E68

IMS Library Integrity Utilities

Toshi Takahashi

Software Development Laboratory – Yamato(YSL)

Las Vegas, NV **September 15 – September 18, 2003**

RETURN TO INDEX

Agenda

- Overview
- Introduction to each utility
  - Integrity Checker
  - Consistency Checker
  - DBD/PSB/ACB Compare
  - DBD/PSB/ACB Mapper
  - DBD/PSB/ACB Reversal
  - Advanced ACB Generator
- Summary

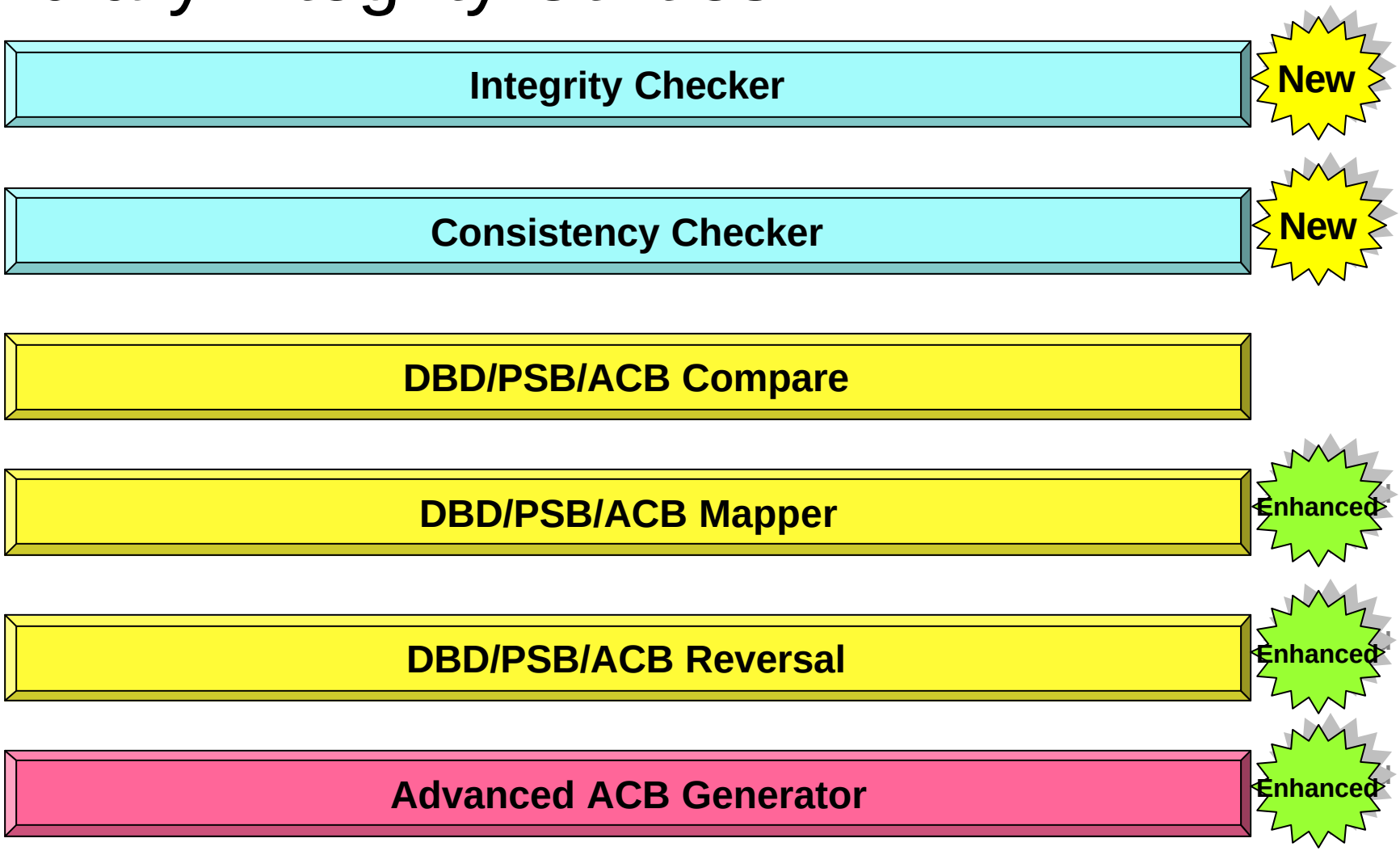
Overview

- IBM IMS Library Integrity Utilities for z/OS Release 1 (5655-I42)
  - General Availability: May 2003
  - User's Guide: SC18-7025-00
  - Follow-on of
    - IMS Library Management Utilities (5655-E04)
    - IMS Advanced ACB Generator (5655-E05)

Overview …

- Supporting IMS
  - IMS Version 6
  - IMS Version 7
  - IMS Version 8
- Prerequisite Operating System
  - OS/390 Version 2 Release 10
  - z/OS Version 1 Release 1 or higher

Library Integrity Utilities



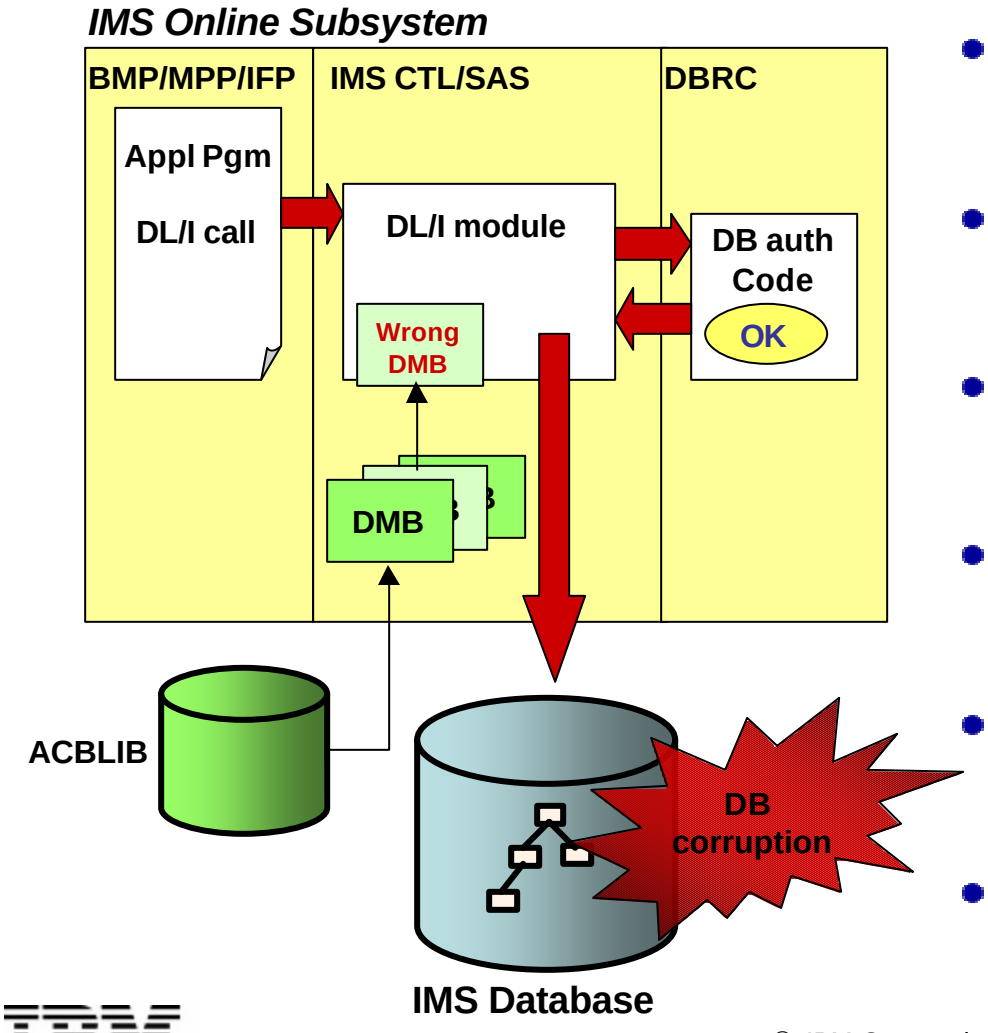
Integrity Checker

New

Key Function

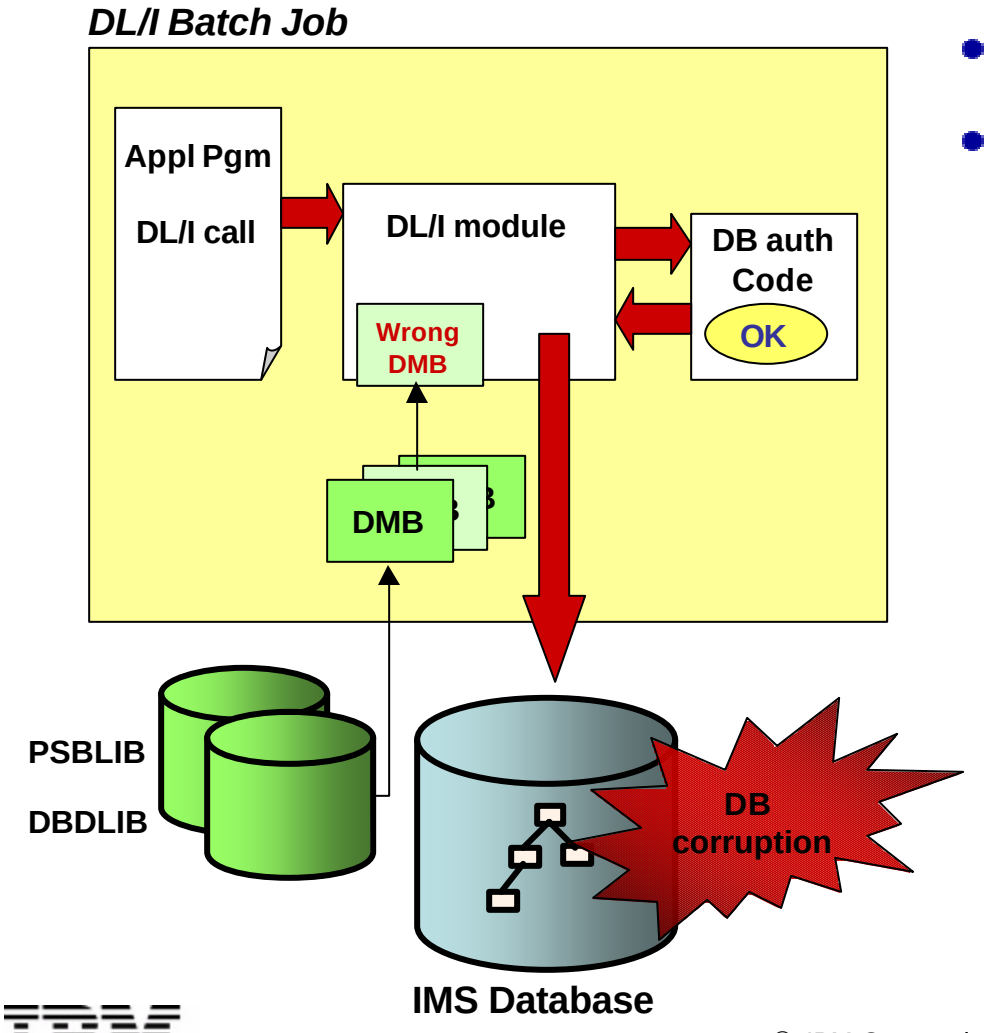
- Preventing DB corruption caused by using a wrong DBD
  - Examples:
    - Using test DBD to update production databases
    - Using old DBD after DBD change applied

DB Corruption scenario - online



- Online Application Program issues DL/I call
- DL/I module uses a wrong DMB
- DL/I module calls DBRC for DB authorization
- DBRC returns authorization OK
- DL/I module has access to DB
- DB corruption

DB Corruption scenario - batch

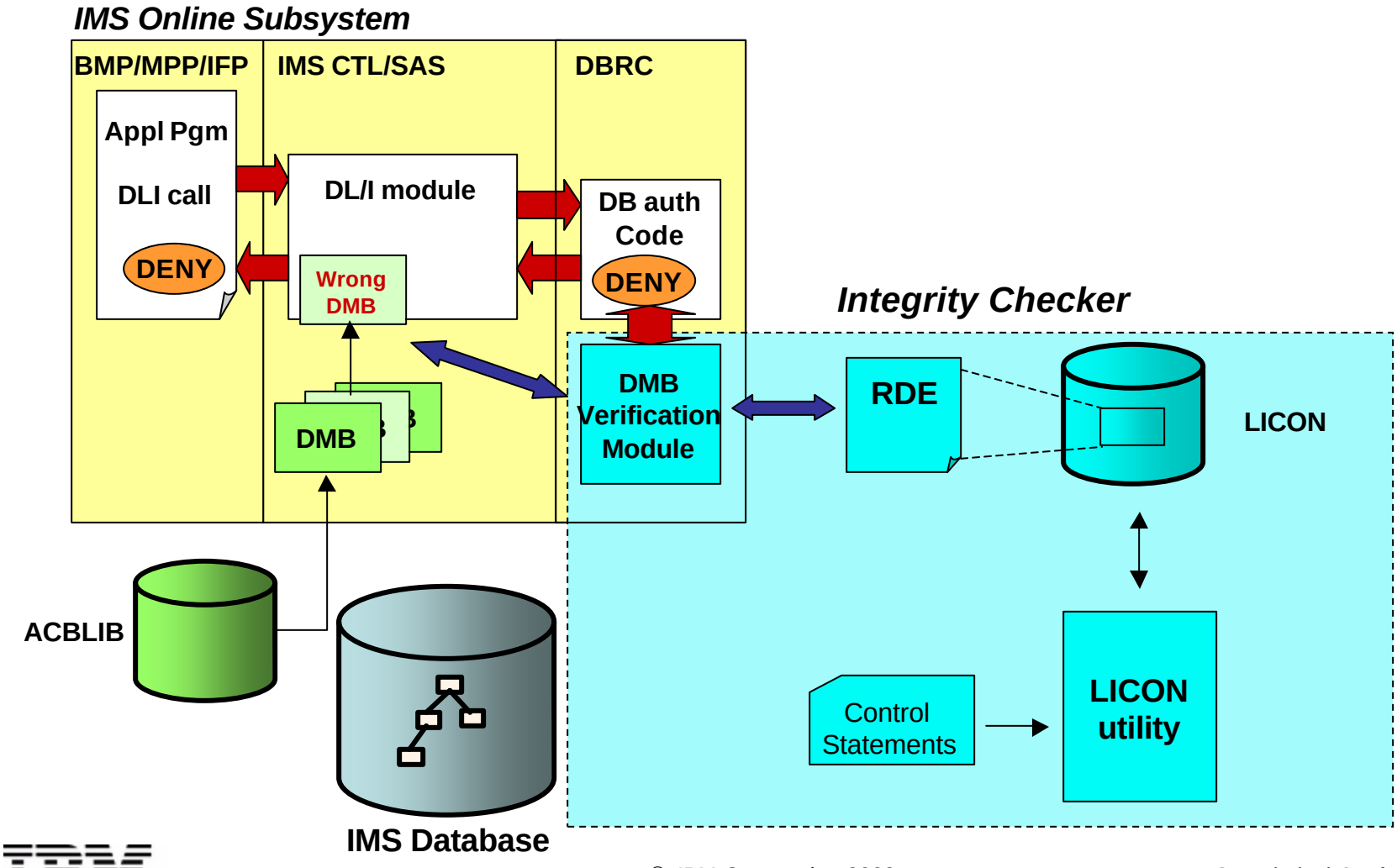


- Same scenario applied
- DL/I module and DBRC DB auth code running in the same batch region

Preventing DB corruption

- Given control from DB authorization process
  - Both online and batch supported
- Checks if DBD to be used is correct
  - Registered DMB Entry (RDE)
  - Library Integrity Control (LICON) data set
- Denies authorization when wrong DBD used
  - *DFS047A - UNABLE TO OBTAIN AUTH. RSN=$$*
  - DATABASE stopped by IMS

Integrity Checker scenario



LICON

- Library Integrity Control data set
- Repository of RDEs
- Single KSDS
  - Need backup and recovery procedure included in your IMS operation procedures
- Dynamically allocated
  - Data Set Name provided by Global Option Module
- Can be shared
  - GRS required if you want to share the LICON from more than one MVS system

RDE

- Registered DMB Entry
- Single KSDS record
- Contains:
  - DMB information to be verified
  - Verification options
  - History data of RDE
- One “current” RDE for each DBD
  - Expired RDEs kept for backup purpose

RDE

- **Information of DMB that IMS used to load the database:**

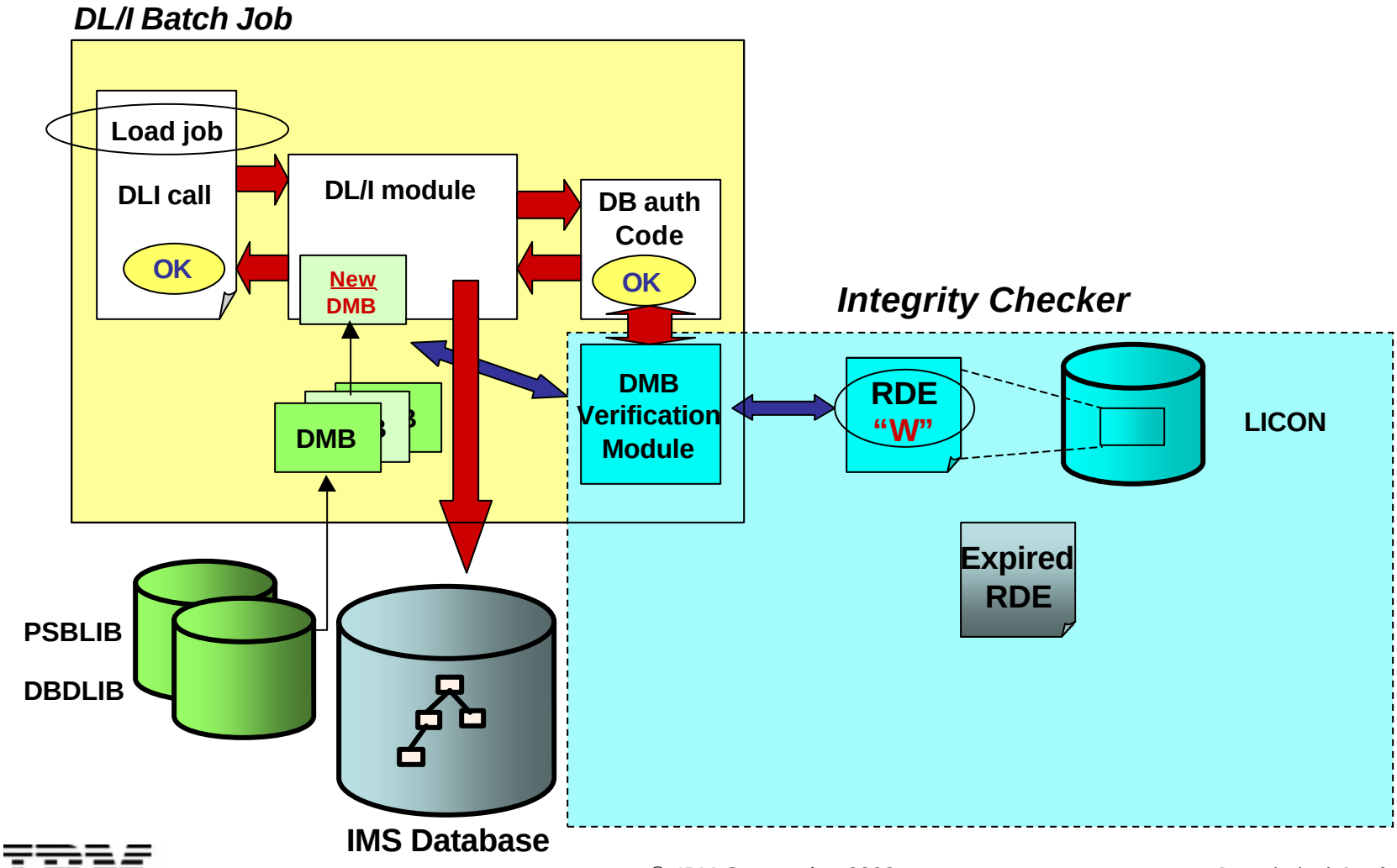
  - Database Info
  - DSG Info
  - Segment Info
  - …

- **Verification options that Integrity Checker uses to verify DMB**
- **History data on the creation and modification of each RDE**

Verification Options

- Four different IMS processing environments:
  - IMS online subsystems
  - IMS batch application jobs
  - IMS database load jobs (PROCOPT=L)
  - IMS database image copy jobs
- For each of above four environments, you can specify:
  - Whether DMB verified or not
    - *Y* or *N*
  - Action taken after a mismatch found
    - *D* (deny authorization) or *W* (issue warning)

Option “Warning”



Who creates initial RDE?

- LICON utility with *INIT.DB* command
  - Batch utility to maintain the LICON data set
- DMB verification routine
  - If no “current” RDE exists, DMB verification routine creates one
    - Online overhead

```
//LIU     JOB
//LIU    EXEC PGM=FABLIU00
//STEPLIB  DD DSN=LIU.SHPSLMD0
//         DD DSN=IMS.SDFSRESL
//DBDLIB   DD DSN=IMS.DBDLIB
//FABLPRNT DD SYSOUT=*
//FABLIN   DD *
  INIT.DB DBD(*) -
    CHECKON(Y,D) -
    CHECKBAT(Y,D) -
    CHECKLD(Y,W) -
    CHECKIC(Y,W)
/*
```

DBD change

- DMB verification routine creates new RDE for changed DBD for the following jobs:
  - Jobs for which option “Warning” in effect
  - Reload utility jobs
    - IMS HD Reorganization Reload
    - IMS HISAM Reorganization Reload
    - IMS High Performance Load

LICON utility

- Batch utility to maintain LICON data set
- Command based process
  - *INIT.LICON* initializes LICON data set
  - *INIT.DB* creates RDE for DBD (DBDLIB/ACBLIB)
  - *CHANGE.DB* changes RDE options
  - *DELETE.DB* deletes RDE
  - *EXPIRE.DB* makes RDE expire
  - *LIST.DB* lists RDE contents
  - *RECOVER.DB* recovers RDE from expired one
  - *VERIFY.DB* verifies DBD (DBDLIB/ACBLIB)

Activating Integrity Checker

- Create Global Option Module
- Define cluster for LICON data set
- Initialize LICON with *INIT.LICON* command
- Create RDEs with *INIT.DB* command
- Concatenate LIU library to the STEPLIB DD and add FABLPRNT DD
  - DBRC startup procedure and DLIBATCH procedure
- Restart IMS

Global Option Module

- Contains the data set name of LICON
  - For dynamic allocation
- Contains default options used for RDE creation
- No sample module supplied by IBM
  - You need to create one
    - *LIU@INST* – installation level
    - *LIU@imsi* – IMS subsystem level

```
//LIU     JOB
//LIU  EXEC FABLPGEN,MBR=LIU@INST
//C.SYSLIB DD DSN=LIU.SHPSMAC0
//C.SYSIN  DD *
LIU@INST FABLPGIN VERIFY=SNGL,  X
          MSGROUT=(2,7,11),     X
          MSGDESC=(7),          X
          CHECKON=(Y,D),        X
          CHECKBAT=(Y,D),       X
          CHECKLD=(Y,D),        X
          CHECKIC=(Y,D),        X
          GENMAX=5,             X
          LICON=LIU.FABLICON
    END
/*
```

Restrictions

- DBRC required
  - Database does not have to be registered to RECON
- Does not support the following DB organization
  - MSDB
  - GSAM
  - HALDB

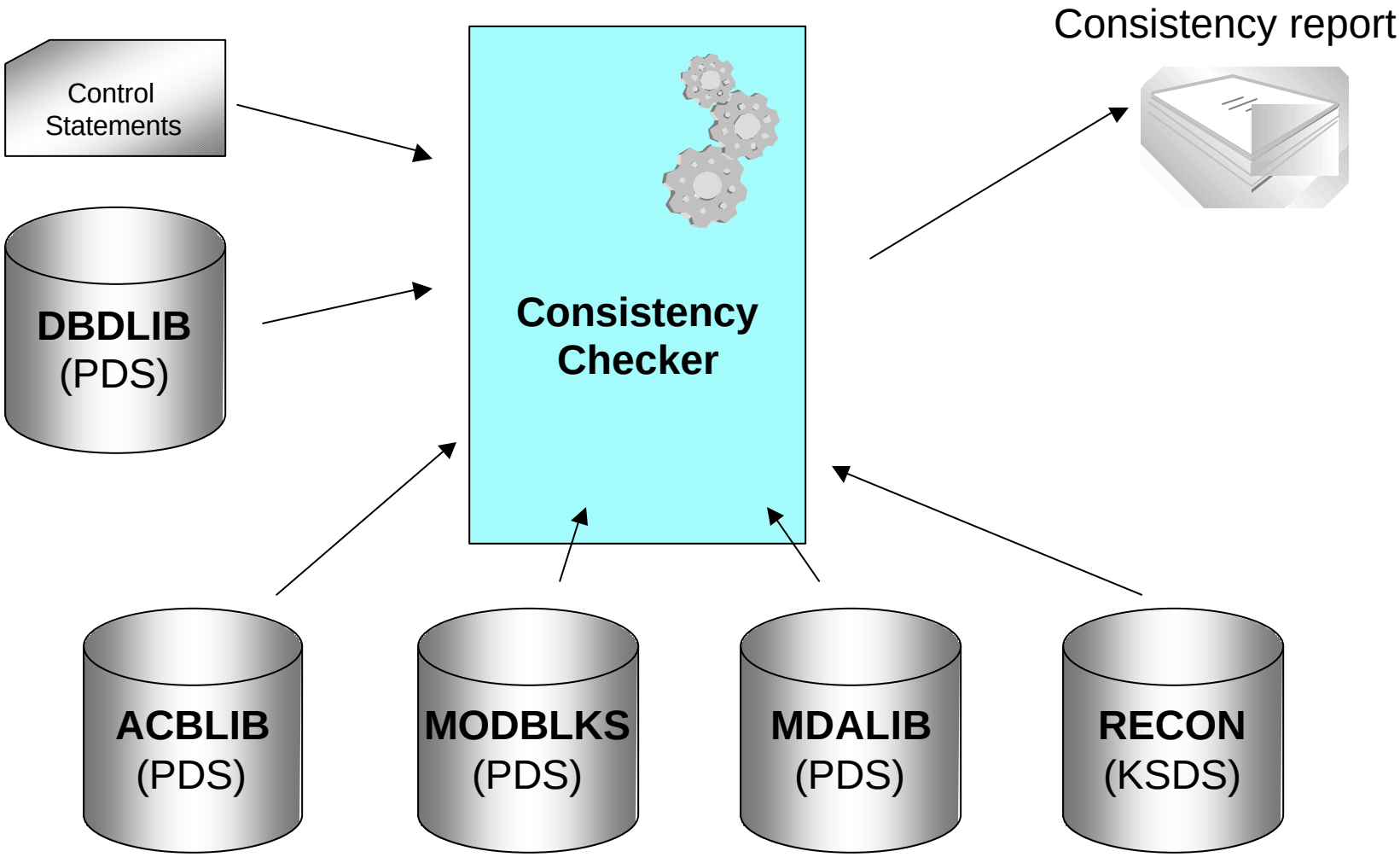
Consistency Checker

New

Key Function

- Ensuring necessary definition in IMS has been created for your database.
  - ACB in ACB library
  - Database Definition entry in MODBLKS module (DFSDDIRx)
  - DFSMDA dynamic allocation member for database data sets in MDA library
  - DB and DSG registration in RECON
- Batch utility

Data Flow



Verified elements

	ACBLIB	MODBLKS	DFSMDA	RECON
(S)HSAM (S)HISAM HDAM HIDAM INDEX	Y	Y	Y	Y
PHDAM PHIDAM PSINDEX	Y	Y	NO	Y
GSAM	NO	Y	Y	NO
LOGICAL	NO	Y	NO	NO
MSDB	Y	Y	NO	NO
DEDB	Y	Y	NO	Y

Verification for each element

- ACB member
  - Contents must be consistent with DBD's
    - Gendate, DB organization, Access method, Number of segments, Randomizer parameters, …
- DFSDDIRx in MODBLKS
  - DBD name must be defined in it

Verification for each element …

- DFSMDA member
  - DD names must be consistent with DBD's
  - DD names and data set names must be consistent with RECON's
- RECON registration
  - DD names must be consistent with DBD's
  - DD names and data set names must be consistent with the DFSMDA member's

Whether checked or not

- If corresponding DD specified, then checked
  - **//ACBLIB DD**
  - **//MODBLKS DD**
  - **//DFSMDA DD**
- CHKRECON=YES needed for RECON
  - Allowing dynamic allocation for RECONs

Consistency Checking

- Different from DBD Compare
  - Does not thoroughly compare the contents
  - Verify if required elements exist and consistent
- Useful for IMS migration and installation
  - Ensure every required definition migrated
- Invoked for specified DBD names
  - Wildcard character (*,%) can be used
  - DBD library used for wildcard matching

Consistency Report (1)

```
IMS LIBRARY INTEGRITY UTILITIES - CONSISTENCY CHECKER                "MESSAGES"
5655-I42                                                  DATE: 07/29/2003  TIME: 15.38.51

FABL2006I ACBLIB   DATA SET IS SPECIFIED
FABL2006I MODBLKS  DATA SET IS SPECIFIED
FABL2006I DFSMDA   DATA SET IS NOT SPECIFIED
FABL2010I CONTROL CARD SUPPLIED IS: *
FABL2010I CONTROL CARD SUPPLIED IS:    DDIRSFX=N
FABL2010I CONTROL CARD SUPPLIED IS:    FAILONLY=NO
FABL2010I CONTROL CARD SUPPLIED IS:    FAILRC=20
FABL2010I CONTROL CARD SUPPLIED IS:    CHKRECON=YES
FABL2010I CONTROL CARD SUPPLIED IS:    DBD=DBDATA*
FABL2007I PARAMETER USED IS: DDIRSFX=N
FABL2007I PARAMETER USED IS: FAILONLY=NO
FABL2007I PARAMETER USED IS: FAILRC=20
FABL2007I PARAMETER USED IS: CHKRECON=YES
FABL2001I DBD TO BE PROCESSED IS DBDATA0
FABL2003E CONSISTENCY CHECK FAILED FOR DBDATA0
FABL2001I DBD TO BE PROCESSED IS DBDATA9
FABL2003E CONSISTENCY CHECK FAILED FOR DBDATA9
```

Consistency Report (2)

```
IMS LIBRARY INTEGRITY UTILITIES - CONSISTENCY CHECKER              "DBD CHECK REPORT"
5655-I42                                                  DATE: 07/29/2003  TIME: 15.38.51

LIBRARY INFORMATION
-------------------

  IMS       : 7.1
  RECON     : 7.1
  DFSRESLB  : VOLUME=IMSLB4  DSNAME=IMS71A.SDFSRESL
  DBDLIB    : VOLUME=DBT001  DSNAME=DBT001.DBDLIB
  ACBLIB    : VOLUME=DBT001  DSNAME=DBT001.ACBLIB
  MODBLKS   : VOLUME=IMSLB4  DSNAME=IMS71A.MODBLKS                  SUFFIX = N
  RECON1    :                DSNAME=DBT001.RECON1
  RECON2    :                DSNAME=DBT001.RECON2
  RECON3    :                DSNAME=DBT001.RECON3
```

Consistency Report (3)

```
IMS LIBRARY INTEGRITY UTILITIES - CONSISTENCY CHECKER              "DBD CHECK REPORT"
5655-I42                                                  DATE: 07/29/2003  TIME: 15.38.51

DBD NAME  : DBDATA0

DB INFORMATION
--------------

  LIBRARY   CHK  ITEM/FIELD    CONTENTS                  DBDLIB
  --------  ---  -----------  ------------------------  ------------------------
  ACBLIB          ACB MBR      FOUND
                   IMSREL      710                       710
             ***   GENDATE     12/27/2002 17:53          07/29/2003 15:15
                   ACCESS      HDAM,OSAM                 HDAM,OSAM
             ***   SEGS               2                         3
                   RMNAME      DFSHDC40                  DFSHDC40
             ***   ANCH               2                         1
             ***   RBN               10                        20
             ***   BYTES            400                       100
  MODBLKS         DB DEF       FOUND
                   ACCSLVL     EXCLUSIVE
  RECON           DB RECORD    FOUND
                   SHRLVL      3
                   TYPE        IMS
                   DBORG/DSORG HDAM,OSAM
```

Consistency Report (4)

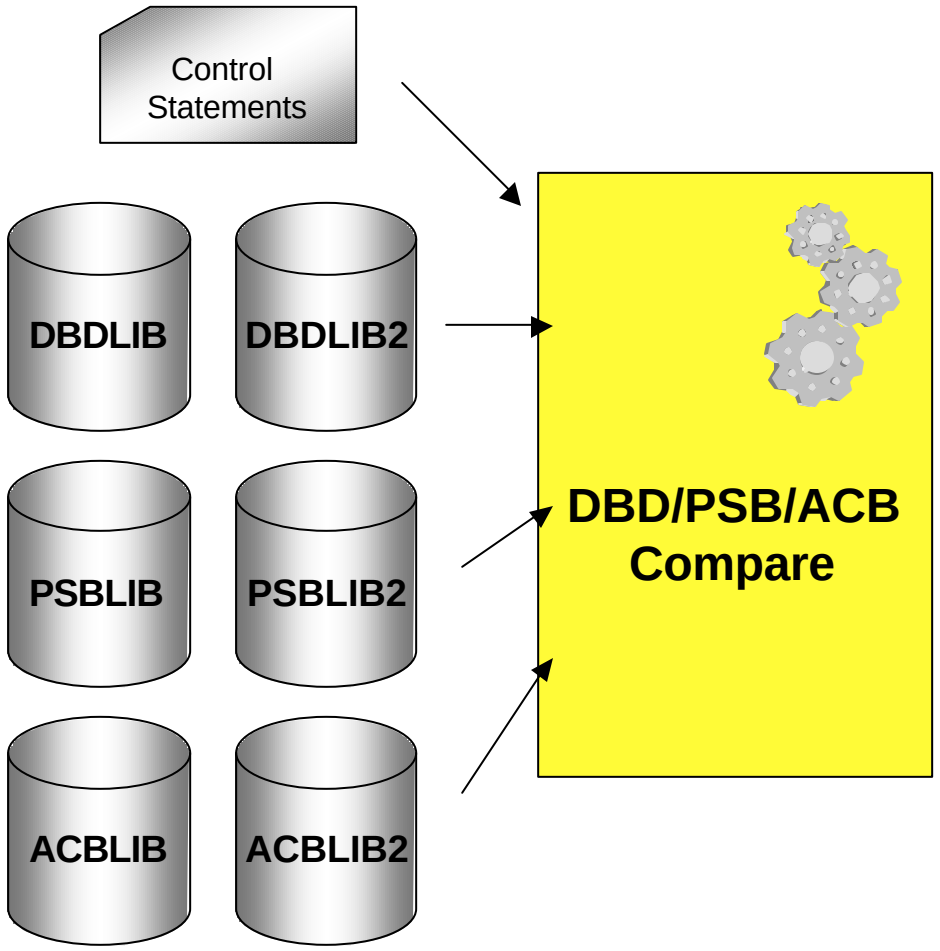
```
IMS LIBRARY INTEGRITY UTILITIES - CONSISTENCY CHECKER              "DBD CHECK REPORT"
5655-I42                                                  DATE: 07/29/2003  TIME: 15.38.51

DSG INFORMATION
---------------

                  D  ----- DBDLIB ------    ----- ACBLIB ------   M  ------------------- DFSMDA / RECON --------

     DSG #  CHK  D  DD1/DD2     BLKSIZE    DD1/DD2     BLKSIZE    R  DD1/DD2    DISP   DSNAME
  --------  ---  -  --------   --------   --------   --------   -  --------   ----   ------------------------
         1  ***  1  DBDATA0        4096   DBDATA01*       4096   R  DBDATA0          DBT.DBDATA0
         2  ***  1  DBDATA1        4096   DBDATA02*       1024*  R  DBDATA1          DBT.DBDATA1

LEGEND
------
  MR       - THIS FIELD INDICATES 'DFSMDA / RECON' DATA ARE:
               B:  RETRIEVED FROM BOTH DFSMDA AND RECON
               M:  RETRIEVED FROM DFSMDA
               R:  RETRIEVED FROM RECON
```

DBD/PSB/ACB Compare

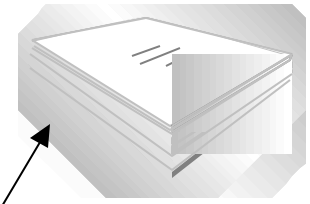
Key Function

- Reporting the difference between DBD/PSB/ACB members that have the same name but reside in separate object libraries
  - Difference listed with description of the field
- Batch utility

Data Flow



DBD/PSB/ACB Compare report



```
DBD/PSB/ACB COMPARE REPORT

DBDLIB  DSN=xxx
DBDLIB2 DSN=xxx

DIFFERENCE
LIBRARY1  LIBRARY2  SECTION
YES       NO        VSAM
NO        YES       OSAM
200       180       SEGM LEN
```

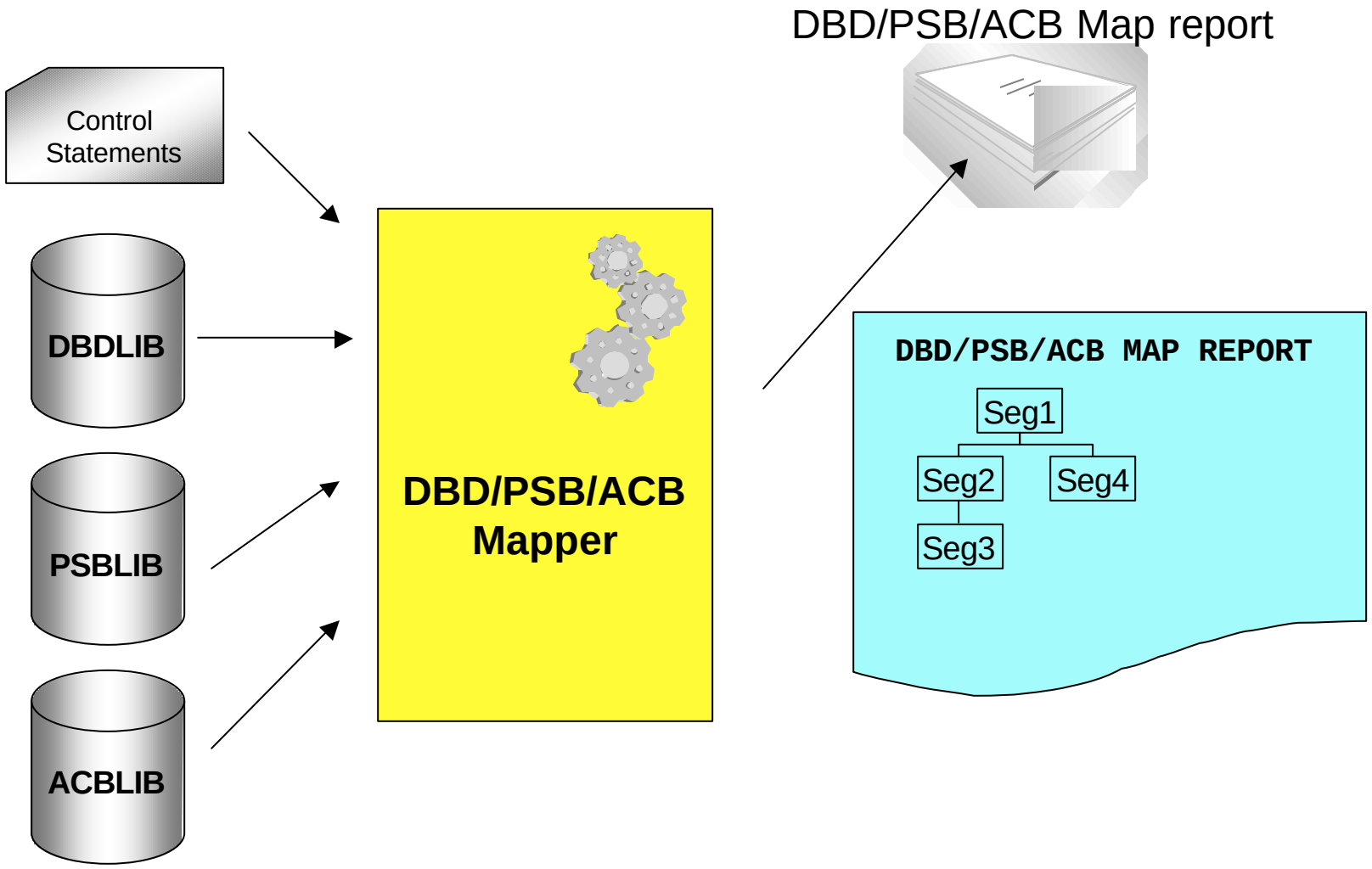
DBD/PSB/ACB Mapper

Key Function

- Producing printed map (picture of segment hierarchy) from DBDs, PSBs, and ACBs.
- Batch utility
- Enhancements included:

  - DBD-type ACB (DMB) mapping
  - Providing MAPDBD function of other IBM IMS utilities:
    - IMS High Performance Pointer Checker (HPPC) Version 2

Data Flow


DBD/PSB/ACB Map report
Control Statements
DBDLIB
PSBLIB
ACBLIB
DBD/PSB/ACB Mapper
DBD/PSB/ACB MAP REPORT
Seg1
Seg2
Seg4
Seg3

DBD-type ACB (DMB) Mapping

- You can specify DBD-type ACB (DMB) name directly to the new *ACBDBD=* control statements
  - Example:

```
//MAPPER  JOB
//STEP1  EXEC PGM=FABMMAIN
//STEPLIB  DD DISP=SHR,DSN=LIU.SHPSLMD0
//ACBLIB   DD DISP=SHR,DSN=TEST.ACBLIB
//SYSPRINT DD SYSOUT=*
//SYSOUT   DD SYSOUT=*
//SYSIN    DD *
  ACBDBD=DEDBJN23  <- DBD-TYPE ACB
/*
```

MAPDBD Function

- To use MAPDBD function in HPPC V2,
  - Concatenate LIU library to STEPLIB DD of HPPC V2 JCL
  - Add *MAPDBD=YES* parameter to the REPORT control statement in the PROCCTL DD.

```
//PROCCTL DD *
  PROC TYPE=ALL
  DATABASE DB=HDAMDB,DD= …
  REPORT MAPDBD=YES, ...
/*
```

➡ DBD Map Report will be generated

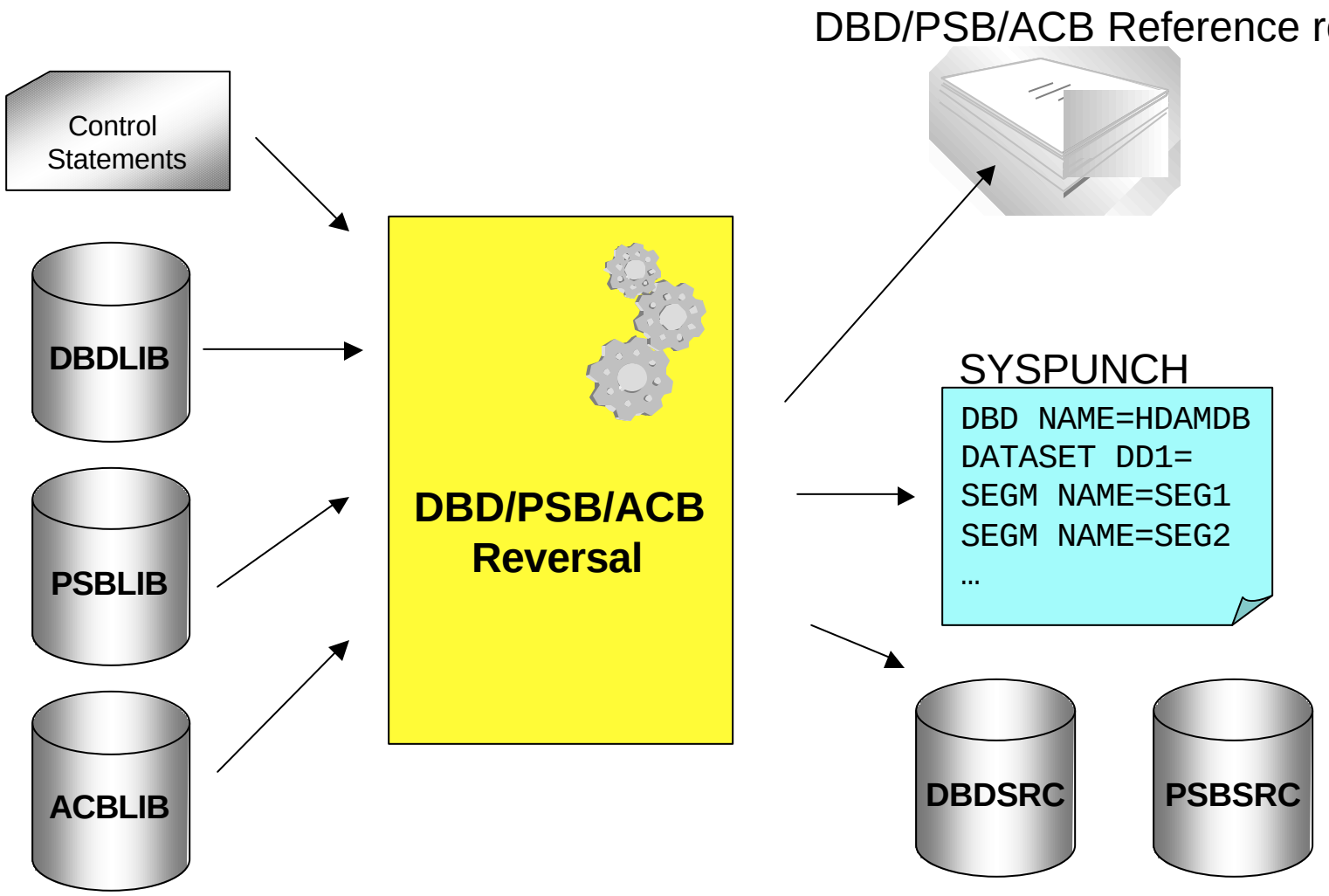
DBD/PSB/ACB Reversal

Key Function

- Converting DBD/PSB/ACB member back into IMS DBDGEN/PSBGEN utility control statements
- Batch utility
- Enhancements included: 

  - DBD-type ACB (DMB) reversal
  - Providing DECODEDBD function of other IBM IMS utilities:
    - IMS Parallel Reorganization (IPR) Version 2
    - IMS High Performance Pointer Checker (HPPC) Version 2

Data Flow



DBD-type ACB (DMB) Reversal

- You can specify DBD-type ACB (DMB) name directly to the new *DECODE ACBDBD* control statements
  - Example:

```
//REVERSAL JOB
//STEP1  EXEC PGM=FABNRVRS
//STEPLIB  DD DISP=SHR,DSN=LIU.SHPSLMD0
//ACBLIB   DD DISP=SHR,DSN=TEST.ACBLIB
//SYSPRINT DD SYSOUT=*
//SYSOUT   DD SYSOUT=*
//SYSIN    DD *
  DECODE ACBDBD INCLUDE=DEDBJN23  <- DBD-TYPE ACB
/*
```

DECODEDBD function

- To use DECODEDBD function of IPR V2,
  - Concatenate LIU library to STEPLIB DD of IPR V2 JCL (IPR Driver, IPR Unload, IPR Reload JCL)
  - Add *DECODEDBD=YES* control statement to the HPSIN input stream:

```
//HPSIN DD *
  OUTPUT=SYSUT2,*HD
  DECODEDBD=YES
/*
```

➡ Decoded DBD Report will be generated

DECODEDBD function …

- To use DECODEDBD function of HPPC V2,
  - Concatenate LIU library to STEPLIB DD of HPPC V2 JCL
  - Add *DECODEDBD=YES* parameter to the REPORT control statement in the PROCCTL DD.

```
//PROCCTL DD *
  PROC TYPE=ALL
  DATABASE DB=HDAMDB,DD= …
  REPORT DECODEDBD=YES, ...
/*
```

➡ Decoded DBD Report will be generated

Advanced ACB Generator

Key Functions

- Providing High-speed generation process for processing large volumes of IMS ACBs
- Functional Replacement for the IMS ACBGEN utility
- Batch utility
- Enhancement included:

  - Suppressing automatic PSB rebuild when replacing DBDs with changes that do not affect PSBs
    - Same with IMS V7 ACBGEN enhancement

Summary

- Two new utilities help you mange your IMS databases
  - Integrity Checker
  - Consistency Checker
- Many enhancements provide you with further ease-of-use
  - DBD-type ACB (DMB) mapping and reversal
  - MAPDBD= / DECODEDBD= functions
  - Suppress automatic rebuild of PSBs

End of Presentation