S25

Achieving High Availability with the IMS Database Tools

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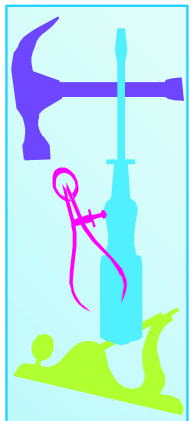

IMS Tools

For Availability

Abstract

- There are a number of new IMS Tools that can directly increase the availability of your applications and systems. This session describes the problems, and presents practical solutions using the IMS Database Tools.

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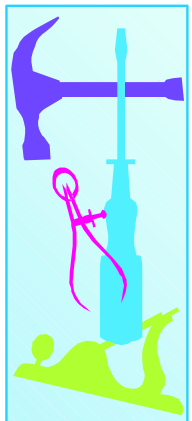

IMS Tools

For Availability

High Availability

- Achieving High Availability
  - Outage Avoidance
  - Outage Minimisation
- Value of the IMS Tools
  - Database Administration
  - Performance Management
  - Recovery and Replication
  - Application Management

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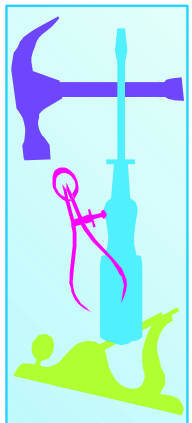
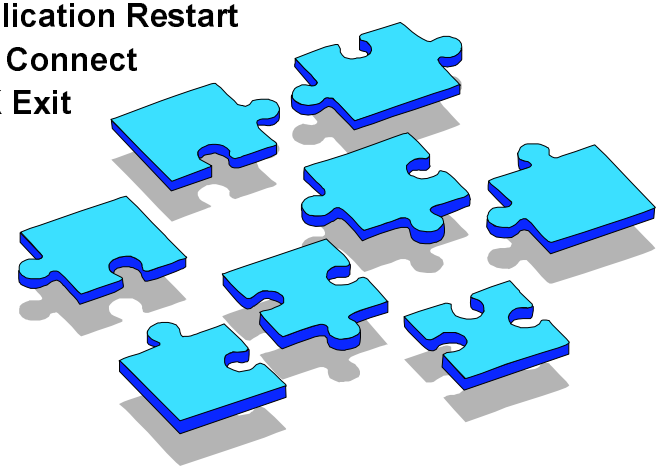
Agenda



IMS Tools For Availability

- Database Administration
  - High Performance Unload
  - High Performance Load
  - Index Builder
  - High Performance Prefix Resolution
  - IMS Parallel Reorganization
  - DB Repair Facility
  - IMS Control Suite
  - Library Management Utilities
  - Advanced ACB Generator
  - ETO Support
  - Command Control Facility
  - High Performance Sysgen Tools
  - High Performance Pointer Checker
  - Fast Path Basic Tools
    - DEDB Unload/Reload
    - DEDB Pointer Checker
    - DEDB Tuning Aid
  - Fast Path Online Tools
    - DEDB Online Pointer Checker
    - DEDB Online Data Extract
    - DEDB Online Area Extender
  - Sequential Randomizer Generator
  - IMS Partition DB
  - IMS Compression - Extended
- Performance Management
  - IMS Performance Analyzer
  - Queue Control Facility
  - Dynamic Resource Control Facility
  - Workload Router
- Recovery and Replication
  - Online Recovery Service
  - IMS Recovery Saver
  - Database Integrity Control Facility
  - IMS Image Copy Extensions
  - DB2 Recovery Manager
  - DEDB Fast Recovery
  - Data Propagator
- Application Management
  - Batch Terminal Simulator
  - MFS Reversal Utilities
  - Application Restart
  - IMS Connect
  - Y2K Exit



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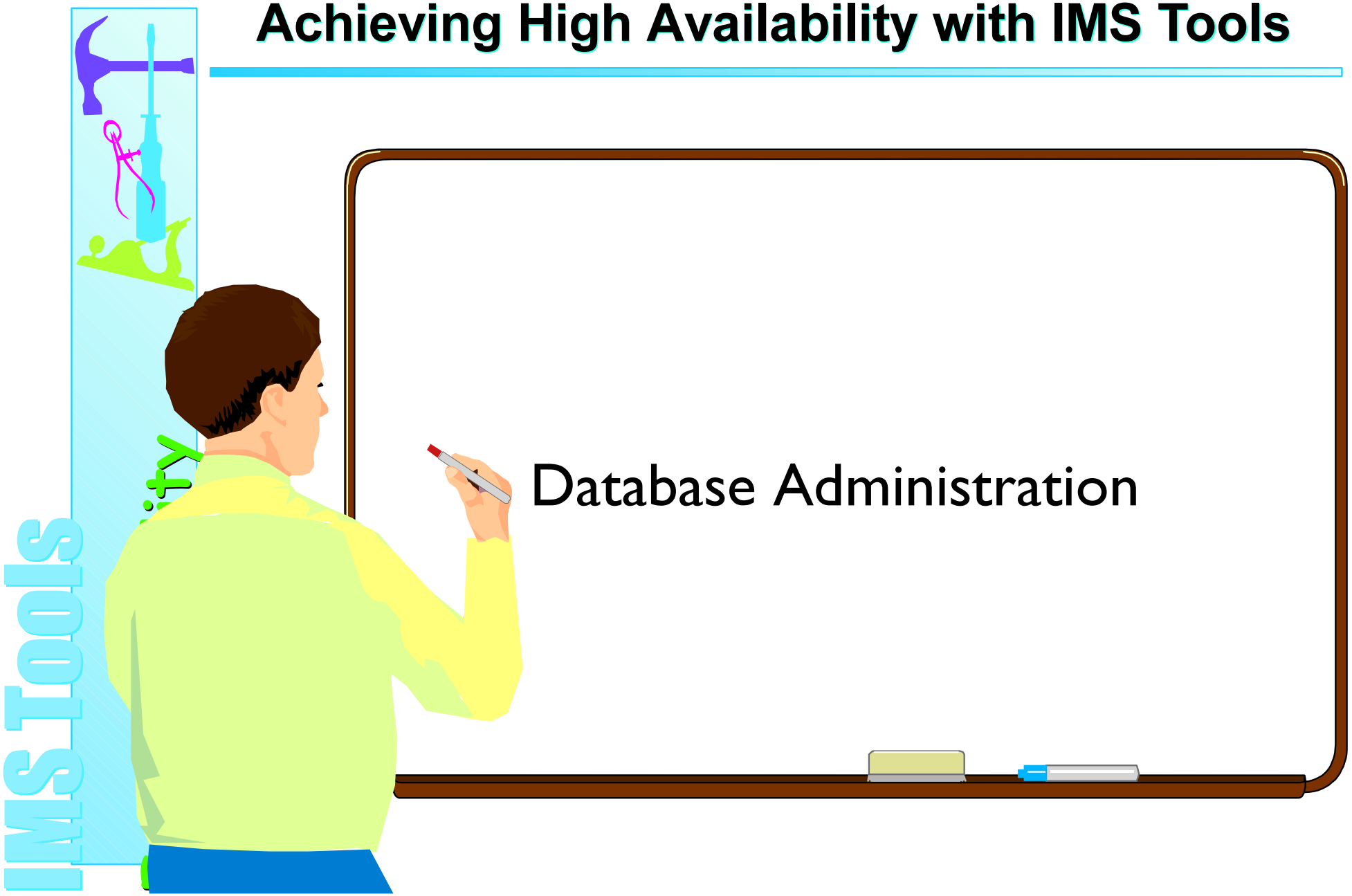
Achieving High Availability with IMS Tools



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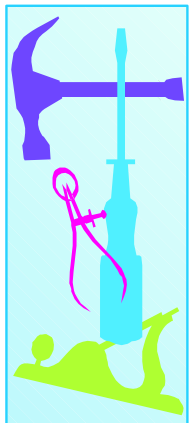

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High Performance Unload

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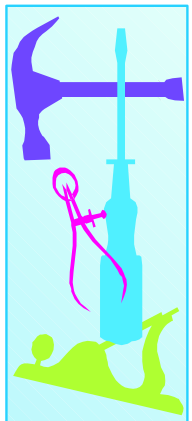
IMS High Performance Unload



IMS Tools For Availability

- Replaces (and enhances) DBT HSSR feature
  - fully compatible JCL
- Includes full support for HALDB
  - unload one, several or all partitions
  - migration/fallback support
- DB Unload Utilities
  - dynamic allocation of DB datasets
  - option to leave compressed data compressed
  - multiple unload formats
  - can unload broken DBs
  - variety of statistical reports
- Application programming interface
  - for stand-alone batch programs
  - transparent to programmer
- Sequential Subset Randomizer
  - Randomising module to enable fast sequential processing of DB subset

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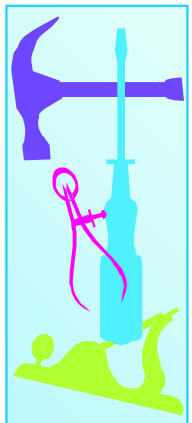

IMS Tools
For Availability

IMS High Performance Load

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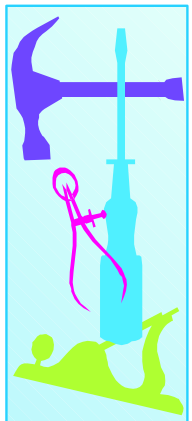

IMS Tools For Availability

IMS High Performance Load

- Includes two utilities
  - DB Load Utility
  - HDAM Physical Sequence Sort for Reload
- The Load Utility
  - complements High Performance Unload Utility
    - compressed/uncompressed input in various formats
    - dynamic allocation of DB datasets
  - supports HALDB
    - including a high-speed alternative to IMS Partition Initialisation Utility
  - and migration reload
  - can be used to initialise empty DBs

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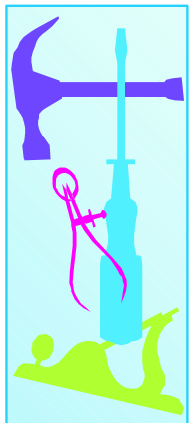

IMS Tools For Availability

IMS Index Builder

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Excellent Performance!!

Sorts and Loads Multiple Indices in Parallel

Starts a SORT address space for each index

Uses Cross Memory to pass records to each SORT

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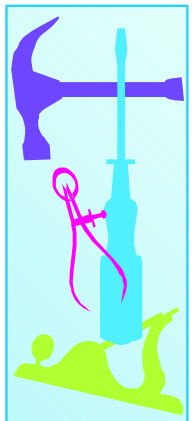
IMS Index Builder



IMS Tools For Availability

- Simplifies Index recovery and maintenance
- Reduces Index maintenance time
- Eliminates need to image copy Indexes
- Add or Rebuild all or some secondary indexes of an IMS database
  - Using as input:
    - Output from initial load or reload after a reorg
    - DL/I scan of the IMS database
    - Output from prefix resolution (DFSURIDX)
  - Supports empty secondary indexes
  - Easy-to-use one step procedure
- Rebuild HIDAM primary index
- DBRC notification support
- HALDB support for IMS V7

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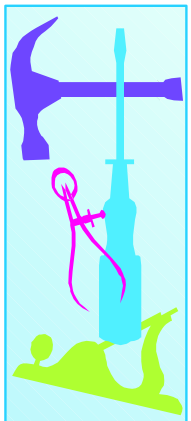
IMS Index Builder



IMS Tools For Availability

- Provides fast and flexible way to rebuild primary and secondary indices
- Uses as input
  - Output from initial load or reload after a reorg (DFSURWF1)
  - DL/I scan of the IMS database
  - Output from prefix resolution (DFSURIDX)
- Easy to use
- Fully supports:
  - Empty secondary indices
  - Addition of new secondary indices
- Splits DFSURWF1 INPUT while rebuilding secondary indices
  - SPLIT function
- Rebuilds HIDAM primary indices

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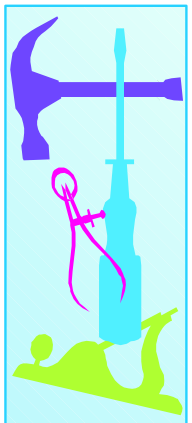
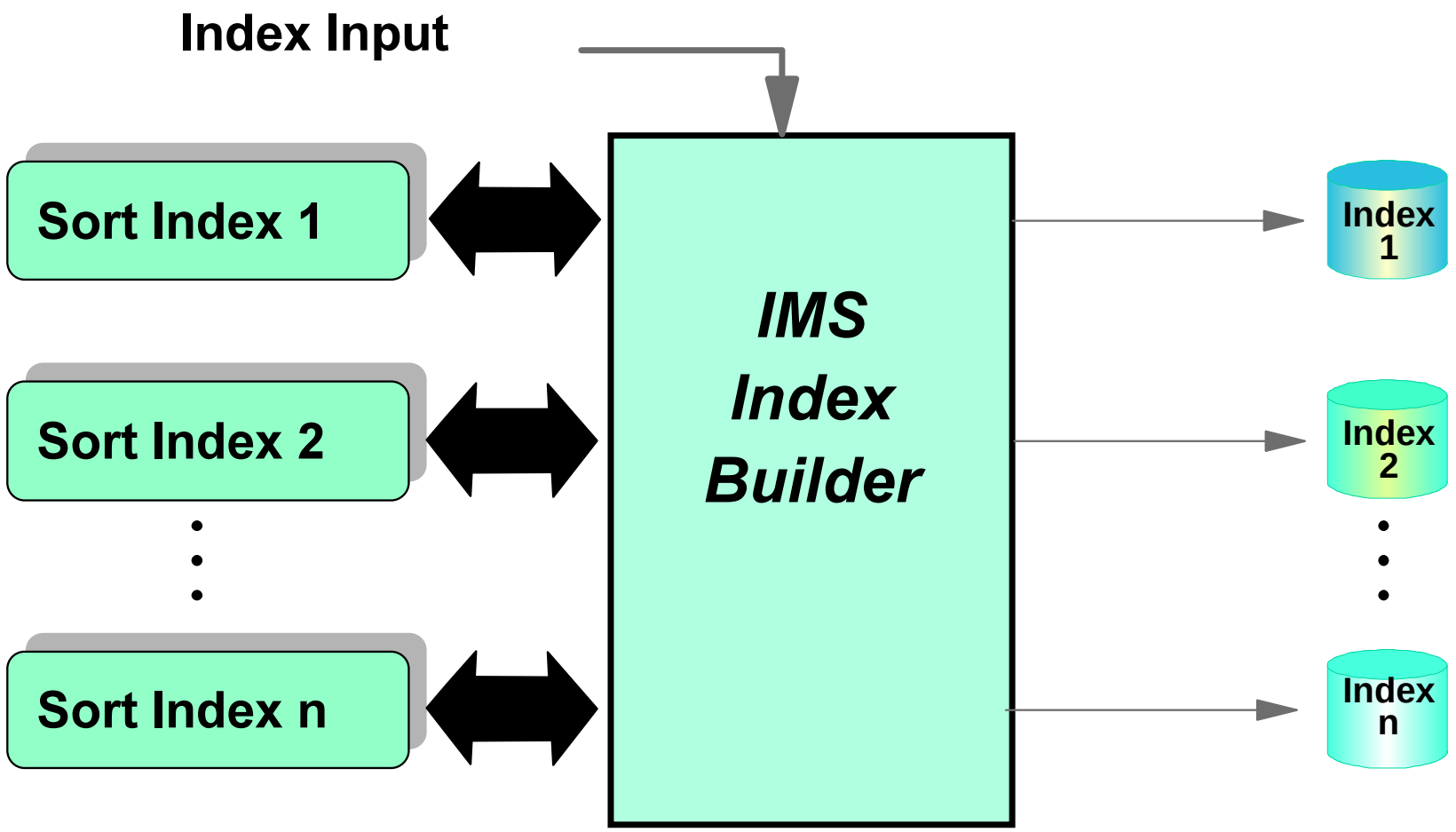
IMS Index Builder



IMS Tools For Availability



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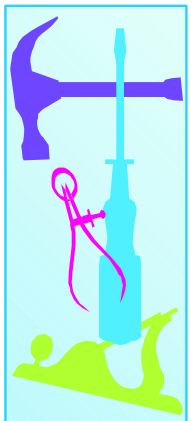

IMS Tools For Availability

- IMS IB must sort index records when rebuilding secondary indices
- IMS IB uses parallel sort as follows:
  - Start as many SORT address spaces as secondary indices to be built
  - Use Cross Memory to pass the records of each index to the corresponding SORT address space and to read them back sorted
- Advantages are
  - Takes full advantage of CMOS technology
  - Indices are loaded in parallel
  - Each SORT address space sorts fixed length records ready to be loaded (optimal length, no key/record padding)

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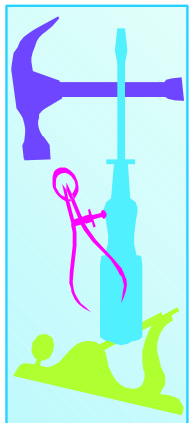

IMS Tools

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IMS High Performance Prefix Resolution

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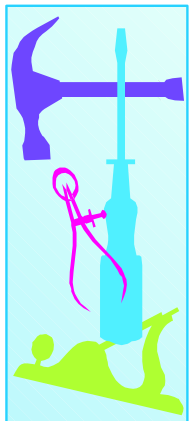

IMS Tools For Availability

IMS High Performance Prefix Resolution

- Replaces Basic IMS Utility
  - Improves performance up to 40%
  - Runs as a one step job
  - Uses BatchPipes to eliminate intermediate work file 2
  - Separates the processing of secondary indexes and logical relationships
- less time required for reorganization

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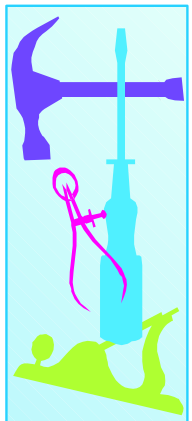

IMS Tools

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IMS Parallel Reorganization

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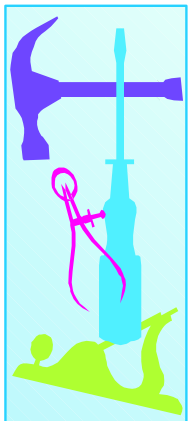
Parallel Reorganization



IMS Tools For Availability

- Combines all the performance utilities needed to reorg hierarchic direct databases into a single package
- provides infrastructure to run
  - IMS High Performance Unload
  - IMS High Performance Load
  - IMS Index Builder
- Dynamic allocation of input and output data sets
- Provides automated name swapping for input and output data sets
- Automated IMS command processing
- Full DBRC support

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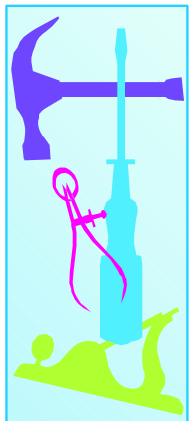

IMS Tools

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IMS Data Base Repair Facility

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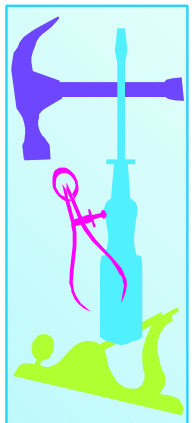
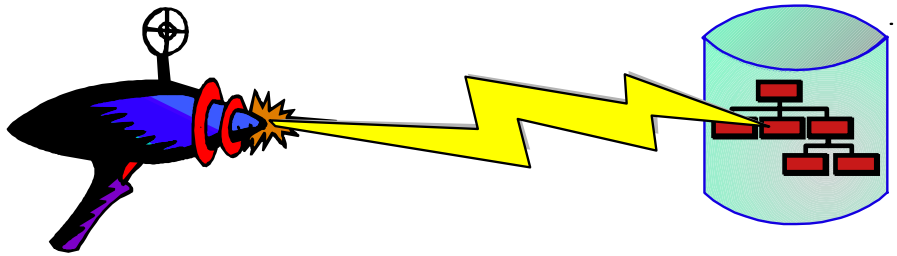
IMS Data Base Repair Facility



IMS Tools For Availability

- Enhanced version of the previous tool, “VSAM Zapper”
  - Supports VSAM and OSAM DBs
  - Supports Fast Path DBs
- Interactive via an ISPF front-end
- For changing segment data or pointers
- Includes
  - pointer navigation
  - backout safety feature
- faster to repair than to recover, less offline time
- recover DB, then re-run applications / transactions



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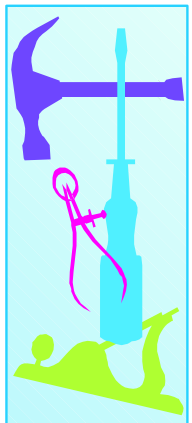

IMS Tools

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Database Control Suite

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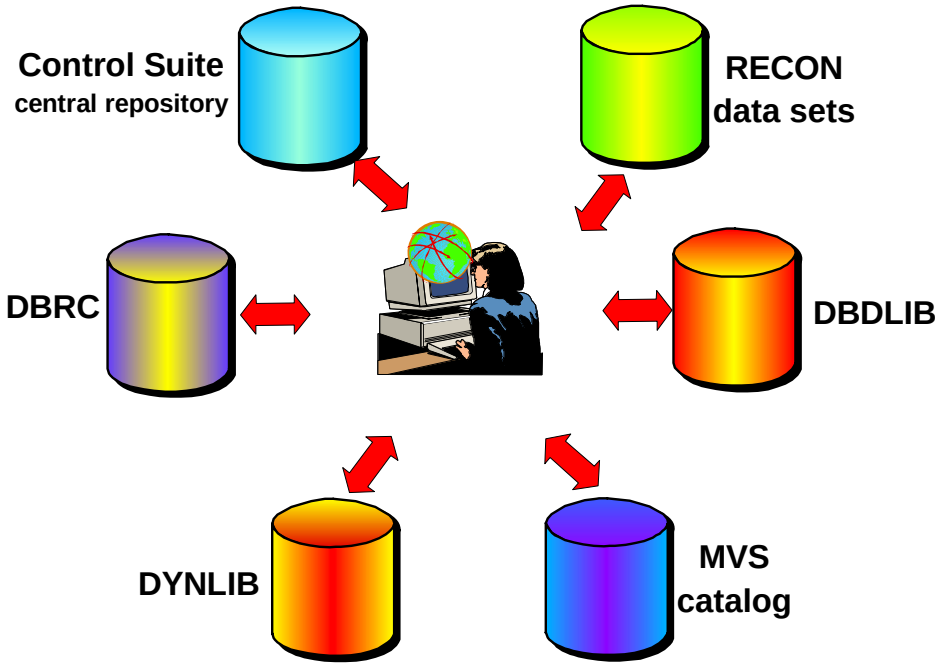
Database Control Suite

- The Control Suite brings together the various IMS database tools and utilities into an integrated central repository
- The Control Suite contains all the tools necessary to maintain and manage the IMS databases from a central focal point.
- faster to fill in fields on a screen than to look up manual, create JCL, etc



IMS Tools For Availability

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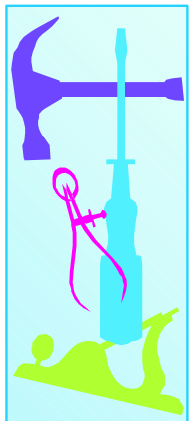

IMS Tools

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IMS Library Management Utilities

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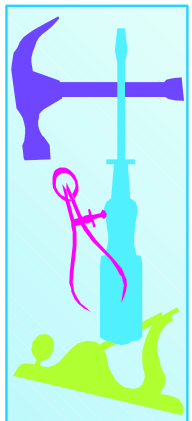
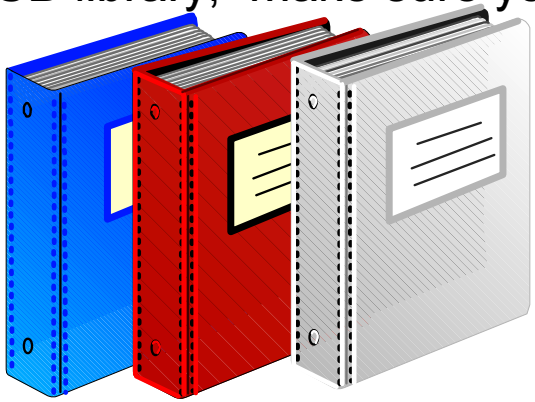
IMS Library Management Utilities



IMS Tools For Availability

- DBD/PSB/ACB Mapper
  - produces pictorial layout of DB structure
- DBD/PSB/ACB Compare
  - reports differences between blocks with same name in different libraries
- DBD/PSB and ACB Reversal
  - re-generates source statements from load library members
  - reports information on blocks and their relationships
- outage avoidance by having properly maintained libraries
- protect against loss of databases
  - mapping ACB/PSB library, make sure you are using what you expect



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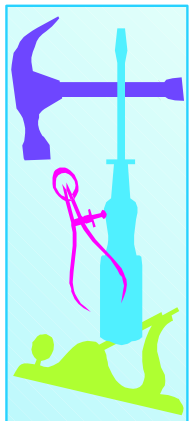

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IMS Advanced ACB Generator

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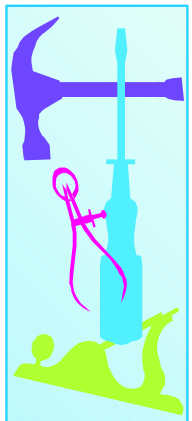

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IMS Advanced ACB Generator

- Advanced ACBGEN is dramatically faster
  - expecially in an emergency
  - more time to desk-check results before using the library

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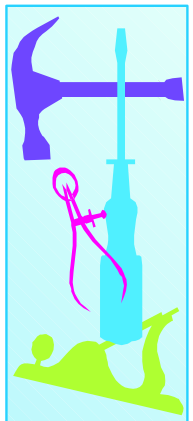

IMS Tools

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IMS ETO Support

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Implement

Tailor

Exploit the benefits

... of ETO

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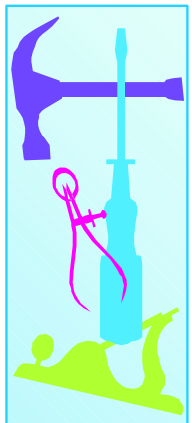
IMS ETO Support



IMS Tools For Availability

- The Extended Terminal Option (ETO) of IMS was designed to be easy to implement
  - But, users discovered application dependencies on terminal related names. Consequently (and for other reasons) ETO implementation usually requires the use of various ETO Exits must be written in assembler
- The ETO Support Tool generates these exits
  - based on user specified requirements
  - can be modified online
- faster ETO implementation
  - less gens to perform (fewer changes)
  - less gens to cut in (outages for cutin)
  - less risk of getting things wrong with the process

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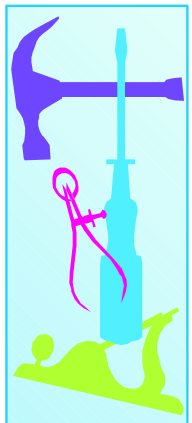

IMS Tools

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IMS Command Control Facility

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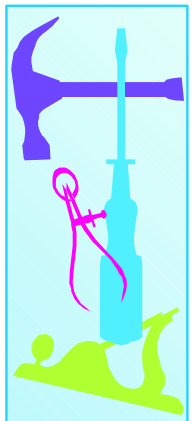

IMS Tools

For Availability

IMS Command Control Facility

- Processes IMS commands across all regions in a Sysplex using the batch command processer
- Executes IMS commands from a batch utility or from a TSO session via an ISPF interface
- Synchronizes Online Change and database commands across all regions in a Sysplex
- Coordination across the sysplex

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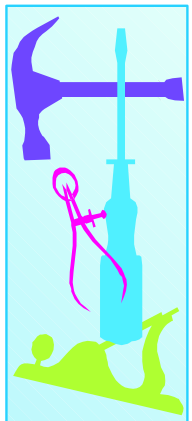

IMS Tools For Availability

IMS High Performance Sysgen Tools

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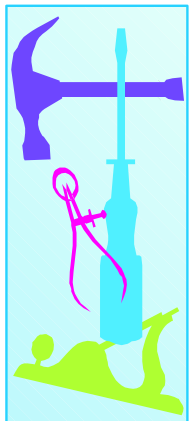

IMS Tools For Availability

IMS High Performance Sysgen Tools

- Perform IMS sysgens for application resource changes
  - transactions, programs, databases and route codes
  - in a single job step or online
- Create and maintain IMS-plex sysgen configurations
- same as other gen utilities
- shorter gen time, expecially in an emergency

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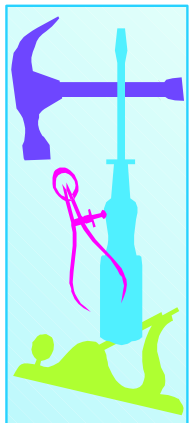

IMS Tools

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IMS High Performance Pointer Checker

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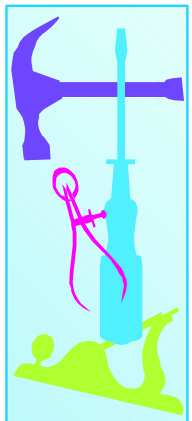

IMS Tools

For Availability

IMS High Performance Pointer Checker

- pointer checker during Image Copy
  - with Image Copy Extensions
- Avoid outage to check databases
- immediate notification of any errors
  - less complex database recovery

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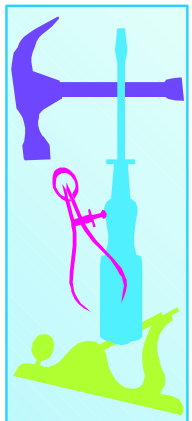

IMS Tools For Availability

IMS Fast Path Basic Tools

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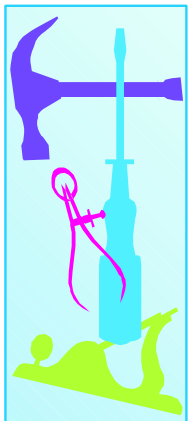
IMS Fast Path Basic Tools



IMS Tools For Availability

- DEDB Load/Unload feature
  - New optional format of unload dataset can reduce the volume of the unload dataset
- DEDB Pointer Checker feature
- DEDB Tuning Aid feature
  - An extension of the DEDB Pointer Checker.
  - Evaluates potential DEDB design modifications without unloading and reloading the database
  - DEDB Tuning Aid uses data previously extracted by the Data Base Tools DEDB Pointer Checker.
- Tuning Aid
  - avoid database full conditions

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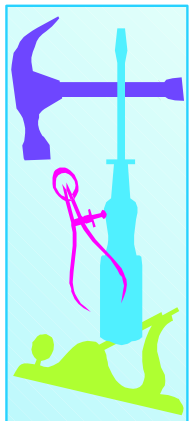

IMS Tools For Availability

IMS Fast Path Online Tools

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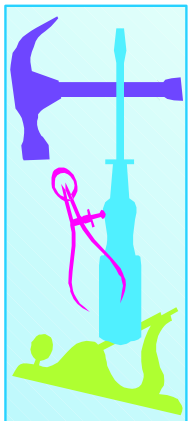
IMS Fast Path Online Tools



IMS Tools For Availability

- DEDB Online Pointer Checker
  - A Summary Report of pointer errors found
  - An option to produce a snap listing of CIs found to be in error
  - An option to take an Image Copy during execution (similar to the IMS Concurrent Image)
  - DBRC notification of the image copy
  - Dual Image Copy output datasets
- DEDB Online Data Extract
  - Easy to use tool to extract data from a DEDB are that is online
  - Provide selectable extract capability
  - Select segment offset with value
  - Control statement driven
  - Operates as an online utility
  - Uses locking protocols to ensure a consistent view to the area
  - Compression support
- DEDB Online Area Extender
  - expand the size of the DEDB area without taking it offline.

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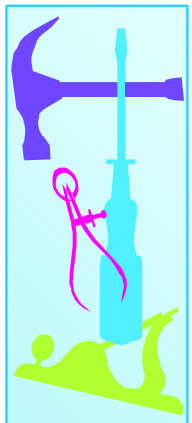

IMS Tools

For Availability

IMS Partition Data Base

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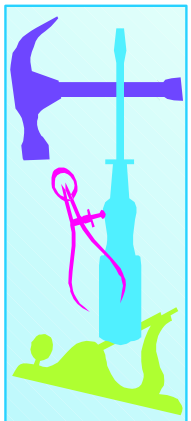
IMS Partition Data Base



IMS Tools For Availability

- Extends the 4GB limit to a 128 GB
  - Up to 32 partitions of 4 GB each
  - Improves Capacity
- Improves Availability
  - Reorganisation in parallel or by partition
- Support HDAM and HIDAM databases
- Support SHISAM and HISAM root only databases (since V2)
- Support Primary and Secondary indices (since V2)
- VSAM and OSAM
- Viewed by IMS and DBRC as a full-function database with multiple dsgroups
- Supported by all IBM IMS database utilities6
- Shortened batch windows
  - parallel processing of partitions

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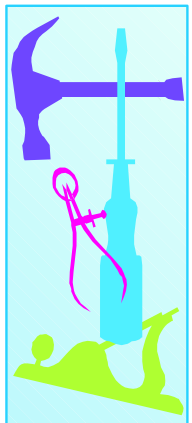

IMS Tools

For Availability

IMS Compression - Extended

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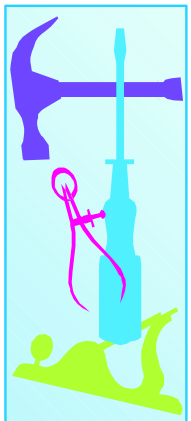
IMS Compression - Extended



IMS Tools For Availability

- A productivity aid for implementing IMS Hardware Assisted Data Compression
  - Need more DASD space?
  - Approaching the 4GB limit?
  - Minimize the performance impact of compression?
- Functions:
  - Analyze
  - Build
  - Compress
  - Examine
- ISPF panels for
  - Extensive 'Help' facilities
- Tutorial (Compress documentation)

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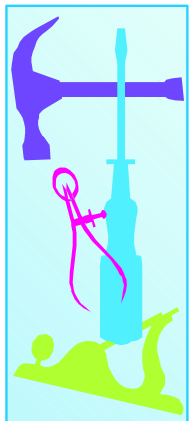

IMS Tools

For Availability

IMS Compression - Extended

- Reduced batch windows
- fewer I/Os for database
  - image copy, recovery
  - smaller reorganization times
    - avoid expand/compress

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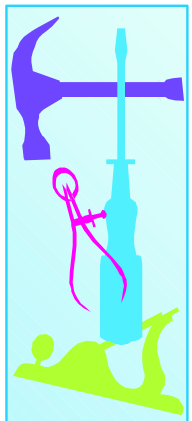

IMS Tools

For Availability

High Performance Change Accumulation

5655-F58

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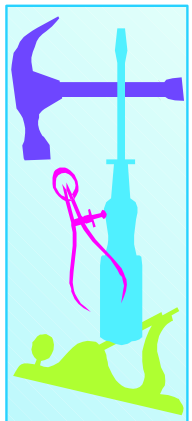

IMS Tools

For Availability

High Performance Change Accumulation

- Improved operations
  - Parallel Change Accumulation runs the standard Change Accumulation utility in parallel. Multiple jobs (address spaces) are triggered via multiple JOB statements in a single JCL stream, which has to be submitted by the user.
  - IMS High Performance Change Accumulation will trigger a single job through the internal reader, without the need to submit the JCL manually. The job will function as a multitask address space, ensuring parallel streaming of both input and output data.
- Easier installation
  - Eliminates the need for the XCM address space and subsystem.

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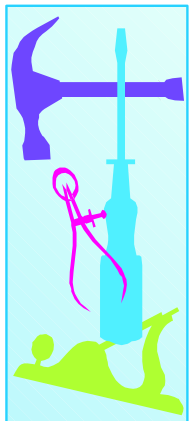

IMS Tools For Availability

High Performance Change Accumulation

- Improved flexibility and performance
  - Parallel Input/Output ensures an elapsed execution time as short as possible. Input data (from RLDSs) and output data (new CAs) are processed in parallel. The user can control the number of parallel processes. If the number of parallel processes are user throttled, the excess processes will be processed in series after the first maximum number of tasks have completed. This results in elongated execution time, but the option is provided and up to the user to exploit.
  - Single pass of input/output.
- Improved interface
  - ISPF and Batch interface for operations.
  - ISPF interfaces allow for customization, setup, and execution.
- Provides full support for DBRC

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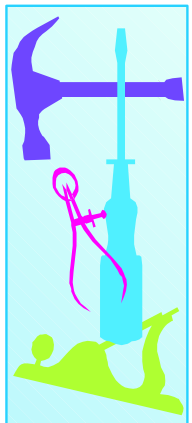

IMS Tools
For Availability

Parallel Reorganization

5655-F74

"Parallel Reorg" means
Unload, Reload, & Index Builder run concurrently

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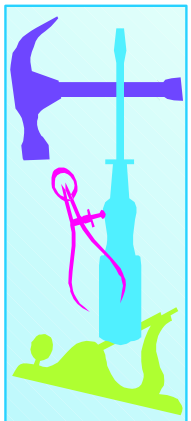
Parallel Reorganization



IMS Tools For Availability

- A complete set of IMS Fast Utilities in one package
  - Unload
  - Reload
  - Prefix Resolution
  - IMS Index Builder
  - DB Scan
- Only minimum JCL changes
  - Transfer of data between batch jobs (separate address spaces)
  - No intermediate data sets
- Standalone utilities or parallel processing
- Database Read access authorised during most of the reorganisation process
- Provides recoverability of the reorganisation process

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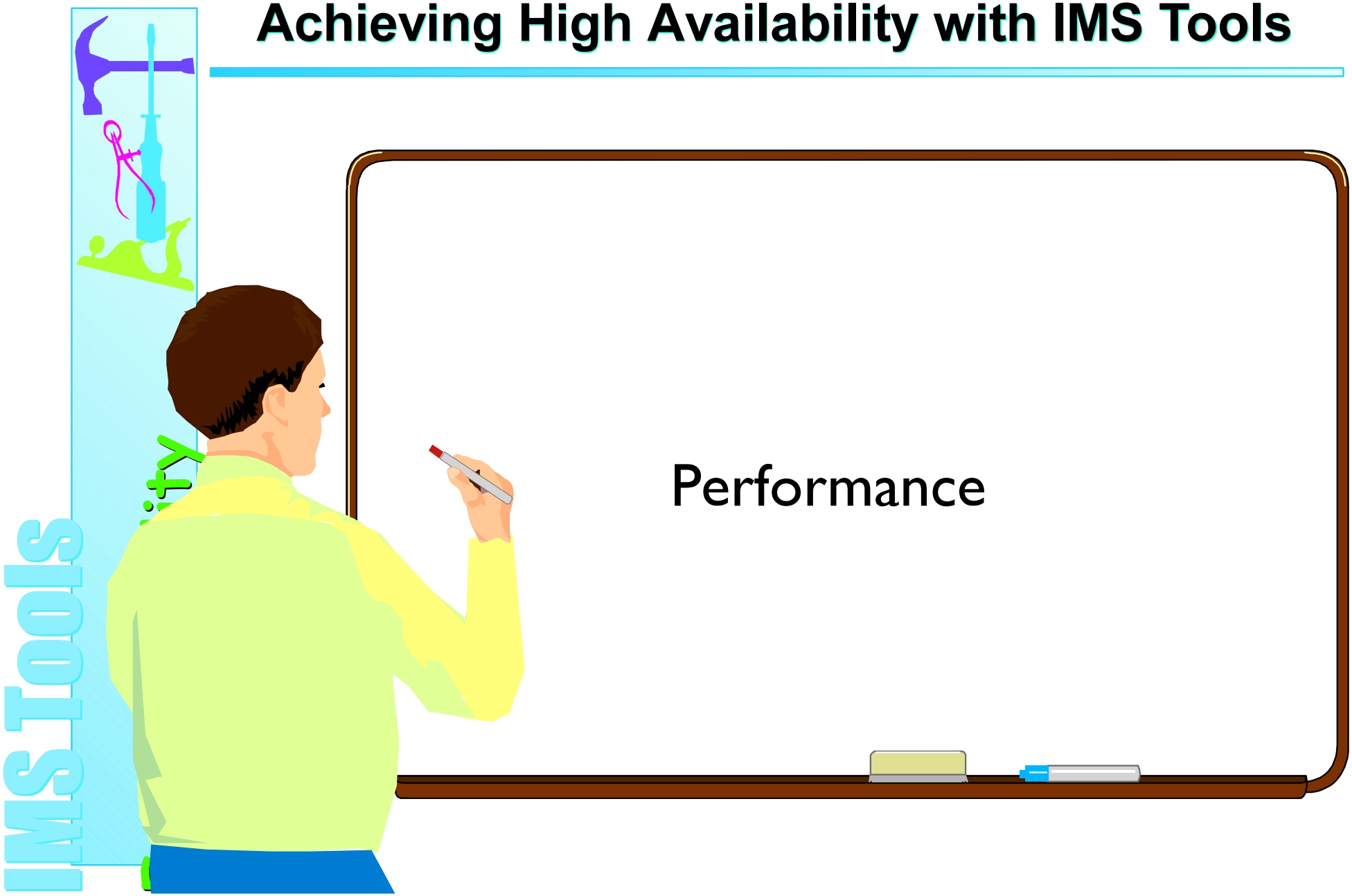
Achieving High Availability with IMS Tools



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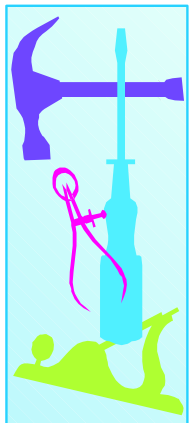

IMS Tools

For Availability

IMS Performance Analyzer

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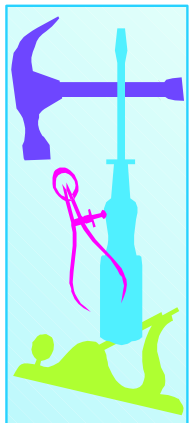

IMS Tools

For Availability

IMS Performance Analyzer

- Easy way to uncover, analyze and fix performance problems
- All the information you need to manage IMS resources and system performances
- Performance, Usage and Availability reports
  - Improve existing reports (when migrating from IMSASAP/IMSPARS)
  - Provide NEW reports including IRLM, RACF usage, OSAM, and external subsystem connection statistics
  - Shared Queue, MSC, APPC support
- Better Usability, Improved formatting
- Better Documentation
- New facilities
  - Easy to use ISPF interface
  - Extract file option
  - GDDM reporting
  - PC download
  - End User Tools

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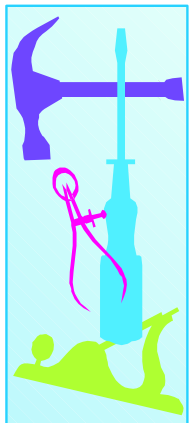

IMS Tools

For Availability

IMS Queue Control Facility

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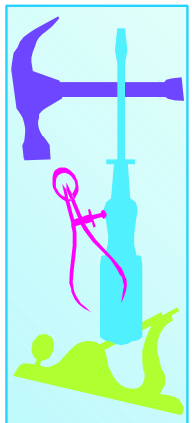
IMS Queue Control Facility



IMS Tools For Availability

- IMS message queue recovery after a cold start
  - Following planned or unplanned outage
- IMS application program recovery
  - To reprocess some transactions after the program is corrected
- IMS stress, regression and application testing
  - Production load simulation
  - Creation of test cases
- Port messages to other IMS systems
  - To migrate to a new release
  - To test recovery on a backup site
- Avoid re-entering transactions after a coldstart
- Regression and Stress Testing
  - capture txns from one system, replay on another system
  - better application testing, avoid appl program problems

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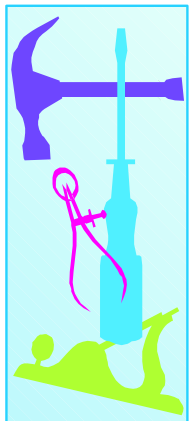

IMS Tools

For Availability

Dynamic Resource Control Facility for IMS/ESA

5697-D14

This "Online Monitor" puts comprehensive resource information at your fingertips and help you spot and resolve potential problems before they become critical!

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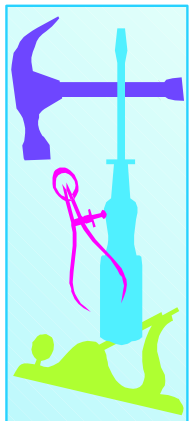
Dynamic Resource Control Facility



IMS Tools For Availability

- Online Monitor
  - Productivity aid for IMS system and application programmers
  - 47 functions
  - IMS application and MFS screen provided
  - /FORMAT DRCF
- Remote Function Execution
  - Managing several IMS systems from one DRC
  - APPC synchronous conversation between the local and the remote
  - Local DRC as IMS modified application
  - Remote DRC as IMS standard application
- Audit facility
  - Record on origin and nature of functions
- Security facility
  - Internal authorization definition
  - Or external security manager
- Detect when unusual situations arise
  - procative measures to avoid IMS outage/appl outage
    - e.g. PI Pool getting full, DMB Pool, RECANY buffers, etc

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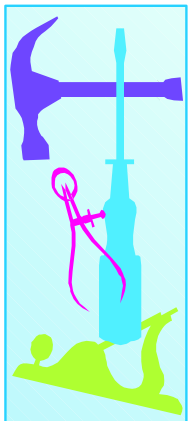
DRCF - System Availability Features



IMS Tools For Availability

- Data Base Allocation (DBAL)
- Online interface to IMS dynamic database allocation.
- Dependent region termination (KILL)
- Possibility to terminate IMS dependent regions that cannot be terminated with the IMS /STOP REGION command.
- IMS Pool Contents Map (PLMP)
- Mapping of the contents and location of the resources in the DL/I PSB pools, the DMB pool, and the Fast Path EPCB pool
- Queued Transaction Input Processor (QTIP)
- Possibility to dequeue IMS input transactions from the IMS message queue
- Post QTIP Reset using QREV function

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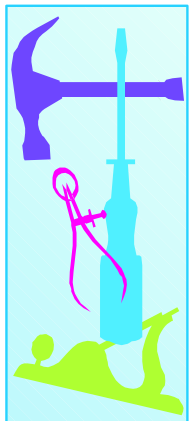

IMS Tools

For Availability

Workload Router

5697-B87

Distributes IMS transactions

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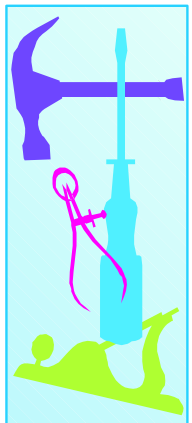

IMS Tools

For Availability

Workload Router

- Distributes IMS transactions via predefined paths via MSC links
- Supports Non-cloned or Cloned System configurations
- Provides weighted distribution to balance transaction workload in Sysplex
- Supports Parallel MSC sessions for MSC link load balancing / availability
- Automatically:
  - Detects inactive resources and re-routes transactions
  - Reconfigures workload distribution among available systems if outage occurs
- No IMS User modifications required to install this product
- Provides an online, real-time administrative interface for monitoring and dynamically updating the WLR configuration
- Spread workload across multiple systems
  - less impact in the event of an outage

Achieving High Availability with IMS Tools

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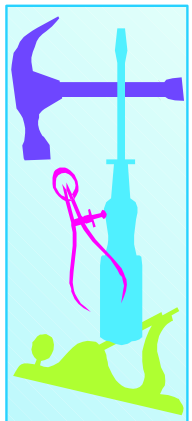

IMS Tools

For Availability

IMS Online Recovery Service

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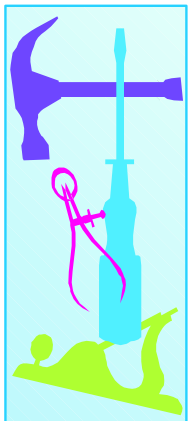
IMS Online Recovery Service



IMS Tools For Availability

- Recovers databases and Fast Path Areas
  - using either complete or incomplete Change Accumulation
  - and Image Copys
- Applies database and Fast Path Area changes simultaneously
  - in single pass of IMS log data sets
- Performs time stamp forward recovery
- Starts databases and areas automatically after recovery
- Faster Recoveries
- Change Accumulation not required for Data Sharing IMSs
- Point in time recovery

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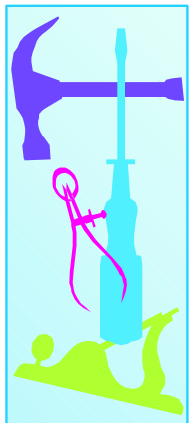

IMS Tools

For Availability

IMS Recovery Saver

5655-E16

IMS Recovery Saver is a potential solution to the problem areas of timestamp recovery, disaster recovery and IMS and DB2 coordinated recovery.

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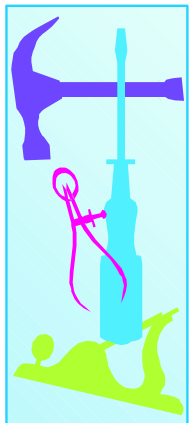

IMS Tools

For Availability

IMS Recovery Saver

- IMS Recovery Saver changes reality by conditioning a set of IMS logs and a copy of the RECON to allow IMS databases to be recovered to any time stamp
  - Trims IMS log data streams to a common time stamp
    - DB consistency with IMS/ESA Version 5 logs
    - DB/DC consistency with IMS/ESA Version 6 logs
  - Updates the RECON to indicate that all IMS activity ceased at the common time stamp
- Allows incremental recovery point disaster recovery methodology to work in a data sharing environment
- Allows time stamp recovery to any time stamp
- Assists in coordinated IMS - DB2 recoveryGives the user the ability to recover IMS full function databases to any time without requiring the existence of an IMS recovery point
- Recondition Recon after a DRP
- PITR without ORS

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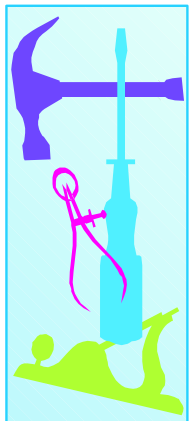

IMS Tools For Availability

IMS Recovery Saver

- RS does just 2 things:
  - Allows a timestamp recovery to ANY time
    - No recovery point needed
  - Updates the RECONs to agree with the state of the database
    - Creates a recovery point
- RS does not care which databases need to be recovered.
- RS Phases
  - Analyze control statement input
  - Analyze RECON dataset and validate Truncation Time
    - Based on OPEN/CLOSE times ar recorded in the RECON
  - Allocate/analyze Input Logs (OLDS or SLDS) and Copy them into work files
  - Revalidate Truncation Time based on log data stream content
    - Based on the time where the log records were actually created
  - Create Truncated Output Logs
  - Determine in-flight and in-doubt units of recovery
  - Perform RECON maintenance operations

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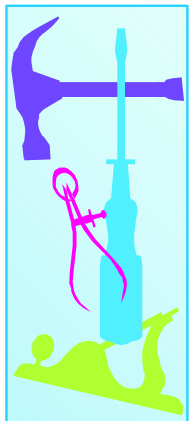

IMS Tools

For Availability

IMS Recovery Saver

- Improved IMS data availability by eliminating need to establish IMS recovery points for disaster recovery or potential time stamp recovery purposes
  - Ability to recover IMS databases to any time without requiring the existence of a recovery point
- Reduction in disaster recovery service restoration times by automatically performing all necessary RECON maintenance operations
- Ability to continue to use the incremental recovery point disaster recovery methodology with data sharing
- Ability to perform coordinated disaster recovery between IMS databases and DB2 objects without requiring that both IMS and DB2 be quiesced
- Ability to backup RECON data sets that contain records greater than 32,760 bytes in size in a single step
  - Reduction in planned outages by providing complete support for RECON data sets with records greater than 32,760 bytes in size

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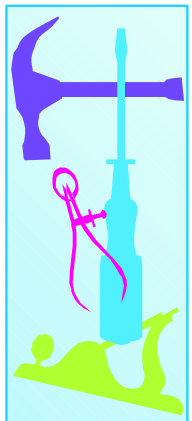

IMS Tools

For Availability

IMS Image Copy Extensions

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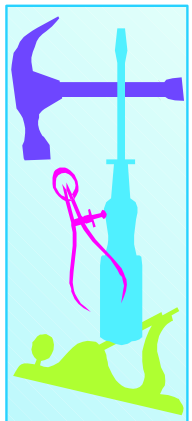

IMS Tools

For Availability

IMS Image Copy Extensions

- Pointer Checker during Image Copy
- Avoid outage to check databases
- immediate notification of any errors
  - less complex database recovery

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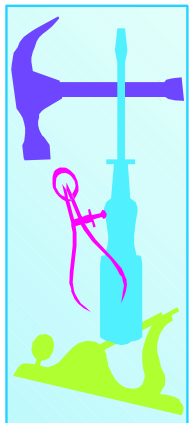

IMS Tools

For Availability

DB2 Recovery Manager

5697-F56

Simplifies and coordinates the recovery of both DB2 and IMS data to a common point

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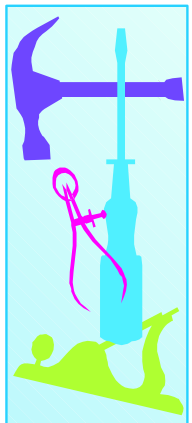
IMS DEDB Fast Recovery



IMS Tools For Availability

- Assists technical support personnel in the operation and maintenance of the data integrity of IMS Fast Path databases
- Fast and efficient way to recover DEDB databases when IMS Emergency Restart Fails
- Replaces the need to run Database Recovery utility for every DEDB area
- Insurance for maintaining data integrity
- Fast Recover saves time... Takes only minutes to run!
  - DEDB areas are not recovered from image copy but from the:
    - Last checkpoint,
    - DEDB internal control blocks,
    - DEDB and I/O toleration buffers
- Fast Recover eliminates...
    - Log Recovery
    - Manual update of RECON dataset
    - Time for operational planning
    - Deallocation of DEDB areas
- Fast Recover produces helpful reports ...

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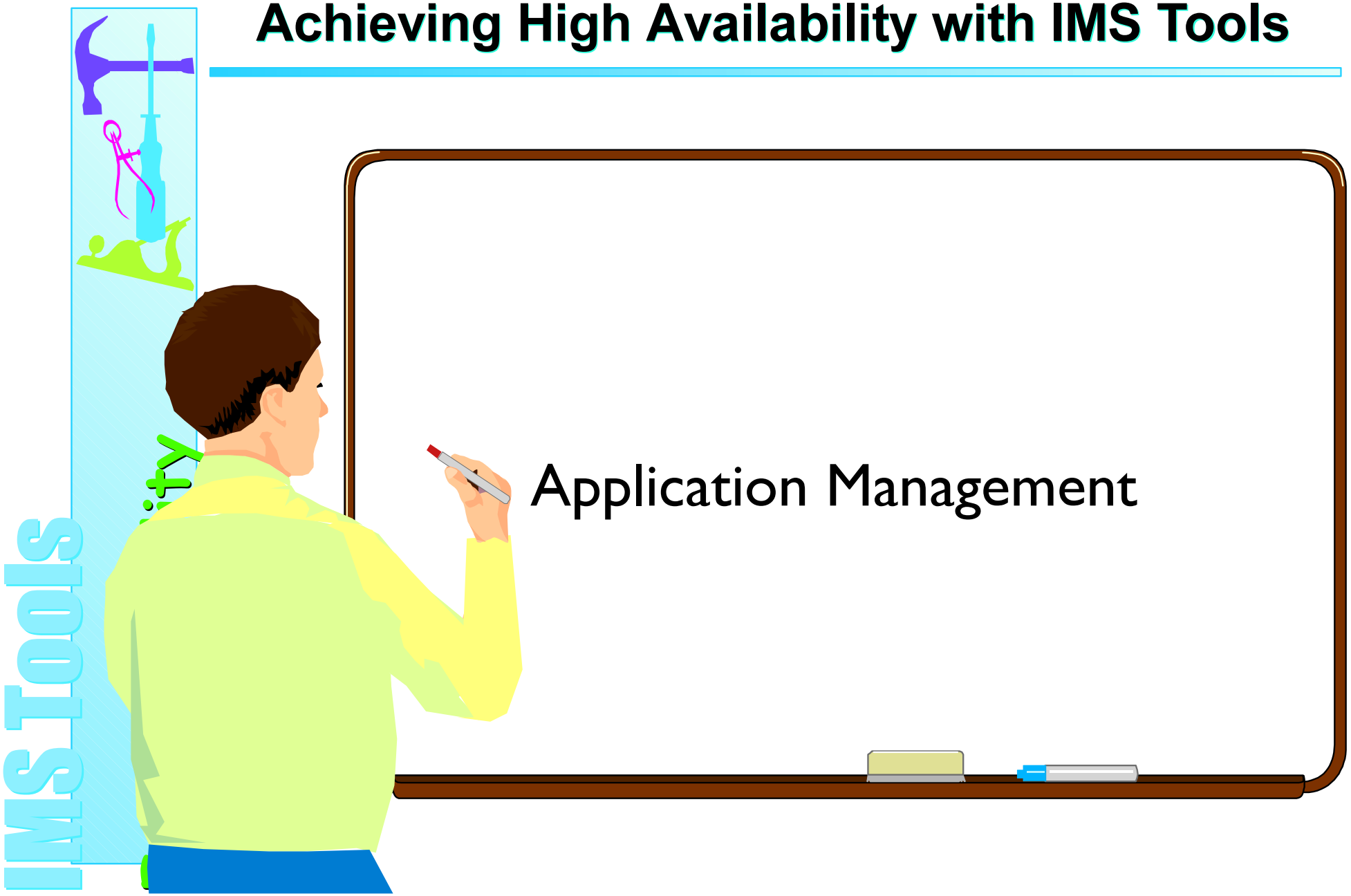
Achieving High Availability with IMS Tools



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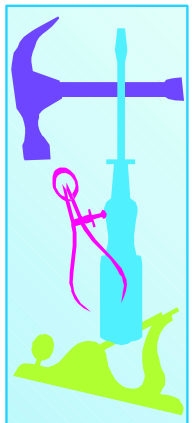

IMS Tools

For Availability

IMS Batch Terminal Simulator

5655-A14

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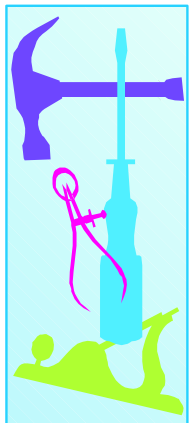
IMS Batch Terminal Simulator



IMS Tools For Availability

- Unique Capabilities NOT found elsewhere
  - Terminal Simulation
  - Testing of IMS message applications
  - Extensive debugging
    - IMS & DB2 call trace
  - MQSeries call trace support
  - LU6.2/APPC support
- Transparent to the application
  - No changes to application program
  - No changes to IMS code
- Increased application programmer productivity
- Flexibility
- More stable online systems
- Enhances program documentation
- Training tool & Application Testing
  - application availability

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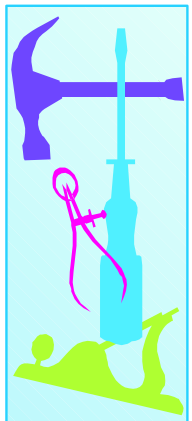

IMS Tools

For Availability

Application Restart

5655-E14

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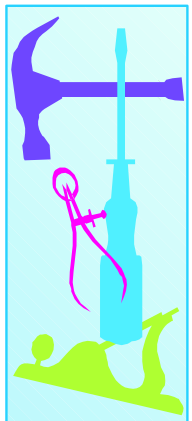

IMS Tools

For Availability

Application Restart

- Faster to identify restart point
- Accurate identification of restart points

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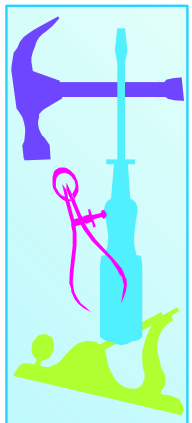

IMS Tools For Availability

Summary

- Database Administration
  - High Performance Unload
  - High Performance Load
  - Index Builder
  - High Performance Prefix Resolution
  - IMS Parallel Reorganization
  - DB Repair Facility
  - IMS Control Suite
  - Library Management Utilities
  - Advanced ACB Generator
  - ETO Support
  - Command Control Facility
  - High Performance Sysgen Tools
  - High Performance Pointer Checker
  - Fast Path Basic Tools
    - DEDB Unload/Reload
    - DEDB Pointer Checker
    - DEDB Tuning Aid
  - Fast Path Online Tools
    - DEDB Online Pointer Checker
    - DEDB Online Data Extract
    - DEDB Online Area Extender
  - Sequential Randomizer Generator
  - IMS Partition DB
  - IMS Compression - Extended
- Performance Management
  - IMS Performance Analyzer
  - Queue Control Facility
  - Dynamic Resource Control Facility
  - Workload Router
- Recovery and Replication
  - Online Recovery Service
  - IMS Recovery Saver
  - Database Integrity Control Facility
  - IMS Image Copy Extensions
  - DB2 Recovery Manager
  - DEDB Fast Recovery
  - Data Propagator
- Application Management
  - Batch Terminal Simulator
  - MFS Reversal Utilities
  - Application Restart
  - IMS Connect
  - Y2K Exit

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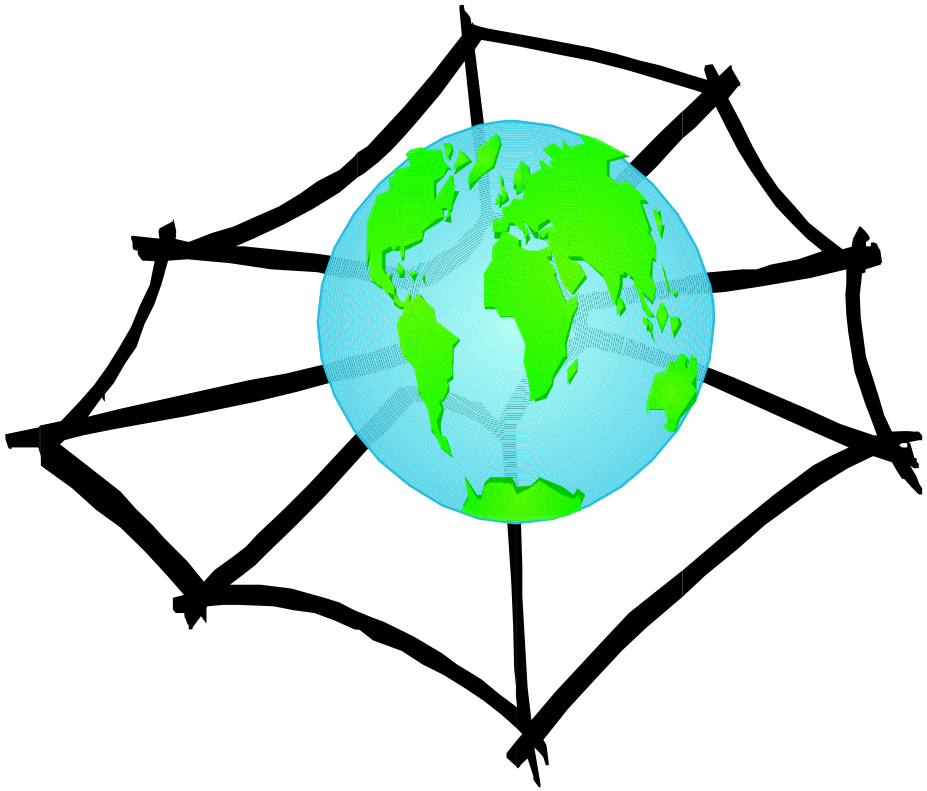
More Information



www.ibm.com/software/data/db2imstools

IMS Tools
For Availability

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