IBM Software Group

IMS29

IMS Parallel Reorganization for improved IMS Full Function Database Reorganization

Thomas Esser

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Agenda

- IMS Parallel Reorganization V3 Objectives
- IPR Driver V3 – How does it wok?
- The Future of IPR Driver

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IMS Parallel Reorganization V3 Objectives

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IMS Parallel Reorganization Driver (IPR Driver)

- Current IPR Driver (V3)
  - Drives multiple IBM IMS Tools in a single job step
  - Enables offline or read-only reorganization
  - Can reorganize a non-partitioned full-function database that has no external logical relationship
  - Can reorganize a HALDB partition, a sequence of partitions, and the entire HALDB
  - Can take image copy with optional pointer check during the reorganization

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IMS Tools running under IPR Driver V3

- High Performance Database Tools
  - **IMS High Performance Unload V1** + PTF UQ93748 (required)
  - **IMS High Performance Load V2** (required)
  - **IMS Index Builder V2.3** + PTF UQ93283
    (required if INDEXBLD=YES and the database has a secondary index)
  - **IMS High Performance Prefix Resolution V3**
    (required if PREFIXRES=YES and the database has an internal logical relationship)
  - **IMS High Performance Image Copy V3.2** (required if IC=YES)
  - **IMS High Performance Pointer Checker V2** + PTF UQ93559
    (required if IC=YES and HASH pointer checking is needed)
- Other database management tools
  - **IMS Library Integrity Utilities V1**
    (required if DECODEDBD=YES or DECODESXD=YES)

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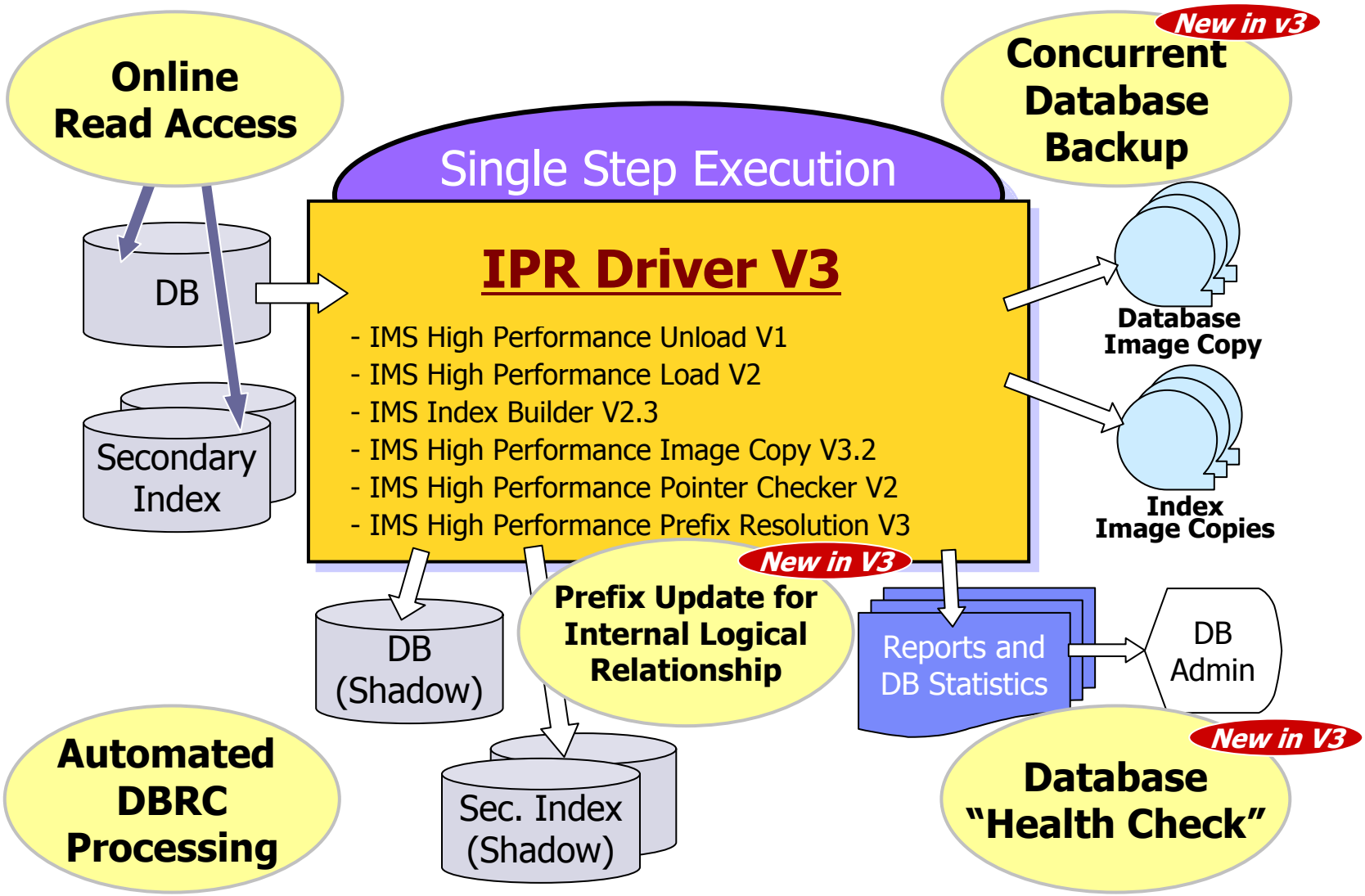
IPR Driver V3 – Big Picture



IPR: IMS Parallel Reorganization

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IPR Driver V3 Functions

- **Stopping the database or making it read-only before reorg**
  - IMS /DBR or /DBD DATABASE command is issued by IPR Driver
- **Reorganizing database data sets into "shadow" data sets**
  - Unload, Reload, and Index-Builder tasks run concurrently
  - New: Image copies can be taken during reorg, with optional HASH pointer check
    - → **Type-A Image Copy**
- New **Updating segment prefixes after the database reload**
  - For the database that has internal logical relationship
    - → **Concurrent Prefix Update**
- New **Taking image copies with optional HASH check after the prefix update**
    - → **Type-B Image Copy**
- **Stopping the database at the completion of READ-ONLY reorg**
  - IMS /DBR DATABASE command is issued by IPR Driver
- **Performing post-reorganization process**
  - Original and "shadow" data sets names are swapped
  - DBRC is notified of the reorg completion and the image copy

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IPR Driver Objectives

- IPR Driver development objectives are:
  - To run multiple reorganization tasks concurrently in a single job step
  - To make JCL statements simpler for easier coding and modification
  - To reduce the CPU time and elapsed time required to reorganize a database

We believe that these objectives have been almost attained in V3.

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Then…

- What are still needed?
- What will be the future of IPR Driver?
- Before discussing these topics, let's look at how the IPR Driver V3 works

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IPR Driver V3
How does it work?

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JCL Statements for Type-A Image Copy (a sample)

```
//IPR       EXEC PGM=HPSGMAIN,PARM='DBD=YOURDBD,DBRC=Y'
//STEPLIB   DD DISP=SHR,DSN=TOOLS.LIBRARY
//           DD DISP=SHR,DSN=IMS.SDFSRESL
//IMS       DD DISP=SHR,DSN=IMS.DBDLIB
//IMSDALIB DD DISP=SHR,DSN=IMS.DALIB
//HPSIN     DD *
(REORG)
  IMSCMD=YES
  DBSHARE=YES
  IC=YES
  INDEXBLD=YES
  NAMESWAP=YES
  DELOLDDS=YES
/*
//ICEIN     DD *
  GLOBAL    HDPC=(Y,HISTORY),ICHLQ=IMSICA
/*
//HISTORY   DD DISP=SHR,DSN=HDPC.HISTORY
```

The control statements for IPR Driver, IPR Unload, IPR Reload, Index Builder, and High Performance Prefix Resolution can be specified in **HPSIN**.

The control statements for High Performance Image Copy can be specified in **ICEIN**.

All SYSOUT streams for reports and statistics can be allocated dynamically
- You do not need to know the DD names for various utility outputs

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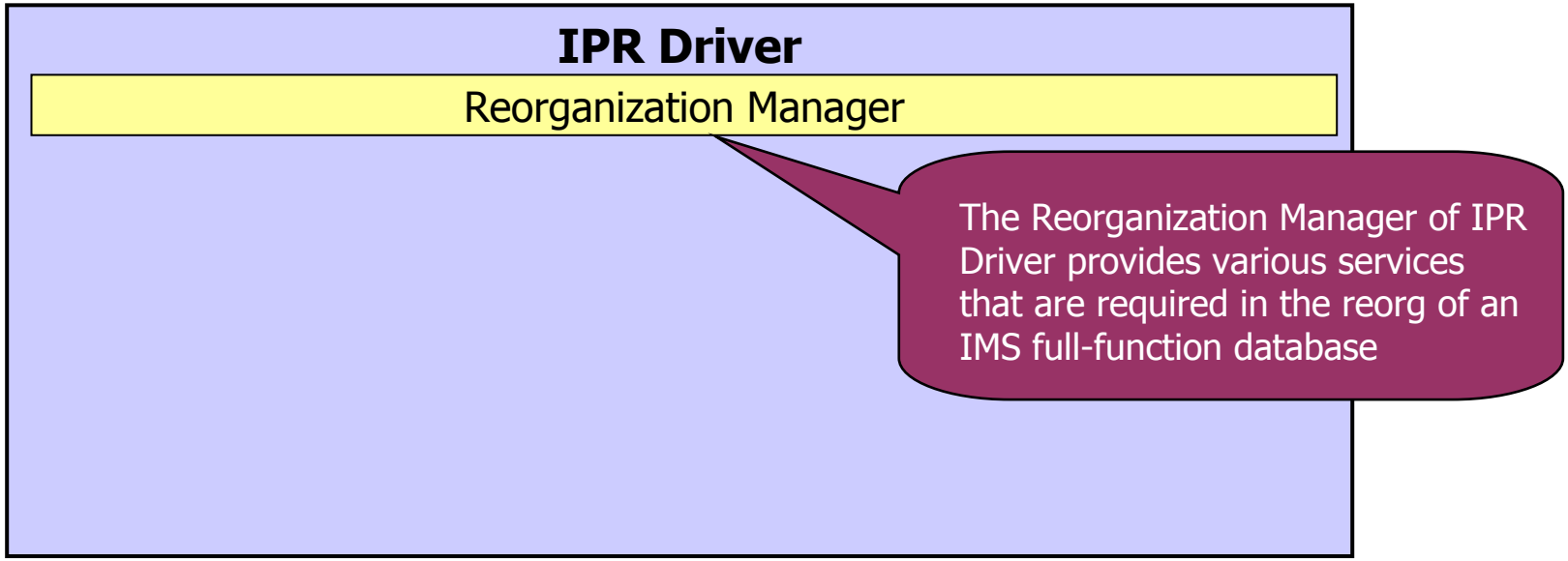
IPR Driver V3 Type-A Image Copy – Process Flow



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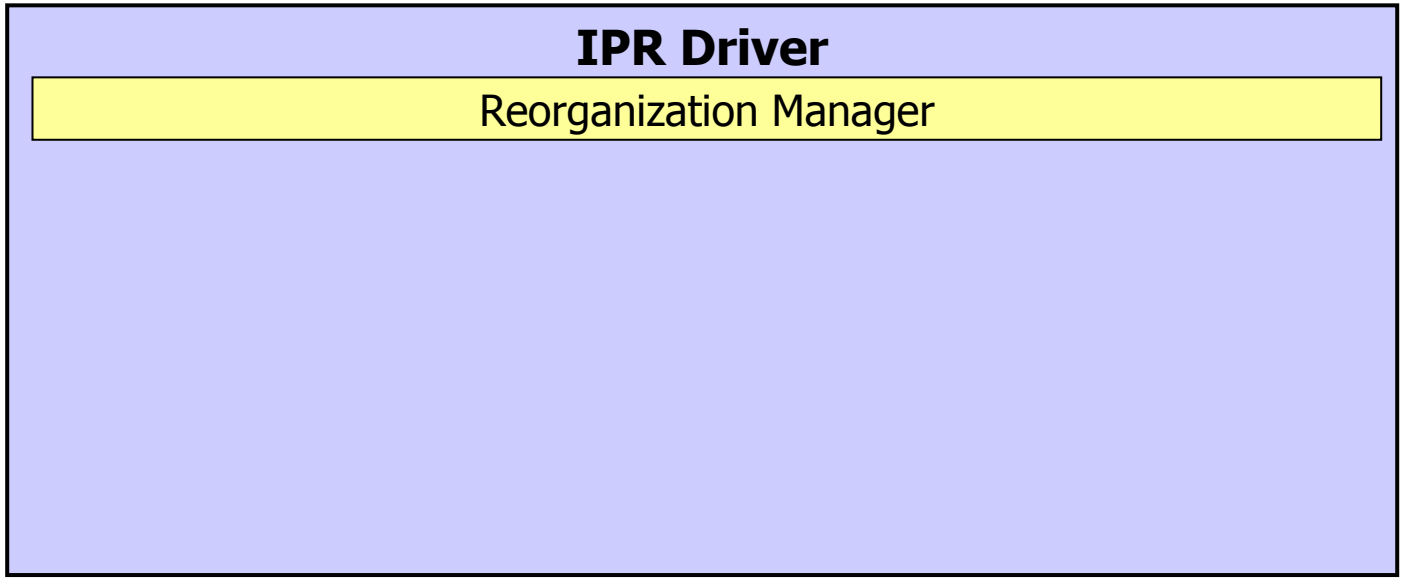
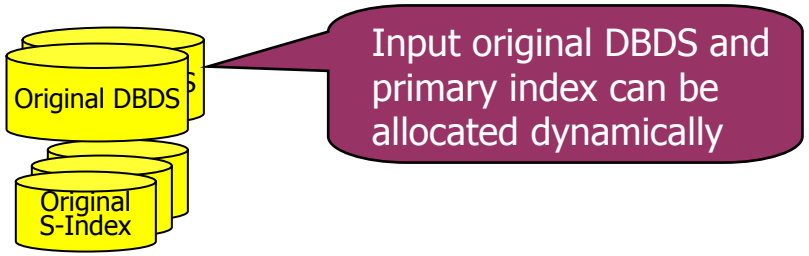
IPR Driver V3 Type-A Image Copy – Process Flow





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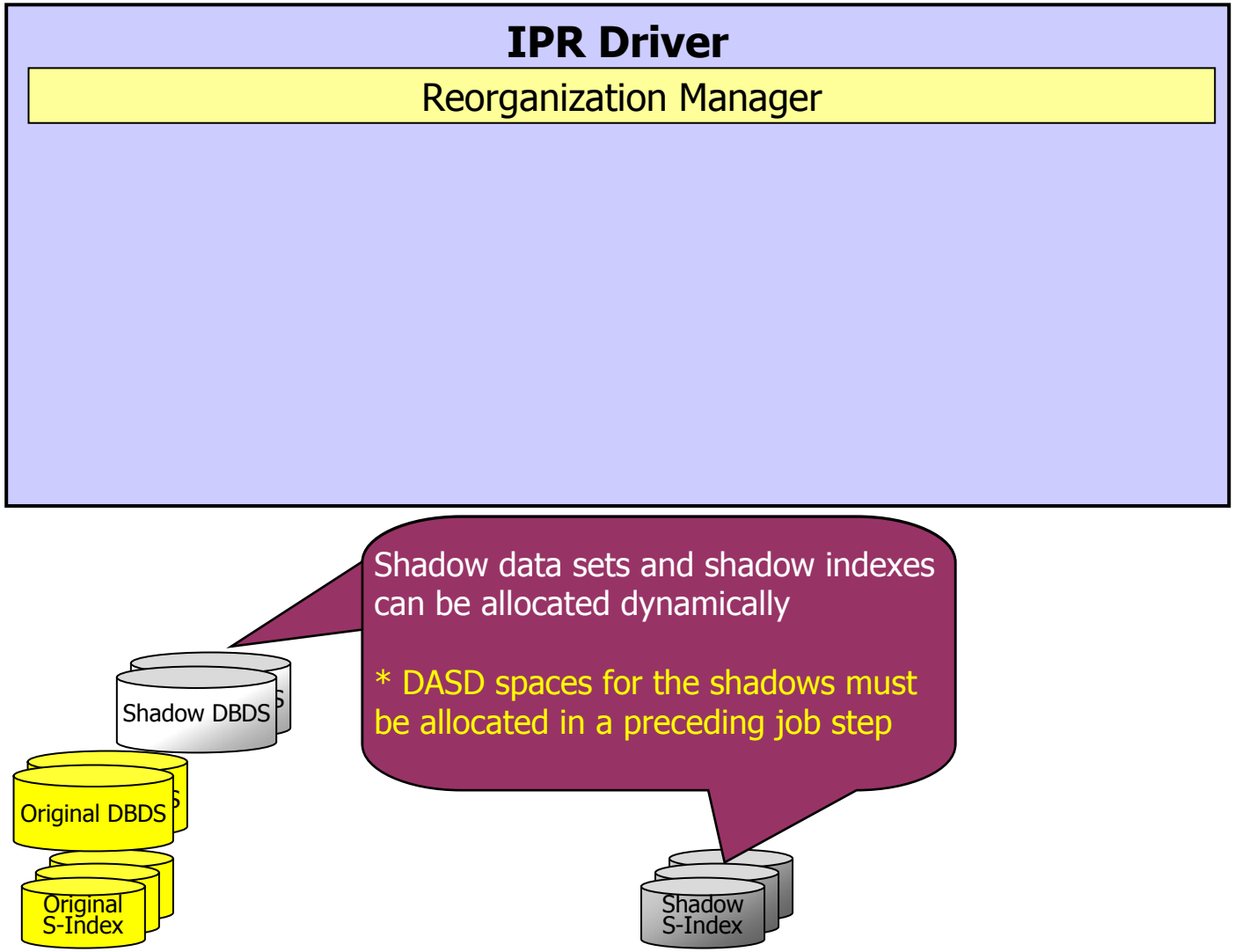
IPR Driver V3 Type-A Image Copy – Process Flow



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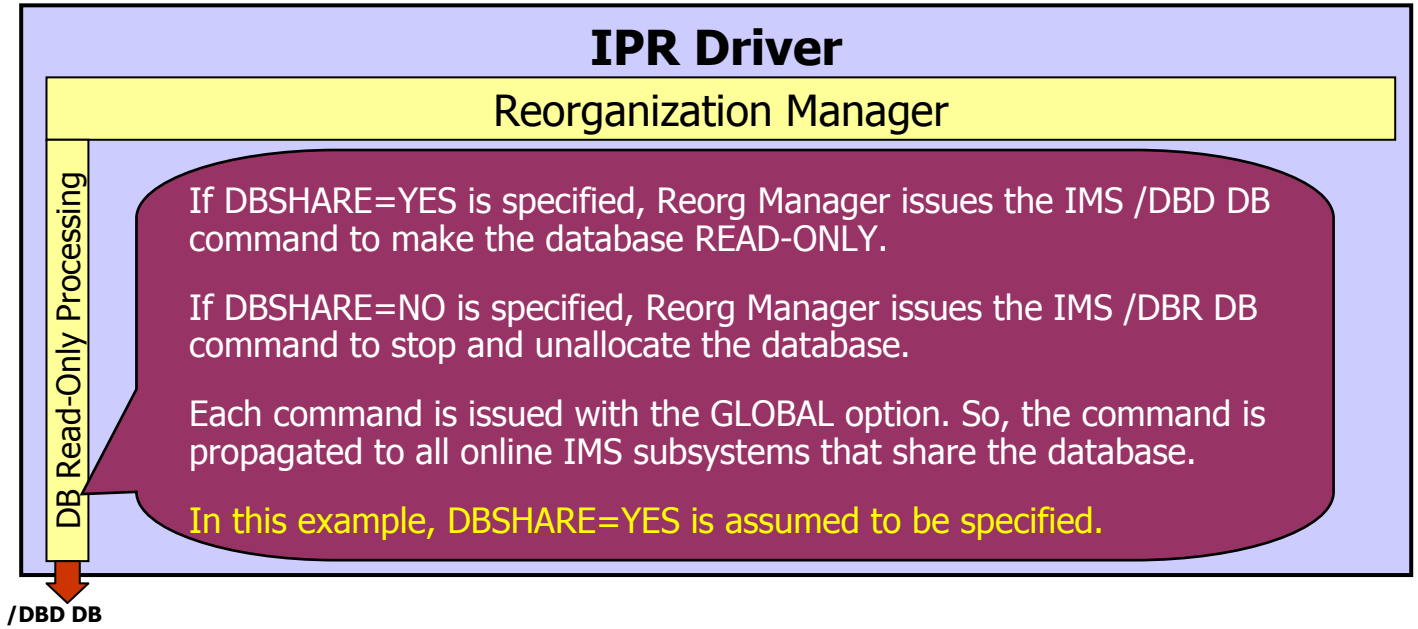
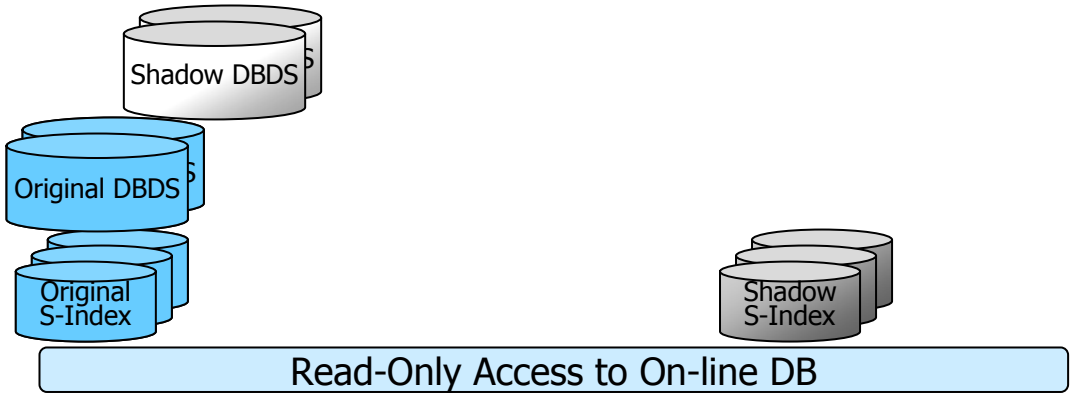
IPR Driver V3 Type-A Image Copy – Process Flow





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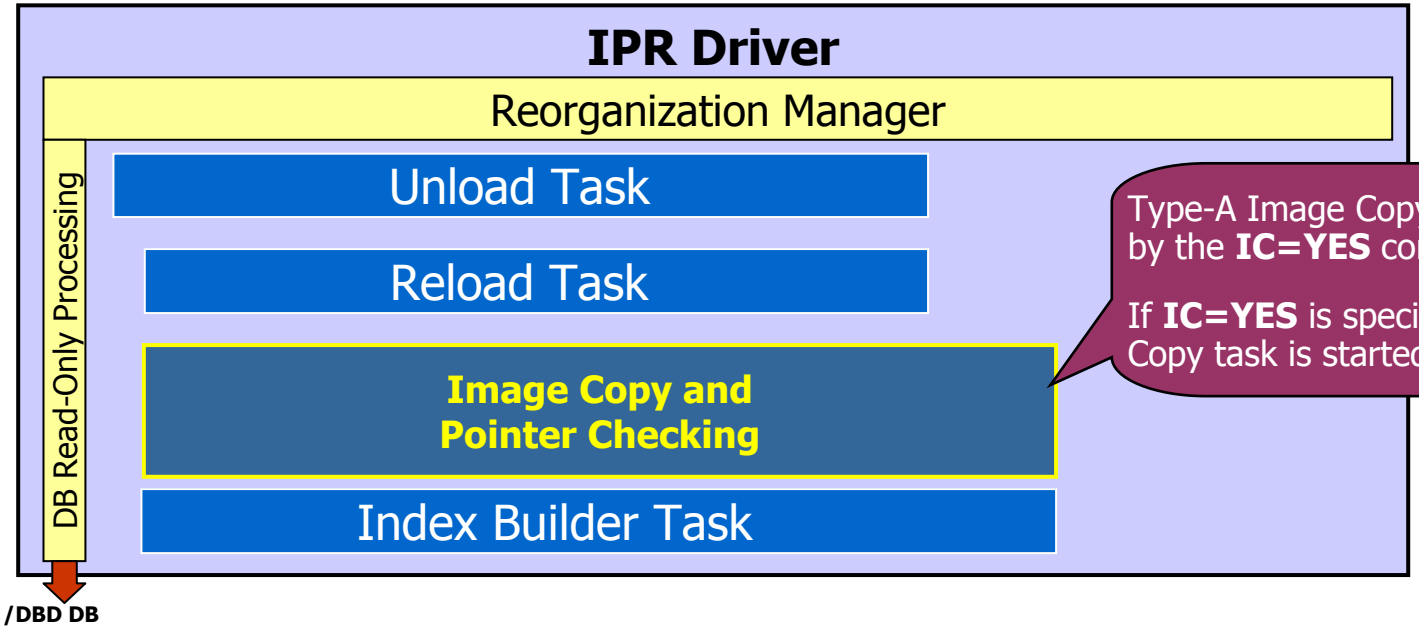
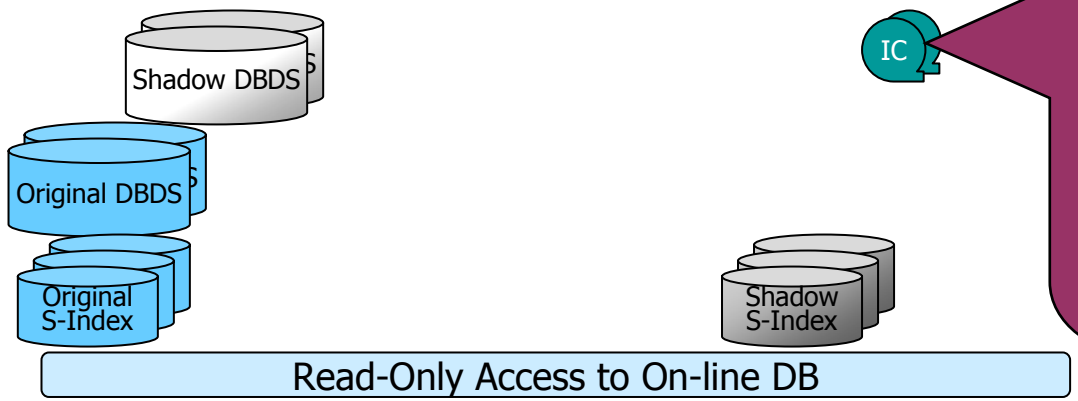
IPR Driver V3 Type-A Image Copy – Process Flow



Type-A Image Copy is activated by the **IC=YES** control statement.

If **IC=YES** is specified, the Image Copy task is started.



The image copy data sets for primary database and the HIDAM primary index can be allocated dynamically.

If the image copy is taken on DASD, the space can be allocated dynamically based on the ICEIN control statements.

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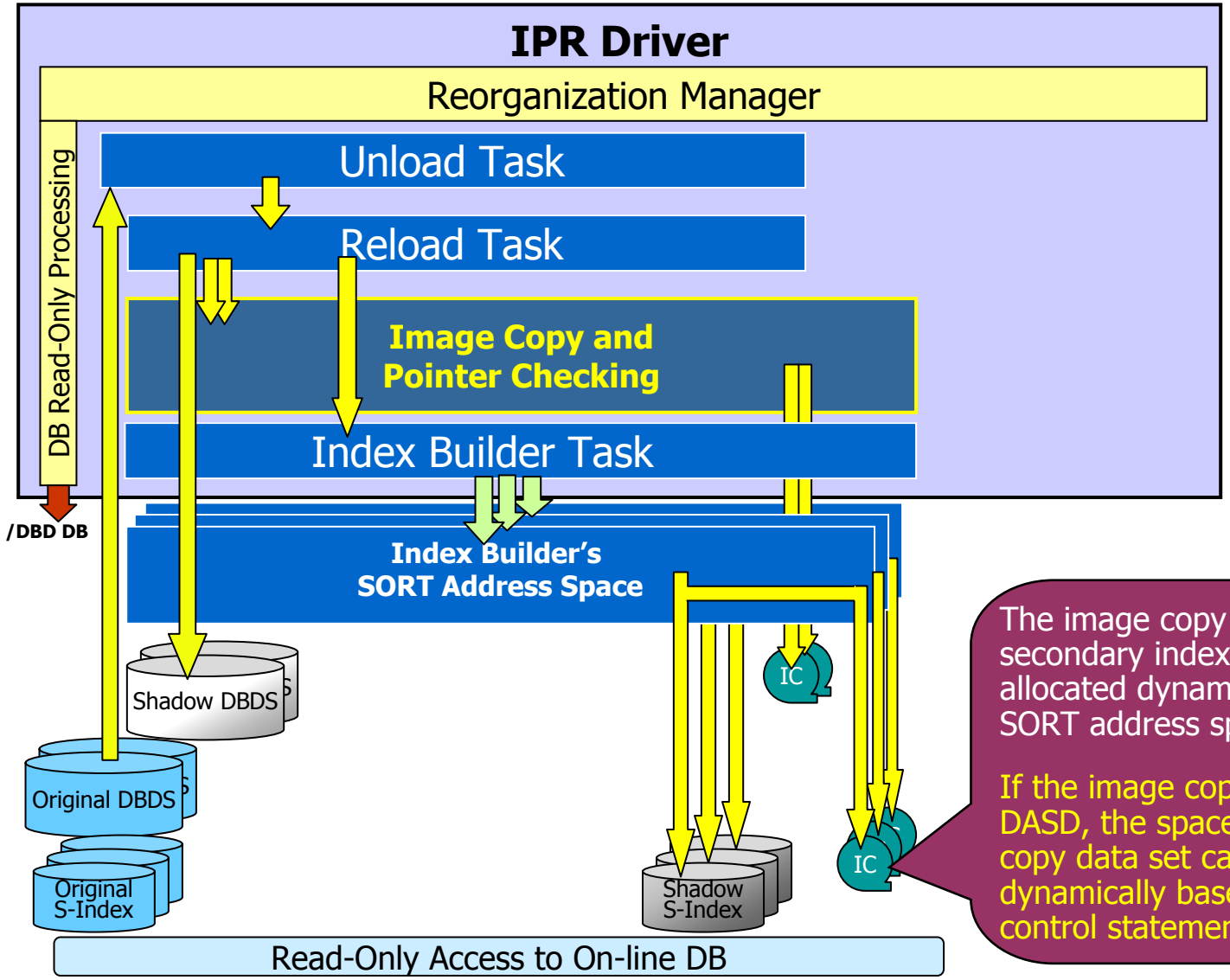
IPR Driver V3 Type-A Image Copy – Process Flow



The image copy data set for a secondary index can be allocated dynamically in each SORT address space.

If the image copy is taken on DASD, the space for the image copy data set can be allocated dynamically based on the ICEIN control statements.

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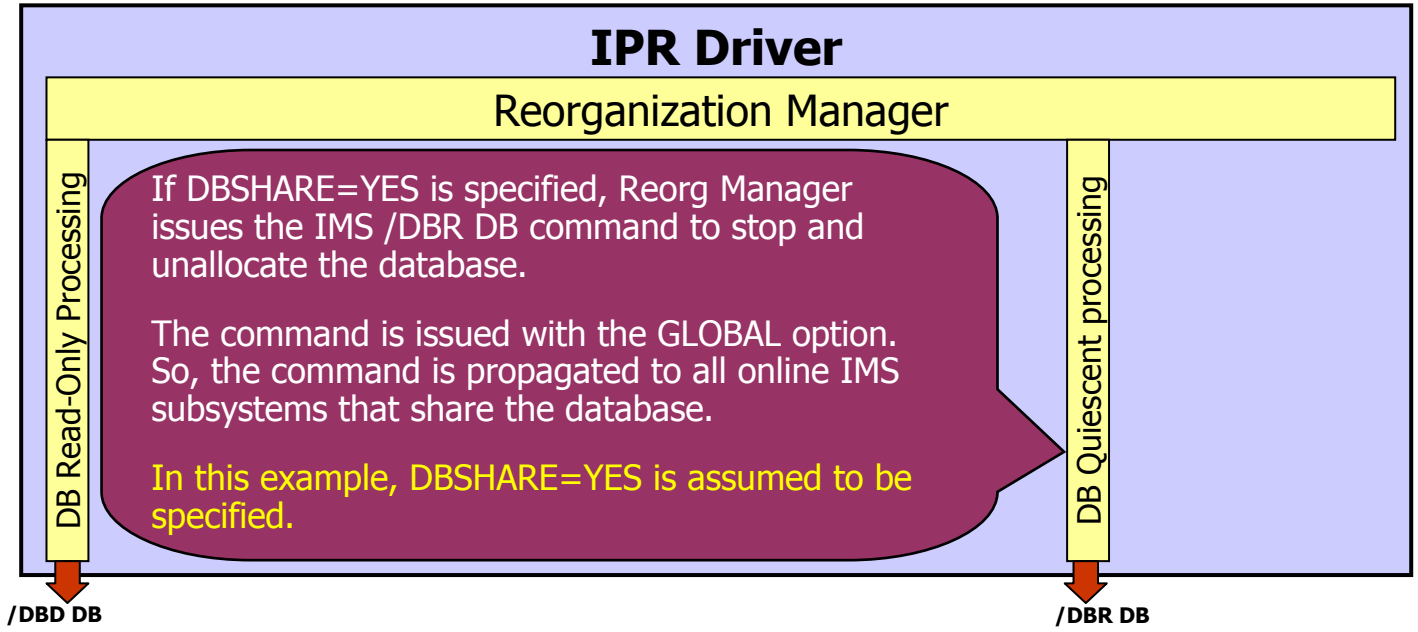
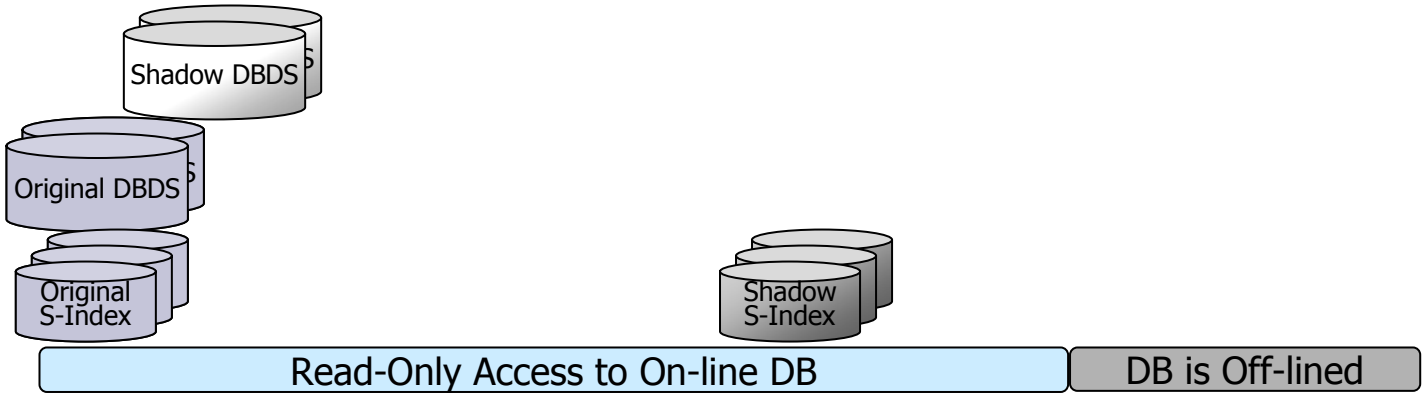
IPR Driver V3 Type-A Image Copy – Process Flow





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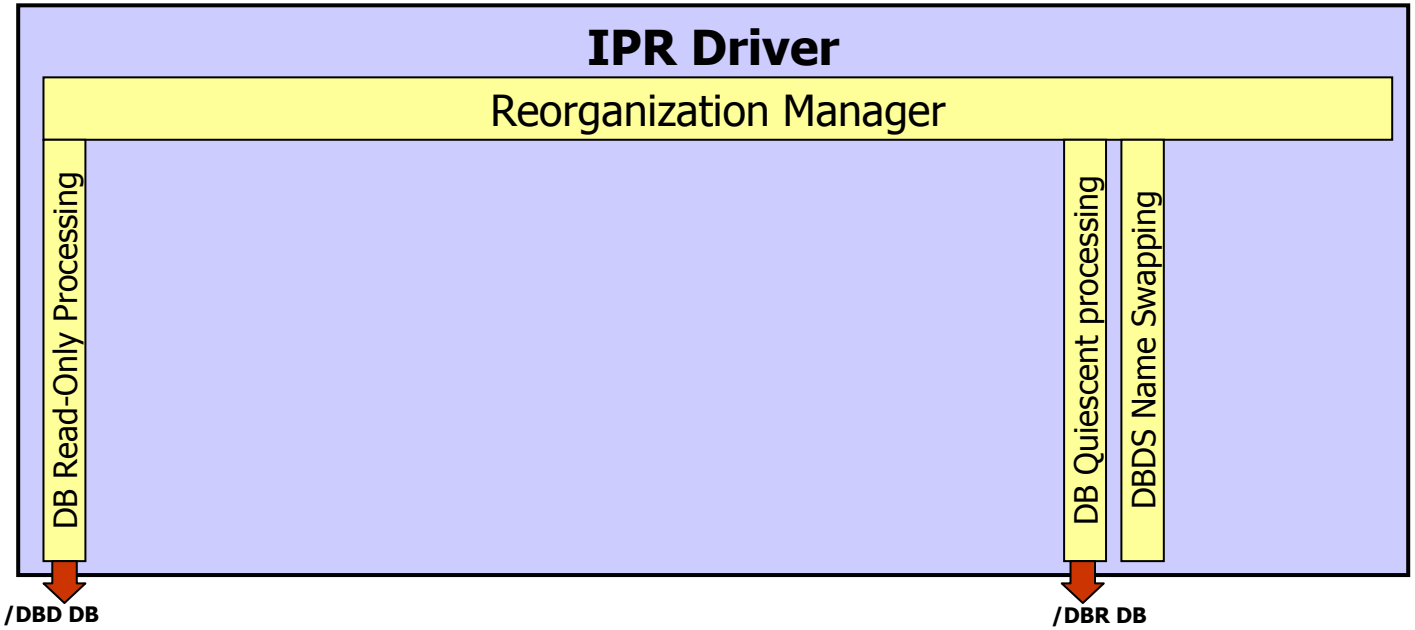
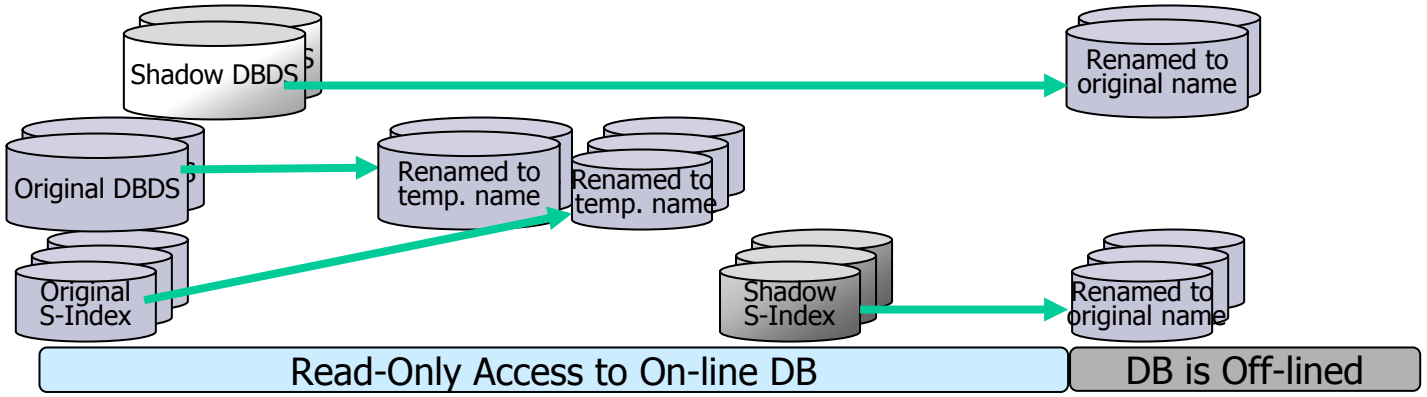
IPR Driver V3 Type-A Image Copy – Process Flow





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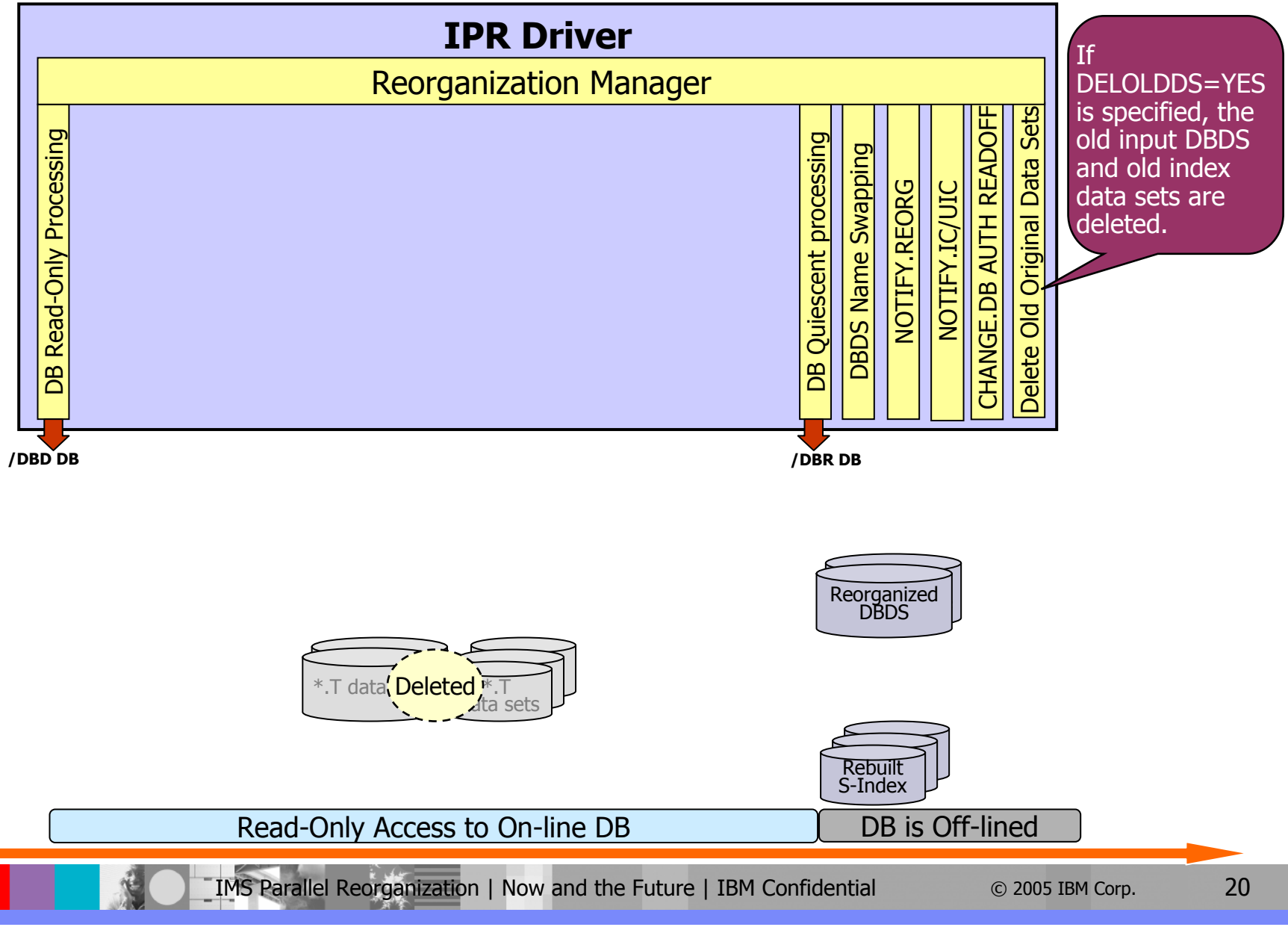
IPR Driver V3 Type-A Image Copy – Process Flow



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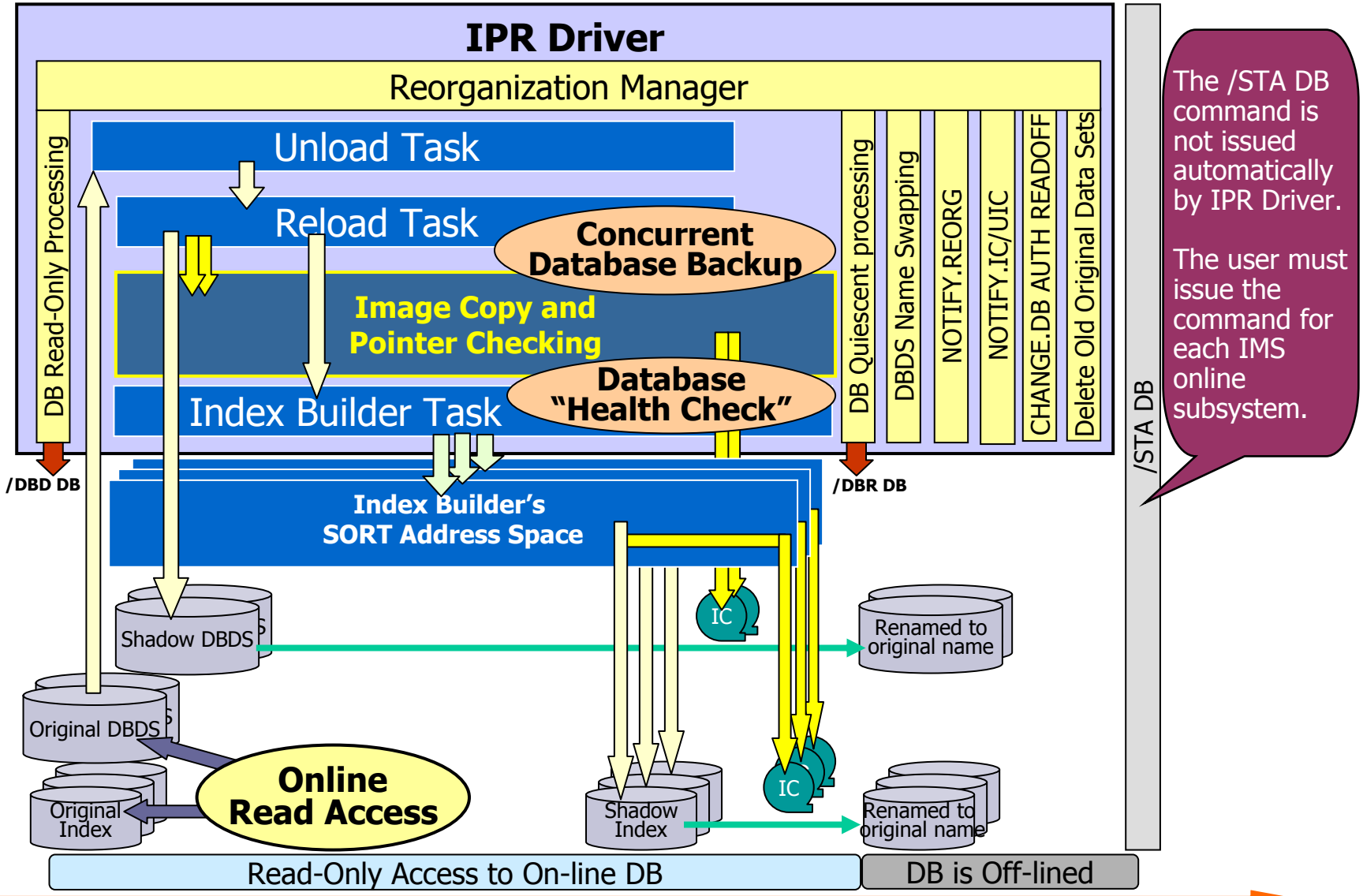
IPR Driver V3 Type-A Image Copy – Big Picture



The /STA DB command is not issued automatically by IPR Driver.

The user must issue the command for each IMS online subsystem.

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JCL Statements for Type-B Image Copy for a database that has no logical relationship

```
//IPR       EXEC PGM=HPSGMAIN,PARM='DBD=YOURDBD,DBRC=Y'
//STEPLIB   DD DISP=SHR,DSN=TOOLS.LIBRARY
//           DD DISP=SHR,DSN=IMS.SDFSRESL
//IMS       DD DISP=SHR,DSN=IMS.DBDLIB
//IMSDALIB DD DISP=SHR,DSN=IMS.DALIB
//HPSIN     DD *
(REORG)
  IMSCMD=YES
  DBSHARE=YES
  IC=YES
  ICTYPE=B
  INDEXBLD=YES
  NAMESWAP=YES
  DELOLDDS=YES
/*
//ICEIN     DD *
  GLOBAL    HDPC=(Y,HISTORY),ICHLQ=IMSICA
/*
//HISTORY   DD DISP=SHR,DSN=HDPC.HISTORY
```

This is the only difference.

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JCL Statements for Concurrent Prefix Update and Type-B Image Copy

```
//IPR       EXEC PGM=HPSGMAIN,PARM='DBD=SAMPLEDB,DBRC=Y'
//STEPLIB   DD DISP=SHR,DSN=TOOLS.LIBRARY
//          DD DISP=SHR,DSN=IMS.SDFSRESL
//IMS       DD DISP=SHR,DSN=IMS.DBDLIB
//IMSDALIB  DD DISP=SHR,DSN=IMS.DALIB
//DFSURCDS  DD DISP=SHR,DSN=DFSURCDS
//DFSURWF1  DD DISP=(NEW,PASS,DELETE),DSN=&&DFSURWF1,
//             UNIT=SYSALLDA,SPACE=(CYL,(n,m)),
//             DCB=(RECFM=VB,LRECL=800,BLKSIZE=2400)
//HPSIN     DD *
(REORG)
  IMSCMD=YES
  DBSHARE=YES
  IC=YES
  INDEXBLD=YES
  NAMESWAP=YES
  PREFIXRES=YES
  DELOLDDS=YES
(PREFIXRES)
  UPDLPC=NO
/*
//ICEIN     DD *
  GLOBAL    HDPC=Y,ICHLQ=IMSICA
/*
```

You do not need to specify the ICTYPE control statement.

If IC=YES and **PREFIXRES=YES** are specified and the database has an internal logical relationship, ICTYPE=B is implicitly set.

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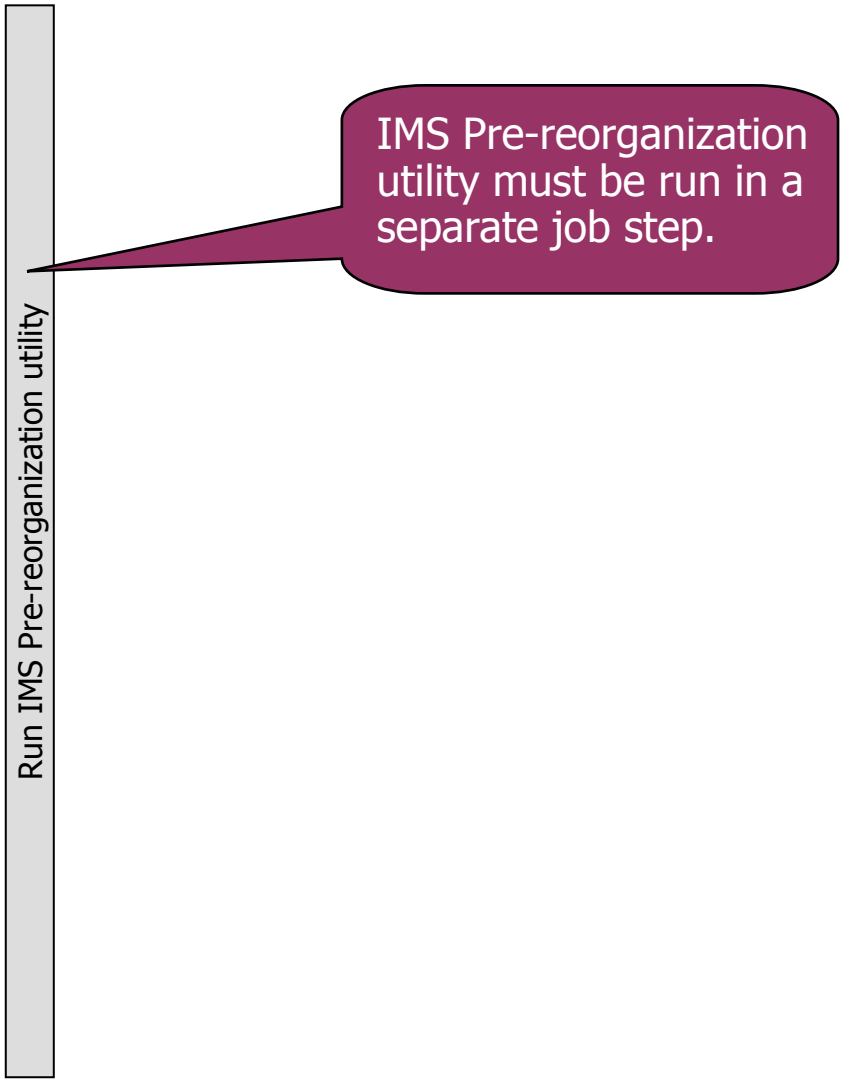
Concurrent Prefix Update and Type-B Image Copy – Process Flow



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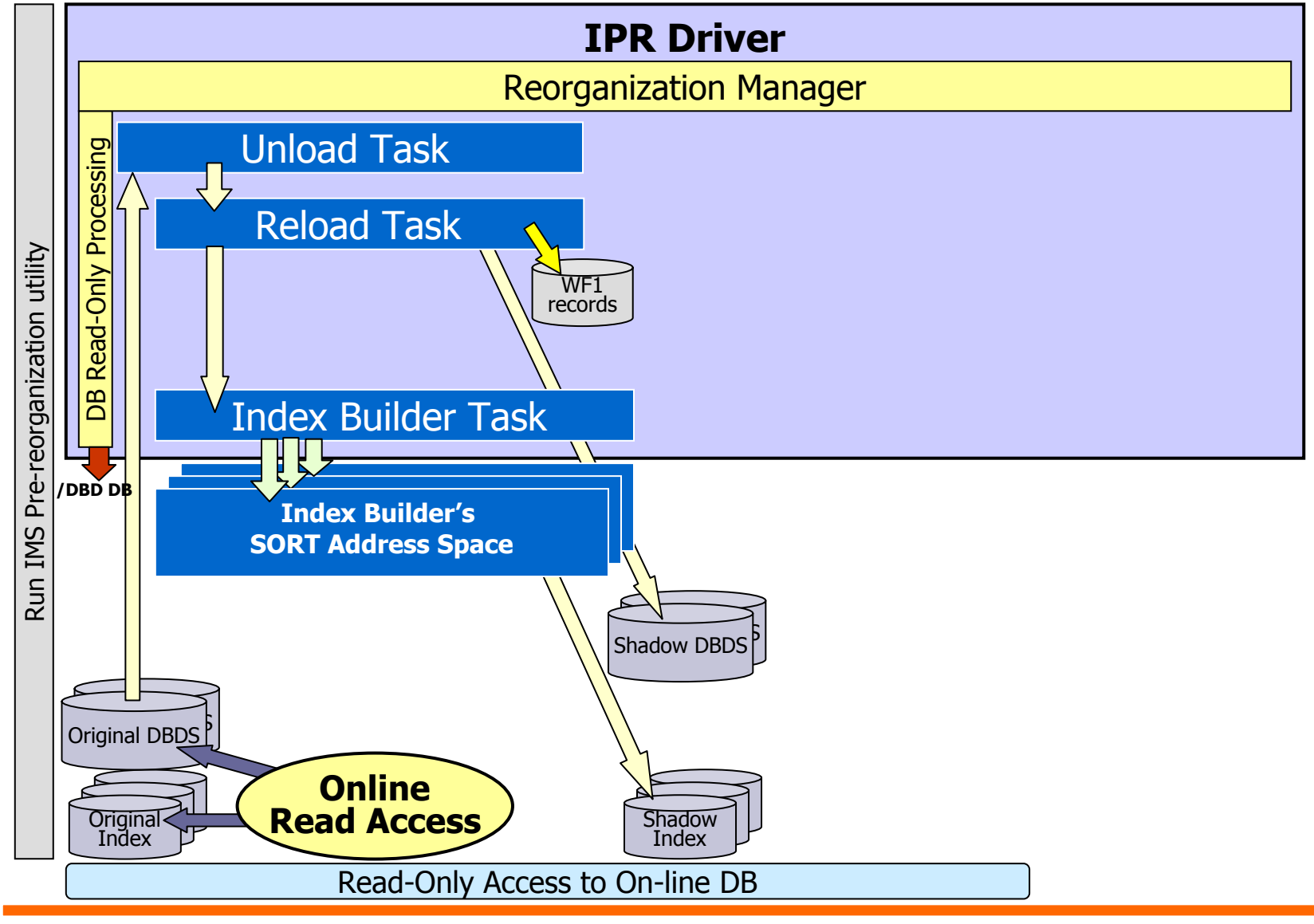
Concurrent Prefix Update and Type-B Image Copy – Process Flow



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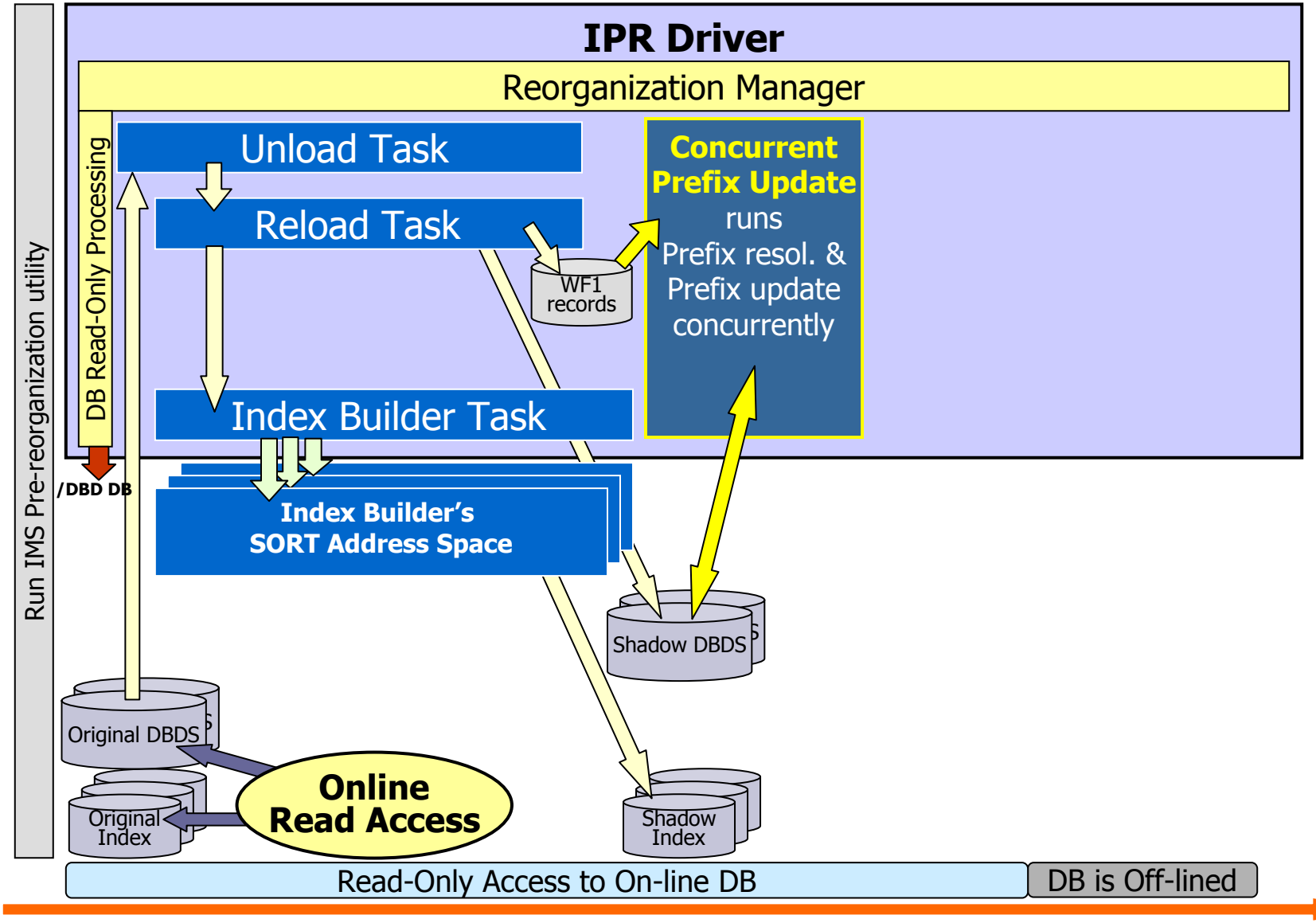
Concurrent Prefix Update and Type-B Image Copy – Process Flow



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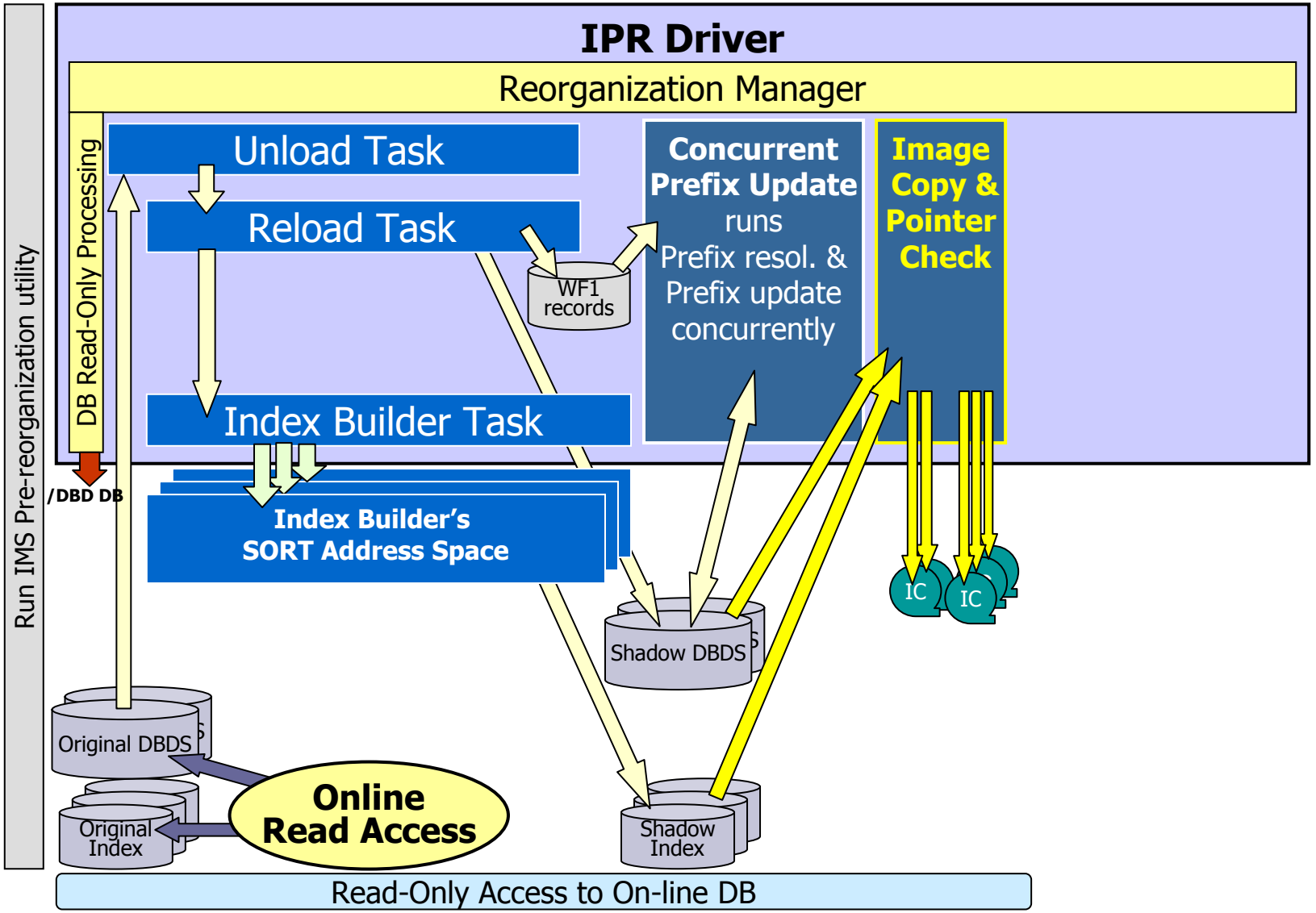
Concurrent Prefix Update and Type-B Image Copy



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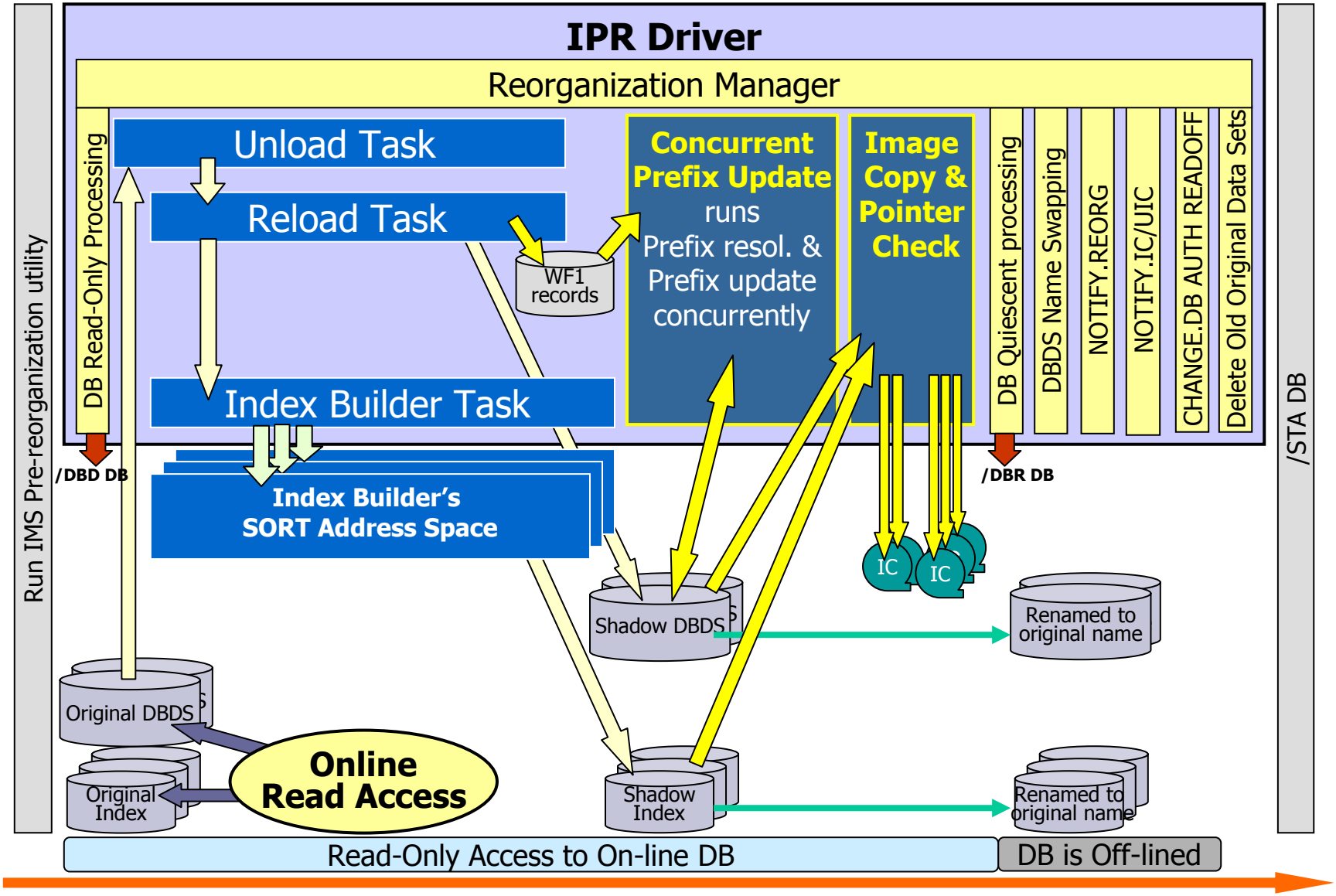
Concurrent Prefix Update and Type-B Image Copy



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The Future of IPR Driver

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The Future Direction

- More automation, less manual intervention
- More consolidation of administrative data
- More autonomic capabilities

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More automation, less manual intervention

- More automation, less manual intervention
  - Name Swap Enhancements
  - Automated /STA DB after reorg completion
  - Internal IDCAMS invocation
  - Other requirements under evaluation
- More consolidation of administrative data
- More autonomic capabilities

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Name Swap Enhancements

- Requirements
  - MR0425026140: Optional rename method
  - MR0823043817: Route IPR IDCAMS "name swapping" SYSOUT to separate dataset
  - MR0823042318: IPR control statement to impose shadow index datasets have '.*x*' suffix

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Optional rename method

- **Requirement**
  - The old input data sets should be renamed to the shadow names so that they can be reused
- **Solution**
  - Introducing a new control statement:

    DISPOLDDS=DELETE|NEWSHADOW|TEMPNAME

    - Default is DISPOLDS=TEMPNAME
    - Installation default option can be set for DISPOLDDS

  - DISPOLDDS specifies the disposition of the original data sets after a successful reorganization
  - DISPOLDDS=TEMPNAME is equal to DELOLDDS=NO
  - DISPOLDDS=DELETE is equal to DELOLDDS=YES

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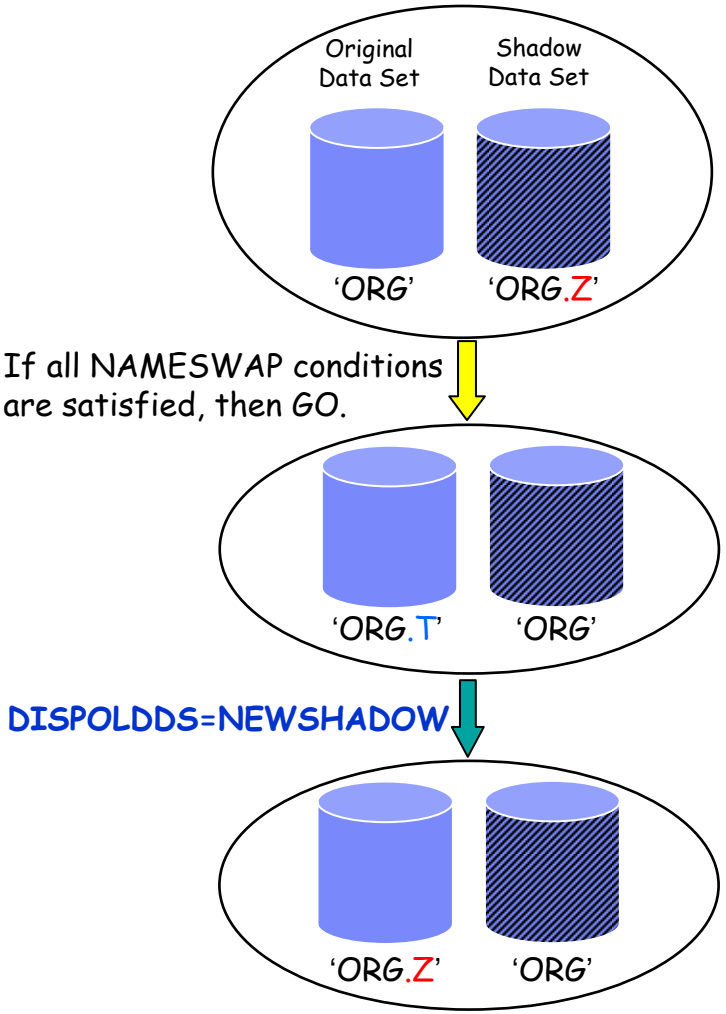
Optional Rename Method – DISPOLDDS=NEWSHADOW

- If DISPOLDDS=NEWSHADOW is specified, the old data sets are renamed to the shadow data set names
- If the database is VSAM and the REUSE attribute is specified, the old data sets that are renamed to the shadow names can be used as the new shadow data sets for the next run of IPR Driver



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Route "name swapping" SYSOUT to separate data set

- **Requirement**
  - Route a sequence of IDCAMS commands for "manual name swapping" to separate data set, not print it in the report SYSOUT
- **Solution**
  - Introducing a new DD statement:

    HPSGSWAP

    - Defines the optional output data set that will contain the IDCAMS command stream for data set name swapping.
  - The command stream is produced only when manual name swapping is necessary.
  - The data set is intended to be used as the SYSIN for IDCAMS
  - No command stream will be produced if the automated name swapping is performed

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Impose shadow indexes have suffix – Background

- Background of the requirement
  - IPR Driver cannot know the name of the original indexes and cannot produce the IDCAMS statements for renaming the shadow indexes to the original names if both of the following conditions are met:
    - DBRC is inactive
    - Shadow index data sets are specified in the JCL stream
      - that is, INDEXBLD=YES,NEW and DYNALLOC=(*xxx*,*xxx*,NO)

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Impose shadow indexes have suffix – Solution

- Solution
  - Introducing a new control statement

    SINDEXSUF=YES|<u>NO</u>
    - Default is SINDEXSUF=NO
    - Installation default option can be set for SINDEXSUF
  - SINDEXSUF specifies whether or not each shadow index name is assumed to be the original name plus a suffix
  - If SINDEXSUF=YES, the IDCAMS statements for renaming shadow indexes to those original names are produced even if the original names are not known from either RECON or dynamic allocation members

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Requirement: Automated /STA DB after reorg completion

- Requirement
  - MR0510041741: IPR should verify completion of DBR and STA, with retry capability

Note: IPR Driver already has the automated /DBR command processing with retry capability

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Automated /STA DB – Planned Solution

- Planned Solution
  - Using Tools Online System Interface (TOSI) for IMS command processing
  - Implementing both /DBR and /STA DB capabilities by using TOSI
  - Continuing to support /DBR and /DBD DB capabilities through E-MCS console

* TOSI is used to issue its action commands and IMS commands. TOSI is started during IMS initialization. TOSI allows clients to start and stop full function database resources and issue IMS commands that need to interact with online DB/DC IMS or CICS DBCTL systems that own the target databases.
* TOSI is used in QCF V2.

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Requirement: Internal IDCAMS Invocation

- MR0502015556
  - Eliminate need for IDCAMS step. Utility should be directed to DD statement which contains IDCAMS control cards (delete/define and allocate statements). Needs to be treated as an option based on control cards or a CC override to what is stated as being the default.

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Internal IDCAMS Invocation – Planned Solution

- Planned Solution
  - Checking the attributes and gathering statistics of the input database and secondary indexes
  - Allocating spaces for the shadow data sets automatically in the IPR Driver job step
  - If a specific DD statement is coded in the IPR Driver JCL stream, it is used as SYSIN for IDCAMS to allocate space for the shadow data sets

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Internal IDCAMS Invocation – Issues and Concerns

- Issues and Concerns
  - Volume selection in non-SMS environment
    - A solution: If enough space is left on the volumes where the original data sets are allocated, IPR allocates the space for shadows on the same volumes
  - Multi-volume OSAM data sets
    - How to select volumes for each of such data sets

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Other requirements under evaluation

- MR090104463: HP Load Capability to invoke Image Copy & Pointer Checker during Load
- MR1015043419: Interface to Program Restart Facility for BMP control

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Direction – consolidation & autonomic capabilities

- More automation, less manual intervention
  - Name Swap Enhancements
  - Automatic /STA DB after reorg completion
  - Internal IDCAMS invocation
  - Other requirements under evaluation
- More consolidation of administrative data
  - Attend the Bob's session tomorrow!
- More autonomic capabilities
  - Attend the Bob's session tomorrow!

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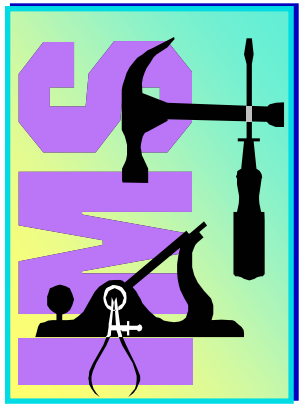
IMS Tools Product Portfolio

Database Administration

- IMS Library Integrity Utilities
- IMS HALDB Conversion and Maintenance Aid
- IBM Data Encryption for IMS and DB2 Databases
- IMS Sequential Randomizer Generator
- IMS HD Compression- Extended



Performance Management

- IMS Buffer Pool Analyzer
- IMS Performance Analyzer
- IMS Problem Investigator
- Tivoli OMEGAMON XE for IMS for z/OS
- IMS Network Compression Facility

Application Management

- IMS Connect
- **IMS Connect Extension**
- IMS MFS Reversal Utilities
- IMS Batch Terminal Simulator
- IMS Batch Backout Manager
- IMS Program Restart Facility

Recovery Management

- IMS DEDB Fast Recovery
- IMS HP Image Copy
- IMS HP Change Accumulation
- IBM Application Recovery Tool for IMS and DB2 Databases
- IMS Database Recovery Facility

Utilities Management

- **Full Function Databases**
  - IMS HP Unload
  - IMS HP Load
  - IMS Index Builder
  - IMS HP Prefix Resolution
  - IMS Parallel Reorg
  - IMS HP Pointer Checker
- **Fast Path Databases**
  - IMS HP Fast Path Utilities
- **Administration**
  - IMS Database Repair Facility
  - IMS Database Control Suite

TM/Online System Management

- IMS ETO Support
- IMS Queue Control Facility
- **IMS Parameter manager**
- IMS HP Sysgen Tool
- IMS Command Control Facility
- IMS Workload Router (MLC)

Information Integration

- IMS DataPropagator
- DB2 II Classic Federation for zOS
- DB2 II Event Publisher for IMS

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Links

All IBM Data Management Tools:

http://www.ibm.com/software/data/db2imstools/

Redbooks :

http://www.redbooks.ibm.com/pubs/pdfs/redbooks/

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Summary

- New functions of IBM's IMS Parallel Reorg V3
  - IMS Parallel Reorganization V3 Objectives
  - IPR Driver V3 – How does it wok?
  - The Future of IPR Driver
- IMS Tools Portfolio
- Links

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