IMS 14 Database Enhancements

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Database Enhancements

- Database Enhancements
- DBRC Enhancements
- IMS Management of ACBs

OSAM HALDB 8G Support with No OLR

- **Challenge Addressed**
  - When moving to OSAM HALDB, the database size must be reduced from 8G to 4G

Target Market:

All OSAM HALDB users who want to have the 8 GB OSAM data set capacity for their HALDB partitions

- **Solution**
  - Allow 8GB OSAM support for HALDBs
    - Online reorganization support would still limit OSAM database to 4G
      - OSAM HALDB that is 8GB capable cannot use the HALDB online reorganization process
    - Option at the database level
      - Some HALDBs can be defined 8GB, others can be 4GB & use OLR
  - DBRC commands enhanced to set 8G option for OSAM HALDB master databases

- Provides increased scalability for OSAM HALDB databases

Automatic SDEP Buffer Management

Target Market:

All IMS Fast Path SDEP users

- **Challenge Addressed**
  - Shared SDEP CIs not being deleted due to one low activity IMS system
  - Undeleted SDEP may cause DEDB Area to fill and cause a database outage

- **Solution**
  - IMS 14 allows SDEP CIs to be automatically cleaned up on a regular basis
    - User Defined Frequency
    - User Defined Interval
  - Reduce the physical delete lag from logical delete

- Automates existing manual processes associated with SDEP processing
- Reduces potential DEDB Area outages associated with SDEP usage

FP DEDB Alter Enhancements

Target Market:

IMS Fast Path users requiring 24x7 availability of DEDB Areas

- **Challenge Addressed**
  - Need to change the DEDB Area definition SIZE, UOW, and/or ROOT parameters to increase the size of an Area when SDEPs are defined
  - Need to add an Area to a DEDB without bringing the DB offline
  - Need to support XRF and FDBR environments when ACBSHR=N

- **Solution**
  - Enhance the existing IMS 13 DEDB Alter capabilities
    - Allow alter when SDEPs are defined
    - Allow the addition of one or more Areas to the end of a DEDB
    - Segment Edit/Compression exit can be added
      - Assumes the user has an exit that can handle the mix of compressed and non-compressed segments
      - IMS does not provide an exit that supports a mix of compressed and non-compressed segments
    - Allow alter when using XRF/FDBR with ACBSHR=N

  - Improves data availability by allowing selected DEDB changes without taking the database offline

FDBR Resolve In-Doubt Notification Exit – DFSFIDN0

- **Challenge Addressed**
  - It can be difficult to code the DFSFIDN0 exit to properly resolve in-doubt work when DB2 is involved in the unit of work

Target Market:

All FDBR customers that use the ESAF interface (e.g., DB2) and wish to identify in-doubt UORs after an abend

- **Solution**
  - New sample DFSFIDN0 user exist that issues a new message for each in-doubt ESS UOR
    - DFS3722I identifies in-doubt work by: Subsystem Name, Subsystem Type, Resolve-in-doubt Action, and Origin Application Schedule Number (OASN)
    - Automation can monitor the messages and act upon the in-doubt UOR
  - Improves usability when using both FDBR and DB2 z/OS
  - Can reduce the time DB2 holds locks during an IMS abend

Database Enhancements

- **FP 64-Bit Buffers for High Speed Utilities**
  - UOWs which have large numbers or segments in IOVF cannot be processed due to a lack of available 31-bit ECSA
  - New keywords on utility SYSIN DD controls storage allocation location
    - FPUBUF64 or FPUBUF31
- **Open Database Manager (ODBM) Accounting**
  - Provide optional SMF records that can be used for application charge back
  - Enabled through new parameter in CSLDIxxx
    - LOGOPT=(ACCOUNTING)
  - SMF type 29, subtype 01 records
- **OSAM DEB information moved to 31 bit private storage**
  - Increase the number of OSAM datasets open at a time
  - Provide 24-bit virtual storage relief

Database Enhancements

- **DBRC Enhancements**
  - New REPAIR.RECON command can be used to verify and fix inconsistencies in the RECON data set related to DMB numbers
  - DBRC migration and coexistence with IMS 12 and IMS 13

IMS Dynamic Database

Target Market:

All IMS DB customers

- **Challenge Addressed**
  - Database schemas are static and changes require system definition and generation
- **Solution**
  - Allow optional IMS management of ACBs
    - IMS Catalog is the trusted source of database and program definitions
    - ACB, DBD & PSB libraries no longer used or needed by IMS
    - IMS system can use either Catalog or ACBLIB for all definitions
  - Allow optional use of Data Definition Language (DDL) to affect database and schema changes
  - Provide an audit trail to capture information about IMS Catalog updates
- **Business Value**
  - Removes the external need for PSBGEN, DBDGEN, and ACBGEN
  - Support the use of industry standard DDL for database and schema change
    - Use DDL-authoring tools prevalent in the market

IMS Management of ACBs

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All IMS DB customers

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  - Database schemas are static and changes require system definition and generation

- **Solution**
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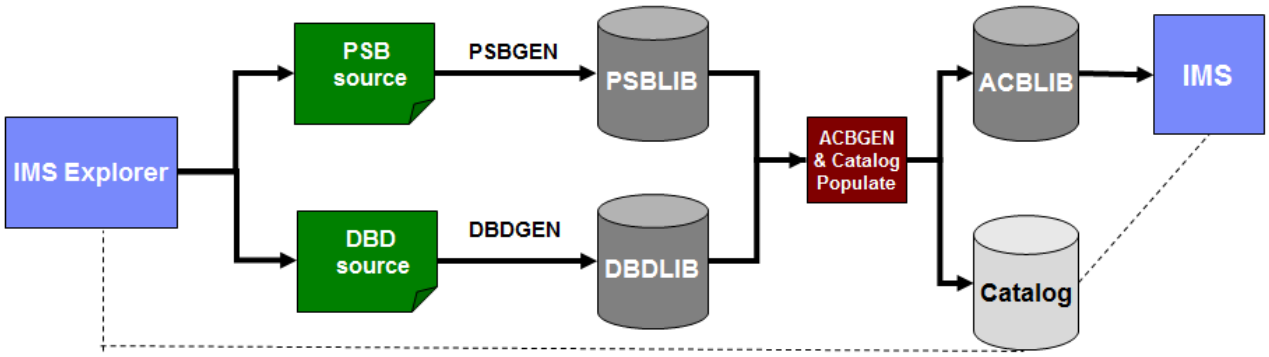
    - IMS Catalog is the trusted source of database and program definitions
    - ACB, DBD & PSB libraries no longer used or needed by IMS
    - IMS system can use either Catalog or ACBLIB for all definitions

- **Business Value**
  - Removes the external need for PSB, DBD, and ACB GEN processes
  - Dynamic implementation of IMS database and program resource definitions
    - No system outage required to create or modify IMS databases
    - Improved IMS database availability

IMS Catalog Review

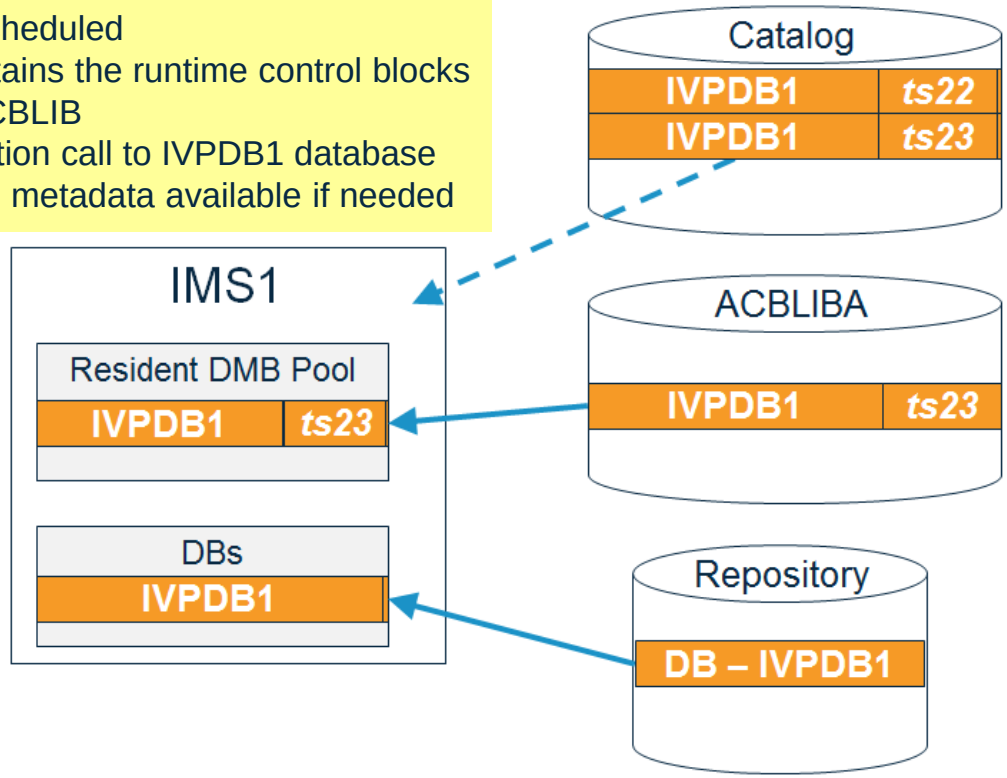
- The IMS catalog contains metadata about IMS program and database resources, and application COPYBOOKs / INCLUDEs
  - Includes all program and database related information defined to an IMS system, including databases, fields, segments, data types, and more
  - Changes to these IMS resources are reflected in the catalog metadata
- IMS PHIDAM / OSAM HALDB database with 4 Data Set Groups
- Using the IMS Catalog and ACBLIB
  - IMS database and program resource definitions start with DBD and PSB macro source coding, followed by DBDGEN and PSBGEN
  - Followed by “ACBGEN & Catalog Populate Utility” processing
    - Catalog and active ACB member are kept in sync via the ACBGEN process
  - IMS runtime database and program control blocks obtained from ACBLIB
  - IMS metadata is available from the catalog



IMS Resource Definitions Today

- **IMS Catalog**
  - Contains multiple instances & versions of database, program, and application metadata
- **IMS ACBLIB**
  - Contains the active ACB control blocks defining the DBD and PSB resources
    - Used by IMS to load the Application Control Blocks at runtime
- **IMS DRD Repository**
  - Defines the resources available for use in the IMS system

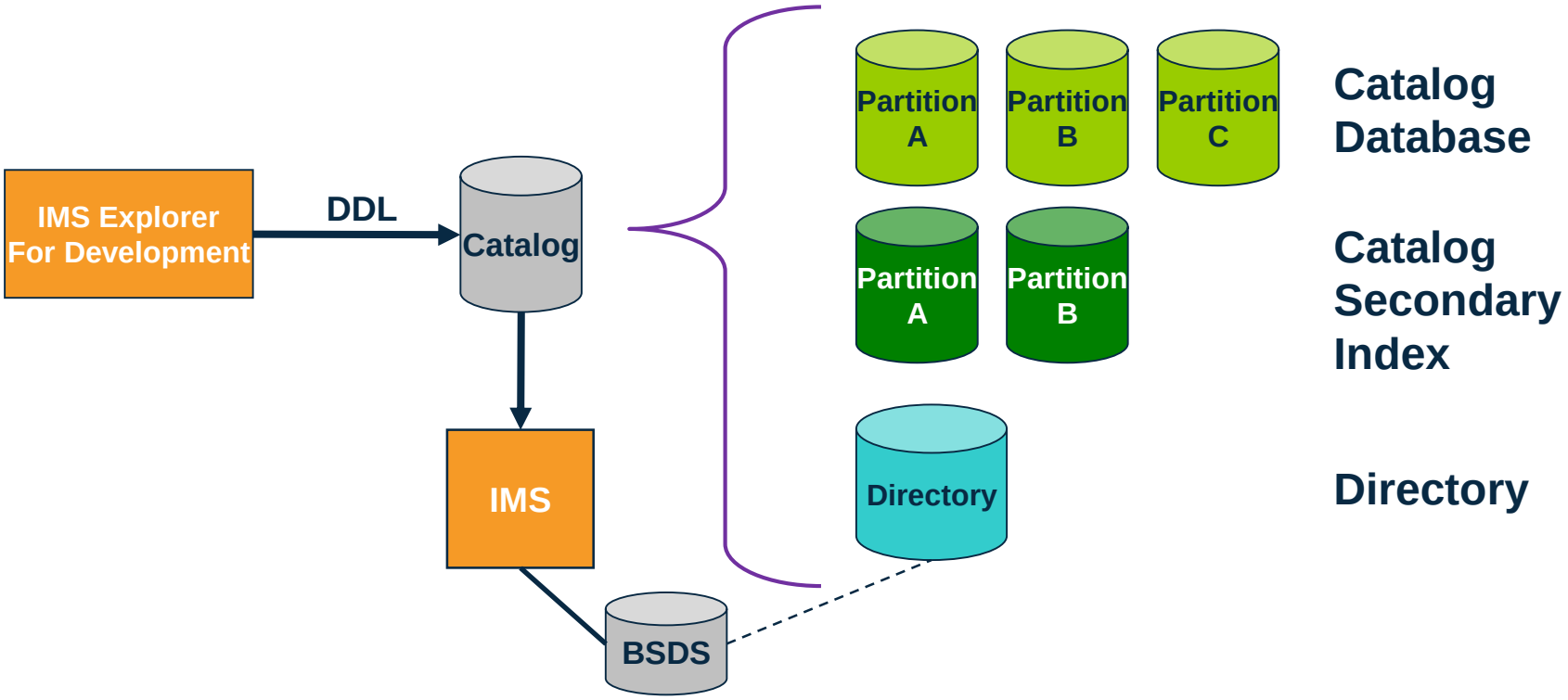
- PSB Scheduled
- IMS obtains the runtime control blocks from ACBLIB
- Application call to IVPDB1 database
- Catalog metadata available if needed



IMS Management of ACBs Tomorrow

- In IMS14, customers may optionally enable IMS management of Application Control Blocks (ACBs) for databases and program views
  - Use **Data Definition Language (DDL)** to affect IMS database and schema changes
  - IMS Catalog updated automatically when SQL DDL statements are used
    - If directed, IMS can activate changes to the database and program view definitions automatically
    - Changes not activated automatically are stored within IMS for later activation
      - » **IMPORT DEFN SOURCE(CATALOG) command**
  - SQL DDL statements can be submitted to IMS through products such as the IMS Explorer for Development, Java programs, or other DDL utilities
    - No longer need to code DBD and PSB macros
    - No longer need to generate DBDs, PSBs, and ACBs with utilities
    - No need to use Online Change or recycle an IMS system to activate an ACB
  - **ACBMGMT=CATALOG** in the <CATALOG> section of DFSDFxxx proclib member
    - IMS can build, activate, and load ACBs into memory dynamically from the catalog when database and program view definitions are created via SQL DDL statements

IMS 14 Catalog



- An IMS Catalog is made up of several components
  - A Catalog HALDB Database (many partitions, 4 Data Set Groups)
  - A Secondary Index
  - Directory Dataset(s)

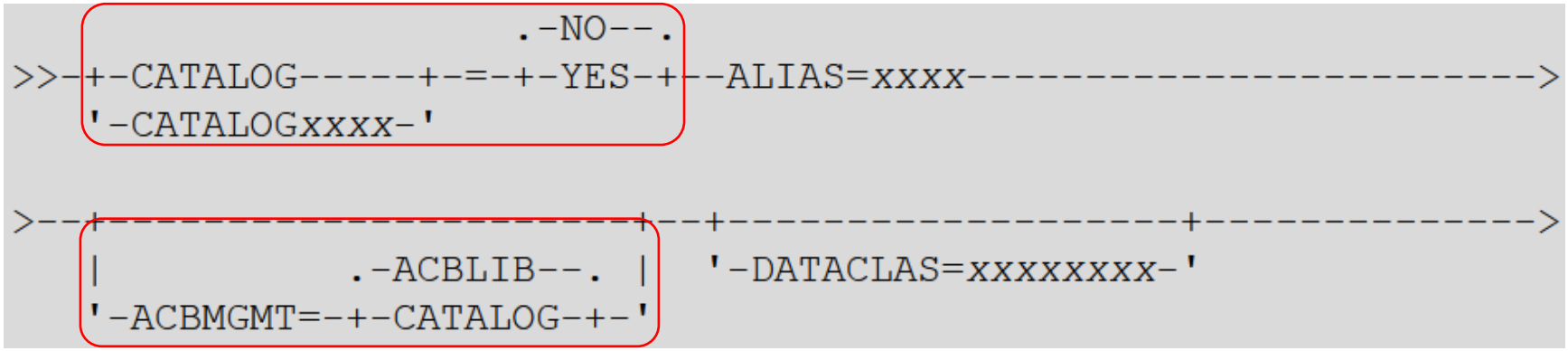
IMS Management of ACBs

- ACBs are stored in the IMS Directory which is an extension of the Catalog
- The Directory has functionality similar to an ACBLIB
  - Directory records have a format much like the ACBs in an ACBLIB
  - The Directory is kept in sync with the Catalog
- IMS will self-manage the Directory
  - A Directory data set is automatically allocated as a PDSE
    - another Directory data set is allocated when the PDSE becomes full
  - PDSEs are named using an extension of the catalog database data set name
    - <HALDB data set prefix>.DI<suffix>
- IMS will maintain a Boot Strap Data Set (BSDS) containing information about the Directory data set(s)
- When IMS ACB management is enabled
  - IMS will use the Directory to indicate which members are active in the IMS catalog
  - IMS will reference the Directory to get the runtime application control blocks
- 1:1 relationship between ACBs in the Directory and the Catalog
  - If the Catalog is shared then Directory data sets are shared
  - If the Catalog is non-shared then Directory data sets are non-shared

IMS Management of ACBs Directory

- PDSE Benefits
  - Automatic reuse of space
    - No manual compression required
  - Allows up to 123 extents
  - PDSE directory automatically extends
    - No “out of directory block” errors
  - Maximum size of a PDSE member is 15,728,639 records
  - Maximum number of PDSE members is 524,236
  - All updates to a PDSE are atomic, unlike a traditional PDS
    - Canceled jobs or system crashes will not corrupt a PDSE
  - Can be shared across a SYSPLEX

Enabling IMS Catalog ACB Management



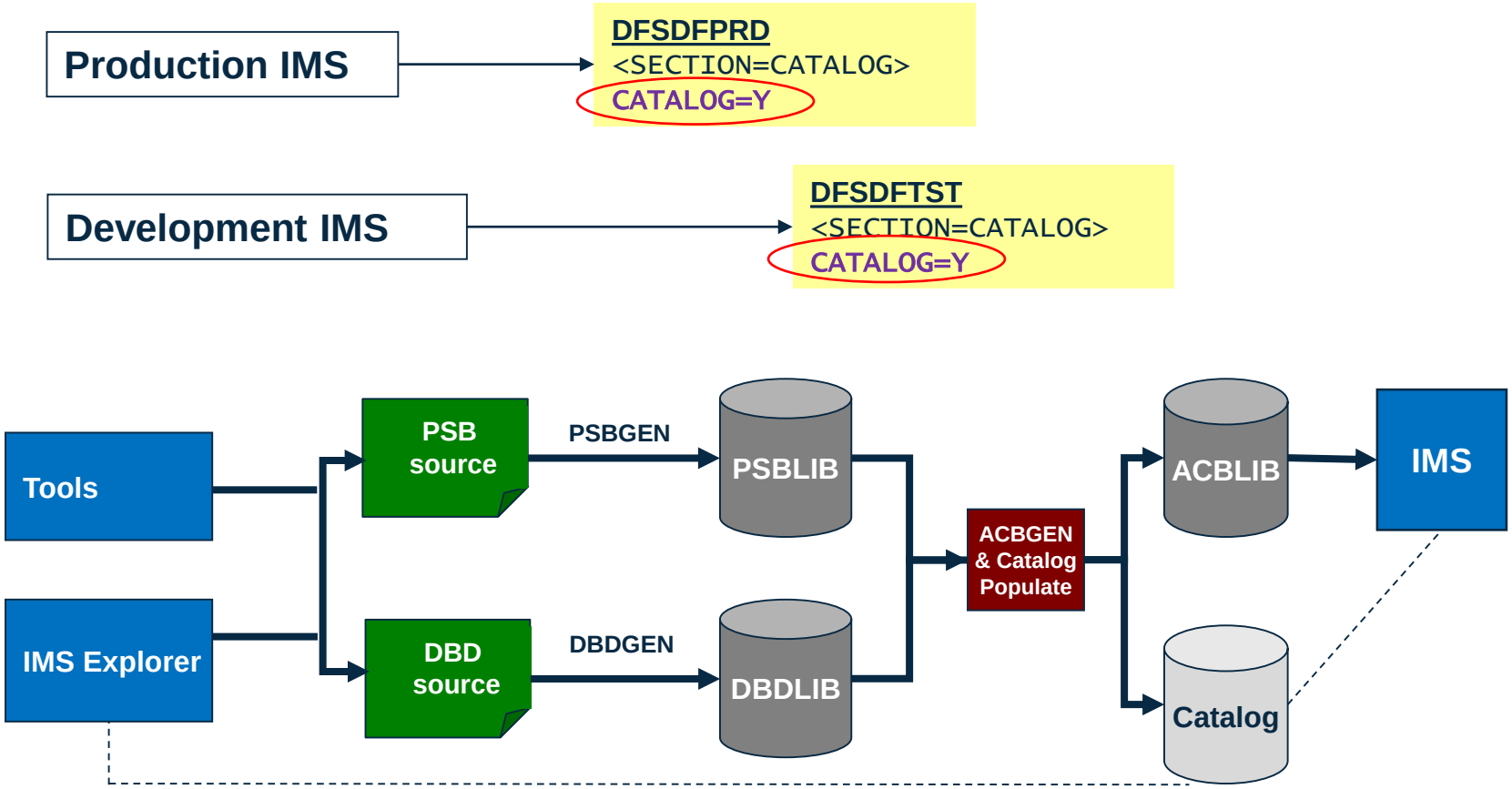
- In the CATALOG section of the DFSDFxxx PROCLIB member
  - Enable the IMS Catalog
    - CATALOG=**NO**
      - Specifies the IMS catalog is disabled
      - Default value and value if CATALOG section is omitted
    - CATALOG=YES
      - Specifies the IMS catalog is enabled
      - Catalog runtime resources must be included in the IMS system
        - » DFSCP000, DFSCD000, and DFSCX000

Enabling IMS Catalog ACB Management

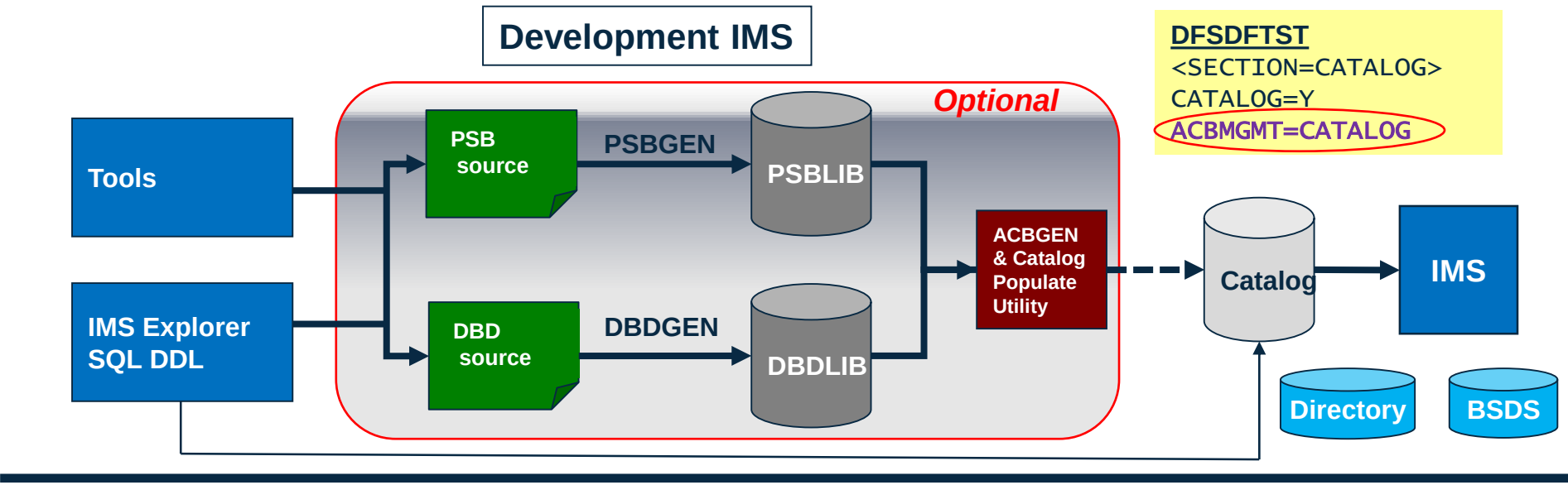
- Enable IMS Catalog ACB management
  - ACBMGMT=**ACBLIB**
    - IMS catalog is enabled and populated
    - User manages the runtime control blocks
      - » gen utilities, ACBLIB, and OLC
    - IMS catalog will be used by IMS to retrieve metadata
    - Default option if IMS catalog is enabled
  - ACBMGMT=CATALOG
    - IMS catalog must be enabled and populated using DFS3PU00 utility with MANAGEDACBS=SETUP
    - IMS manages runtime application control blocks using the IMS catalog
    - IMS will abend if the internally managed directory data sets are not found
    - DBD, PSB and ACB libraries no longer required

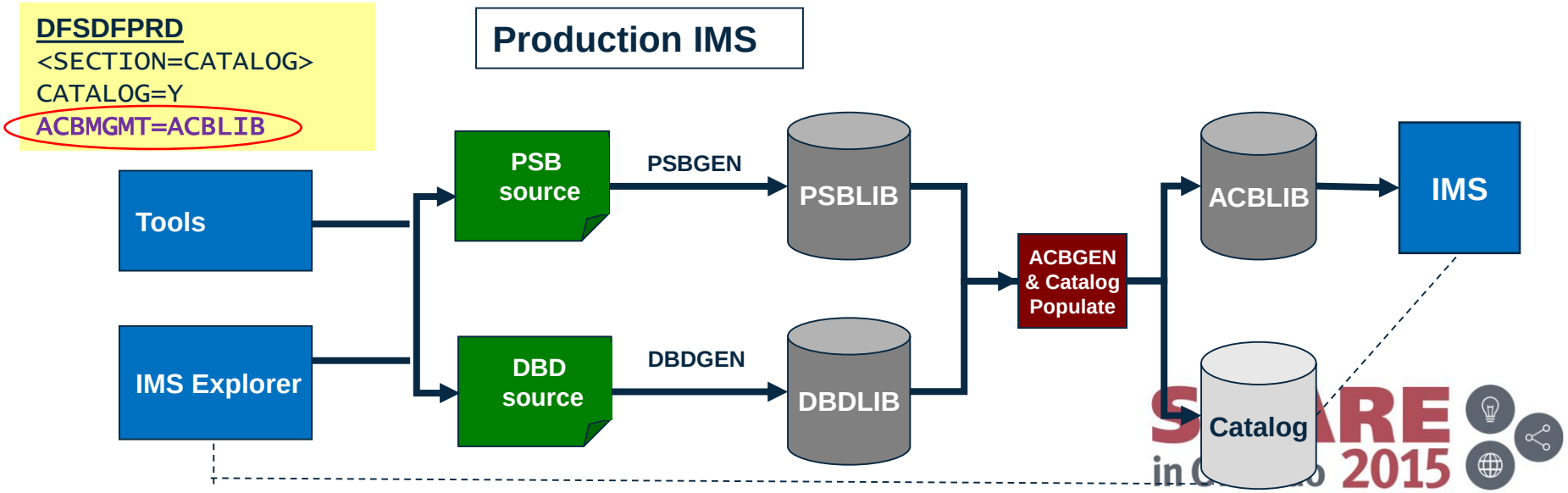
```
<SECTION=CATALOG>                                              /*Section Header*/
CATALOG=Y                                                    /*Enable IMS catalog*/
ALIAS=DFSC                                          /*Use standard catalog prefix DFSC*/
ACBMGMT=CATALOG           /*IMS manages the runtime application control blocks*/
RETENTION=(INSTANCES=5,DAYS=365)                             /*Retention criteria*/
```

Pre-IMS 14: IMS with Catalog and ACBLIB

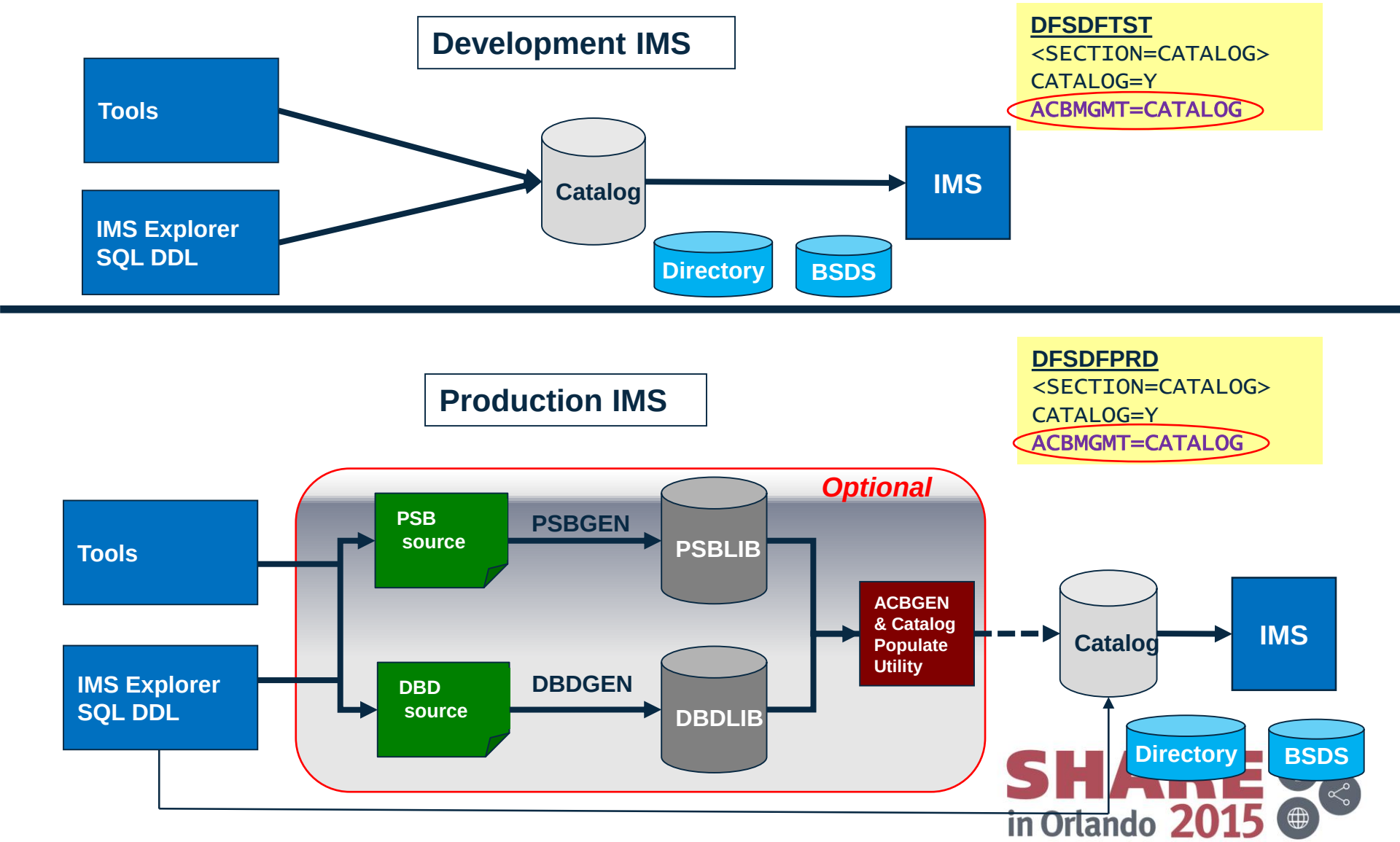


IMS 14: Transition to IMS Catalog Managed ACBs

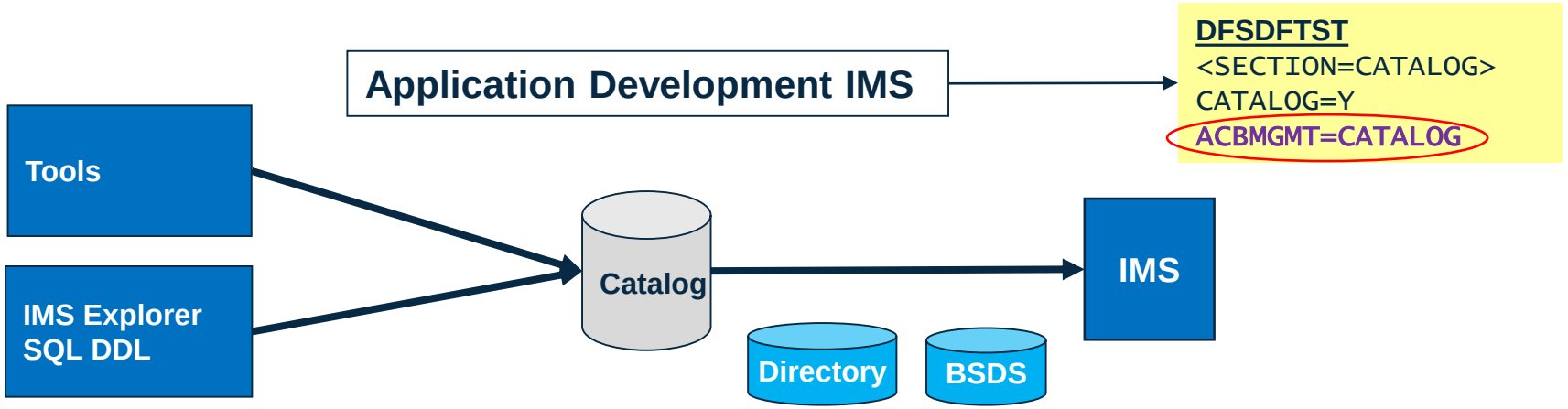


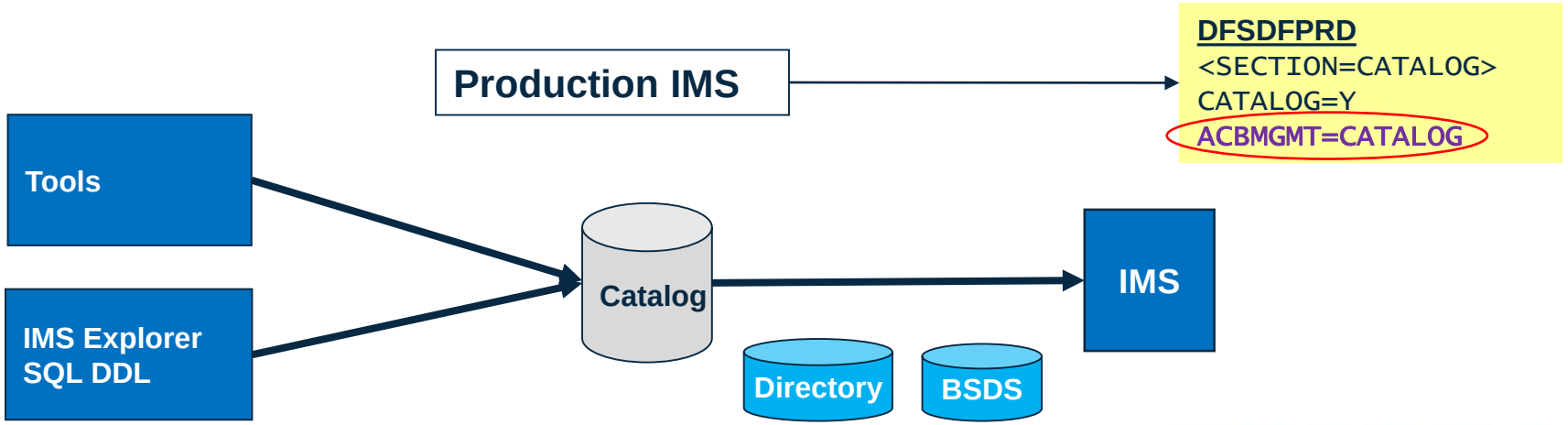


IMS 14: Transition to IMS Catalog Managed ACBs



IMS 14: Total Transition to IMS ACB Management

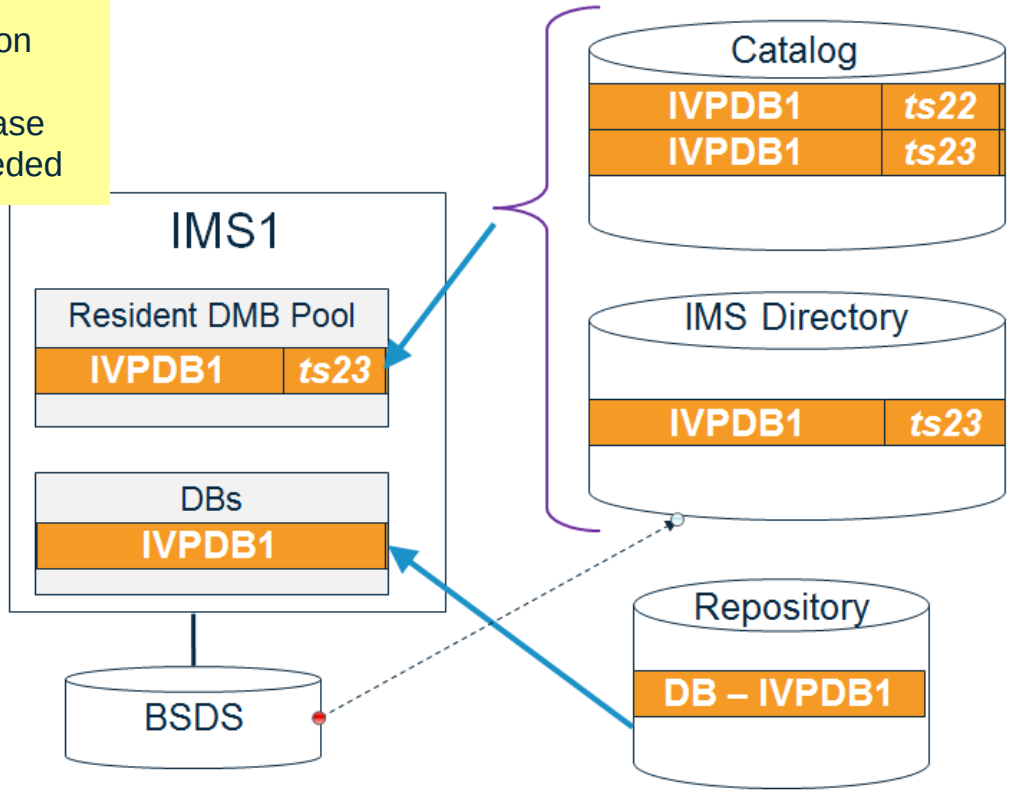




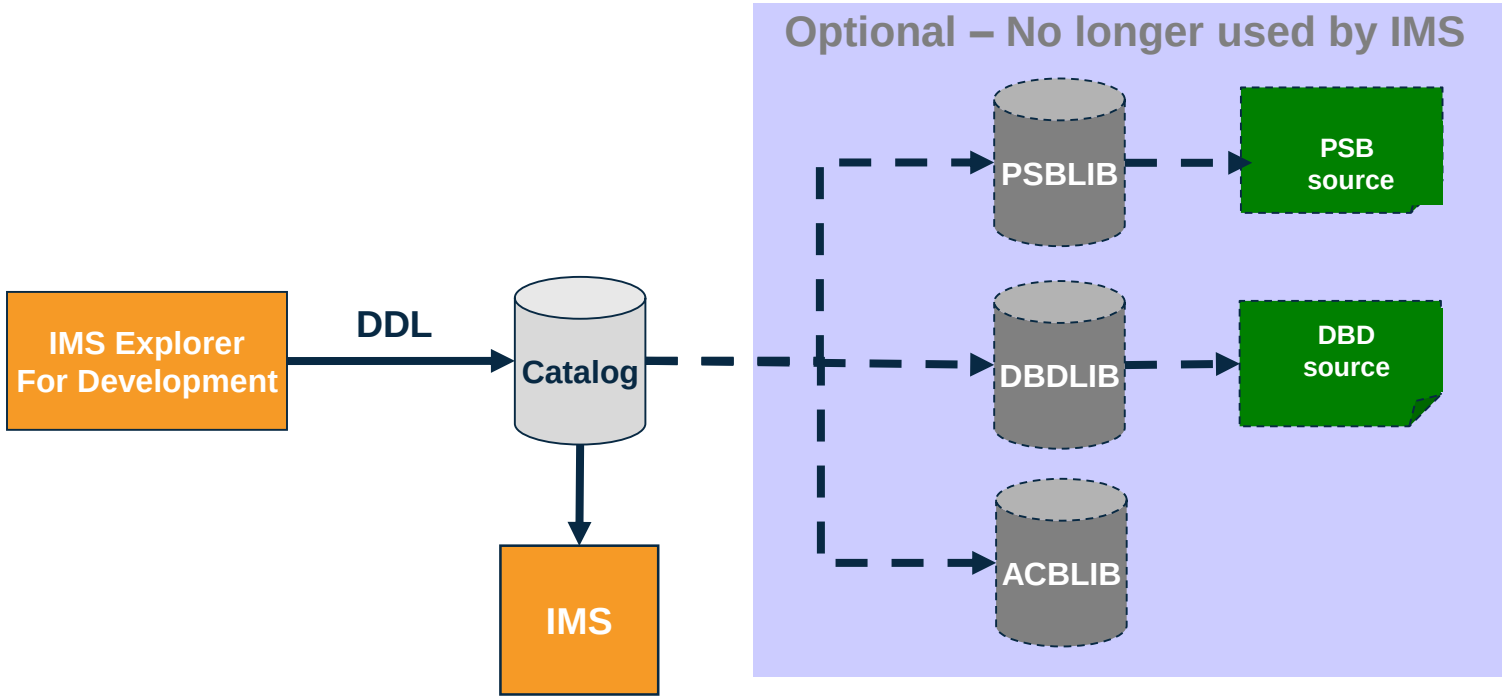
Running with IMS Catalog Managed ACBs

- IMS databases and programs are defined in the Catalog
  - Defines the active instance of database, program, and application metadata
  - Contains additional instances of database, program, and application metadata
  - Contains the application control blocks (ACBs)
- DRD Repository
  - Defines the resources available for use in an IMS system

- PSB Scheduled
- IMS obtains the runtime application control blocks from the Catalog
- Application call to IVPDB1 database
- Catalog metadata available if needed



IMS ACB Management Advantage



- Create DDL statements to build or modify IMS database or program resources
- IMS processes SQL DDL statements
- Activation of some DDL commands can happen automatically or commands are held in pending activation state until an IMPORT command is entered
  - **IMPORT DEFN SOURCE(CATALOG)**
- IMS application control blocks will be loaded from the catalog at runtime

Maintaining DBDLIB, PSBLIB and ACBLIB

- **Two methods to retain and maintain DBD, PSB and ACB libraries**
  - **Run the ACB Generation & Catalog Populate utility (DFS3UACB)**
    - Builds the application control blocks in ACBLIB
    - Updates the IMS catalog metadata and flags the active resources
    - Activates the ACBs by loading them into the IMS directory

    OR

  - **Run the ACB Maintenance utility, DFSUACB0**
    - Builds the application control blocks in ACBLIB

    AND
  - **Run the IMS Catalog Populate utility, DFS3PU00**
    - Updates the IMS catalog metadata and flags the active resources
    - Activates the ACBs by loading them into the IMS directory

Architectural Considerations

- Dynamic Database Definition function is disabled by default
- IMS catalog must be defined, populated and enabled
- IMS managed ACBs must be enabled
- IMS directory data sets and the BSDS can be built by IMS
- Internally created tasks are used to update the catalog
  - Number of PSTs may need to be increased if getting near your maximum
- Increased usage of 64 bit storage with the function enabled
  - Improved performance
- Internal construction of DMBs and PSBs are in a new code path
  - Any customized exits used in the generation of these control blocks ?
- Requires CSL - SCI and OM
- DBDLIB, PSBLIB and ACBLIB will no longer be maintained by IMS
- DBDGEN, PSBGEN and ACBGEN can be manually maintained

Operational Considerations

- Operational Characteristics
  - IMS will manage the directory
  - Databases and programs can be created and updated through DDL
  - No longer need to maintain …
    - DBD source, PSB source, DBDLIB, PSBLIB, and ACBLIB
    - Migration / Coexistence path will allow for continued usage of DBD and PSB source during transition
- Operational Considerations
  - Catalog should be updated through DDL
  - Catalog can still be updated with the Catalog Populate utility
    - Allows support for existing path of source to catalog via DBDGEN / PSBGEN / ACBGEN
  - Reorganize the IMS catalog database with OLR
  - Image Copy the IMS catalog on a regular basis
  - Include IMS catalog components in a Global Mirroring consistency group
  - Audit data will be collected for IMS catalog database updates

Performance Considerations

- Performance Characteristics
  - Performance has not been determined yet
    - Expectation is that IMS performance should not be impacted by catalog
  - Few differences in using catalog with directory vs. ACBLIB during IMS initialization
    - IMS must load control blocks directly into memory from DASD
  - Increased usage of 64 bit storage to cache control blocks
    - Eliminates I/O to directory during normal scheduling after caching
    - Reduces I/O to directory during the activation of changes
  - IMS automatically executes steps to change resources while processing DDL
    - Activation process may take longer since IMS does more work
- Performance Considerations
  - Impact of DDL change is similar to impact of DBD or PSB source change

Setup / Migration Considerations

- IMS catalog sharing
  - An IMS 14 catalog can be shared with IMS 12 or IMS 13
  - Older IMS will not process new fields in the catalog
- Sharing catalog with directory on previous releases
  - Can be done but not recommended
    - Difficult to keep resources in sync
    - IMS 14 catalog updated by DDL
    - IMS 12 & 13 source DBD / PSB updates followed by DBD, PSB and ACBGEN
  - Recommendation
    - Enable catalog, migrate to IMS 14 then enable IMS Managed ACBs
- Currently no plans for IMS 12 or 13 coexistence APARs
- DFS3UACB utility should not be needed after migration to DDL
  - Use during migration from DBD / PSB source to DDL

Migration Considerations

- Use of the new IMS ACB management feature is optional
- Define HALDB Catalog database, install/gen catalog DBD/PSB/ACBs, and enable the IMS catalog and IMS ACB management
  - DFSDFxxx PROCLIB member <SECTION=CATALOG>
    - CATALOG=YES
    - ACBMGMT=CATALOG
  - Run the Catalog Populate utility with MANAGEDACBS=SETUP
    - Creates a new IMS directory and corresponding BSDS required by IMS to manage ACBs
    - Loads the IMS directory with the ACBs contained in the concatenated ACBLIBs
  - IMS obtains runtime ACB control blocks from the IMS catalog
  - No longer need to gen ACB control blocks using utilities
  - No longer need to use Online Change to in-effect ACB changes
  - DBD, PSB and ACB libraries can be retired
- Start adding and changing database definitions dynamically using DDL