# IMS Database Design & Implementation Training

Duration: **5 Day**

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## Overview

This course provides detailed information required for the design of IMS Full Function databases and Data Entry Data Bases (DEDBs. It covers the definition of IMS Control Blocks (DBD and PSB), and the characteristics of HISAM, HDAM and HIDAM, PHDAM, and PHIDAM (HALDB) organisations. The physical structure of these database types is examined in detail, and the reasons for choosing a particular organisation to match an application's needs. In addition, GSAM and Secondary Indexes are discussed, and also the physical implementation of logical relationships, uni-directional and bi-directional (physical and virtual). Other topics are database housekeeping, the relevance of DBRC, database monitoring for performance and error recovery.

## Prerequisites

Knowledge of IMS fundamentals, gained through attendance of the course **IMS Essentials**, or experience of DL/1 programming. Familiarity with z/OS access methods, especially VSAM, would be an advantage.

## What You Will Learn

- define the IMS control blocks PSB and DBD
- describe the characteristics of HISAM, HDAM and HIDAM
- match the above organisations to a particular application
- describe GSAM and Secondary Indexes
- implement secondary indexes and logical relationships
- implement database housekeeping
- describe DBRC.

## Outline

**IMS Control Blocks for Applications**

IMS - the hierarchical Data Base Management System; Hierarchical terminology summary; Program Specification Block (PSB); PSB statements; PCB: PROCOPTs PSB generation; ACB generation; PSB / program relationships: Linkage Section Procedure (or Entry) statement, Batch JCL; DBD; Database macro function; DBD handling; Application definition macro function; PSB handling; Dynamic PSB option.

**IMS DB HS & Hybrid Access Methods**

DL/I organisations and access methods; Full-function organisations; Fastpath organisations; HISAM; Insertion; Deletion; HISAM database definition; Hybrid - SHISAM; Hybrid - GSAM.

**IMS DB Implementation**

Stages; DFSDDLT0; Using DFSDDLT0; Status card; CALL cards; DATA card; Other cards; Examples of

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DFSDDLT0 control cards; CALL image capture.

**HD Access Methods**

Hierarchical direct; Logical record; Free space; HIDAM; Characteristics; Available options; When to use; Database; Index; HIDAM database definition: HIDAM DBDs; The Index DBD; The Body DBD; HDAM; Characteristics; Available options; When to use; HDAM database definition; Space management for HIDAM and HDAM; Physical child pointers; Physical Child First; hysical Child First and Last; Physical twin pointers; Physical Twin Forward; Physical Twin Forward and Backward; No Twin Pointers; Hierarchic pointers; Pointers in HIDAM and HDAM; Prefix format.

**Database Reorganisation Utilities**

Reorganisation; Why reorganise?; Unload and reload; HISAM reorganisation; DFSURUL0; DFSURRL0; HD reorganisation; DFSURGU0; DFSURGL0.

**Secondary Indexing**

Secondary indexing Pointer segment; Target segment; Source segment; Direct pointing; Symbolic pointing; Database DBD; Secondary Index Database DBD; PCB; SSA; Secondary data structure; Stand-alone processing; Restrictions; To process; Things to consider; Processing a secondary index; Secondary index DBDs; XDFLD statement; Target and Source; Secondary Data Structures; Independent AND in Boolean SSAs.

**Logical Relationships**

Logical relationships; Unidirectional Logical Relationship; Bidirectional physically-paired logical relationship; Bidirectional virtually-paired logical relationship; Logical Parent Pointer; Logical Child Pointer; Logical Twin Pointer; Physical Parent Pointer; LCHILD statement; SEGM statement for Child; SEGM statement for Children; SEGM statement of Real Child; SEGM of Virtual Child; General rules; Logical databases; DBDs; Order (Physical); Item (Physical); OrderL (Logical); Bi-directional Physical pairing; Bi-directional Virtual pairing; Logical rules; Logical databases and utilities.

**Further Database Utilities**

Additional reorganisation utilities; Pre-Reorganisation Utility (DFSURPR0); Database Scan Utility (DFSURGS0); Prefix Resolution Utility (DFSURG10); Prefix Update Utility (DFSURGP0); Reorganisation with secondary index; Reorganisation with logical relationships.

**IMS Data Base Recovery Control (DBRC)**

DBRC overview; RECON initialization and structure; RECON records; Maintaining the RECONs; Migrating RECONs to new release; Skeletal JCL; Log maintenance JCL; Entering commands online; Batch command support; Database registration; RECON maintenance; Problems; Database Recovery Control; DBRC log control; DBRC share control; DBRC database control; Database recovery; Overview of Parallel RECON Access.

**Larger Databases**

Problem; Solutions; High Availability Large Data Base (HALDB); Logical relationships and secondary indexes are supported; PHDAM - partitioned HDAM; PHIDAM - partitioned HIDAM - Index is also

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partitioned; PSINDEX - partitioned secondary index; Hierarchic structure is maintained; Partition selection (deciding in which partition a record resides); Partitioning choices Logical DB considerations; The DFSHALDB control statement; HALDB self healing pointers; Partitioned Data Structure; HALDB data sets; What DBRC sees; Changing partition boundaries; HALDB online reorganisation; Data Entry Database (DEDB); Data Entry Database; Area; Data Entry Database; Area structure; Root Addressable Part; Independent Overflow Part; Sequential Dependent Part; Data Entry Database; Unit of work ; Logical Record; Data Entry Database - Sequential Dependent Segments; Data Entry Database - segment contents; Data Entry Database - subset pointers; Data Entry Database - POS call.

**IMS Database Integrity**

Backup and recovery; Logging; What events are logged?; Log data sets; Online Log Data Sets (OLDS); Write-Ahead Data Sets (WADS); System Log Data Sets (SLDS); Recovery Log Data Set (RLDS); Restart Data Set (RDS); Archiving; Automatic; Manual; Contents of the log; Sample Log record types; Backup; Image copy; Database Image Copy Utility (DFSUDMP0); Online Database Image Copy Utility (DFSUICP0); Fuzzy copying and log requirement; Image Copy Utility (DFSUDMT0); Change Accumulation; Change Accumulation Utility (DFSUCUM0); Database Recovery; Database Recovery Utility (DFSURDB0); Time stamp recovery.

**Sharing Data & Data Sharing**

Sharing access - the problem; Sharing access - solutions; Control region / DLISAS; Program isolation; Locking; Database locking; What is locked?; Rules for locking; PROCOPT = GOx; PROCOPT = E; Deadlocks; Data Sharing - general; Database-level sharing; Block-level sharing.... z/OS; Block-level sharing....> z/OS.

**IMS DB Monitoring**

Performance; What factors affect performance?; DB performance (1); DB monitor; VSAM Buffer Pool Report; VSAM Statistics Report; Database Buffer Pool Report; Program I/O Report; DL/I Call Summary Report; DFSSTAT reports; IEHLIST utility; IDCAMS LISTCAT; Database surveyor utility; IMS Monitor Summary and System Analysis Program; DB tuning options; Program I/O report; Program summary report; Database buffer pool report; VSAM buffer pool report; Database failures; Write errors; Read errors 13.13 Examples.

**New Uses for IMS Databases**

XML databases; Open Database Manager; IMS Connect and ODBM; Java DL/I Access.