
                                                    VOLSER=222222
                    -------------------------------------------------------------------------
                     DBDS
                     DSN=DHVNTZ02.FKXXI02E                                    TYPE=IMS
                     DBD=DHVNTZ02  DDN=HIDAM2   DSID=002 DBORG=HIDAM  DSORG=VSAM
                     CAGRP=**NULL**  GENMAX=2    IC AVAIL=0     IC USED=1     DSSN=00000000
                     NOREUSE        RECOVPD=0
                     DEFLTJCL=**NULL**  ICJCL=ICJCL     OICJCL=OICJCL     RECOVJCL=RECOVJCL
                     RECVJCL=ICRCVJCL
                     FLAGS:                            COUNTERS:
                       IC NEEDED      =OFF
                       RECOV NEEDED   =OFF
                       RECEIVE NEEDED =OFF             EEQE COUNT              =0
                    -------------------------------------------------------------------------
                     IMAGE
                     RUN     = 11.044 14:03:26.8           *  RECORD COUNT =49
                     STOP    = 00.000 00:00:00.0              BATCH     USID=0000000001

                     IC1
                     DSN=IMSVS.DHVNTZ02.HIDAM2.IC.IC140323         FILE SEQ=0001
                     UNIT=SYSDA                     VOLS DEF=0001 VOLS USED=0001
                                                    VOLSER=222222
                     IMAGE
                     RUN     = 11.044 18:25:37.5           *  RECORD COUNT =49
                     STOP    = 00.000 00:00:00.0              BATCH     USID=0000000003

                     IC1
                     DSN=TEMP.IC.IC1.DHVNTZ02.HIDAM2.D11044.T183934   FILE SEQ=0001
                     UNIT=3390                      VOLS DEF=0001 VOLS USED=0001
                                                    VOLSER=333333
```

Next steps

If the ICR was successfully created by DRF, it is now registered to DBRC as a
CONCUR image copy, and you are now able to continue running updates on your
online or allocated databases. All future updates (logs and CAs) start from the
newly created ICR. If you perform another ICR or standard recovery, DRF uses the
previous image copy (in this scenario, it is the ICR) and uses any archived logs or
change accumulation data sets as input.

Chapter 6. Using IMS Index Builder to rebuild indexes during recovery

In this scenario, DRF is used to run IMS Index Builder against HALDBs to rebuild the indexes.

The database that is used in this scenario is a PHIDAM or OSAM database with four partitions and one secondary index with four partitions.

When you include the IB() keyword in the DRF ADD statement, you are instructing DRF to run IMS Index Builder for HALDBs to rebuild your indexes. You can include many optional keywords in the IB() statement, however, for the purposes of this scenario the standard defaults are used.

In this topic:
- "Creating and running a DRF job"
- "Reviewing the output" on page 26
- "Common errors and problems" on page 27

Creating and running a DRF job

Perform the following steps to create and run a DRF job that runs IMS Index Builder (IB) against HALDBs to rebuild the indexes.

Before you begin
- To rebuild the indexes, you must have IMS Database Recovery Facility (DRF) and IMS Index Builder (IB) installed. For more information, see *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide* and *IMS Index Builder for z/OS User's Guide*.
- Complete the tasks in sample member FRXITKB.

Procedure
1. Install and configure the required DRF load libraries and utilities. For more information, see "Installing IMS Recovery Solution Pack libraries" on page 2
2. Customize the procedures and JCL found in the sample library (SFRXSAMP(FRXDRF)).

   Modify or update the following sets of procedures and JCL:

   FRXBPECF
   > Sample configuration file for BPE.

   FRXDRFZZ
   > Sample configuration file for DRF.

   FRXJCLIP
   > Sample utility address space JCL for IB and DFSPREC0.

   FRXJCLSB
   > Sample DRF subordinate address space procedure.

   FRXMAS
   > Sample DRF master address space procedure. You must include the name of your IB LOADLIB in the STEPLIB.

FRXDRF

Sample batch job to run DRF.

3. Customize the FRXDRF JCL to run DRF ICR.

Make a copy of *your.hlq*.SFRXSAMP(FRXDRF) JCL.

The following example shows modified DRF JCL to run a recovery and use IB to rebuild the indexes:

```
//DRF      EXEC FRXMAS,DRFMBR=ZZ
//SYSIN DD *
 ªDRFIAX(FRXJCLIP)
 REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
 SORTPARM(ASPREF(AS))
 DBDSL101(DISP(NEW))
  OUTPUT(PRO)
 ᵇADD DB(DBOHIDK5) IB(HALDB=BOTH,BLD_SECONDARY(ALL)) -
  DBATRB(DBDSL(101))
START ERROR(CONT)
//
```

Notes:

a. DRFIAX specifies the name of the procedure that is used to initiate the utility address space for IB.

b. DRF recovers the DBOHIDK5 (PHIDAM/OSAM) database and rebuilds the primary index and ILE, including rebuilding all of the secondary indexes by using the IB() keyword. You can customize the IB keywords to your specifications. For more information, see *IMS Recovery Solution Pack: IMS Database Recovery Facility User's Guide*.

4. Submit the DRF job.

Reviewing the output

This section describes the important parts of the DRF output. Review the output to help you understand the results of running this job.

The DRF utility report lists the return codes for the primary indexes and ILEs that were rebuilt by IMS Index Builder, including the rebuilt secondary indexes.

The following example shows the output from a sample DRF/IMS Index Builder job.

```
D A T A B A S E   R E C O V E R Y   F A C I L I T Y   C O M M A N D S / C O N T R O L   S T A T E M E N T S

FRD7201I  DRFIAX(FRXJCLIP)
FRD7201I  REPORT(RPTTYPE=SEP,DRFUNIT=SYSDA,DRFHLQ=MYDRF1)
FRD7201I  SORTPARM(ASPREF(AS))
FRD7201I  DBDSL101(DISP(NEW))
FRD7201I  OUTPUT(PRO)
FRD7201I  ADD DB(DBOHIDK5) IB(HALDB=BOTH,BLD_SECONDARY(ALL)) -
FRD7201I      DBATRB(DBDSL(101))
FRD7201I  START ERROR(CONT)


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   S U M M A R Y   R E P O R T
```

Database Name	DD/Area Name	DSID	IC	CA	LOG	Records Written	Subord. Reg Name	STC #	Final Status
POHIDKA	POHIDKAA	1	36	0	0	36	AS029501	296	Delete / define complete
POHIDKB	POHIDKBA	1	2	0	0	2	AS029502	297	Delete / define complete
POHIDKC	POHIDKCA	1	2	0	0	2	AS029503	298	Delete / define complete
POHIDKD	POHIDKDA	1	36	0	0	36	AS029501	296	Delete / define complete

(header rows above data: `--------- Records Read ---------` spanning IC / CA / LOG)

```
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY          Date: 02/13/2011 Time: 23:27    Page: 2


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   U T I L I T Y   R E P O R T
```

```
Database   DDN        Database Data Set Name                         IC    PC/DP IB    PR   Utility Final Status
--------------------------------------------------------------------------------------------------------------------
POHIDKA    POHIDKAA   IMSTESTS.DBOHIDK5.A00001                       N/A   N/A   N/A   N/A
POHIDKB    POHIDKBA   IMSTESTS.DBOHIDK5.A00002                       N/A   N/A   N/A   N/A
POHIDKC    POHIDKCA   IMSTESTS.DBOHIDK5.A00003                       N/A   N/A   N/A   N/A
POHIDKD    POHIDKDA   IMSTESTS.DBOHIDK5.A00004                       N/A   N/A   N/A   N/A
POHIDKA    PRIMINDX   IMSTESTS.DBOHIDK5.X00001                       N/A   N/A   00    N/A
POHIDKB    PRIMINDX   IMSTESTS.DBOHIDK5.X00002                       N/A   N/A   00    N/A
POHIDKC    PRIMINDX   IMSTESTS.DBOHIDK5.X00003                       N/A   N/A   00    N/A
POHIDKD    PRIMINDX   IMSTESTS.DBOHIDK5.X00004                       N/A   N/A   00    N/A
POHIDKA    ILDS/ILE   IMSTESTS.DBOHIDK5.L00001                       N/A   N/A   00    N/A
POHIDKB    ILDS/ILE   IMSTESTS.DBOHIDK5.L00002                       N/A   N/A   00    N/A
POHIDKC    ILDS/ILE   IMSTESTS.DBOHIDK5.L00003                       N/A   N/A   00    N/A
POHIDKD    ILDS/ILE   IMSTESTS.DBOHIDK5.L00004                       N/A   N/A   00    N/A
P2XIDKD    P2XIDKDA   (Partition Index Database)                     N/A   N/A   00    N/A

Final Return (RC) and Reason (RSN) Codes

---IC---    ---PC---    ---DP---    ---IB---    ---PR---    ---LIU--
RC   RSN    RC   RSN    RC   RSN    RC   RSN    RC   RSN    RC   RSN

N/A  N/A    N/A  N/A    N/A  N/A    00   N/A    N/A  N/A    N/A  N/A
FRD0000I IMS RECOVERY SOLUTION PACK V1R1 : IMS DATABASE RECOVERY FACILITY           Date: 02/13/2011 Time: 23:27    Page: 3
```

Common errors and problems

To avoid possible IMS Index Builder errors when you attempt to rebuild your indexes, you should define your indexes as REUSE.

Chapter 7. Questions or comments

If you need help with configuring or running DRF or with reviewing DRF results, consult the IMS Recovery Solution Pack documentation at http://publib.boulder.ibm.com/infocenter/dzichelp/v2r2/topic/com.ibm.imstools.frx.doc/frxhome.htm.

For additional help, contact your IBM® support representative.