Change in the IMS World: When “Fast” Is Not Enough
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IMPLEMENT CHANGES WHILE MAINTAINING AVAILABILITY

When IMS was released in 1968, IT organizations were able build applications that could access data faster than ever before. Some IMS users discovered that they needed larger databases, faster access, and higher transaction rates, so IBM developed Fast Path and data entry databases (DEDBs). DEDBs were based on full function HDAM databases, but secondary indexes and logical relationships were eliminated to unleash that insatiable need for speed.

More than 30 years later, DEDBs remain ideal for high-volume, data-intensive applications with high availability requirements. Outages are simply not an option in many Fast Path environments.

When any database is disorganized, performance can degrade and the chances of an unplanned outage increase. Outages are problematic, especially for Fast Path databases because one of the main reasons to use Fast Path is to ensure continuous availability. Any outage is costly because you lose processing time during the outage, and depending on the environment, you may incur financial penalties for outages.

It has been said many times that the only thing that is certain is change. Applications evolve. Data volumes change. New data needs to be captured. For example, you may need to resize segments, adjust the randomizer, or change the compression algorithm, but you can’t afford the outage. In a traditional Fast Path world, change means one of two things: accept less-than optimal application performance or functionality or take an outage to implement the changes. Obviously, neither of these options is what the business wants to hear.

A better option is to minimize planned outages for maintenance and keep applications online during maintenance activities. When you use the best tools and plan ahead, you can react to changing requirements without sacrificing availability.

How valuable would it be to implement structure changes with minimal outages? With BMC Fast Path Online Restructure/EP, you can restructure an entire database or just specified areas with outages of minutes instead of hours. You can perform the following structural changes while the database is online and available 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)
- modify lengths of variable-length segments (decrease the minimum length or increase the maximum length)
- add, change, or remove a compression exit

ONLINE DEDB STRUCTURE CHANGES

BMC Fast Path Online Restructure/EP uses patent-pending technology to restructure a shadow copy of the database, capture and apply changes from the online environment, and then switch the original and restructured data set names.

Restructuring a DEDB requires the following processes.

![Diagram](image)
» Prepare - create a Restructure Plan data set that contains information about the changes you want to make to
the database. The Prepare function gathers input for subsequent processing, 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, and can perform an analysis of all areas
that are in the source database (if you have a license for BMC Fast Path Online Analyzer/EP).
» Shadow Initialization - initialize the shadow area data sets, using input from the Restructure Plan data set. 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 - 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 following tasks
restructure the areas:
  - 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.
  - The Change Capture task captures all application changes that are made to the original area data sets.
  - The Change Apply task takes the captured changes and applies them to the shadow area data sets.
» During the post-processing task, the areas that were restructured take a brief outage. During this outage, the
  data set names are swapped, DBRC notifications are processed, and application control blocks (ACBs) and
  randomizers are reloaded
Let’s look at these phases in more detail.

**PREPARE**
The first step to an online database restructure is to create a plan. The Prepare function creates the Restructure
Plan data set that holds the information that is used by the rest of the restructure process. You can perform the
Prepare function at any time (days or even weeks ahead of the actual restructure process), and you can perform
it several times, allowing you to evaluate different design alternatives. The nice thing about Prepare is that it lets
you see if the restructure will achieve the results you want before you actually make the changes.

![Diagram of Prepare process]

Figure 1: Prepare
Before executing the Prepare function can be executed, you create the appropriate control blocks and load modules that are required for the restructured database design. The Prepare function analyzes the changes between the existing (old) database design and the proposed (new) design, and it determines the minimum processing requirements. You can review the output to evaluate the proposed design and to plan the actual restructure. You can also specify a time when it will be acceptable to have a short outage to complete the post-processing tasks.

The Prepare function provides the ability to model changes and is designed to be run iteratively. By modeling the changes, you can determine the impact of the changes. You may find that the entire database needs to be restructured. You may see that a different randomizer or some application changes would improve performance. The Prepare function can identify database error conditions that would cause the restructure job to fail.

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).

**INITIALIZE SHADOW SETS**

The next step is to initialize (format) the shadow area data sets. The primary shadow area contains the restructured data set. You can also allocate a secondary shadow area that is an exact copy of the primary area. The secondary shadow area is an image copy that is registered with DBRC; by using this data set, you can avoid executing a post-restructure image copy.

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![Diagram of Shadow area initialization](image-url)

**Figure 2: Shadow area initialization**

**RESTRUCTURE**

Now we are getting to the heavy lifting (see Figure 3). During restructure processing, all restructured areas in the original database are copied to the target areas in the shadow database. Online activity (updates) are captured and applied until the post-processing activities occur.
BMC Fast Path Online Restructure/EP validates the Restructure Plan to prevent unplanned changes from affecting the restructure. It then begins the process of populating the shadow copy with existing data.

To achieve a sync point, BMC Fast Path Online Restructure/EP uses patent-pending technology to quiesce the affected databases. Active BMPs are stopped automatically if you are using BMC APPLICATION RESTART CONTROL for IMS (AR/CTL for IMS); otherwise, you must stop the active BMPs. After obtaining the sync point, BMC Fast Path Online Restructure/EP begins the restructure process. The affected databases and BMPs are restarted, and the databases are available for online processing during the restructure process.

During the restructure, all updates to the affected areas are captured and examined. Updates to database records that have already been copied to the shadow areas are applied to the shadow. Updates to database records that have not yet been copied to the shadows are discarded; these changes will be applied when that record is copied.

After all of the areas have been copied to the shadows, the post-processing phase begins. If you did not specify an outage window in the Restructure plan, post-processing begins immediately. If you specified an outage window, post-processing is delayed until the beginning of the specified window.
POST-PROCESSING
Post-processing tasks complete the restructure activities. BMC Fast Path Online Restructure/EP handles all of the following activities:

1. Enter outage window
2. Suspend BMP processing (automatic if BMC AR/CTL for IMS is installed)
3. /DBR affected areas
4. Stop capturing changes
5. Apply remaining updates to restructured areas
6. Rename area data sets
7. NOTIFY.REORG
8. Reload of affected areas (automatic if BMC DELTA for IMS is installed)
9. NOTIFY.IC (automatic if you used a secondary shadow data set)
10. Start areas
11. Resume BMP processing (automatic if BMC AR/CTL for IMS is installed)
12. Execute Copy Image Copy (xxx if BMC IMAGE COPY PLUS is installed) - the resulting image copy can be used by any standard recovery utility.
SUMMARY
BMC Fast Path Online Restructure/EP enables you to respond to changes while maintaining availability. It dramatically minimizes the outage required for database structure changes by keeping databases online and available to applications for 99% of the restructure time. It enables you to model the restructure and ensure that the changes will yield the results you need.

For more information, see www.bmc.com/ims.

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