Highlights

- Provides one-step IMS Fast Path data-base reorganization with minimal impact to database availability

- Supports IMS Fast Path databases in-cluding IMS Fast Path secondary indexes

- Provides advanced tooling to analyze and manage space utilization of IMS Fast Path databases

- Supports I/T Operational Analytics using User-Supplied Policies to dynamically extend and reorganize IMS Fast Path databases

- Manages the integrity of key IMS data-base library resources including DBDs, PSBs, and ACBs

- Program Number: 5655-W14

IMS Fast Path Solution Pack

IMS Fast Path Database Administration Solution

IMS™ is IBM's premier transaction and hierarchical database manage-ment system. IMS was designed for high availability, superior perfor-mance, growth and capacity, and full database integrity. The ability to operate and manage this highly complex IMS system and database environment determines the Total Cost of Operation (TCO). The IBM® IMS Tools lowers TCO by equipping IMS system programmers and IMS database administrators (DBAs) with the facilities they need to effec-tively monitor and manage this mission-critical environment. The IBM IMS Tools provide automation, validation, and auditing of all database and transaction management activities.

The *IMS Fast Path Solution Pack* provides the complete solution for the IMS Database Administrator (DBA) who needs to manage IMS Fast Path databases. As IMS Fast Path databases increase in size and complexity, IMS DBA's need the ability to monitor and proactively make adjustments to prevent critical system outages. The *IMS Fast Path Solution Pack* uses Smarter Tooling facilities to reduce time-consuming database reorganizations when possible and to perform them more efficiently when they are needed. The *IMS Fast Path Solution Pack* is integrated with the *IBM Manage-ment Console for IMS and DB2* that provides IMS DBA's with the ability to view historical information and database trends using a graphical user interface.

IMS Fast Path Solution Pack

The *IMS Fast Path Solution Pack* combines a number of sophisticated IMS database products into a single solution as shown in Figure 1. The *IMS Fast Path Solution Pack* provides both online and offline IMS database reorganization, support for IMS library maintenance, and the ability to check and repair database integrity and pointer errors. This solution also provides support to manage IMS secondary indexes. The *IMS Database Solution Pack* captures Smarter Tooling data during several phases of IMS database administration. This data is used extensively to allow IMS DBA's to proactively manage their IMS Fast Path environment.

Figure 1: IMS Fast Path Solution Pack Component Products

IMS High Performance Fast Path Utilities

The *IMS Fast Path Solution Pack* provides a set of extensive and easy-to-use utilities to assist IMS DBA's with the tooling they need to analyze, maintain, and tune IMS Fast Path databases. The utilities include the *IMS Fast Path Advanced Tool,* the *IMS Fast Path Basic Tools,* the *IMS Fast Path Online Tools,* and the *IMS Online Space Management Tool.* In addition to these primary tools, the IMS Fast Path Utilities also provides several other supplementary utilities.

IMS Fast Path Advanced (FPA) Tool

The *IMS Fast Path Advanced Tool* provides key functions to manage offline IMS Fast Path DEDB databases and IMS Fast Path Secondary Indexes. The tool has sophisticated algorithms to reduce elapsed time and CPU processing time by exploiting data spaces for IOVF and SDEP part locations. This tool processes multiple DEDB areas concurrently using internal sorting routines which further reduces I/O processing times.

IMS Fast Path Advanced Tool (Unload and Reload)

The *IMS Fast Path Advanced Tool* supports Unloading and Reloading an IMS Fast Path DEDB database. The Unload function can unload a single DEDB area or it can unload multiple DEDB areas concurrently without impacting all of the areas of the database. The IMS DEDB areas are unloaded into QSAM data sets. A sort step can be included in the process, and optionally, an image copy can be generated after the Unload process is completed.

The Reload function allows an IMS DEDB area to be reloaded using the QSAM data sets. It can reload a single IMS DEDB area or multiple IMS DEDB areas concurrently. It can sort the data and it can take an image copy when the Reload process is completed.

IMS Fast Path Advanced Tool (Change)

The IMS Fast Path Advanced Tool can reorganize or restructure a single IMS DEDB area or multiple IMS DEDB areas concurrently without impacting all of the IMS DEDB areas in the database using the Change process. The IMS DEDB areas can be analyzed and an image copy can be generated at the completion of the change process.

IMS Fast Path Advanced Tool (Reorg)

The *IMS Fast Path Advanced Tool* uses the Reorg function to reorganize a set of UOWs in an IMS DEDB area. The Reorg function evaluates the amount of free space in a set of UOWs and based on this finding it determines the order to reorganize the UOWs. A user-specified value determines the number of UOWs that are organized before the reorganization is performed.

IMS Fast Path Advanced Tool (Analyze)

The *IMS Fast Path Advanced Tool* uses the Analyze function to verify the integrity of an IMS DEDB database. It reviews pointer values, free space element chains, and VSAM control fields in IMS DEDB databases. It also verifies pointer segments in IMS Fast Path Secondary Index databases. The Analyze function provides a comprehensive analysis of space utilization including the performance characteristics and physical attributes of the IMS DEDB database. The Analyze function can accept a VSAM ESDS data

set or an image copy as input. Optionally, the Analyze function can create an image copy at the completion of the Analyze process. An example of the IMS Fast Path Advanced Tool DEDB Area Analysis Report is shown in Figure 2.
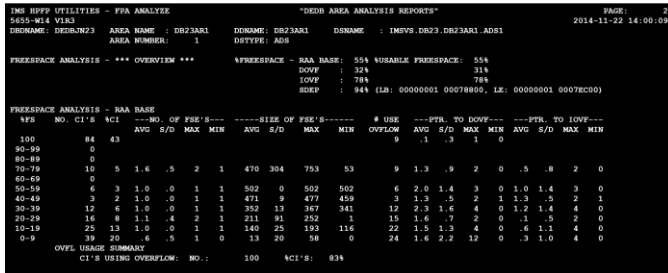

Figure 2: IMS Fast Path Advanced Tool DEDB Area Analysis report

IMS Fast Path Advanced Tool (Tune)

The *IMS Fast Path Advanced Tool* provides a fast and efficient facility to tune IMS DEDB databases. It simulates changes in IMS DBD definitions and randomizers without reloading the segments. The Tune function provides the IMS database administrator with the ability to select specific physical database attributes to meet optimal performance and space utilization requirements.

IMS Fast Path Advanced Tool (Extract)

The *IMS Fast Path Advanced Tool* provides an easy-to-use method to extract segment data into a QSAM data set for one or more offline IMS DEDB areas. This function is useful for creating record reports and extracting specific records to populate a test database.

IMS Fast Path Advanced Tool (DMAC Print)

The *IMS Fast Path Advanced Tool* provides a facility to map the contents of the DMAC blocks for one or more IMS DEDB areas. The DMAC is an important CI that contains information on the ROOT, UOW definition, SDEP LB/LE values, and other key values. This function maps both the global and local sections with offset, label, and values.

IMS Fast Path Advanced Tool (Initialize Area)

The *IMS Fast Path Advanced Tool* provides a facility to initialize one or more area data sets in an IMS DEDB database. The data sets are initialized and the IMS DEDB areas are formatted using the DBDGEN specifications.

IMS Fast Path Advanced Tool (Build Index and Resync)

The *IMS Fast Path Advanced Tool* has facilities to support IMS Fast Path Secondary Indexes. The tool can build secondary index databases from multiple IMS DEDB Areas as shown in Figure 3.
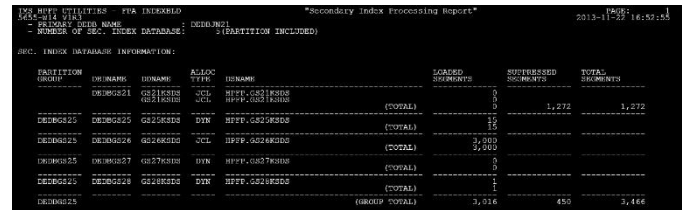

Figure 3: IMS Fast Path Advanced Tool Secondary Index Build Report

It is also integrated with *the IMS Recovery Solution Pack* to allow IMS Fast Path Secondary Indexes to be rebuilt during IMS DEDB Area recovery.

The *IMS Fast Path Advanced Tool* also provides a Resync function to synchronize IMS Fast Path Secondary Indexes with the primary IMS DEDB database after the Secondary Index no longer accurately reflects changes in the IMS DEDB Areas. This function is performed online while the IMS Fast Path Secondary Index is available to the application. The Resync function is shown in Figure 4.
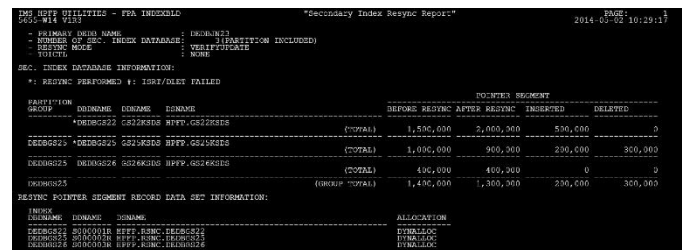

Figure 4: IMS Fast Path Advanced Tool Secondary Index Resync Report

IMS Fast Path Basic (FPB) Tools

The *IMS Fast Path Basic Tools* provide IMS DBA's with the ability to analyze, maintain, tune and migrate offline IMS DEDB databases. It should be noted that the IMS Fast Path Basic Tools are provided for compatibility with older versions of the *IMS Fast Path Solution Pack*. The *IMS Fast Path Advanced Tools* have better performance, more functions, and simpler inputs and is IBM's recommended approach for managing IMS Fast Path databases.

IMS Fast Path Basic Tools (Unload and Reload)

The *Unload* and *Reload* utilities provide an efficient process for unloading, reloading, and reorganizing or restructuring IMS DEDB databases.

IMS Fast Path Basic Tools (DEDB Tuning Aid)

The *DEDB Tuning Aid* utility allows IMS DEDB Area definition parameters to be evaluated without unloading and reloading the database.

IMS Fast Path Basic Tools (DEDB Pointer Checker)

The *DEDB Pointer Checker* utility provides a fast and efficient process for verifying the integrity of all IMS Fast Path pointer values, free space element chains, VSAM control fields, and space utilization. This evaluation of IMS Fast Path information helps IMS DBA's manage space, performance, and the physical attributes of IMS DEDB databases. When errors are discovered by the *DEDB Pointer Checker* utility, they can be corrected by the *IMS Database Repair Facility* which is also included in the *IMS Fast Path Solution Pack*.

IMS Fast Path Online (FPO) Tools

The *IMS Fast Path Online Tools* allow IMS Fast Path databases to be managed and maintained without taking the IMS DEDB databases offline.

IMS Fast Path Online Tools (Online Pointer Checker)

The *Online Pointer Checker* verifies the integrity of IMS pointer values, free space element chains, and VSAM control fields while the IMS DEDB Area remains online and updatable.

IMS Fast Path Online Tools (Online Data Extract)

The *Online Data Extract* utility unloads IMS DEDB databases or extracts specific segment data.

IMS Fast Path Online Tools (Online Data Extender)

The *Online Area Extender* utility allows IMS DBA's to increase the IOVF and SDEP part sizes while the IMS DEDB Area remains online.

IMS Fast Path Online Tools (Online Expert Reorganization)

The *Online Expert Reorganization* utility provides "in-place area reorganization" without taking the IMS DEDB database offline.

IMS Fast Path Online Tools (Online DMAC Print)

The *Online DMAC Print* utility allows IMS DBA's to print the DMAC which is an important Control Interval (CI) of the IMS DEDB database. The DMAC contains information for Root and UOW definitions and SDEP LB/LE values. An example of the two-page *Online Print DMAC* report is shown in Figure 5 and Figure 6.

IMS Online Space Management (OSM) Utility

The *Online Space Management (OSM)* utility simplifies reorganization and the extension of IMS DEDB areas by integrating and automating the IMS DEDB database space management tasks. This utility drives the IMS Fast Path Online Tools (*Online Expert Reorganization* utility, *Online Area Extender* utility, and the *Online Pointer Checker* utility), and optionally, the standard *IMS DEDB Sequential Dependent Scan (DBFUMSC0)* utility and the *IMS DEDB Sequential Dependent Delete (DBFUMDL0)* utility in one job step to reorganize, extend, and verify the integrity of an IMS DEDB Area.

Figure 5: IMS Fast Path Online Print DMAC Report (Page 1 of 2)

```
IMS HPFP UTILITIES - ODM                        "DMACPRT report"                              PAGE:
2
5655-W14 V1R3                                                                                  2014-11-22
16:07:24

  - AREA NO:    1  AREANAME: DB23AR1

  - DMAC INFORMATION :  DMAC GLOBAL SECTION in IMS storage

     OFFSET    LABEL      VALUE              COMMENT
     --------  --------   --------------     ----------------------------------------------------------
     000000  DMACVNO    121                VERSION NUMBER
     000003  DMACLKID   8                  AREA LOCK ID
                                           * DMACLKCD    C'8' : AREA LOCK ID FOR AREA
     000004  DMACDBNM   DEDBJN23           DATA BASE NAME
     00000C  DMACNAME   DB23AR1            AREANAME FOR AREA
     000014  DMACDBRC   X'03'              DBRC USAGE INDICATOR
                                               DMACREGR    X'80' : AREA REGISTERED WITH DBRC
                                               DMACWDUI    X'40' : DBRC USAGE INDICATOR CHANGED
                                               DMACSDWRA.. X'08' : ALL LOCAL 2ND TIME.
                                               (DMACSDWRAPLCL2)
                                               DMACSDWRA.. X'04' : ALL LOCAL 1ST TIME.
                                               (DMACSDWRAPLCL1)
                                             * DMACSDW2    X'02' : COMPAT WRAP 2ND TIME.
                                             * DMACSDW1    X'01' : COMPAT WRAP 1ST TIME.
     000015  DMACDUI    X'11157F0659331F'  DBRC USAGE INDICATOR
     00001C  DMACSYSI                      IMS SUBSYSTEM ID
     000024  DMACOCNT   148      X'00000094' COUNT OF UNUSED INDEPENDENT OVERFLOW CI'S
     000028  DMACCUSN   X'0005'            DMAC CUSN
     00002A  DMACFLG4   X'88'              FLAG BITS...
                                             * DMACF4SH    X'80' : AREA HAS A SHARABILITY
                                               DMACF4CC    X'40' : DEDB CONVERSION COMPLETED
                                               DMACF4FC    X'20' : FORCE CLOSE DUE TO IRIM FAIL
                                               DMACF4LR    X'10' : LOCK REJECT AT COMMIT-ROLS AND RETRY THE LOCK A
                                             * DMACF4SD    X'08' : AREA HAS SDEP SEGMENT
                                               DMACF4CS    X'04' : AREA HAS A CACHED DEVICE WHICH RECEIVED AN I/O
                                               DMACCHG     X'02' : OLC AREA LEVEL CHANGE
                                               DMACF4RC    X'01' : MADS IOT RECOVERY STARTED
     00002B  DMACUTIL   X'A0'              UTILITY CONNECT FLAG
                                             * DMACUTON    X'80' : UTILITY ACTIVE ON THIS AREA
                                               DMACHSSP    X'40' : HSSP ACTIVE ON THIS AREA
                                             * DMACUOWL    X'20' : UOW LOCK MODE ON THIS AREA
                                               DMACPBPU    X'10' : PRIVATE BUFFER POOL USER
                                               DMACRDAH    X'08' : HS READ AHEAD
                                               DMACUTEE    X'04' : EXIT EXTEND IN CONTROL
     00002C  DMACFBAD   990      X'000003DE' BLOCK NUMBER OF FIRST BLOCK WHICH WOULD BE BEYOND THE SEQUENTIAL PART.
```

Figure 6: IMS Fast Path Online Print DMAC Report (Page 2 of 2)

IMS High Performance Image Copy

The *IMS High Performance Image Copy* tool uses advanced copy technology to create backup copies of IMS database data sets. It automates the error-prone manual operations normally required to create IMS image copies. The *IMS High Performance Image Copy* tool supports IBM FlashCopy, EMC TimeFinder, and Hitachi's FlashCopy Emulation fast-replication technologies. It supports the creation of image copies when the databases are taken offline as well as the concurrent image copies when the databases remain available to applications. The *IMS High Performance Image Copy* tool is fully integrated with the *IMS Fast Path Solution Pack*.

IMS Library Integrity Utilities

The *IMS Library Integrity Utilities* ensure the IMS DBD, PSB, ACB, IMS Catalog, RECON, and MFS libraries are consistent and have full integrity. The tool provides facilities to map and compare database control blocks in these libraries and to recreate source members from compiled control blocks. This tool helps prevent IMS Fast Path database corruption that happens when IMS applications use incorrect IMS control blocks to access an IMS Fast Path DEDB database. The *IMS Library Integrity Utilities* verify that the Database Management Block (DMB) that is used to access the IMS DEDB database is the same as the one that was used to load the IMS DEDB database.

There is a sophisticated graphical user interface that shows the relationships between the IMS database definitions, too. When the *DBD/PSB Map Viewer of the IMS Language Integrity Utilities* are installed in the *IBM Management Console for IMS and DB2*, the user can have a graphical view of IMS database structures, IMS program specifications, IMS DBD and PSB source code, IMS DBD and PSB XML documents, and the relationship between IMS DBDs, logical DBDs, and the cross reference relationship between IMS DBDs and PSBs. This graphical view is shown in Figure 7.
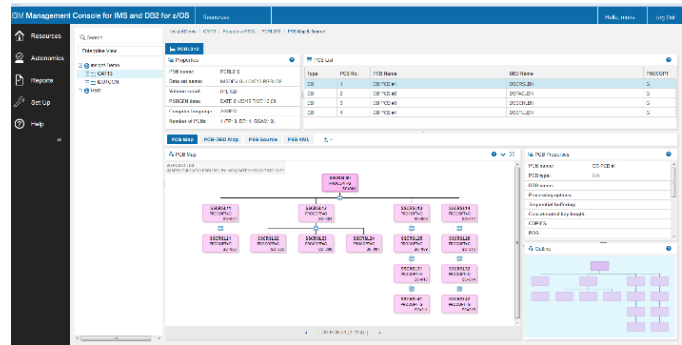
Figure 7: IMS Library Integrity Utilities PSB Viewer in IBM Management Console for IMS and DB2

IMS Database Repair Facility

The *IMS Database Repair Facility* corrects data corruption and pointer errors in VSAM and OSAM database data sets. The *IMS Database Repair Facility* corrects IMS DEDB database pointers that are discovered by the *IMS DEDB Pointer Checker* utility.

IMS Smarter Tooling

IMS Smarter Tooling is the art of applying data analytics to IT operations to extract insights and provide automation to IMS database administration tasks.

The *IMS Fast Path Solution Pack* fully exploits Smarter Tooling by capturing and consolidating information from multiple resources. This complex data is simplified through visual displays allowing IMS DBA's to make intelligent tuning and performance optimization decisions.

By monitoring these key conditions, the *IMS Fast Path Solution Pack* allows the IMS DBA to proactively identify critical and impending problems where corrective action can result in reducing costly failure situations. For example, information is gathered to anticipate degrading application performance and out of space conditions that require database reorganizations. The *IMS Fast Path Solution Pack* keeps historical records of utility executions, real time statistics, and impending database conditions. This data is used for trend analysis which is another key component of Smarter Tooling. The historical information when combined with current conditions allows the IMS DBA to predict future database behavior.

While some actions can trigger self-managing tasks, other actions may require execution during specified periods of time. The *IMS Fast Path Solution Pack* provides scheduling functions that are based on rules and thresholds to drive actions to resolve critical conditions. The IMS Smarter Tooling capabilities are incorporated into the *IMS Smarter Tooling Server* component of *IMS Tools Base*.

IMS Smarter Tooling Server

The *IMS Smarter Tooling Server* automates the collection of sensor data, initiates policy evaluations, and allows users to schedule maintenance operations during appropriate time periods. The *IMS Smarter Tooling Server* is fully integrated with IMS DEDB Area expansion and reorganization and can be triggered by user-specified policy thresholds.

IMS Database Sensor Data Collection

The *IMS Database Sensor* utility is a key component of the *IMS Smarter Tooling Server*. It is responsible for collecting database activity and key conditions that can be used in Smarter Tooling. It is integrated in the *IMS Fast path Advanced Tool*, the *IMS Fast Path Online Tool* and the *IMS High Performance Image Copy* tool. It can run as a stand-alone utility and the sensor data can be printed using the *IMS Fast Path Database Sensor Printing Utility*. This utility scans databases, analyzes space utilization, and collects statistics that are stored in the

IMS Tools Knowledge Base (ITKB) sensor data repository for use by other tools in the *IMS Fast Path Solution Pack*. The data categorization is shown in Figure 8.

IMS Policy Services

The *IMS Smarter Tooling Server* allows users to set policies to determine when specific conditions are met in the IMS database system environment. A policy is a rules-based condition or threshold. When the policy is met or the threshold is reached, a notification can be sent to the IMS DBA or a corrective action can be initiated. These policies provide conditional control over maintenance operations which can reduce the total cost of operations (TCO). For example, the policies may reduce the number of reorganizations for rarely changed databases.

IMS ITOA Data Categorization
Area Level Statistics
Area Definitions
Free space percentages
Usage of DEDB IOVF and DOVF
Number of segment occurrences
Database record statistics
Randomizing synonym statistics
Physical I/O statistics
UOW statistics
UOW or UOW Group Level Statistics
Free space percentages
Usage of DEDB IOVF and DOVF
Database record statistics
Randomizing synonym statistics
Physical I/O statistics

Figure 8: IMS Database Sensor Utility Smarter Tooling Categorization

IMS Smarter Tooling Graphical User Interface

The *IMS Smarter Tooling Server* is fully integrated with the *IBM Management Console for IMS and DB2* to provide a graphical user interface (GUI) for the IMS Smarter Tooling data. Data is displayed on a web browser and IMS DBA's

can view interactive charts showing historical data and database trends. The *IMS Smarter Tooling Server* detects database exceptions and automatically displays them on the browser along with recommended actions to resolve the issues.

IMS Tool Knowledge Base for Reports

The *IMS Fast Path Solution Pack* generates many statistical reports. These reports are stored in the *IMS Tool Knowledge Base (ITKB)* repository for centralized viewing and historical analysis.

For more information

To learn more about the IBM IMS Tools product line, please contact your IBM representative or IBM Business Partner, or visit: www.ibm.com/software/data/db2imstools/products/ims-tools.html