Fast Path Online Restructure/EP
User Guide

Supporting

Version 3.10 of Fast Path Online Restructure/EP

December 2011
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  - system hardware configuration
  - serial numbers
  - related software (database, application, and communication) including type, version, and service pack or maintenance level
- sequence of events leading to the issue
- commands and options that you used
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About this book

This book contains detailed information about the Fast Path Online Restructure/EP (Extended Performance) product for the IBM® IMS™ environment. Fast Path Online Restructure/EP is a database restructure tool that is included in the BMC Software Fast Path/EP Series product family. These products provide tools for database administrators, systems programmers, and technical support personnel who manage and maintain IMS Fast Path databases.

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<td>installation documents</td>
<td><em>BMC Products for IMS Installation Guide</em></td>
<td>provides installation procedures and optional post-installation procedures for database administrators and technical support personnel involved with the initial installation and maintenance installation of BMC Fast Path products for IMS</td>
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<td></td>
<td><em>BMC Products for IMS Configuration Guide</em></td>
<td>provides optional post-installation procedures for implementing BMC Fast Path products for IMS after installation</td>
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## Conventions

This book uses the following special conventions:

- All syntax, operating system terms, and literal examples are presented in this typeface.

- Variable text in path names, system messages, or syntax is displayed in italic text:

  testsys/instance/fileName

- The symbol => connects items in a menu sequence. For example, **Actions => Create Test** instructs you to choose the **Create Test** command from the **Actions** menu.
Revision bars in the document mark changes that clarify or correct existing information or that provide new information. Revision bars do not mark editorial changes, formatting changes, or corrections of typographical errors unless these updates significantly affect your use of the information.

**Syntax statements**

The following example shows a sample syntax statement:

```plaintext
COMMAND KEYWORD1 [KEYWORD2 | KEYWORD3] KEYWORD4={YES | NO} fileName...
```

The following table explains conventions for syntax statements and provides examples:

<table>
<thead>
<tr>
<th>Item</th>
<th>Example</th>
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</table>
| Items in italic type represent variables that you must replace with a name or value. If a variable is represented by two or more words, initial capitals distinguish the second and subsequent words. | alias 
  databaseDirectory 
  serverHostName |
| Brackets indicate a group of optional items. Do not type the brackets when you enter the option. A comma means that you can choose one or more of the listed options. You must use a comma to separate the options if you choose more than one option. | [tableName, columnName, field] [-full, -incremental, -level] (UNIX) |
| Braces indicate that at least one of the enclosed items is required. Do not type the braces when you enter the item. | {DBDName | tableName} 
  UNLOAD device={disk | tape, fileName | deviceName} 
  {-a | -c} (UNIX) |
| A vertical bar means that you can choose only one of the listed items. In the example, you would choose either commit or cancel. | {commit | cancel} 
  {-commit | -cancel} (UNIX) |
| An ellipsis indicates that you can repeat the previous item or items as many times as necessary. | columnName . . . |
Summary of changes

For detailed information about enhancements, changes, and corrections that are included in your version of the product, see the product release notes. The release notes are available from the BMC Support Central page (http://www.bmc.com/support).
Introduction to Fast Path Online Restructure/EP

This chapter introduces the Fast Path Online Restructure/EP product. The following topics are discussed:

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Overview

The BMC Fast Path Online Restructure/EP product is an application enhancement tool that is included in the BMC Fast Path/EP Series of products. The Fast Path/EP Series consists of the following products:

- Fast Path Analyzer/EP
- Fast Path Indexer/EP
- Fast Path Online Analyzer/EP
- Fast Path Online Image Copy/EP
Fast Path Online Restructure/EP capabilities

- Fast Path Online Reorg/EP
- Fast Path Online Restructure/EP
- Fast Path Reorg/EP

These products deliver a range of functions for reorganizing databases, managing spaces, and associating indexes with Fast Path databases.

With Fast Path Online Restructure/EP, you change the structure of a data entry database (DEDB) while the database is online to IMS. After reading an area directly from DASD, the product writes the restructured DEDB directly to DASD. Writing directly to DASD can potentially reduce processing time and downtime.

Fast Path Online Restructure/EP capabilities

Fast Path Online Restructure/EP creates an environment that encourages you to exploit the advantages of DEDBs without the downtime associated with traditional batch maintenance processes. You can perform the following structural changes while the database is online to IMS:

- add and remove areas
- resize areas
- perform randomizer changes
- add segments at the end of a hierarchical path
- add a sequential dependent segment (SDEP)
- add, change, or remove a compression exit
- modify lengths of variable-length segments (decrease the minimum length or increase the maximum length)
- modify segment content

Advantages of using Fast Path Online Restructure/EP

Applications with high transaction rates demand fast transaction throughput and typically have voluminous storage requirements. Many of the world’s most business-critical applications use IMS Fast Path to take advantage of the transaction rate, large storage capabilities, and speed characteristics of data entry databases (DEDBs). However, these business-critical applications also need to remain online while structural changes are made to the database.
BMC created the Fast Path Online Restructure/EP product to meet the growing customer demand for 24x7 data availability. Fast Path Online Restructure/EP can efficiently make structural changes to a DEDB without taking the areas offline.

Fast Path Online Restructure/EP allows the areas to remain online through the use of shadow databases. The shadow databases receive a copy of the restructured data; the product captures and applies changes to that data as they occur in the online systems. When the appropriate areas have been restructured and all changes have been applied, a short outage occurs while the original areas and the newly restructured areas are swapped.

Fast Path Online Restructure/EP restrictions

The following restrictions for DEDB structural changes apply to Fast Path Online Restructure/EP:

- Fast Path Online Restructure/EP is designed to handle database changes with a minimum outage time; it is not designed to handle application program changes. As a result, the following restrictions apply:
  - You cannot insert a segment within the hierarchical path of an existing segment.
  - You cannot remove an existing segment.
  - You cannot add or remove a key sequence field on a segment.
  - You cannot change a direct dependent segment to an SDEP or an SDEP to a direct dependent segment.

- SDEP marker segments are not supported.

**NOTE**

If you are using expressions to modify the affected segment, you can make the following changes:

- You can modify the length of a key sequence field.
- You can modify a segment from fixed length to variable length or from variable length to fixed length.
- You can modify the length of a fixed length segment.
- For variable length segments, you can increase the minimum length, nor decrease the maximum length.

For more information about using expressions, see “Modifying segment contents by using expressions” on page 50.
Fast Path Online Restructure/EP functions

The Fast Path Online Restructure/EP product provides the following functions.

Prepare function

The Prepare function creates a Restructure Plan data set that contains information about the changes you want to make to the database. The Restructure Plan data set is used for input into the Shadow Initialization and Restructure functions.

In addition, the Prepare function

- identifies any requested changes that are not supported for restructure processing
- determines the minimum processing requirements by indicating which areas in the original database need to be processed
- optionally performs an analysis of all areas that are in the source database

For the Prepare function to perform an analysis of all areas, you must have a license for the Fast Path Online Analyzer/EP product.

Shadow Initialization function

The Shadow Initialization function initializes the shadow area data sets so that they are ready for Restructure function processing. This function receives input from the Restructure Plan data set. The Shadow Initialization function must be performed before Restructure function processing.

If secondary shadow area keywords are specified during Prepare function processing, the Shadow Initialization function initializes both the primary and secondary shadow area data sets. The secondary shadow area data set is a copy of the primary shadow area data set, which can be used for backup and recovery purposes.
Restructure function

The Restructure function uses the information in the Restructure Plan data set to make structural changes to the shadow area data sets while the original area data set is available to your online IMS system. The Restructure function completes the following steps:

1. The Area Copy task copies all data from the original area data sets to the shadow area data sets. The required database structure changes are made during the area copy process. An IFP task is started for each area to be restructured. Multiple IFP tasks can be performed in parallel, depending on the available IMS resources.

2. The Change Capture task captures all DL/I updates that are made to the original area data sets.

3. The Change Apply task takes the captured changes and applies them to the shadow area data sets.

4. During post-processing, a database outage occurs. The following post-processing tasks are completed to make the restructured areas available to the online IMS system:
   - The Restructure function issues a /DBR command to take the restructured areas offline.
   - The online and primary shadow area data sets are swapped.
   - DBRC registration is added and other information is updated as needed.
   - ACB/PFX control blocks and randomizers are reloaded into your IMS system.
   - The Restructure function issues a /STA command to make all areas in the database available by bringing them online.

If any post-processing task fails, you can restart the task by using the Restart function.

Restart function

The Restart function can be used to resume the post-processing task if a failure occurs during restructure post-processing or after early termination was requested. The Restart function allows you to continue from a failure point without going through the entire restructure process again.
If a failure occurs during the Area Copy, Change Capture, or Change Apply tasks, execute the Shadow Initialization function, and then rerun the restructure job to resume these tasks.

## Fast Path Online Restructure/EP operational considerations

This section lists system and processing requirements, configuration considerations, and best practices recommendations that apply to Fast Path Online Restructure/EP.

### System requirements

The following system requirements apply to Fast Path Online Restructure/EP:

- IBM z/OS® operating system version 1.7 or later
- IMS version 9.1 or later
- APF authorization for the Fast Path Online Restructure/EP load library

### Processing requirements

The following processing requirements apply to Fast Path Online Restructure/EP:

- Database Recovery Control (DBRC) registration is required for the database to be restructured.
- Additional DASD is required for the primary shadow area data sets.
- A short online outage is required for the restructured database.
- IFP utility and HSSP processing are limited during restructure processing.
Configuration considerations

The following configuration considerations apply to Fast Path Online Restructure/EP:

- BMC licenses Fast Path Online Restructure/EP to run on specific CPUs.

- To shorten database outage time, BMC recommends that you use DELTA IMS with Fast Path Online Restructure/EP. If you use DELTA IMS (includes load modules from DLALIB), version 6.5.02 or later is required.

- To prevent SDEP processing corruption, BMC recommends that you install the IMS usermods for the IBM SDEP Scan and Delete utilities.

- Ensure that version 4.7.00 or later of the DBULIB or IMLIB is installed. You can use load module DBULEVEL to verify the version.

For more information, see the Database Product for IMS Configuration Guide.

Recommendations for best practices

Installing the following components enhances processing of Fast Path Online Restructure/EP. BMC recommends that you install these components.

Usermods for the IBM SDEP Scan and Delete utilities

BMC recommends that you install the IMS usermods that are provided for the IBM SDEP Scan and Delete utilities. The usermods prevent the SDEP Scan and Delete utilities from executing during restructure processing. Not allowing these utilities to execute prevents duplicate SDEPs from occurring in the shadow area data sets.

Secondary shadow area data sets

Additional DASD is required for the secondary shadow data sets. These data sets can be used for recovery purposes, until a valid image copy of the online database is performed.
Synergy with other BMC products

Fast Path Online Restructure/EP works with other BMC products in your environment to optimize resource usage and to increase the advantages that you receive from the products. BMC recommends that you install these products.

DELTA IMS

Version 6.5.02 or later of DELTA IMS should be active on your IMS system. The DELTA interface automatically reloads ACB control blocks into the IMS system, which shortens the online outage time.

If DELTA IMS is not active on your IMS system, you must complete specific post-processing tasks manually. For more information, see Appendix A, “Completing post-processing tasks manually.”

RECOVERY PLUS for IMS

RECOVERY PLUS for IMS can use the secondary shadow area data sets as input into a recovery.

IMAGE COPY PLUS

IMAGE COPY PLUS can use the secondary shadow area data sets as input to create a standard batch image copy.

APPLICATION RESTART CONTROL for IMS

Version 3.7.00 or later of APPLICATION RESTART CONTROL for IMS should be active on your IMS system. APPLICATION RESTART CONTROL for IMS automatically stops BMPs from executing when the restructure process begins, and restarts them as needed.

Fast Path Online Analyzer/EP

BMC licenses Fast Path Online Analyzer/EP to run on specific CPUs. You can perform an analysis of all areas for the restructured database during Prepare function processing.
Chapter 2  Getting started with Fast Path Online Restructure/EP

This chapter describes how Fast Path Online Restructure/EP works and helps you get started with basic Fast Path Online Restructure/EP tasks. The following topics are included:

- **Fast Path Online Restructure/EP architecture** ........................................... 26
- **Fast Path Online Restructure/EP processing** .............................................. 27
- **Performing staging tasks** ................................................................. 27
- **Fast Path Online Restructure/EP command set** ...................................... 28
  - PREPARE command ........................................................................... 28
  - SHADOW_INIT command ................................................................. 28
  - RESTRUCTURE command ................................................................. 29
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  - Identifying the DEDB areas to be processed ..................................... 34
  - Multiple area data sets ................................................................. 34
- **Configuration considerations for the Prepare and Restructure functions** .... 35
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Figure 1 shows the components of the Fast Path Online Restructure/EP product and how they interact with each other to restructure a DEDB while online to IMS.

Figure 1  Fast Path Online Restructure/EP architecture
Fast Path Online Restructure/EP processing

To use Fast Path Online Restructure/EP, perform the tasks that are provided in Table 1.

<table>
<thead>
<tr>
<th>Step</th>
<th>Task</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Perform staging tasks.</td>
<td>Create control blocks and load modules for the new database definition.</td>
<td>For more information, see “Performing staging tasks” on page 27.</td>
</tr>
<tr>
<td>2</td>
<td>Create the Restructure Plan data set.</td>
<td>Use the PREPARE command to create a Restructure Plan data set. This data set contains information about the new database structure.</td>
<td>summarized in this chapter For detailed information, see Chapter 3, “Preparing for a DEDB restructure.”</td>
</tr>
<tr>
<td>3</td>
<td>Initialize shadow area data sets.</td>
<td>Use the SHADOW_INIT command to initialize the shadow area data sets before restructuring the database.</td>
<td>summarized in this chapter For detailed information, see Chapter 4, “Initializing shadow area data sets.”</td>
</tr>
<tr>
<td>4</td>
<td>Execute online restructure processing.</td>
<td>Use the RESTRUCTURE command to restructure the database and perform restructure post-processing tasks.</td>
<td>summarized in this chapter For detailed information, see Chapter 5, “Restructuring a DEDB online.”</td>
</tr>
<tr>
<td>5</td>
<td>(optional) Restart restructure processing.</td>
<td>Use the RESTART command to restart post-processing if a task fails during restructure post-processing, or if you perform early termination of a post-processing task. Perform this task as needed.</td>
<td>summarized in this chapter For detailed information, see Chapter 6, “Restarting post-processing.”</td>
</tr>
</tbody>
</table>

Performing staging tasks

Before you can use Fast Path Online Restructure/EP, complete the following staging tasks:

1. *(optional)* If you are changing the randomizer or any compression algorithms, compile and link the new routines into a staging library.

2. Create the new database definition (DBD) for the database that you want to restructure, and run DBDGEN to generate the new DBD definition.

3. *(optional)* Create the new DBD for any new or changed PFX indexes or IBM native indexes, and run DBDGEN to generate the new DBD definition.
4 (optional) Create the new restructure program specification block (PSB), and run PSBGEN to generate the new PSB definition.

5 Execute ACBGEN (or PFXAGEN) to build the ACB members into a staging library.

6 (optional) If you are adding new areas to the database, register the new areas to DBRC, and make all new area data sets unavailable.

7 (optional) If you are using expressions to modify the content of a database segment that requires application program changes, compile and link the new programs into a staging library.

Fast Path Online Restructure/EP command set

The Fast Online Restructure/EP command set includes several primary commands. You can use these commands to restructure a DEDB. Each command can execute as PFPSYSIN input to the PFCMAIN program that Fast Path Online Restructure/EP provides.

Each command is discussed in detail in subsequent chapters of this book.

PREPARE command

By using the Fast Path Online Restructure/EP Prepare function, you can prepare for an online DEDB area restructure by creating a Restructure Plan data set that contains information about the areas that will be restructured. The PREPARE command is executed in a batch job, runs under the control of IMS, and submits online IFP tasks. For more information, see Chapter 3, “Preparing for a DEDB restructure.”

SHADOW_INIT command

By using the Fast Path Online Restructure/EP Shadow Initialization function, you can initialize the shadow area data sets. The SHADOW_INIT command is executed in a batch job. For more information, see Chapter 4, “Initializing shadow area data sets.”
RESTRICTURE command

By using the Fast Path Online Restructure/EP Restructure function, you can alter or make changes to a DEDB area while it is online to IMS. The RESTRUCTURE command is executed in a batch job, runs under the control of IMS, and submits online IFP tasks. For more information, see Chapter 5, “Restructuring a DEDB online.”

RESTART command

By using the Fast Path Online Restructure/EP Restart function, you can restart the restructure process if

- errors occur during restructure post-processing activities
- you requested early termination of the restructure process

The RESTART command is executed in a batch job and runs under the control of IMS. For more information, see Chapter 6, “Restarting post-processing.”

JCL requirements

This section provides an example of the minimum JCL that is needed to execute Fast Path Online Restructure/EP functions. It also provides information about the EXEC statements and DD statements that are required to execute the JCL.

Execution JCL

Figure 2 shows JCL that is used to execute the Fast Path Online Restructure/EP product functions.

Figure 2  JCL for processing of a Fast Path Online Restructure/EP command (part 1 of 2)

```plaintext
//PFCMAIN EXEC PGM=PFCMAIN,REGION=OM
//STEPLIB DD DISP=SHR,DSN=BMC.ICO.LOAD
// DD DISP=SHR,DSN=BMC.PFP.LOAD
// DD DISP=SHR,DSN=BMC.DBU.LOAD
// DD DISP=SHR,DSN=BMC.DLA.LOAD
// DD DISP=SHR,DSN=yourname.DLA.OPTIONS
// DD DISP=SHR,DSN=IMSVS.RESLIB
```
EXEC and DD statements

JCL to execute Fast Path Online Restructure/EP includes EXEC and various DD statements. For more information about coding EXEC and DD statements, see the Fast Path/EP Series Reference Manual.

EXEC

The EXEC statement includes the program name PFCMAIN.

To ensure optimum performance, BMC recommends that you request the maximum available storage for execution of Fast Path Online Restructure/EP product functions. Maximum storage is normally requested by specifying REGION=0M on the EXEC statement for the JOB step. Some sites might have different requirements. To determine how to request the maximum REGION size, check with your IBM OS/390® systems programmer.

STEPLIB DD

The STEPLIB DD statement identifies the libraries containing the Fast Path/EP load modules (the Fast Path/EP library that was allocated and unloaded during installation) and the IMS RESLIB. It also identifies any libraries used for dynamic allocation.

The Fast Path/EP online products require that the installation library containing the BMC-supplied region controller module, BMCRRC00 (alias DFSRRC00), be concatenated preceding the IMS RESLIB data set in the STEPLIB DD statement. The BMC DFSRRC00 module is a replacement of the IMS region controller module.
In addition, the Fast Path Online Restructure/EP product requires the installation library containing IMS Database Utilities (DBU) load modules be included in the STEPLIB DD statement. BMC recommends that you also include the installation library containing the optional DELTA IMS (DLA) load modules in the STEPLIB DD statement.

--- NOTE ---

All data sets in the STEPLIB concatenation must be APF-authorized.

---

**AMSOUT DD**

The AMSOUT DD statement for the Restructure function is required when executing the Restart function. During Restructure function processing, the AMSOUT DD statement identifies a PDS or PDSE data set in which the following data will be written:

- restart information for post-processing tasks that failed
- information for swapping data sets during post-processing

If a failure occurs during Restructure function processing, the AMSOUT DD statement must be provided in the restructure job so the Restart function can be executed.

Do not modify the contents of the AMSOUT data set. Modifying the data set might make the information unusable when executing the Restart function.

**NEWACB DD**

The NEWACB DD statement identifies the ACB library that contains the database definition that describes the database as it will appear when it is restructured, and the IBM native indexes for the restructured database. The restructure process will copy all control blocks contained in this data set to the active IMSACB in your IMS control region.

This data set should be unique for each restructure that is performed. Dynamic allocation is not available for the NEWACB DD statement.
NEWPFXLB DD

The optional NEWPFXLB DD statement identifies the staging library that contains the modified PFX indexes for the restructured database. During the Restructure function, Fast Path Online Restructure/EP copies the contents of the NEWPFXLB data set to the PFXLIB data set. The NEWPFXLB DD statement is required when the following conditions exist:

- Fast Path Indexer/EP is active in the IMS control region specified on the ACCESS keyword.
- The IMS control region STEPLIB DD statement contains the PFXLEVEL member.
- The IMS control region JCL includes the PFXLIB, PFXLIBA, or PFXLIBB DD statement.

The NEWPFXLB data set should be unique for each restructure that is performed. Dynamic allocation is not available for the NEWPFXLB DD statement.

NOTE
If no changes are necessary, copy the PFX control block from the active PFXLIB in your IMS control region.

NEWRESLB DD

The optional NEWRESLB DD statement identifies the staging library containing any new randomizer or compression routines for the restructured database. If the NEWRESLB DD statement is not specified, STEPLIB is used.

PFPOPTS DD

The optional PFPOPTS DD control statement contains the input control statements that set Fast Path/EP options. PFPOPTS uses the command statements that are in the Fast Path/EP command language. If no options are set with the PFPOPTS statement, internal defaults are used.

The PFPOPTS DD statement can refer to a standard input file, a sequential data set, or PDS member that contains options settings.
Depending on the environment settings or standards that are defined at your site, you might need to specify the following keywords on the PFPOPTS DD statement:

- IFP_ACCOUNT
- IFP_LIMIT
- IFP_JOBNAME

For more information, see “Configuration considerations for the Prepare and Restructure functions” on page 35 and the Database Product for IMS Configuration Guide.

**PFPPRINT DD**

The optional PFPPRINT DD statement identifies the processing log output data set. If the PFPPRINT DD statement is not specified in the JCL, Fast Path Online Restructure/EP dynamically allocates the data set as a standard SYSOUT data set.

**PFPPRINx and PFPRPTSx DD**

The PFPPRINx and PFPRPTSx DD statements are dynamically allocated for each IFP task that is started. For these DD statements, \( x \) represents the IFP number (address space ID).

**PFPRPTS DD**

The optional PFPRPTS DD statement identifies the report output data set. If omitted from the JCL, Fast Path Online Restructure/EP dynamically allocates the data set as a standard SYSOUT data set.

**PFPSYSIN DD**

The PFPSYSIN DD statement identifies the input control statement data set that specifies Fast Path Online Restructure/EP functions.

**Dynamic allocation of DD statements**

The minimum JCL that is required for execution of Fast Path Online Restructure/EP product functions is simple because many of the necessary data sets can be allocated dynamically. If you supply the appropriate DD statements in your JCL, the specified data sets are used. BMC recommends that you omit these DD statements so that dynamic allocation is used.
Identifying the functions to be performed

**IMS ACB library**

Fast Path Online Restructure/EP functions executing in offline mode require access to the IMS ACB library containing the database definitions (DMB) for the DEDB area or areas to be processed. If the IMSACB DD statement is omitted from the JCL, Fast Path Online Restructure/EP attempts to dynamically allocate it. The IMSACB DD statements (IMSACB, IMSACBA, IMSACBB, OLCSTAT, MODSTAT and MODSTAT2) are used to identify the active ACB library. For details about using DD statements to identify the IMS ACB library, see the *IMS/ESA System Administration Guide*.

**NOTE**

The IMS/ESA release level of the ACB library must be the same as that of the RESLIB that is included in the STEPLIB DD statement concatenation.

**Area data set**

The registered area data set name is obtained from DBRC.

**Identifying the functions to be performed**

The PFPSYSIN control statements identify the functions to be performed. As shown in Figure 3, the DBD keyword is required for each Fast Path Online Restructure/EP function command. The DBD keyword identifies the DEDB (DBD name) to be processed by the command.

**Figure 3   Specifying function commands**

```
PREPARE DBD=dbdname1, ACCESS=(ONLINE,imsid)...
```

**Identifying the DEDB areas to be processed**

Fast Path Online Restructure/EP can automatically select areas for restructuring, or you can use the REQUIRE_AREA keyword to select specific areas.

**Multiple area data sets**

Multiple area data sets (MADs) are not supported. Fast Path Online Restructure/EP processes the first area data set that is registered in the area data set list for an area.
For functions that read and update the database, the area data set list that is registered for each area is searched (in collating sequence by DD name) for the first area data set that is marked as available for use and that has no error queue elements (EQE)s. The selected area data set is read and updated; all other area data sets are marked as unavailable and renamed by using the value for the RETAINED_SUFFIX keyword.

For functions that create the database, the first area data set (in collating sequence by DD name) is selected and created. All other area data sets are marked as unavailable and renamed by using the value for the RETAINED_SUFFIX keyword.

When functions that update or create the database have completed successfully, only one area data set will be marked as available. Use the IBM Online MADS Create utility to resynchronize the other (unavailable) area data sets.

**Configuration considerations for the Prepare and Restructure functions**

Before you can successfully use the Prepare and Restructure functions, it is very important that you understand how the following components were configured during installation:

- enabling the IFP address space to start dynamically
- authorizing SAF to schedule an IFP job

The Fast Path Online Restructure/EP product uses dynamically started tasks to run interactive Fast Path (IFP) regions. The options selected by the product installer might require you to specify additional keywords when you execute the product. Contact the product installer at your site to verify the installation options that are used in your execution environment.
Enabling IFP address space to start dynamically

Fast Path Online Restructure/EP uses dynamically started tasks to run IFP external address spaces (regions) from the Prepare and Restructure functions. These tasks require access to module PC$XAINI for successful execution. Use one of the following options to ensure that the module is available to the tasks:

- Authorize Fast Path Online Restructure/EP to add module PC$XAINI to the link pack area (LPA) dynamically.

  If this recommended method is used in your environment, no additional keywords are required to execute the Prepare and Restructure functions.

- Ensure that module PC$XAINI is available in the STEPLIB of the started task by creating a new PROCLIB member.

  If this method is used, provide a PFPOPTS DD statement (in the prepare and restructure job) that specifies the IFP_PROCNAME keyword on the OPTIONS command.

  The IFP_PROCNAME keyword specifies the newly created PROCLIB member name that will be used instead of IEESYSAS.

For more information, see the Database Products for IMS Configuration Guide.

Authorizing SAF to schedule an IFP job

Fast Path Online Restructure/EP defaults to using the same job name for the IFP regions (started tasks) that is used for the prepare and restructure job. Determine whether your site has set SAF rules for started tasks based on the job name:

- If your site has not set SAF rules for started task job names, no additional keywords are required for you to execute the Prepare and Restructure functions.

- If your site has set SAF rules for started task job names, probably only certain job names are allowed to run as started tasks. As a result, you need to change the default job name, and provide a PFPOPTS DD statement that specifies the job name:

  —To change the default job name, specify the IFP_JOBNAME keyword to define the job name that is used when external address spaces are started.

  —Provide a PFPOPTS DD statement (in the prepare and restructure job) that specifies the IFP_JOBNAME keyword on the OPTIONS command. This keyword specifies the job name to be used when starting IFP regions.
Specifying additional keywords

For more information, see the *Database Products for IMS Configuration Guide.*

**Specifying additional keywords**

Depending on the environment settings or standards that are defined at your site, you might also want to specify the following keywords on the OPTIONS command:

- **IFP_ACCOUNT** defines whether accounting information is to be supplied when starting IFP regions. The default is to copy accounting information from the prepare and restructure job.

- **IFP_LIMIT** defines the maximum number of concurrent IFP regions that will be attached by the PREPARE and RESTRUCTURE commands. The range is from 1 to 256. The default is 4.

For more information, see the *Fast Path/EP Series Reference Manual.*
Preparing for a DEDB restructure

This chapter provides information about the use of the Prepare function that is provided by Fast Path Online Restructure/EP. The Prepare function creates the Restructure Plan data set, which is used for input into the Shadow Initialization and Restructure functions. The following topics are discussed:

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  Determining minimum processing requirements ..................... 41
Prepare function restrictions ......................................................... 42
DBRC considerations ..................................................................... 42
Prepare function inputs and outputs ............................................ 42
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Scenario 5—Using expressions to modify segment contents with the PREPARE command .......................................................... 67

Prepare function overview

By using the Prepare function of the Fast Path Online Restructure/EP product, you can create a Restructure Plan data set that contains information that is needed to restructure a DEDB online. The Restructure Plan data set is used for input into the Shadow Initialization function, Restructure function, and the Restart function (if needed).

The Prepare function must be performed before the actual restructure process. The Prepare function can be performed anytime (days or even weeks ahead of the actual restructure process). It can also be performed several times before the actual restructure process is initiated, allowing you to evaluate different design alternatives.

Before the Prepare function can be executed, you must first create the appropriate control blocks and load modules that are required for the new restructured database design. The Prepare function analyzes the changes between the existing (old) database design and the proposed (new) design. Included in these changes are any changes to the definitions of PFX indexes and IBM native indexes. You can review the output to evaluate the proposed design and to plan the actual restructure of the database.

The Prepare function executes an online (IFP region) utility program. The IFP utility program compares the control blocks and load modules that define the existing (old) database with the control blocks and load modules that define the restructured (new) database.

The output from the Prepare function is saved as a Restructure Plan data set that is used as input into the Shadow Initialization function, Restructure function, and Restart function (if needed). The information is saved in a format that cannot be modified. As a result, no additional design changes can be made between the execution of the Prepare function and the Restructure function. If additional changes are made, the Prepare function must be executed again.

Preparing a DEDB for an online restructure by using the Prepare function yields less I/O, processing time, and downtime during the restructure process.
Identifying changes

The Prepare function makes a detailed comparison of the IMS control blocks that define the database to identify the changes that are being requested. For a list of changes that can be requested, see “Fast Path Online Restructure/EP capabilities” on page 18.

The following comparisons are made:

- DMCB comparison (compares DMCB fields, area attributes, segment attributes, and field attributes)
- randomizer module comparison
- compression module comparison

The output from the Prepare function identifies any changes that are not supported. For a list of restrictions, see “Fast Path Online Restructure/EP restrictions” on page 19.

Determining minimum processing requirements

Because of the types of database changes involved, identifying the parts of a database that need to be restructured can be difficult. The Prepare function eliminates this complexity by automatically determining the minimum processing requirements.

Some changes might require that all areas be processed, but other changes might require only a subset of areas need to be processed. The Prepare function determines which areas in the existing database must be processed during the restructure. It determines which areas to process by sampling the root segments in the existing database and then accessing the randomizer (for the restructured database) to determine where the root segments will be placed in the restructured database. If no root segments within an area will be moved to a new RAP (within either the same or a different area), then that area does not need to be processed during Restructure function processing. As a result, Restructure function processing is optimized by eliminating areas that do not need to be processed.
Prepare function restrictions

The following restrictions apply to the Fast Path Online Restructure/EP Prepare function:

- You cannot specify multiple PREPARE commands in the same command stream.
- You cannot use PREPARE commands in the same command stream with a SHADOW_INIT, RESTRUCTURE, or RESTART command.
- A Restructure Plan data set is created if W-level pointer errors occur. However, a Restructure Plan data set is not created if F-level or C-level pointer errors occur.
- You cannot use POINTER_VALIDATION=NONE with the PREPARE command.

DBRC considerations

Before you execute the Prepare function, you must register old areas with DBRC. You can use the optional REGISTER subcommand with the PREPARE command to register new areas, or you can register new areas in DBRC before you execute the Prepare function. For more information about the REGISTER subcommand, see “Registering new areas” on page 54.

Prepare function inputs and outputs

The PREPARE command can accept input from the following sources:

- old and new randomizers
- old and new compression routines
- old and new ACB control blocks
- old and new PFX control blocks
- specific areas within a DEDB

The output from the PREPARE command is a sequential data set (called the Restructure Plan data set) that contains information that can be used as input into the Shadow Initialization and the Restructure functions. Inputs and outputs are shown in Figure 4.
The Prepare function generates the following reports to the report log when DEDB prepare activities are complete:

- Area Summary Report
- DBD Comparison Report
- Randomization Input Summary Report
- Randomization Output Summary Report
**PREPARE command keywords and subcommands**

Table 2 lists the keywords and subcommands that are available for the PREPARE command.

**Table 2  Prepare command keywords and subcommands (part 1 of 2)**

<table>
<thead>
<tr>
<th>Function</th>
<th>Command or subcommand</th>
<th>Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>selecting the database and areas to be restructured</td>
<td>PREPARE</td>
<td>DBD REQUIRE_AREA</td>
</tr>
<tr>
<td>specifying the access mode for area data sets and the subsystem used for the prepare</td>
<td>PREPARE</td>
<td>ACCESS</td>
</tr>
<tr>
<td>suppressing repetitious messages</td>
<td>PREPARE</td>
<td>MESSAGE_SUPPRESSION ORPHANED_SDEP_MSG</td>
</tr>
<tr>
<td>renaming the original area data set after restructure process completes</td>
<td>PREPARE</td>
<td>RETAINED_SUFFIX</td>
</tr>
<tr>
<td>specifying the name of the primary shadow area data set</td>
<td>PREPARE</td>
<td>SHADOW_SUFFIX</td>
</tr>
<tr>
<td>specifying the name of the secondary shadow area data set</td>
<td>PREPARE</td>
<td>SHADOW2_DSNAMESHADOW2_SUFFIX</td>
</tr>
<tr>
<td>modifying segment contents by using expressions</td>
<td>OUTPUT</td>
<td>FIELDS SEGMENT WHERE</td>
</tr>
<tr>
<td>using a history file</td>
<td>PREPARE</td>
<td>HISTORY_DDNAME</td>
</tr>
<tr>
<td>analyzing a DEDB during prepare</td>
<td>PREPARE</td>
<td>LARGEST_DATABASE_RECORDS POINTER_VALIDATION RAP_VALIDATION SDEP_VALIDATION</td>
</tr>
<tr>
<td>specifying an outage window for post-processing</td>
<td>PREPARE</td>
<td>OUTAGE_WINDOW</td>
</tr>
</tbody>
</table>
### Table 2  Prepare command keywords and subcommands (part 2 of 2)

<table>
<thead>
<tr>
<th>Function</th>
<th>Command or subcommand</th>
<th>Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>allocating the Restructure Plan data set</td>
<td>PLAN_FILECTL</td>
<td>DDNAME DNAME</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Related keywords:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AVGREC DATACLAS DISP EXPDT LIKE MGMTCLAS RETPD SPACE STORCLAS UNIT VOLCINT VOLSER</td>
</tr>
<tr>
<td>registering new areas</td>
<td>REGISTER</td>
<td>ADDN ADSN CFSTR1 CFSTR2 DEFLTJCL GENMAX GSGNAME ICJCL LKASID MAS OAREA PRELOAD PREOPEN RECOVJCL RECOVPD RECVJCL REUSE TRACK</td>
</tr>
<tr>
<td>generating analysis reports</td>
<td>REPORT</td>
<td>all associated keywords</td>
</tr>
<tr>
<td>detecting exception conditions</td>
<td>THRESHOLD</td>
<td>all associated keywords</td>
</tr>
</tbody>
</table>

For more information about PREPARE command syntax, including subcommands and keywords, see the *Fast Path/EP Series Reference Manual*. 

---

*Chapter 3  Preparing for a DEEDB restructure* 45
JCL requirements

Figure 5 provides an example of the JCL that is required to invoke the Prepare function. You execute the PREPARE command with program PFCMAIN.

![Figure 5 Execution JCL for the Prepare function](image)

Selecting the database and areas

The DBD keyword identifies the name of the DEDB to be restructured. The DBD keyword is required for restructure prepare processing. The prepare process detects when an area number has changed, and marks the input and output areas for restructure processing.

**NOTE**

When you insert an area into the middle of the area list, the product restructures all areas following the inserted area and changes the DSID of the areas in DBRC.

If the prepare process detects that an area data set name is registered as NULLFILE in DBRC, the prepare function automatically excludes the dummy area from the list of areas to be processed. However, Randomization Analysis determines whether the database randomizer selected a dummy area as the target for output root segments.
You can use the optional REQUIRE_AREA keyword to identify areas to be selected for input (unloaded) into the prepare process. You can specify one or more area names or area numbers (including ranges, if applicable). If you specify the REQUIRE_AREA keyword, the areas will be selected even if the prepare process does not select them for processing.

Using the EMPTY parameter with the REQUIRE_AREA keyword identifies whether all empty areas are to be selected for input (unload) processing even if the restructure prepare process does not automatically select the areas for processing. Specify YES to indicate that empty areas are to be processed.

**NOTE**
BMC does not recommend using the REQUIRE_AREA keyword because it nullifies the intelligence of the prepare process to automatically select only the areas that need to be processed in restructure processing.

### Specifying the access mode

The ACCESS keyword in Figure 6 identifies the access mode for the area data sets that are processed by the randomizer analysis and is used for the prepare process.

The IMS access type is defined by using the ONLINE (default) parameter, which indicates that the area data sets are processed by an IFP region associated with the specified IMS subsystem.

The IMS subsystem ID (*imsid*) or IMS group (*imsgroup*) name is used for the dynamic allocation of the IMSRESLB, IMSACB, and RECON data sets.

**Figure 6** Specifying the ACCESS keyword during prepare processing

```
ACCESS=(ONLINE,imsgroup)
or
ACCESS=(ONLINE,imsid)
```

### Allocating the input area data set

The Fast Path Online Restructure/EP Prepare function attempts to obtain the data set name for allocation in the following order:

1. The area data sets are supplied in the JCL.
2. The registered area data set name is obtained from DBRC.
Renaming the original area data set

The RETAINED_SUFFIX keyword identifies the 1-character to 8-character suffix to be appended to the original area data set name when it is renamed when the restructure process is completed. The default is O.

The combined length of the original area data set and the suffix (including the period used as the separator) cannot exceed 44 characters. This requirement applies to the cluster name and to the data component name.

The value for the RETAINED_SUFFIX keyword is written to the Restructure Plan data set.

Naming the primary shadow area data set

The primary shadow data set becomes the online area data set when the restructure process is completed.

The SHADOW_SUFFIX keyword identifies the 1-character to 8-character suffix to be appended to the original area data set name to form the name of the primary shadow area data set. The default is Z.

The combined length of the original area data set and the suffix (including the period used as the separator) cannot exceed 44 characters. This requirement applies to both the cluster name and to the data component name.

The value for the SHADOW_SUFFIX keyword is written to the Restructure Plan data set. The primary shadow area data set names that are defined in the Prepare function are processed by the Shadow Initialization, Restructure, and Restart functions.

---

**NOTE**

The allocated area data set name supplied in the JCL must match the area data set name (ADSN) registered in DBRC.

If ADSN(NULLFILE) is registered in DBRC, the area is excluded from prepare and restructure processing.
Naming the secondary shadow area data set

In addition to creating a primary shadow area data set, BMC recommends that you create a secondary shadow area data set that can be used for backup and recovery purposes. The secondary shadow data set is a copy of the primary shadow data set that is created during Restructure function processing. You must specify either the SHADOW2_DSNAME or SHADOW2_SUFFIX keyword to name the secondary shadow data set; the keywords are mutually exclusive.

The value for the SHADOW2_DSNAME or SHADOW2_SUFFIX keyword is written to the Restructure Plan data set. The secondary shadow area data set names that are defined in the Prepare function are processed by the Shadow Initialization and Restructure functions.

SHADOW2_DSNAME keyword

The SHADOW2_DSNAME keyword specifies a mask name for the secondary shadow data set name. There is no default value.

The secondary shadow data set name produced by the mask (after variable substitutions are performed) must conform to standard data set naming rules. It cannot contain a reference to a partitioned data set (PDS) member name. It can contain a reference to a generation data set group (GDG), with or without a relative generation number, such as “(+1)”.

SHADOW2_SUFFIX keyword

The SHADOW2_SUFFIX keyword identifies the 1-character to 8-character suffix to be appended to the original area data set name to form the name of the secondary shadow area data set. There is no default value.

The combined length of the original area data set and the suffix (including the period used as the separator) cannot exceed 44 characters. This requirement applies to both the cluster name and the data component name.
Using secondary shadows for recovery

Recovery of an area data set is dependent upon the circumstances of the failure. However, if you have specified secondary shadow area data sets, you can:

- Restore the broken area with the contents of the secondary shadow area data sets (by using IDCAMS REPRO), and perform a roll forward recovery.

- If you have RECOVERY PLUS for IMS installed, you can use the secondary shadow area data set as input into your full or timestamp recovery, provided that an EXTENDED BUFFER MANAGER (XBM) subsystem is active.

- If you have IMAGE COPY PLUS installed, you can use the Copy Image Copy (CIC) function to create a standard image copy by using the secondary shadow data set as input. The image copy can be used by any standard recovery utility.

  — If you have RECOVERY PLUS for IMS installed, specify the SIC(2) keyword in your recovery JCL; the standard image copy will be automatically referenced as input to a full or timestamp recovery.

  — If you have a standard recovery utility installed, use DBRC commands to invalidate the primary image copy, forcing the standard recovery utility to use the secondary image copy as input.

Modifying segment contents by using expressions

Expressions can be used as a customization tool with the DEDB online restructure processes provided by the Fast Path Online Restructure/EP product. During a DEDB online restructure, the OUTPUT subcommand and its associated keywords (SEGMENT, WHERE, and FIELDS) can be used to modify the content of the segment. By default, the output areas will contain the full, unmodified contents of the input segments. You specify the OUTPUT subcommand with the PREPARE command. The Prepare function creates a Restructure Plan data set that contains information about the changes you want to make to the database. The Restructure Plan data set provides input for the Restructure function.
The following considerations apply when you use the OUTPUT subcommand:

- You must specify one or more OUTPUT subcommands for the segment you want to modify.
- When the OUTPUT subcommand is specified, all input and output areas are selected for restructure processing. The OUTPUT subcommand forces an early termination to occur during restructure post-processing. The early termination allows you to perform any necessary application program changes before bringing the database back online. EARLY_TERMINATION=(BEFORE,START_DATABASE) is assumed.

For more information about the operations and syntax rules for coding expressions, see the expression language chapter in the *Fast Path/EP Series Reference Manual*.

**SEGMENT keyword**

The SEGMENT keyword is required on the OUTPUT subcommand. Use this keyword to select segments of the specified name for modification during the restructure process.

**FIELDS keyword**

To modify the segment contents, you can use the OUTPUT subcommand with the optional FIELDS keyword. The FIELDS keyword specifies a list of expressions; the value of each expression is evaluated and placed into the output segment in the order that the expressions are specified. The length of the segment is computed by the product as the sum of the lengths of the values produced from these expressions.

*Figure 7* shows an example in which the Prepare function specifies that a literal value be inserted into each occurrence of the output segment during a DEDB online restructure.

*Figure 7  Modifying output segment contents*

```
PREPARE DBD=dbname,...,
  OUTPUT SEGMENT=SEGD,
  FIELDS=(3:20,4P'0',23:*)
```

**NOTE**

If you modify the position or length of the symbolic key field, the FIELDS keyword is required on each of the OUTPUT subcommands for that segment.
Allocating the Restructure Plan data set

**WARNING**

When you use the FIELDS keyword with the OUTPUT subcommand to modify the value of the symbolic key field, the segments must remain in ascending key sequence under their parent. Fast Path Online Restructure/EP does not provide a facility to resequence the dependent segments. The restructure process terminates if the dependent segments are not maintained in ascending key sequence.

**WHERE keyword**

The content of the output segment can be controlled by using conditional qualification that is specified by the optional WHERE keyword on the OUTPUT subcommand. If multiple OUTPUT subcommands are specified for the same segment, the first subcommand in which the selection criteria is satisfied is used. If the selection criteria is not satisfied for any OUTPUT subcommand for a segment, the input segment is copied to the output area without modification.

Figure 8 shows an example in which the Prepare function specifies that the content of a segment be conditionally modified during a DEDB online restructure. If the WHERE condition specified on the OUTPUT subcommand is met, the FIELDS keyword modifies the segment content. If the condition is not met, the segment content remains unchanged.

**Figure 8**  Conditionally modifying segment contents by using WHERE keyword

```
PREPARE DBD=dbdname,
   OUTPUT SEGMENT=SEGD,
      FIELDS=(3:20,C'ABC',26:*),
      WHERE=(23:3 EQ C' ')
```

Allocating the Restructure Plan data set

The Restructure Plan data set that is created by the Prepare function is used for input into the Shadow Initialization and Restructure functions. This data set contains information that is required to perform the restructure of the original database into the shadow database. A separate Restructure Plan data set must be created for each database that is specified.

When processing the Prepare function, the Restructure Plan data set can be supplied in the JCL, or it can be accessed by using dynamic allocation.

- For JCL allocation, you can supply the Restructure Plan data set DD statement in the JCL and then specify the DDNAME keyword with the PLAN_FILECTL subcommand.
For dynamic allocation, you can specify the DSNAME keyword with the PLAN_FILECTL subcommand. You can also use the DISP keyword to control the allocation and disposition of the data set. The DISP=USE status parameter indicates conditional allocation. If the data set does not exist, it is created (as if DISP=NEW had been specified). If the data set already exists, it is reallocated (as if DISP=OLD had been specified). If CATLG is specified, the normal and conditional parameters are changed from CATLG to KEEP. In addition to the DISP keyword, the following keywords can also be used to control the allocation of a data set:

— AVGREC
— DATACLAS
— EXPDT
— LIKE
— MGMTCLAS
— RETPD
— SPACE
— STORCLAS
— UNIT
— VOLCNT
— VOLSER

Specifying an outage window for post-processing

You can use the optional OUTAGE_WINDOW keyword (Figure 9) to specify the earliest and latest time post-processing can start. During this outage time, the database is unavailable for updates because the areas are taken offline so that the data sets can be swapped.

The value for the OUTAGE_WINDOW keyword is written to the Restructure Plan data set. If the OUTAGE_WINDOW keyword is also specified during restructure processing, it overrides the value in the Restructure Plan data set.

Figure 9 Specifying the OUTAGE_WINDOW keyword

OUTAGE_WINDOW=[start-date-time],[end-date-time]
Registering new areas

The REGISTER subcommand registers with DBRC a new area that is inserted into the middle of an area list or appended to the end an area list.

- If you are inserting the area into the middle of an area list, you must use the REGISTER subcommand to register the new area.

- If you are appending the area to the end of an area list, you can use the REGISTER subcommand with the PREPARE command, or you can register the new areas with DBRC before executing the Prepare function.

The Restructure function issues INIT.DBDS and INIT.ADS commands to DBRC for new areas using the parameters provided on the REGISTER subcommand.

**NOTE**

Inserting an area into the middle of an area list changes the DSID of all of the subsequent areas in the list. The product records the DSID in IMS log records for recovery purposes. As a result, DBRC does not allow the DSID to be changed. The Restructure function automatically performs the following tasks for all areas that have changes to the DSID:

- saves registration information stored in DBRC
- issues a DELETE=DBDS command to DBRC
- reissues corrected INIT.DBDS and INIT.ADS commands to DBRC
- forces the areas to be restructured

The Prepare function writes the registration information to the Restructure Plan data set. The Restructure function reads the data set and performs the registration during post-processing. For examples of the REGISTER subcommand, see Figure 10 and Figure 11.

**Figure 10  Specifying the REGISTER subcommand for one area**

```
PREPARE DBD=dbdname,ACCESS=(ONLINE,imsid)
    PLAN DNAME='yourname.PLAN.&DBD',DISP=(USE,CATLG)
REGISTER OAREA=areaname1,
    ADDN=addname1,
    ADSN='yourname1',
    GENMAX=4,REUSE=NO,ICJCL=member10,RECOVJCL=member11
REGISTER OAREA=areaname2,
    ADDN=addname2,
    ADSN='yourname2',
    GENMAX=4,REUSE=NO,ICJCL=member10,RECOVJCL=member23
```
Prepare function reports

Prepare processing can produce the following reports:

- Area Summary Report
- DBD Comparison Report
- Randomization summary reports
- Analysis reports

Area Summary Report

The Area Summary Report provides basic information about each area analyzed during prepare processing. It is generated automatically with each analyzer report set and precedes all other analysis reports. Threshold exception conditions are shown on the report. For a detailed description of the Area Summary Report, see the Fast Path/EP Series Reference Manual.

DBD Comparison Report

The DBD Comparison Report (Figure 12 on page 55) provides a side-by-side comparison of the original (input) database definition with the restructured (output) database definition. The middle column indicates the type of differences between the two database definitions: DSID changed (which indicates when the DSID is modified for the AREA), changed, added, or removed.

Figure 12  DBD Comparison Report (part 1 of 2)

Date: 12/7/2011  FAST PATH ONLINE RESTRUCTURE/EP  (3.10.00.00)
Time: 11:22AM  DBD Comparison Report  Page 1

Input database definition

```
PREPARE DBD=dbdname,ACCESS=(ONLINE,1msid)
    PLAN DSNNAME='yourname.PLAN.&DBD',DISP=(USE,CATLG)
    REGISTER OAREA=ALL,
        ADSN='yourname.DB.&ADDN',
        ICJCL=member11,RECOVJCL=member33
```

Output database definition
Figure 12  DBD Comparison Report (part 2 of 2)
Prepare processing provides the Randomization Input Summary and Randomization Output Summary reports. The reports (Figure 13) provide the results of the randomization analysis that is performed during Prepare function processing.

Randomization Input Summary Report

The Randomization Input Summary Report provides root segment counts for the input areas. For each input area, the report shows the total number of root segments in the original (input) areas and where the segments will be located in the restructured (output) areas. The segments can be any of the following areas:

- the same area and RAP as the original database (indicating the number of root segments that will not be relocated by the Restructure function)
- a different area
- the same area, but located in a different RAP

The report also shows the following information:

- the number of root segments chained by a RAP
- the original areas that must be included in the restructure process (unloaded)

Randomization Output Summary Report

The Randomization Output Summary Report provides root segment counts for the output areas. For each output area, the report shows the total number of root segments that will appear in the restructured (output) areas and where the segments originated (input). The segments can originated from any of the following areas:

- the same area and RAP as the original database (indicating the number of root segments that will not be relocated by the Restructure function)
- a different area
- the same area, but from a different RAP

The report also shows the following information:

- the number of root segments chained by a RAP
- the areas that must be created during the restructure process (reloaded)
Additional analysis reports

In addition to the Area Summary Report, the following additional analysis reports can also be produced. For detailed descriptions of the analysis reports, see the Fast Path/EP Series Reference Manual.

- Free Space Analysis
- IOVF Space Analysis
- UOW Detailed Analysis
- Pointer Analysis
- Segment I/O Analysis
- Segment Length Analysis
- Segment Placement Analysis
Analyzing the DEDB during the prepare process

During the database prepare process, you can use the POINTER_VALIDATION keyword to specify whether the analysis function should be performed on all areas within the source database and to determines at what level the analysis should be performed.

Table 3  POINTER_VALIDATION keyword values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO</td>
<td>(default) indicates that an analysis will be performed only if the Prepare function determines that it needs to perform the randomizer analysis. If a randomizer analysis is not needed, the analysis will not be performed.</td>
</tr>
<tr>
<td>FULL</td>
<td>QUICK</td>
</tr>
</tbody>
</table>

If an SDEP segment is defined for the database, you can specify one of the values on the SDEP_VALIDATION keyword listed in Table 4 to control how SDEP pointers are to be validated.

NOTE
You must have a license for Fast Path Online Analyzer/EP to generate the analysis reports.
You can also specify additional keywords or commands that are associated with the analysis function:

- Use the RAP_VALIDATION keyword to control how RAPs are processed. The XREF, PLACEMENT, and RERANDOMIZE subparameters are available with the RAP_VALIDATION keyword. The following combinations of these subparameters are valid with the RAP_VALIDATION keyword:

  — RAP_VALIDATION=(XREF, PLACEMENT, RERANDOMIZE) (default)
  — RAP_VALIDATION=(XREF, PLACEMENT, )
  — RAP_VALIDATION=(XREF,, RERANDOMIZE)
  — RAP_VALIDATION=(XREF,)
  — RAP_VALIDATION=(, PLACEMENT, RERANDOMIZE)
  — RAP_VALIDATION=(, PLACEMENT,)
  — RAP_VALIDATION=(,, RERANDOMIZE)
  — RAP_VALIDATION=(,,) (same as default)

### Table 4  SDEP_VALIDATION keyword values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUICK</td>
<td>(default) generates a checksum for all sequential dependents within the area. The checksum consists of the sum of the RBAs for each segment occurrence minus the RBAs of all SDEP pointers. Because there should be only one pointer to each segment, a non-zero value indicates a pointer problem.</td>
</tr>
<tr>
<td>FULL</td>
<td>constructs a complete cross-reference of every pointer and segment occurrence. The analysis function checks every pointer to ensure that a segment occurrence appears at the referenced location. The complete chain of sequential dependents that are associated with the root segment are identified. The analysis function verifies that each segment occurrence is referenced by one (and only one) pointer.</td>
</tr>
<tr>
<td>OFF</td>
<td>bypasses logical verification of sequential dependent pointers. The product still reads the SDEP control intervals to perform physical validation and to gather statistics.</td>
</tr>
<tr>
<td>NONE</td>
<td>bypasses all processing of the SDEP control intervals. The product does not perform physical validation and does not gather statistics.</td>
</tr>
</tbody>
</table>

---

**NOTE**

Orphaned SDEP segments in the input area will not be copied to the shadow area data set.

---

You can also specify additional keywords or commands that are associated with the analysis function:
XREF constructs a complete cross-reference of every RAP and root segment occurrence. The analysis function checks every pointer to ensure that a root segment appears at the referenced location. The complete chain of root segments associated with the RAP is identified. The analysis function ensures that every root segment occurrence is referenced by one pointer.

PLACEMENT indicates that the placement of every root segment is validated by calling the randomizer (if available) to confirm the following placement:

— The root segment is located in the proper area.
— The root segment is located in the proper RAP.

RERANDOMIZE indicates that the randomizer for the output is to be called to perform root randomization analysis.

- Use the LARGEST_DATABASE_RECORDS keyword to specify the number of largest database records to be tracked by the analysis process.
- Use the REPORT and THRESHOLD subcommands to control the generation of analysis reports and exception testing.

The example in Figure 14 requests that analysis be performed on all areas that are processed by the PREPARE command. Direct pointers are validated by specifying FULL for the POINTER_VALIDATION keyword. SDEP pointers (if any exist) are validated by using the same technique. Default reports are to be produced and no threshold checking is performed.

Figure 14 Requesting analysis during DEDB prepare

```
PREPARE DBD=dbdname,ACCESS=(ONLINE,imsid),
               POINTER_VALIDATION=FULL
```

Generating analysis reports

If you have a license for Fast Path Online Analyzer/EP, you can use the REPORT subcommand to control the generation of analysis reports. The REPORT subcommand lets you specify characteristics of output reports.

The REPORT subcommand defines a report set which consists of analysis selections, UOW range selection, report formatting options, and routing options. Multiple REPORT subcommands can be used to request the generation of multiple report sets. Each report set is independent of every other report set.
You can specify reporting controls by placing your REPORT subcommands within the GLOBAL command. These reporting specifications are used by all analysis functions within the job step. To override these reporting specifications, place one or more REPORT subcommands within the PREPARE command.

**Detecting exception conditions**

If you have a license for Fast Path Online Analyzer/EP, you can use the THRESHOLD subcommand to facilitate the monitoring of particular database characteristics during analysis, the analysis function provides the THRESHOLD subcommand and its associated keywords to indicate database threshold settings. Using these keywords, you can specify that warning messages be sent to the processing log when certain database conditions are detected. Threshold tests are performed only when you specify the corresponding threshold keywords. Any threshold exception conditions that are detected are shown also on the Area Summary Report. The threshold keywords are categorized into the general groups that are listed in Table 5.

**Table 5  Threshold types and keywords**

<table>
<thead>
<tr>
<th>Threshold type</th>
<th>Threshold keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>free space</td>
<td>DOVF_FREESPACE_PERCENT</td>
</tr>
<tr>
<td></td>
<td>FREESPACEDOVF_IOVF</td>
</tr>
<tr>
<td></td>
<td>FREESPACERAA_DOVF</td>
</tr>
<tr>
<td></td>
<td>FREESPACERAA_IOVF</td>
</tr>
<tr>
<td></td>
<td>IOVF_FREESPACE_PERCENT</td>
</tr>
<tr>
<td></td>
<td>IOVF_USED_PERCENT</td>
</tr>
<tr>
<td></td>
<td>RAA_FREESPACE_PERCENT</td>
</tr>
<tr>
<td></td>
<td>RAP_OVERFLOW_PERCENT</td>
</tr>
<tr>
<td>I/O</td>
<td>RECORD_IO_AVERAGE</td>
</tr>
<tr>
<td></td>
<td>RECORD_IO_MAXIMUM</td>
</tr>
<tr>
<td></td>
<td>ROOT_IO_AVERAGE</td>
</tr>
<tr>
<td></td>
<td>ROOT_IO_MAXIMUM</td>
</tr>
<tr>
<td>RAP usage</td>
<td>SYNONYM_CHAIN_LENGTH</td>
</tr>
<tr>
<td></td>
<td>SYNONYM_CHAIN_MAXIMUM</td>
</tr>
<tr>
<td></td>
<td>SYNONYM_CHAIN_PERCENT</td>
</tr>
<tr>
<td>overflow characteristic</td>
<td>RECORD_IOVF_PERCENT</td>
</tr>
<tr>
<td></td>
<td>UOW_DOVF_PERCENT</td>
</tr>
<tr>
<td></td>
<td>UOW_IOVF_AVERAGE</td>
</tr>
<tr>
<td></td>
<td>UOW_IOVF_MAXIMUM</td>
</tr>
<tr>
<td></td>
<td>UOW_IOVF_PERCENT</td>
</tr>
</tbody>
</table>
Suppressing repetitious messages

You can specify thresholds by placing the THRESHOLD subcommand within the GLOBAL command. These implicit threshold specifications are used by all analysis functions within the job step. To override the GLOBAL command, you can explicitly specify a THRESHOLD subcommand within the PREPARE command.

Suppressing repetitious messages

For each anomaly that is encountered in an area, the Prepare function generates a message with a specific suffix (severity) level. When the number of places that a particular condition exists is large, a large number of messages is produced.

You can reduce the number of repetitious messages by using the MESSAGE_SUPPRESSION keyword. Use this keyword to specify the maximum number of times that any given informational, warning, error or critical message is to be produced. In the example in Figure 15, the MESSAGE_SUPPRESSION keyword is used to specify that a warning message be issued no more than 10 times and that an error message be produced no more than 15 times.

Figure 15  Using the MESSAGE_SUPPRESSION keyword with the PREPARE command

```
PREPARE DBD=dbdname,
       MESSAGE_SUPPRESSION=(10,15)
```

To suppress the generation of orphaned SDEP error messages, you can specify ORPHANED_SDEP_MSG=NOMSG as shown in Figure 16.

Figure 16  Using the ORPHANED_SDEP_MSG keyword with the PREPARE command

```
PREPARE DBD=dbdname,
       ORPHANED_SDEP_MSG=NOMSG
```
Using a History file

Use the HISTORY_DDNAME keyword on the PREPARE command to specify the ddname(s) of a DD statement(s) specified in the JCL to which a statistical summary record is written. If the JCL does not contain a DD statement(s) with the referenced ddname(s), an error message is generated. If the ddname(s) refers to a data set that contains data, the summary record is appended to the existing data (as if you had specified DISP=MOD). For information about the record layout for the History file, see the Fast Path/EP Series Reference Manual.

**NOTE**

All fields are written to the History file only when POINTER_VALIDATION=FULL is specified. If any other value is specified for the POINTER_VALIDATION keyword, certain fields in the History file will be set to zero.

Sample PREPARE command scenarios

The scenarios in this section illustrate how to use the PREPARE command.

Scenario 1—Using default values with the PREPARE command

In the example shown in Figure 17, the sample input statements use defaults that allow the PREPARE command to automatically determine:

- input areas that are required for the restructure process
- suffix for the original area data set names that are used when renaming affected online area data sets
- suffix for the primary shadow area data set names
- outage window time
- minimum pointer validation and rap validation options
- dynamic allocation of Restructure Plan data set

**Figure 17** Using default values with the PREPARE command (part 1 of 2)

```
//PFPSYSIN DD *
PREPARE DBD=DPG4A,ACCESS=(ONLINE,IMSP)
PLAN DSNAME='yourdsn.PLAN.&DBD'.
```
Scenario 2—Specifying secondary shadow area data sets with the PREPARE command

In the example shown in Figure 18, the sample input statements use defaults, and secondary shadow area data sets are specified that allow the PREPARE command to automatically determine:

- input areas that are required for the restructure process
- suffix for the original area data set names after they are renamed
- suffix for the primary shadow area data set names
- suffix for the secondary shadow area data set names
- outage window time
- minimum pointer validation and rap validation options
- dynamic allocation of Restructure Plan data set

Figure 18 specifying secondary shadow area data sets with the PREPARE command

```plaintext
//PFPSYSIN DD *
PREPARE DBD=DPG5A,ACCESS=(ONLINE,IMSP)
SHADOW2 SUFFIX=Z2
PLAN DSNAME='yourdsn.PLAN.&DBD',
        DISP=(USE,CATLG),
        UNIT=SYSDA,SPACE=(CYL,1,1)
/*
```

Scenario 3—Using user-controlled options with the PREPARE command

In the example shown in Figure 19, the sample input statements override the defaults for the PREPARE command and specify:

- empty areas be included in restructure process
- a suffix (OLD) for the original area data set names after they are renamed
- a suffix (SH) for the primary shadow area data set names
- a suffix (SH2) for the secondary shadow area data set names
- outage window time (2:00 to 4:40)
Scenario 4—Inserting new areas into the middle of an area list with the PREPARE command

In the example shown in Figure 20, a new area is inserted into the middle of the area list.

Note the following items about this example:

■ The original database includes 5 areas: DPC2100, DPC2200, DPC2300, DPC2400, DPC2500.

■ The product inserts area DPC2250 into the middle of the area list between area DPC2200 and DPC2300.

■ The product restructures area DPC2250 because the area added to the DBD definition.

■ The product restructures area DPC2300 because the DBD includes changes to the area definition parameters.
The product restructures areas DPC2400 and DPC2500 because of DSID changes in the DBD definition.

The parameters provided on the REGISTER subcommand are used by the Restructure process to register the area in DBRC as follows:

<table>
<thead>
<tr>
<th>INIT.DBDS</th>
<th>DBD(DPC2000) AREA(DPC2250) GENMAX(4) ICJCL(IC10) RECOVJCL(REC11) PREOPEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>INIT.ADS</td>
<td>DBD(DPC2000) AREA(DPC2250) ADDN(DPC2251) ADSN(yourname1.DB.DPC2251) UNAVAIL</td>
</tr>
</tbody>
</table>

**Scenario 5—Using expressions to modify segment contents with the PREPARE command**

In the example shown in Figure 21, the contents of segments in all areas are modified during the restructure.

**Figure 21  Using expressions to modify segment contents**

```
PREPARE DBD=dbname,ACCESS=(ONLINE,imsid)
  PLAN DSN='yourname.PLAN.&DBD',DISP=(USE,CATLG)
  OUTPUT SEGMENT=SEGC,
    FIELDS=(3:20,5C' ',23:*)
  OUTPUT SEGMENT=SEGD,
    WHERE=(23:3 EQ C' '),FIELDS=(3:20,C'ABC',26:*)
```

Note the following items about the example:

- Segment SEGC is increased by inserting 5 blanks into the middle of the segment.
- In Segment SEGD, the fields 23:3 are conditionally modified to C'ABC', if the fields are blank.
Chapter 4 Initializing shadow area data sets

This chapter provides information about the use of the Shadow Initialization function that is provided by Fast Path Online Restructure/EP. This function lets you perform tasks to initialize the shadow area data sets before restructuring the DEDB. The following topics are discussed:

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Shadow Initialization function overview

After using the Prepare function to create the Restructure Plan data set, you use the Fast Path Online Restructure/EP Shadow Initialization function to initialize (format) the primary shadow (new) area data sets. This required action enables the primary shadow area data sets for processing by the Restructure function.
If you defined a secondary shadow area data set during prepare processing, you must also use the Shadow Initialization function to initialize the secondary shadow area data set. This secondary shadow data set is a copy of the primary shadow area data set, which can be used for backup and recovery purposes. For more information, “Using secondary shadows for recovery” on page 50.

Shadow Initialization function restrictions

The following restrictions apply to the Shadow Initialization function:

- You cannot use the SHADOW_INIT command with the PREPARE, RESTRUCTURE, or RESTART command.

- If you specify the same area on multiple ALLOCATE subcommands, only the first ALLOCATE subcommand is used.

Shadow Initialization function inputs and outputs

The SHADOW_INIT command can accept input from the new ACB and from the Restructure Plan data set that is created by the PREPARE command. The output from the SHADOW_INIT command is a VSAM cluster of area data sets that will be used during restructure processing. Inputs and outputs are shown in Figure 22.

Figure 22  Shadow Initialization function inputs and outputs
SHADOW_INIT command keywords and subcommands

Table 6 lists the keywords and subcommands that are available for the SHADOW_INIT command.

<table>
<thead>
<tr>
<th>Function</th>
<th>Command or Subcommand</th>
<th>Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>selecting the database to be initialized</td>
<td>SHADOW_INIT</td>
<td>DBD</td>
</tr>
<tr>
<td>specifying the access mode for the area data sets and the subsystem used for initialization</td>
<td>SHADOW_INIT</td>
<td>ACCESS</td>
</tr>
<tr>
<td>processing the Restructure Plan data set</td>
<td>PLAN_FILECTL</td>
<td>all associated keywords</td>
</tr>
<tr>
<td>allocating the primary and secondary shadow area data sets</td>
<td>ALLOCATE</td>
<td>all associated keywords</td>
</tr>
</tbody>
</table>

For more information about SHADOW_INIT command syntax, including subcommands and keywords, see the Fast Path/EP Series Reference Manual.

JCL requirements

Figure 23 provides an example of the JCL that is required to invoke the Shadow Initialization function. You execute the SHADOW_INIT command with program PFCMAIN.

Figure 23 Execution JCL for the Shadow Initialization function (part 1 of 2)

```
//PFC EXEC PGM=PFCMAIN,REGION=0M
//STEPLIB DD DISP=SHR,DSN=BMC.PFP.LOAD
// DD DISP=SHR,DSN=BMC.DBU.LOAD
// DD DISP=SHR,DSN=BMC.DLA.LOAD
// DD DISP=SHR,DSN=BMC.ICO.LOAD
// DD DISP=SHR,DSN=BMC.PASSWORD
// DD DISP=SHR,DSN=yourname.USERLIB
// DD DISP=SHR,DSN=IMSVS.RESLIB
//NEWACB DD DISP=SHR,DSN=yourname.ACLIB.STAGE
//NEWRESLB DD DISP=SHR,DSN=yourname.USERLIB.STAGE
//NEWPFXLB DD DISP=SHR,DSN=yourname.PFXLIB.STAGE
```
Selecting the database and areas

The DBD keyword identifies the name of the DEDB to be initialized. The DBD keyword is required for shadow area initialization processing.

**NOTE**
The list of shadow data set names to be processed were predefined during prepare processing and are included in the Restructure Plan data set.

Specifying the access mode

The ACCESS keyword in Figure 24 identifies the access mode for the area data sets. For shadow initialization processing, the area data sets are accessed in offline mode only. The area data sets are allocated to the batch region and processed directly.

The product uses the IMS subsystem ID (imsid) or IMS group (imsgroup) for the dynamic allocation of the IMSRESLB, IMSACB, PFXLIB, and RECON data sets.

---

**Figure 23  Execution JCL for the Shadow Initialization function (part 2 of 2)**

```
//PFPRINT DD SYSOUT=*  
//PFPRPTS DD SYSOUT=*  
//PFPSYSIN DD *  
SHADOW_INIT DBD=dbdname,ACCESS=(OFFLINE,imsID)  
 PLAN DSNAME='yourname.PLAN.&DBD',DISP=USE  
 ALLOCATE OAREA=(areaname1),  
 SPACE=(units,primary),VOLSER=(volser)  
 ALLOCATE OAREA=(areaname2),  
 SPACE=(units,primary),VOLSER=(volser)  
/*
```

**Figure 24  Specifying the ACCESS keyword during shadow initialization processing**

```
ACCESS=(ONLINE,imsid)
```
Processing the Restructure Plan input data set

When processing the Shadow Initialization function, the Restructure Plan data set can be supplied in the JCL, or it can be accessed by using dynamic allocation.

- If you want to use JCL to supply the Restructure Plan data set, specify the DDNAME keyword with the PLAN_FILECTL subcommand.
- If you want the Restructure Plan data set to be dynamically allocated, specify the DSNAME keyword with the PLAN_FILECTL subcommand.

Allocating the primary shadow area data set

If you elect to dynamically allocate the primary shadow area data set for the SHADOW_INIT command, you can specify unique allocation characteristics for the areas by using the ALLOCATE subcommand and its related keywords. The ALLOCATE subcommand can be used as a replacement for DELETE, DEFINE, and other statements that are normally specified by executing the Access Method Services IDCAMS program.

**NOTE**

If the IDCAMS program is already defined in your job input, it is not necessary to remove it. However, any defining statements that are specified under IDCAMS for the area are superseded by similar parameters that are specified on the ALLOCATE subcommand.

The following functions are defined by specifying combinations of keywords that are specified on the ALLOCATE subcommand:

- delete/define, reuse, or rename the VSAM cluster that is used for the areas
- specify the number of volumes and allocation units for the areas
- pass optional parameters to Access Method Services for the VSAM cluster definition
- specify the SMS storage class, management class, and data class for the areas
- specify space requirements for the areas
- specify volume serial identifiers for the areas
Identifying the areas for ALLOCATE processing

The OAREA keyword identifies the areas (by area name or by area number) that apply to the ALLOCATE subcommand.

Each area that is referenced must appear in the Restructure Plan data set as selected for restructure processing. You can reference any area that is defined in the database, whether or not it has been selected to be restructured. If you reference an area that has not been selected, it is ignored and has no effect on restructure processing.

In addition, you can specify the same area on multiple ALLOCATE subcommands; however, the SHADOW_INIT command uses the first ALLOCATE subcommand that references the area. If an area is not specified in any ALLOCATE subcommand, you must define the cluster manually before executing the SHADOW_INIT command.

Allocating the area data set characteristics

You can specify the IDCAMS_OPTION keyword on the ALLOCATE subcommand to pass optional parameters to Access Method Services for the VSAM cluster definition. Numerous parameters are available for use with this keyword to control the values that are used by AMS for the VSAM cluster definition. For more information, see the IBM Access Method Services Reference Manual.

Other keywords are available that let you specify the SMS class, space requirements, and volume serial identifier for the area. These keywords function in the same manner as on other Fast Path/EP subcommands. The following keywords are available:

- AVGREC
- DATACLAS
- MGMTCLAS
- SPACE
- STORCLAS

For more information about the keywords that are available with the ALLOCATE subcommand, see the Fast Path/EP Series Reference Manual.
Allocating the secondary shadow area data set

If you defined a secondary shadow area data set on the PREPARE command (by specifying either the SHADOW2_DSNNAME or SHADOW2_SUFFIX keyword), you must use the SHADOW_INIT command to allocate the secondary output area dynamically.

The SHADOW_INIT command allocates the secondary output area by using same allocation characteristics and space parameters that are used to allocate the primary output area (see “Allocating the primary shadow area data set” on page 73).

You must also specify one or more of the following additional space parameters on the ALLOCATE subcommand to allocate the secondary output area. If the additional space parameters are not specified, the secondary output area will not be allocated.

- DATACLAS2
- MGMTCLAS2
- STORCLAS2
- VOLSER2

Like the primary output area, the Shadow Initialization function also performs the IDCAMS delete/define on the secondary output area.

**NOTE**

You cannot use JCL to allocate the secondary output area; the Shadow Initialization function always uses dynamic allocation to allocate the data set.

For more information about the keywords that are available with the SHADOW_INIT command and the ALLOCATE subcommand, see the *Fast Path/EP Series Reference Manual*. 
Sample SHADOW_INIT command scenarios

The scenarios in this section illustrate how to use the SHADOW_INIT command.

Scenario 1—Allocating all areas

Figure 25 illustrates how to specify OAREA=ALL on the ALLOCATE subcommand when initializing the primary shadow area data sets.

**Figure 25  Allocating all areas during shadow initialization**

```plaintext
//PFPSYSIN DD *
SHADOW_INIT DBD=DPC3B,ACCESS=(OFFLINE,IMSP)
   PLAN DSNAME='PFP.PLAN.DPC3B',DISP=USE
      ALLOCATE OAREA=ALL,SPACE=(CYL,10),VOLSER=volser
/*
```

Scenario 2—Allocating specific areas by using multiple ALLOCATE subcommands

Figure 26 illustrates how to specify OAREA=areaname by using multiple ALLOCATE subcommands when initializing the primary shadow area data sets.

**Figure 26  Allocating specific areas by using multiple ALLOCATE subcommands**

```plaintext
//PFPSYSIN DD *
SHADOW_INIT DBD=DPCDI,ACCESS=(OFFLINE,IMSP)
   PLAN DSNAME='PFP.PLAN.DPCDI',DISP=USE
      ALLOCATE OAREA=(DPCDI0,RANGE=(DPCDI0,DPCDI0)),
           SPACE=(CYL,100),VOLSER=volser
      ALLOCATE OAREA=DPCDI0,SPACE=(CYL,120),VOLSER=volser
      ALLOCATE OAREA=DPCDI0,SPACE=(CYL,90),VOLSER=volser
/*
```
Scenario 3—Allocating multiple primary and secondary shadows

Figure 27 illustrates how to allocate both primary and secondary shadow area data sets with ALLOCATE subcommands.

```plaintext
//PFPSYSIN DD *
SHADOW_INIT DBD=DPC20,ACCESS=(ONLINE,IMSP)
   PLAN DSNAME='yourdsn.PLAN.&DBD',DISP=SHR
   ALLOCATE OAREA=DPC20A0,
       SPACE=(CYL,200),VOLSER=volser,VOLSER2=volser
   ALLOCATE OAREA=(DPC20B0,DPC20F0),
       SPACE=(CYL,210),VOLSER=volser,VOLSER2=volser
   ALLOCATE OAREA=((RANGE=(DPC20C0,DPC20E0),DPC20G0),
       SPACE=(CYL,220),VOLSER=volser,VOLSER2=volser
   ALLOCATE OAREA=(RANGE=(DPC20H0,DPC20K0)),
       SPACE=(CYL,230),VOLSER=volser,VOLSER2=volser
   ALLOCATE OAREA=(DPC20L0,DPC20M0),
       SPACE=(CYL,100),VOLSER=volser,VOLSER2=volser
/*
```

Scenario 4—Using preallocated area data sets

Figure 28 illustrates how to use a preallocated data set during shadow initialization. In this case, the ALLOCATE subcommand is not used.

The Restructure Plan determines if both the primary and secondary shadow area data sets will be initialized.

```plaintext
//PFPSYSIN DD *
SHADOW_INIT DBD=DPC26,ACCESS=(OFFLINE,IMSP)
   PLAN DSNAME='PFP.PLAN.DPC26',DISP=USE
/*
Chapter 5

Restructuring a DEDB online

This chapter provides information about the use of the database Restructure function that is provided by the Fast Path Online Restructure/EP product. This function changes the structure of a DEDB while the database is online. This following topics are discussed:

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Scenario 2—Specifying the outage window, early termination, and allocation of the PLAN file .................................................. 95
Restructure function overview

By using the Restructure function of the Fast Path Online Restructure/EP product, you can change the structure of a DEDB while it is online to IMS. Restructuring a DEDB by using the Restructure function yields less I/O, processing time, and downtime than other DEDB restructuring methods.

The Restructure function can be used to resize an area in a DEDB, add and remove areas, or change the randomizer in a DEDB. If the DEDB uses data compression, you can add, change, or remove the compression. If the DEDB uses PFX indexes or IBM native indexes, and is being restructured, you can add, change, or delete indexes. You can also perform application processing positioning changes, such as inserting a new segment at the end of a hierarchical path.

The Restructure Plan data set (created by the Prepare function) is used as input into the Restructure function. The Restructure function creates new (shadow) area data sets that are modified to match the new database definition parameters, and contains the up-to-the-minute production application data.

The shadow area data sets must be initialized before the RESTRUCTURE command is executed. For more information, see Chapter 4, “Initializing shadow area data sets.”

During restructure processing, all restructured areas in the original database are copied to the target areas in the shadow database. Online activity (updates) are then captured and applied until the post-processing activities occur.

Fast Path Online Restructure/EP does not tolerate C (critical), E (error), or F (fatal), pointer errors during restructure processing. The Restructure function terminates if an E-level or a C-level pointer error is encountered. As a result, a message is issued, indicating the pointer error, along with a fatal error (RC=16).

Area Copy task

The Area Copy task copies all data from the original area data sets to the shadow area data sets. The required database structure changes are made during the area copy process. An IFP task is started for each area to be restructured. The IFP_LIMIT keyword controls the number of IFP tasks that are started. Multiple IFP tasks can be performed in parallel, depending on the available IMS resources. IFP tasks are reused until all areas are copied.

Area copy processing performs the following tasks:

1. Issues message BMC1156013I, indicating that the Area Copy task has started.
2. Connects to the original area.
3. Sets the Utility Running flag in the DMAC to prevent execution of other DEDB utilities until the restructure process has been completed.

4. *(Change Capture task)* Connects to the original area.

5. Copies all segments in the UOW to the shadow area.

   IOVF and SDEP blocks are read, as needed.

6. Disconnects from the original area.

7. Issues message BMC1156014I, indicating that the Area Copy task has completed.

---

**Change Capture task**

The Change Capture task captures all application changes that are made to the online area data sets, so that they can be applied to the shadow area data sets.

Change capture processing performs the following tasks:

1. Stops active BMPs.

   The APPLICATION RESTART CONTROL for IMS product can be used to automatically restart the BMPs.

2. Issues BMC115057 messages, which indicates the following actions:

   - The task pauses the areas to be restructured.
   - The task connects to the original area and begins capturing and recording application changes.
   - The task starts the areas to be restructured.

3. Completes during the post-processing task.
Change Apply task

The Change Apply task applies all of the captured application changes to the shadow area data sets.

Change Apply processing performs the following tasks:

1. Issues message BMC115603I, indicating that the Change Apply task has started.

2. Issues message BMC115535I, indicating that the Change Apply task has applied all captured changes and is waiting for the outage window.

   At this point, you can modify the OUTAGE_WINDOW keyword, or the Restructure function will continue to capture and apply changes until the outage time is reached.

3. Issues message BMC115606I, indicating that the Change Apply task completed during the post-processing task.

Post-processing task

After the Area Copy task is complete, and the outage window time is reached, the Restructure function performs the following post-processing tasks:

1. Starts the post-processing task.

   The function issues message BMC115608I, indicating that the outage begins.

2. Issues a /DBR command to take the areas to be restructured offline.

   The function issues message BMC115057I for each restructured area.

3. The Change Capture task performs the following processing:

   - Issues message BMC115057I, indicating that recording online application updates were stopped.

   - Applies any remaining changes that were captured.

   - Issues message BMC115604I, indicating the total number of changed records that were captured and applied for the restructured database.

   - Issues message BMC115606I, indicating the Change Capture task was completed.
4. Issues the CHANGE.ADS command to DBRC, indicating that the restructured area was marked “unavailable.”

   The function issues message BMC115059I for each restructured area.

5. *(optional)* To terminate the post-processing task, you can specify the 
   EARLY_TERMINATION=(BEFORE,RENAME_ADS) keyword.

   Specifying early termination allows you to perform user validation. After validation is complete, execute the RESTART command to continue post-processing. For more information about using the RESTART command, see Chapter 6, “Restarting post-processing.”

6. Performs the area data set (ADS) renaming and swapping process.

   The online area data set becomes an old online area data set, and the primary shadow area data set becomes the online area data set.

   The function also performs the following tasks:
   
   - Issues message BMC115324I, indicating the start of the renaming and swapping process.
   - For each restructured area, displays IDCAMS ALTER statements to show how the swap was performed.
     
     — The function renames the online area data set by appending the value of the RETAINED_SUFFIX keyword to the end of the data set name. (The default is "O").
     
     — The function renames the primary shadow area data set to the online area data set name by deleting the value of the SHADOW_SUFFIX keyword at the end of the data set name. (The default is "Z").
   - Issues message BMC115325I, indicating the end of the renaming and swapping process.
7. Performs DBRC processing for each restructured area.

The processing might include changing the DSID for an existing area or registering new areas with the information provided during Prepare processing on the REGISTER subcommand.

The function also issues the following messages:

- BMC11557xI, indicating that registration information was found or added to DBRC
- BMC115041I, indicating the issuance of the NOTIFY.REORG command to DBRC

8. Determines whether DELTA IMS is active in your IMS system:

- If DELTA IMS is active, Fast Path Online Restructure/EP automatically completes all of the required post-processing tasks, which reduces the outage time.
- If DELTA IMS is not active in your IMS system, the Restructure function issues message BMC115540W, indicating that DELTA IMS is not active. The Restructure function automatically terminates post-processing.

**NOTE**

You must complete the post-processing tasks manually. You cannot restart post-processing. For more information, see Appendix A, “Completing post-processing tasks manually.”

9. Updates control blocks in your IMS control region by using the DELTA IMS interface:

- Issues message BMC115903I, indicating ACB control blocks are copied from the staging library into the active ACBLIB.
- *(optional)* Copies PFX control blocks from the staging library into the active PFXLIB.
- *(optional)* Copies randomizers and compression routines from the staging library into RESLIB.
- Issues message BMC115902I, indicating ACB control blocks are reloaded.
10. (optional) You can perform the following steps to terminate post-processing and manually perform a batch image copy:

A. To terminate the post-processing task, specify the EARLY_TERMINATION=(BEFORE,NOTIFY_IC) keyword.

B. Perform a batch image copy.

C. Issue the NOTIFY.IC command to DBRC.

   The process bypasses the NOTIFY.UIC command during restart processing.

D. When the image copy is complete, execute the RESTART command to continue post-processing.

   For more information about using the RESTART command, see Chapter 6, “Restarting post-processing.”

---

**NOTE**

Early termination is not allowed if one of the following conditions exists:

- Secondary shadow area data sets are defined on the PREPARE command.
- The DELTA IMS product is not active on your IMS system.

11. The Restructure function removes the IMAGE COPY NEEDED flag in DBRC for each restructured area.

   - If secondary shadow area data sets are requested, the function issues message BMC115034I, indicating the results of the NOTIFY.IC command.

   - If secondary shadow area data sets are not requested (default), the function issues message BMC115035I, indicating the results of the NOTIFY.UIC command.

---

**NOTE**

The Restructure function does not take an image copy during post-processing. BMC recommends that you take your own image copy of the restructured areas for recovery purposes. For more information, see “Image copy recommendations” on page 87.

12. Determines whether the Prepare function detects one of the following structure changes:

   - segment content changes that could require application program changes
   - structure changes that require PFX indexes or IBM native indexes to be built
Restructure function restrictions

The Restructure function then performs the following tasks:

- Issues message BMC115548W, indicating early termination was requested.
- Automatically terminates post-processing.

13. *(optional)* To terminate the post-processing task, specify the EARLY_TERMINATION=(BEFORE,START_DATABASE) keyword.

Specifying early termination allows you to perform user validation. After validation is complete, execute the RESTART command to continue post-processing. For more information about using the RESTART command, see Chapter 6, “Restarting post-processing.”

14. Issues a /STA command to bring the restructured area online and make it available.

The function also issues message BMC115057I for each restructured area.

15. Issues message BMC115609I, indicating the end of the post-processing task and the outage.

NOTE
You must complete optional post-processing tasks manually when the function detects structure changes. For more information, see Appendix A, “Completing post-processing tasks manually.”

Restructure function restrictions

The following restrictions apply to the Restructure function:

- You cannot specify multiple RESTRUCTURE commands in the same command stream.

- You cannot use a RESTRUCTURE command in the same command stream with the PREPARE, SHADOW_INIT, or RESTART command.

- You must initialize the shadow area data sets before executing the Restructure function.

- You cannot specify EARLY_TERMINATION=(BEFORE, NOTIFY_IC) or EARLY TERMINATION=(BEFORE, START_DATABASE) on the RESTRUCTURE command if DELTA IMS is not installed and active at your site.
You cannot specify EARLY_TERMINATION=(BEFORE, NOTIFY_IC) on the RESTRUCTURE command if either the SHADOW2_DSNAMe or SHADOW2_SUFFIX keyword has been specified on the PREPARE command.

**DBRC considerations**

DBRC registration of the restructured database is required. The REGISTER subcommand, when used with the PREPARE command, registers new areas with DBRC.

- If you are inserting the area into the middle of an area list, you must use the REGISTER subcommand to register the new area.

- If you are appending the area to the end of an area list, you can perform one of the following actions:
  - use the REGISTER subcommand
  - register the new areas with DBRC before you execute the RESTRUCTURE command

**Image copy recommendations**

Fast Path Online Restructure/EP does not take an image copy during restructure post-processing. Instead, a NOTIFY.IC or NOTIFY.UIC command is issued to DBRC for each restructured area to turn off the IMAGE COPY NEEDED flag; this flag was turned on by the NOTIFY.REORG command.

You can address this situation by using one of the following methods to make a backup of the restructured areas:

- To minimize area outage, specify secondary shadow area data sets that are duplicates of the restructured areas and can serve as input for a recovery.

  Post-processing issues a NOTIFY.IC command to DBRC as a batch image copy. The secondary shadow data set name will be used for the image copy data set name (ICDSN).

  For more information, see “Using secondary shadows for recovery” on page 50.

- Use the EARLY_TERMINATION=(BEFORE, NOTIFY_IC) keyword to terminate restructure post-processing, make your own batch image copy of the restructured area, and execute the RESTART command to complete post-processing.
Restructure function inputs and outputs

Because the batch image copy that you make turns off the IMAGE COPY NEEDED flag, post-processing bypasses the NOTIFY.UIC command.

**Restructure function inputs and outputs**

The RESTRUCTURE command can accept input from the following sources:

- Restructure Plan data set
- online database
- shadow database
- online ACBLIBs
- modified ACBLIBs
- modified randomizer routine, compression routine, or both (optional)
- online PFXLIBs (optional)
- modified PFXLIBs (optional)

The output from the RESTRUCTURE command is a newly restructured shadow database, which is renamed to the area data set name that is found in DBRC during post-processing. Figure 29 shows inputs and outputs.
**Restructure command keywords and subcommands**

Table 7 lists keywords and subcommands that are available for the RESTRUCTURE command.

<table>
<thead>
<tr>
<th>Function</th>
<th>Command or subcommand</th>
<th>Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>selecting the database to be restructured</td>
<td>RESTRUCTURE</td>
<td>DBD</td>
</tr>
<tr>
<td>specifying the subsystem for the area copy</td>
<td>RESTRUCTURE</td>
<td>ACCESS</td>
</tr>
<tr>
<td>suppressing repetitious messages</td>
<td>RESTRUCTURE</td>
<td>MESSAGE_SUPPRESSION</td>
</tr>
</tbody>
</table>
JCL requirements

For more information about RESTRUCTURE command syntax, including subcommands and keywords, see the *Fast Path/EP Series Reference Manual*.

### JCL requirements

**Figure 30** provides an example of the JCL that is required to execute the Restructure function. You execute the RESTRUCTURE command with program PFCMAIN, and use the Restructure Plan data set (created by the Prepare function) as input.

**Table 7**  RESTRUCTURE command keywords and subcommands (part 2 of 2)

<table>
<thead>
<tr>
<th>Function</th>
<th>Command or subcommand</th>
<th>Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>terminating restructure during post-processing</td>
<td>RESTRUCTURE</td>
<td>EARLY_TERMINATION</td>
</tr>
<tr>
<td>specifying an outage window for post-processing</td>
<td>RESTRUCTURE</td>
<td>OUTAGE_WINDOW</td>
</tr>
<tr>
<td>processing the Restructure Plan input data set</td>
<td>PLAN_FILECTL</td>
<td>all associated keywords</td>
</tr>
</tbody>
</table>

---

//PFC EXEC PGM=PFCMAIN,REGION=0M
//STEPLIB DD DISP=SHR,DSN=BMC.PFP.LOAD
// DD DISP=SHR,DSN=BMC.DBU.LOAD
// DD DISP=SHR,DSN=BMC.DLA.LOAD
// DD DISP=SHR,DSN=BMC.ICO.LOAD
// DD DISP=SHR,DSN=BMC.PASSWORD
// DD DISP=SHR,DSN=yourname.USERLIB
// DD DISP=SHR,DSN=IMSVS.RESLIB
//AMSOUT DD DISP=SHR,DSN=yourname.AMSOUT.PDS
//NEWACB DD DISP=SHR,DSN=yourname.ACBLIB.STAGE
//NEWRESLB DD DISP=SHR,DSN=yourname.USERLIB.STAGE
//NEWPFXLB DD DISP=SHR,DSN=yourname.PFXLIB.STAGE
//PFPRINT DD SYSOUT=*  
//PFPRPTS DD SYSOUT=* 
//PFPSYSIN DD *  
RESTRUCTURE DBD=DPCON,ACCESS=(ONLINE,imsid),
    PLAN DSNAME='yourname.PLAN.&DBD',DISP=SHR
/*
Selecting the database and areas

The DBD keyword identifies the name of the DEDB to be restructured. The DBD keyword is required for restructure processing.

Specifying the subsystem for the area copy

For restructure processing, use the ACCESS keyword to identify the IMS subsystem or IMS group where the IFP region (that is required to perform the Area Copy task) is executed. The IMS subsystem or IMS group is required and must be specified on the ACCESS keyword.

Processing the Restructure Plan input data set

When processing the Restructure function, the Restructure Plan data set can be supplied in the JCL, or it can be accessed by using dynamic allocation. If you want to use JCL to supply the Restructure Plan data set, specify the DDNAME keyword with the PLAN_FILECTL subcommand. If you want the Restructure Plan data set to be dynamically allocated, specify the DSNAME keyword with the PLAN_FILECTL subcommand. For more information about these keywords, see the *Fast Path/EP Series Reference Manual*.

The Restructure Plan data set that is created by the Prepare function is used for input into the Shadow Initialization function, Restructure function, and the optional Restart function.

Terminating restructure during post-processing

The EARLY_TERMINATION keyword is an optional keyword which specifies whether post-processing should terminate early (before completion of the Restructure function). Table 8 lists the values that are available.
Specifying an outage window for post-processing

You can specify the optional OUTAGE_WINDOW keyword to indicate the earliest and latest time post-processing can start. Message BMC115535I is issued, indicating that the Restructure function waits until the start time is reached. During the outage time, the area is taken offline.

If the end time is reached before the post-processing is complete, the Restructure function terminates. In this case, you must execute the SHADOW_INIT and RESTRUCTURE commands again.

### Table 8 EARLY_TERMINATION keyword values

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE</td>
<td>(default) indicates that post-processing runs until completion. Completion of post-processing tasks will bring the database online.</td>
</tr>
<tr>
<td>BEFORE,RENAME_ADS</td>
<td>indicates that post-processing terminates before the online and shadow area data sets are renamed, and after issuing the CHANGE.ADS command to DBRC. You can perform user validation. Execute the RESTART command to continue post-processing.</td>
</tr>
</tbody>
</table>
| BEFORE,NOTIFY_IC     | indicates that post-processing terminates before the NOTIFY.UIC command is issued to DBRC. For each restructured area, you can perform a batch image copy and issue a NOTIFY.IC command to DBRC. Execute the RESTART command to continue post-processing with the /STA command. The BEFORE,NOTIFY_IC parameter is not allowed on the EARLY_TERMINATION keyword under the following conditions:  
  - The DELTA IMS product is not active in your IMS system.  
  - Secondary shadow area data sets are defined on the PREPARE command. |
| BEFORE,START_DATABASE| indicates that post-processing terminates before the restructured database is brought online. If the DELTA IMS product is not active in your IMS system, the BEFORE, START_DATABASE parameter is not allowed on the EARLY_TERMINATION keyword. |
Using the OUTAGE_WINDOW keyword

The OUTAGE_WINDOW keyword (Figure 31) can be specified on the PREPARE or RESTRUCTURE command. If the value for the OUTAGE_WINDOW keyword is specified for the Restructure function, this value overrides any value that was previously written to the Restructure Plan data set during prepare processing.

**Figure 31  Specifying the OUTAGE_WINDOW keyword**

```
OUTAGE_WINDOW=((start-date-time],[end-date-time])
```

Table 9 lists the values that are available.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>()</td>
<td>(default) specifies that post-processing will begin when the Change Apply task completes</td>
</tr>
<tr>
<td>([end-date-time])</td>
<td>specifies that post-processing will begin when the Change Apply tasks completes, and before outage time occurs</td>
</tr>
<tr>
<td>([start-date-time])</td>
<td>specifies that post-processing will wait for the outage time to occur Message BMC115535I indicates the Restructure function is waiting.</td>
</tr>
<tr>
<td>([start-date-time],[end-date-time])</td>
<td>specifies that once the Change Apply task is complete, post-processing will begin between these times</td>
</tr>
</tbody>
</table>

**Dynamically modifying the outage window**

You can modify the outage window time while the RESTRUCTURE command is executing. You can dynamically modify the value of the OUTAGE_WINDOW keyword by using the MVS MODIFY (F) operator command (Figure 32). Message BMC110692I indicates the new outage window time.

**Figure 32  Dynamically modifying the OUTAGE_WINDOW keyword**

```
/F jobname,SET OUTAGE_WINDOW=((start-date-time],[end-date-time])
```
Completing an online restructure if a restructure job fails

This section provides information about tasks you can perform to complete restructure processing if a restructure job fails. The task you perform depends on when the restructure job failed.

Execute the SHADOW_INIT command

If a restructure job fails before post-processing occurs, you can execute the SHADOW_INIT command, and then rerun the restructure job. For more information, see Chapter 4, “Initializing shadow area data sets.”

Execute the RESTART command

If a restructure job fails during post-processing, you can execute the RESTART command. For more information, see Chapter 6, “Restarting post-processing.”

Execute the DMAC_CLEANUP command

During restructure processing, a flag is set in the DMAC of the online area data set. If the IMS usermods for the IBM SDEP Scan and Delete utilities are installed, the SDEP Scan and Delete utilities will not execute during the restructure process. Not allowing these utilities to execute during the restructure process prevents duplicate SDEP segments from occurring in the shadow area data sets.

If the Restructure function does not complete successfully, the flag must be updated in the DMAC of the online area data set before running subsequent SDEP Scan and SDEP Delete utilities. Use the DMAC_CLEANUP command to update the DMAC.

NOTE

You must execute program PFPMAIN to use the DMAC_CLEANUP command.

Figure 33 shows how to specify the DMAC_CLEANUP command to update the DMAC.
Sample RESTRUCTURE command scenarios

The scenarios in this section illustrate how to use the RESTRUCTURE command.

Scenario 1—Specifying the beginning of post-processing and allocation of the PLAN file

In the example shown in Figure 34, the sample input statements for the RESTRUCTURE command specify the beginning of post-processing and allocation of the PLAN file (Restructure Plan data).

Figure 34  Specifying beginning of post-processing and allocation of the PLAN file

```plaintext
//PFPSYSIN DD *
RESTRUCTURE DBD=DPG4A,ACCESS=(ONLINE,IMSP)
   PLAN DSNAME='PFP.PLAN.DPG4A',DISP=SHR
/*
```

Scenario 2—Specifying the outage window, early termination, and allocation of the PLAN file

In the example shown in Figure 35, the sample input statements for the RESTRUCTURE command specify the following options:

- the allowable outage window for post-processing (This option overrides specifications for the PREPARE command.)

- early termination of post-processing before user image copy notification

- JCL allocation of the PLAN file (Restructure Plan data set)
Figure 35  Specifying outage window, early termination, and allocation of the PLAN file

```//PFPSYSIN DD *
  RESTRUCTURE DBD=DPG4A,ACCESS=(ONLINE,IMSP),
  OUTAGE_WINDOW=(2009.012.02.00,2009.012.04.30),
  EARLY_TERMINATION=(BEFORE,NOTIFY_IC)
  PLAN DDNAME=PLANFILE
/*```
Restarting post-processing

This chapter provides information about restarting post-processing tasks if errors are encountered during restructure post-processing. The following topics are discussed:

Restart function overview .................................................. 97
Restart function restrictions ................................................. 98
RESTART command keywords and subcommands .................. 98
JCL requirements ............................................................... 99
Selecting the databases and areas ....................................... 100
Specifying the subsystem for the area copy .......................... 100
Processing the Restructure Plan input data set ....................... 100
Terminating restart during post-processing .......................... 100
Sample RESTART command scenarios ............................... 101
  Scenario 1—Terminating a restructure to take an image copy and restarting . . 101
  Scenario 2—Terminating a restructure before bringing the restructured areas online .................................................. 102

Restart function overview

Use the Restart function to start the restructure process if a post-processing task fails, or if you perform early termination of a post-processing task.

NOTE

Do not use the Restart function to restart a restructure job that failed before post-processing tasks began. If a restructure job failed before post-processing began, you must resubmit both the shadow initialization and restructure jobs.

The restart process will complete successfully only if the restructure job had started the post-processing phase. Message BMC115608I indicates the beginning of post-processing, and message BMC115609I indicates the end of post-processing. Before executing the Restart function, ensure that message BMC115608I was issued.
You can complete the restart process by using the restructure job JCL. Replace the RESTRUCTURE command with a RESTART command, and remove the EARLY_TERMINATION keyword if post-processing has progressed beyond the early termination point. For more information, see “JCL requirements” on page 99.

**NOTE**
The AMSOUT data set that was used in the restructure job is required for the Restart function. Do not modify the contents of the AMSOUT member or data set.

---

## Restart function restrictions

The following restrictions apply to the Restart function:

- You cannot specify multiple RESTART commands in the same command stream.

- You cannot use a RESTART command in the same command stream with the PREPARE, SHADOW_INIT, or RESTRUCTURE command.

## RESTART command keywords and subcommands

Table 10 lists keywords and subcommands that are available for the RESTART command.

<table>
<thead>
<tr>
<th>Function</th>
<th>Command or subcommand</th>
<th>Keyword</th>
</tr>
</thead>
<tbody>
<tr>
<td>selecting the database to be restructured</td>
<td>RESTART</td>
<td>DBD</td>
</tr>
<tr>
<td>specifying the subsystem for the area copy</td>
<td>RESTART</td>
<td>ACCESS</td>
</tr>
<tr>
<td>terminating restructure during post-processing</td>
<td>RESTART</td>
<td>EARLY_TERMINATION</td>
</tr>
<tr>
<td>processing the Restructure Plan input data set</td>
<td>PLAN_FILECTL</td>
<td>all associated keywords</td>
</tr>
</tbody>
</table>
For more information about RESTART command syntax, including subcommands and keywords, see the Fast Path/EP Series Reference Manual.

JCL requirements

You use the existing JCL that was used for the Restructure function to execute the Restart function. Follow these steps to use the RESTART command in place of the RESTRUCTURE command in restructure JCL:

1. Ensure that DISP=SHR is specified with the AMSOUT data set.

2. Replace the RESTRUCTURE command from the PFPSYSIN control statement with the RESTART command.

3. If post-processing has progressed beyond the early termination point, remove the EARLY_TERMINATION keyword.

Figure 36 shows sample JCL for using the RESTART function.

Figure 36  Execution JCL for the Restart function

```bash
//PFC EXEC  PGM=PFCMAIN,REGION=0M
//STEPLIB  DD DISP=SHR,DSN=BMC.PFP.LOAD
//         DD DISP=SHR,DSN=BMC.DBU.LOAD
//         DD DISP=SHR,DSN=BMC.DLA.LOAD
//         DD DISP=SHR,DSN=BMC.ICO.LOAD
//         DD DISP=SHR,DSN=BMC.PASSWORD
//         DD DISP=SHR,DSN=yourname.USERLIB
//         DD DISP=SHR,DSN=IMSVS.RESLIB
//AMSOUT  DD DISP=SHR,DSN=yourname.AMSOUT.PDS
//NEWACB DD DISP=SHR,DSN=yourname.ACBLIB.STAGE
//NEWRESLB DD DISP=SHR,DSN=yourname.USERLIB.STAGE
//NEWPFXLB DD DISP=SHR,DSN=yourname.PFXLIB.STAGE
//PFPRINT DD SYSOUT=*  
//PFPRPTS DD SYSOUT=*  
//PFPSYSIN DD *
   RESTART DBD=DPCON,ACCESS=(ONLINE,imsid),
   PLAN DSNAMES='yourname.PLAN.&DBD',DISP=SHR
/*
Selecting the databases and areas

The DBD keyword identifies the name of the DEDB to be restructured. The DBD keyword is required for restart processing.

Specifying the subsystem for the area copy

The ACCESS keyword identifies the IMS subsystem or IMS group where the IFP region that is required to perform the Area Copy task is to be executed. The ACCESS keyword is required for restart processing.

Processing the Restructure Plan input data set

The Restructure Plan data set that is created by the Prepare function is used for input into the Shadow Initialization function, Restructure function, and the optional Restart function.

For restart processing, the PLAN_FILECTL subcommand is used with the RESTART command to process the Restructure Plan data set. For more information about the PLAN_FILECTL subcommand, see the Fast Path/EP Series Reference Manual.

Terminating restart during post-processing

The EARLY_TERMINATION keyword is an optional keyword which specifies whether post-processing should terminate early (before completion of the Restart function). Table 8 on page 92 lists the values that are available.
Sample RESTART command scenarios

This scenarios in this section illustrate how to use the RESTART command.

Scenario 1—Terminating a restructure to take an image copy and restarting

In this scenario, a request is made for the Restructure function to terminate, so that an image copy can be made before the areas are started.

In the example shown in Figure 37, the Restructure function is terminated before the NOTIFY.UIC command is issued by using the EARLY TERMINATION keyword.

**Figure 37  Terminating a restructure**

```plaintext
//PFPSYSIN DD *
RESTRUCTURE DBD=DPCON,ACCESS=(ONLINE,imsid),
    EARLY_TERMINATION=(BEFORE,NOTIFY_IC)
    PLAN DSNAME='yourname.PLAN.&DBD',DISP=SHR
/*
```

In the example shown in Figure 38, the areas are started by executing the RESTART command. The Restart function skips the NOTIFY.UIC and then starts the areas.

**NOTE**
Before executing the RESTART command, you must make an image copy. If you do not make and image copy, the IMAGE COPY NEEDED flag will remain on, and the areas will not start.

**Figure 38  Restarting areas after terminating a restructure**

```plaintext
//PFPSYSIN DD *
RESTART DBD=DPCON,ACCESS=(ONLINE,imsid),
    PLAN DSNAME='yourname.PLAN.&DBD',DISP=SHR
/*
```
Scenario 2—Terminating a restructure before bringing the restructured areas online

In this scenario, the Restructure function is terminated before bringing the restructured areas back online. The restructured areas are then started after changes are verified.

In the example shown in Figure 39, the Restructure function is terminated (by using the EARLY_TERMINATION keyword) before starting the restructured areas. All other post-processing tasks are completed.

Figure 39  Terminating a restructure before bringing areas back online

```plaintext
//PFPSYSIN DD *
RESTRUCTURE DBD=DPCON,ACCESS=(ONLINE,imsid),
   EARLY_TERMINATION=(BEFORE,START_DATABASE)
   PLAN DSNAME='yourname.PLAN.&DBD',DISP=SHR
/*
```

In the example shown in Figure 40, the areas are started by executing the RESTART command after all changes have been verified.

Figure 40  Restarting areas after changes are verified

```plaintext
//PFPSYSIN DD *
RESTART DBD=DPCON,ACCESS=(ONLINE,imsid),
   PLAN DSNAME='yourname.PLAN.&DBD',DISP=SHR
/*
```
Completing post-processing tasks manually

When the Restructure function detects whether DELTA IMS is active in your IMS system, you must complete several post-processing tasks manually. Then you can bring the restructured areas online.

DELTA IMS is not active

When DELTA IMS is not active in your IMS system, the Restructure function terminates automatically with an RC=04 code and issues message BMC115540W. The Restructure function automatically completes the post-processing actions shown in Table 11.

<table>
<thead>
<tr>
<th>Post-processing actions</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Processing started</td>
<td>BMC115608I</td>
</tr>
<tr>
<td>/DBR area to be restructured</td>
<td>BMC115057I</td>
</tr>
<tr>
<td>STOP RECORDING DB updates</td>
<td>BMC115057I</td>
</tr>
<tr>
<td>Change Apply statistics</td>
<td>BMC115604I</td>
</tr>
<tr>
<td>Change Apply ended</td>
<td>BMC115606I</td>
</tr>
<tr>
<td>CHANGE.ADS</td>
<td>BMC115059I</td>
</tr>
<tr>
<td>Rename ADS started</td>
<td>BMC115324I</td>
</tr>
<tr>
<td>IDCAMS ALTER statements</td>
<td>N/A</td>
</tr>
<tr>
<td>Rename ADS ended</td>
<td>BMC115325I</td>
</tr>
<tr>
<td>Area registration information</td>
<td>BMC11557xI</td>
</tr>
<tr>
<td>NOTIFY.REORG</td>
<td>BMC115041I</td>
</tr>
<tr>
<td>DELTA IMS Interface not detected</td>
<td>BMC115540W</td>
</tr>
</tbody>
</table>
To complete post-processing tasks when DELTA IMS is not active

1. Issue a /DBR command to take the restructured database or the affected secondary index database offline.

2. Implement control block changes in your IMS:
   - A Copy the ACB control blocks in the staging library to the inactive ACBLIB.
   - B (optional) Copy any PFX changes from your staging libraries to the inactive PFXLIB.
   - C Perform an online change.

3. (optional) Copy any changes from your staging libraries to the STEPLIB. For example, copy any changes to your randomizer or compression routines, or your application programs.

4. (optional) Build the affected secondary index.

5. Create a batch image copy of the restructured areas, including a NOTIFY.IC (notify image copy).

6. Issue a /STA command to make the following areas available by bringing them online:
   - restructured database and areas
   - (optional) affected secondary index database

**NOTE**

BMC recommends that you install DELTA IMS so that Fast Path Online Restructure/EP can automatically complete all post-processing tasks. Allowing post-processing tasks to be automatically completed reduces the outage time on your IMS system.

**DELTA IMS is active**

The Restructure function terminates automatically with an RC=04 code and issues message BMC115548W when the following conditions exist:

- DELTA IMS is active in your IMS system
- one of the following structure changes was detected by the Prepare function:
  - segment content changes that could require application program changes
  - structure changes that require PFX indexes or IBM native indexes to be built
The Restructure function automatically completes the post-processing actions shown in Table 12.

Table 12  Post-processing actions when DELTA IMS is active

<table>
<thead>
<tr>
<th>Post-processing actions</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Processing started</td>
<td>BMC115608I</td>
</tr>
<tr>
<td>/DBR DB</td>
<td>BMC115057I</td>
</tr>
<tr>
<td>STOP RECORDING DB updates</td>
<td>BMC115057I</td>
</tr>
<tr>
<td>Change Apply statistics</td>
<td>BMC115604I</td>
</tr>
<tr>
<td>Change Apply ended</td>
<td>BMC115606I</td>
</tr>
<tr>
<td>CHANGE.ADS</td>
<td>BMC115059I</td>
</tr>
<tr>
<td>Rename ADS started</td>
<td>BMC115324I</td>
</tr>
<tr>
<td>IDCAMS ALTER statements</td>
<td>N/A</td>
</tr>
<tr>
<td>Rename ADS ended</td>
<td>BMC115325I</td>
</tr>
<tr>
<td>Area registration information</td>
<td>BMC11557xI</td>
</tr>
<tr>
<td>NOTIFY.REORG</td>
<td>BMC115041I</td>
</tr>
<tr>
<td>Control blocks copied to active ACBLIB/PFXLIB</td>
<td>BMC115903I</td>
</tr>
<tr>
<td>DELTA IMS Interface completed successfully</td>
<td>BMC115902I</td>
</tr>
<tr>
<td>NOTIFY.IC or NOTIFY.UIC</td>
<td>BMC115034I or BMC115035I</td>
</tr>
<tr>
<td>Early termination was requested</td>
<td>BMC115548W</td>
</tr>
</tbody>
</table>

To complete post-processing tasks when DELTA IMS is active

1  *(optional)* Copy any application program changes to the STEPLIB.

2  *(optional)* Implement changes to the secondary index database.

   A  Issue the /DBR command to take the affected index database offline.

   B  Build the affected secondary indexes.

   C  Issue the /STA command for the affected secondary indexes.

3  Execute the RESTART command by using the JCL for the Restructure process.

The Restart function makes the restructured database and areas available by bringing them online.
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