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Exploring the IMS Catalog Using the Metadata and IMS Open Database (ODBM)

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Catalog Metadata definition in DBD and PSB source



- IMS 12 HALDB Catalog
 - Contains information about IMS program resources, database resources, and relevant application metadata
 - Database Metadata
 - describes a physical database
 - Application Program Metadata
 - describes application program view of the data in the database
 - Arrays and Structures
 - Field data types and data type conversion
 - Field redefines
 - Alternative Field maps for a segment
 - ACBGEN
 - Used to auto-populate the catalog
- Benefits
 - consolidates the application program data requirements into trusted location

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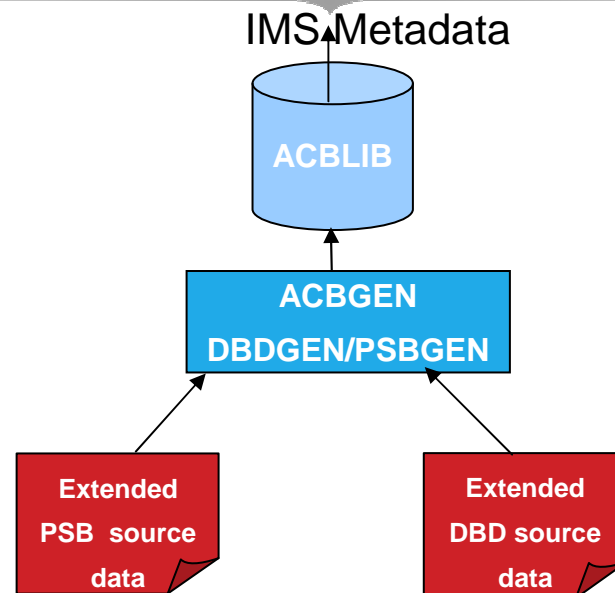
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IMS Catalog Metadata

- Database and Application Program resources are managed by IMS

- IMS Catalog
- database definitions
- Segments, Mappings, Fields and data types
- program specifications



PSB PCB statements changes

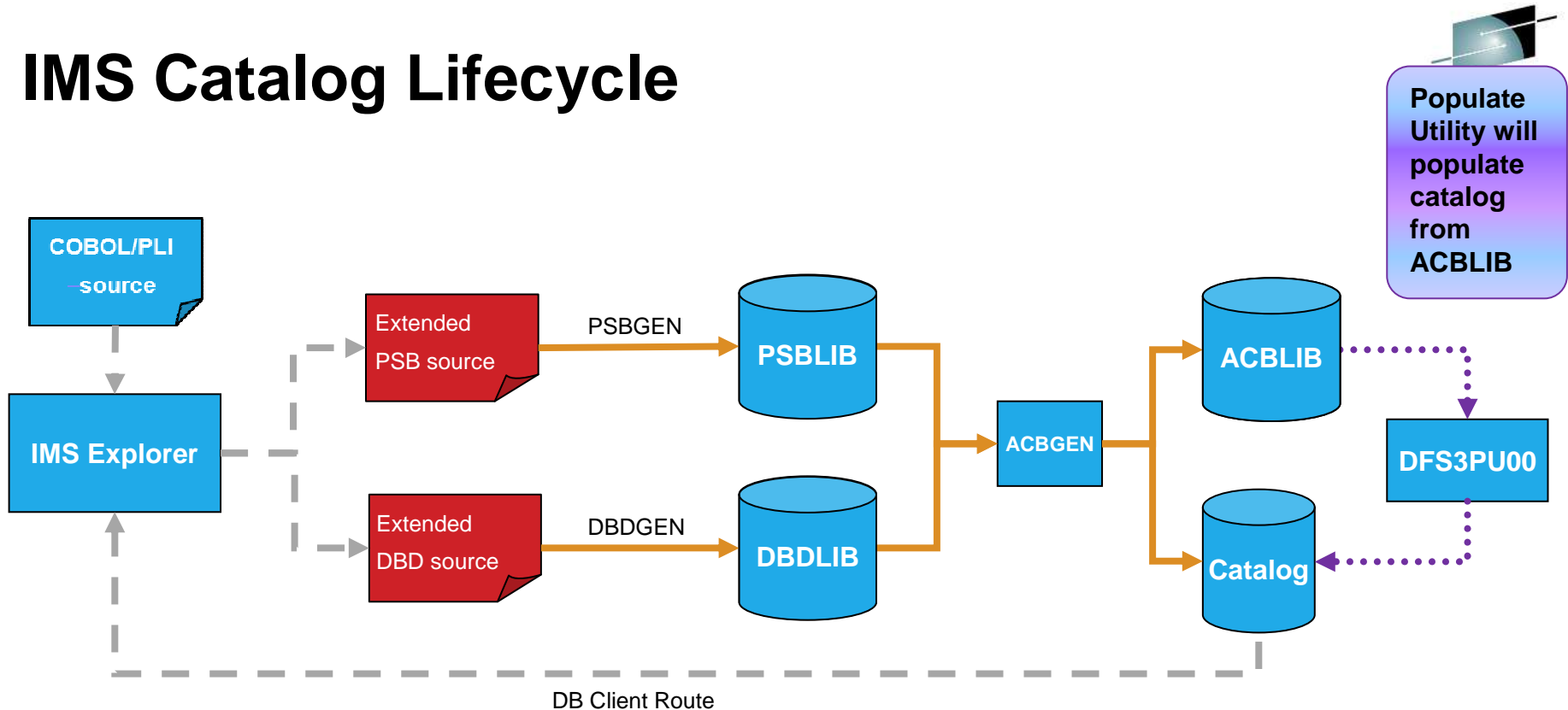
- PCB
 - EXTERNALNAME=
 - An optional alias for the PCB label or the PCBNAME= parameter
 - Java application programs use the external name to refer to the PCB
 - REMARKS=
 - Optional user comments. A 1- to 256-character field. Added to PSBGEN statements

DBD statement changes



- DBD
 - ENCODING=
 - Specifies the default encoding of all character data in the database defined by this DBD.
 - This value can be overridden in individual segments or fields.
- SEGM
 - EXTERNALNAME=
 - An optional alias for the NAME= parameter used by Java application programs to refer to the segment.
- FIELD
 - CASENAME=
 - The name of the map case when alternative mappings are defined for the fields in a segment
 - DATATYPE=
 - Specifies the external data type of the field.
 - EXTERNALNAME=
 - An optional alias for the NAME= parameter used by Java application programs to refer to the field.
- DFSMARSH
 - Specifies the DATATYPE converter routine to transform binary data to external data format
- DFSMAP
 - Defines alternative field mappings in a segment.
- DFSCASE
 - Defines a map case for a segment type that uses DFSMAP alternative field mapping.
- REMARKS=
 - Optional user comments. A 1- to 256-character field. Added to DBDGEN statements

IMS Catalog Lifecycle



- ACBGEN will populate ACBLIB and catalog in same UOW
 - Populates ACBLIB with standard ACB info and extended info
 - Populates the catalog with extended info
- Key points
 - Only way to update catalog is via the Populate Utility or ACBGEN process
 - Extended info stored in ACBLIB members for recoverability
 - Extended info is acquired via the IMS Explorer

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Immediate Benefits

- All Universal drivers leverage the IMS catalog
 - Trusted online (IMS) source for metadata used by the drivers
 - Direct access to IMS metadata in the catalog
 - No longer require the separate Java metadata class
 - Virtual deployment support
 - No longer file-system dependent for metadata
 - Virtual deployment support

- 7 • Metadata is trusted and up-to-date

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Application programming with the IMS 12 Catalog



- IMS catalog resident PSBs for application programs
 - DFSCP000 - High-level assembler and COBOL applications
 - DFSCP002 PL/I - applications
 - DFSCP003 - PASCAL applications
- The following PCBs are included to support different catalog processing models:
 - DFSCAT00 - The primary PCB to access all data in the catalog database..
 - DFSCAT SX - Use this PCB to access the catalog database via the catalog secondary index.
 - DFSCAT X0 - Use this PCB to process the catalog secondary index database.
- All catalog processing is performed with PROCOPT=G.
- GUR call
 - application programs can use the Get Unique Record (GUR) DL/I call to retrieve catalog database record

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GUR Call



- New “GUR” DL/I call
 - Get Unique Record
 - Restricted to use with IMS Catalog database
- Functions like a GU followed by a series of GNP calls
- Returns the entire database record in one call
 - Saves overhead of issuing GU & GNP to retrieve all the metadata for a catalog member
 - Using an AIB token, the call can be continued if the I/O area is too small for entire catalog database record
- Data returned will be in XML format
 - The XML schemas are included in the IMS.ADFSSMPL data set:
 - DFS3XDBD.xsd (for DBD records)
 - DFS3XPSB.xsd (for PSB records)
- Support added for DFSDDLTO and IMS REXX

GUR Call...



- IMS catalog has a structure that uses a header segment as the root for each record.
 - Each header segment instance has either a PSB or DBD child segment instance.
- **GUR AIB IOAREA HEADER PSB**
 - This call locates the first record, which is always a DBD record because DBD precedes PSB in alphanumeric order.
- **GUR AIB IOAREA HEADER (TYPE == PSB) PSB**
 - A GUR call that is issued without a qualification at the PSB or DBD level retrieves the record for the member that is currently active in the ACB library.
- **GUR AIB IOAREA HEADER (RHDRSEQ == PSB BMP255)**
 - GUR call fails if there is no active ACB library member for BMP255
 - AIB return code X'108' and reason code X'338'
- **GUR AIB IOAREA HEADER (RHDRSEQ = PSB BMP255)
PSB (TSVERS ==xxxxxxxxxxxxxxxx)**
 - To retrieve the record for an inactive or removed ACB library member, add an SSA qualification for the correct ACB generation timestamp

SSA enhancements

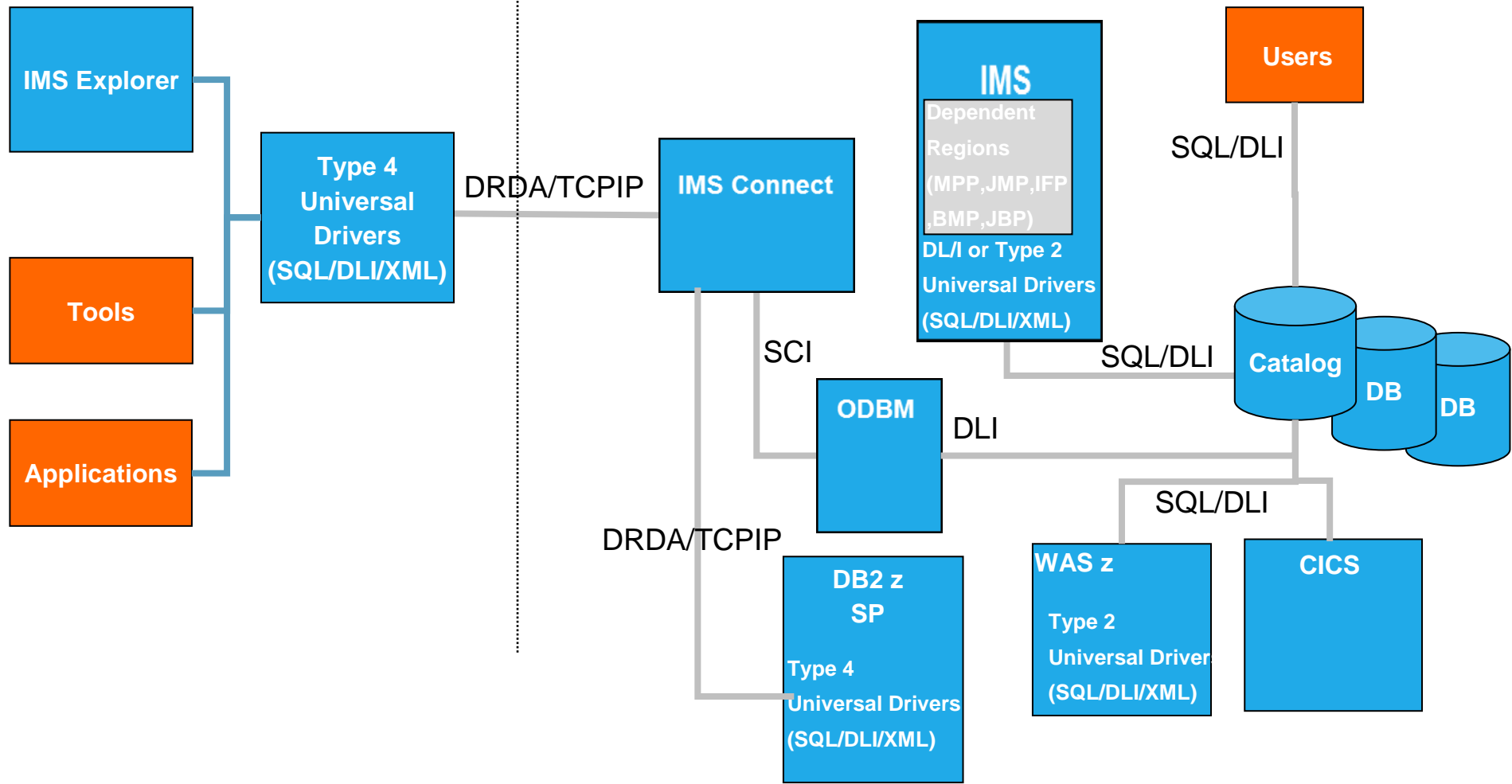
- Segment search arguments (SSAs) can now be based on the offset and field length of the target segment
 - Allows users to issue queries that qualifies on non-searchable fields by specifying the field's offset, length and value
 - SQL
 - Universal Drivers will detect a non-searchable field in the WHERE clause based on Catalog metadata and will internally convert the SSAList qualification an offset
 - DLI
 - Universal Drivers will detect a non-searchable field in the SSAList based on Catalog metadata and will internally convert the qualification to an offset

SSA support for field offset

- New SSA format
 - Allows searching by offset and length instead of field name
 - Fields are no longer required to be defined in the DBD
- Support will be added for DFSDDLTO and IMS REXX
- Performance will be the same as non-key field search
 - IMS will scan the database looking for matches
 - Qualification on root key reduces impact of scan
- SSA will contain 4 byte offset and 4 byte length followed by operator and value
- A field not found will return a normal GE

- To be delivered via service process

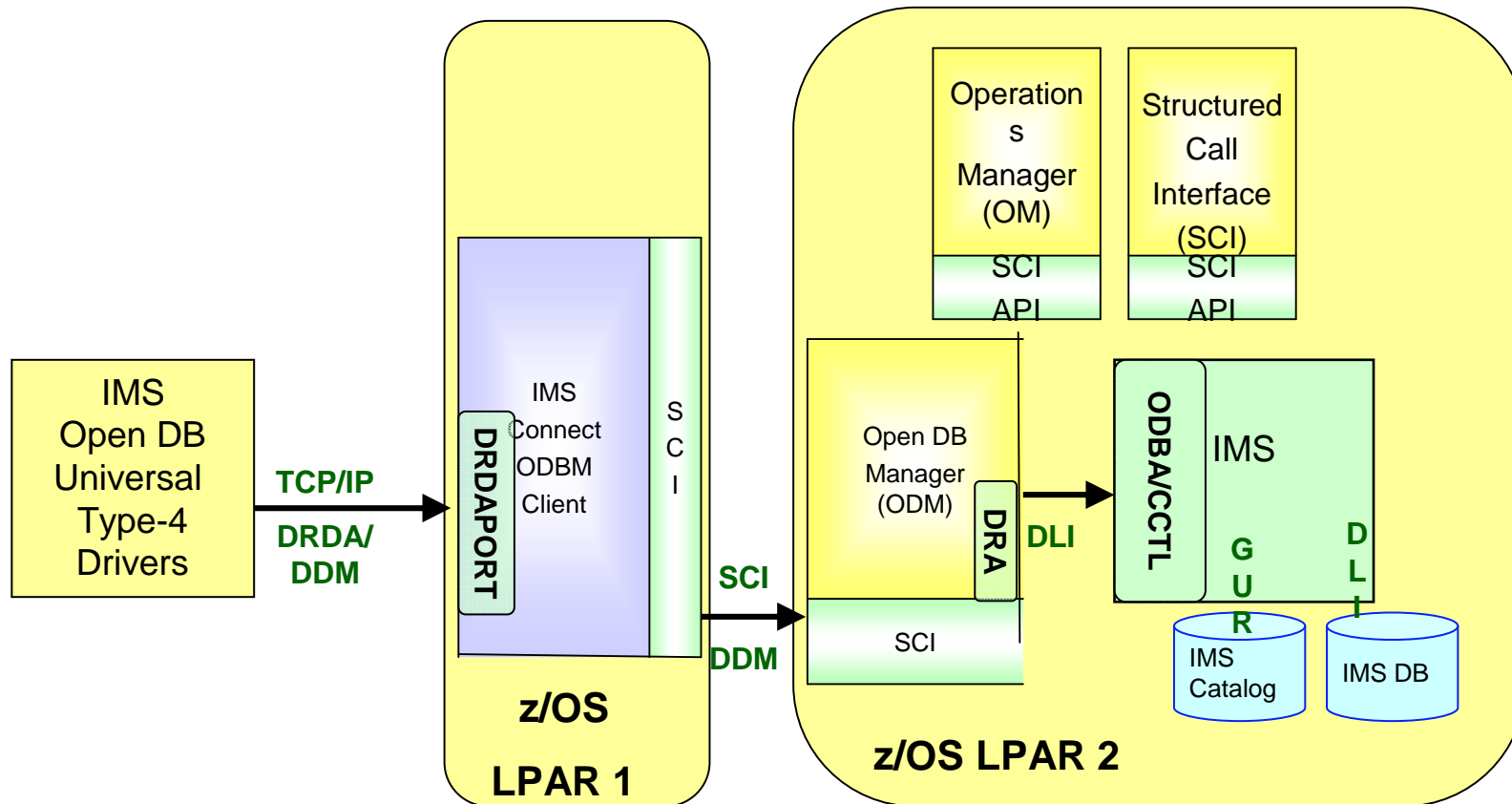
Runtime Catalog Access



IMS Catalog Supported Interfaces

- Open systems
 - Universal drivers - Type 4
 - SQL and DLI interfaces directly to the catalog
 - XML - render catalog information as XML instance document
- z/OS
 - Universal drivers - Type 2 and Type 4
 - SQL and DLI interfaces directly to the catalog
 - XML - render catalog information as XML instance document
 - Traditional IMS languages
 - DLI access directly to the catalog
 - Batch access supported

Open Database Components



IMS Enterprise Suite V2.1 Explorer for Development



The screenshot displays the IMS Enterprise Suite V2.1 Explorer for Development interface. It features a central database schema diagram with tables like DEALER, MODEL, SALES, STOCK, and SALESINF. A green arrow points to the diagram with the text "See database relationships change DBD field attributes".

On the left, a SQL query window shows the following query:

```
SELECT HOSPNAME, HOSPCODE, HOSPLL
FROM PCB01.HOSPITAL
```

Below the query window is a table with the following data:

| Status | Operation | Date | HOSPLL | HOSPCODE | HOSPNAME |
|--------|------------------------------|---------|--------|---------------|--------------|
| ✓ | Succeed select * from pcb... | 8/2/... | 1 | R 1210010000A | ALEXANDRIA |
| ✓ | Succeed select * from pcb... | 8/2/... | 2 | R 1210020000A | SANTA TERESA |
| | | | 3 | R 1210030000A | SANTA CLARA |
| | | | 4 | R 1210040000A | NEW ENGLAND |

A green arrow points to the table with the text "Generate SQL to access IMS data".

On the right, a window titled "Editing view of the current PCB" shows a detailed view of the DEALER table structure, including fields like DLRNO, DLR-NAME, CITY, ZIP, and PHONE. A green arrow points to this window with the text "Edit PSB sensitive segments and attributes".

IMS Enterprise Suite V2.1 Explorer for Development



- Visualization and editing of IMS Database and Program Definitions
 - Provide graphical editors to:
 - Display IMS database hierarchical structures
 - Display/create/edit PSBs
 - Change/add fields on a DBDs
 - Import Cobol CopyBooks and PL/I Structures to a database segment*
 - Generate of DBD and PSB source
- Ability to easily access IMS data using SQL statements
 - Leveraging IMS Universal JDBC driver
- Ability to access the IMS Catalog
- Connectivity to the z/OS system
 - Browse a Data Set and submit JCLs
 - Import and export DBD and PSB source files from a Data Set to the IMS Explorer, and vice-versa
- Supports cross-product integration:
 - IBM® Rational® Developer for System z®
 - IBM Optim™ Development Studio
 - IBM Problem Determination Tools Plug-ins for Eclipse

17 Benefit

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- Simplify IMS application development tasks

*Requires RDz 8



IMS Enterprise Suite V2.1 Explorer for Development



- IMS 12 HALDB Catalog Metadata
 - Universal Driver Type 4 connection
 - Can add COBOL or PL/I metadata to the catalog
 - *Direct update of the catalog metadata is not available*
 - *Requires intermediate ACBGEN to populate the catalog with the extended information*
- PSBs and DBDs editing
 - Send updated DBDGEN and PSBGEN source files to the host
 - run DBDGENs, PSBGENs, ACBGENs, and catalog population

IMS Enterprise Suite V2.1 Explorer for Development

View physical IMS database structure



The screenshot displays the IMS Explorer interface for the AUTODB database. The main window shows a hierarchical diagram of database segments and fields. A callout box labeled "Logical relationship between databases" points to a red dashed line connecting the EMPNO field in the SALES segment to the EMPNO field in the EMPSPAL segment. Another callout box labeled "Additional properties of a segment or field" points to the Properties window at the bottom, which shows details for the DEALER segment.

Logical relationship between databases

Additional properties of a segment or field

| Property | Value |
|--------------------------|--------|
| .Segment statement | |
| Length (BYTES): | 61 |
| Parent segment (PARENT): | 0 |
| Segment name (NAME): | DEALER |
| Source segment (SOURCE): | |
| List of fields | |

IMS Enterprise Suite V2.1 Explorer for Development

View logical IMS database structure



DBD name: AUTOLDB

View: [Icons]

DEALER
Length: 61 bytes
AUTODB.DEALER
DLRNO
DLRNAME
CITY
ZIP
PHONE

MODEL
Length: 37 bytes
AUTODB.MODEL
/SX1
MODTYPE
MODKEY
MAKE
MODEL
YEAR
MSRP
COUNT

SALES
Length: 62 bytes
AUTODB.SALES
AUTODB.SALES
EMPNO
EMPNO
LASTNAME
FIRSTNAME

ORDER
Length: 74 bytes
AUTODB.ORDER
ORDNBR
LASTNAME
FIRSTNAME
DATE
TIME

SALES
Length: 131 bytes
AUTODB.SALES
SALENUM
SALDATE
LASTNAME

STOCK
Length: 46 bytes
AUTODB.STOCK
STKVIN
COLOR
PRICE
LOT
WRNTY

SALESINF
Length: 15 bytes
AUTODB.SALESINF
QUOTA
SALESYTD
COMSSION

EMPINFO
Length: 61 bytes
EMPDB2.EMPINFO
ADDRESS
STREET
CITY
STATE
ZIP

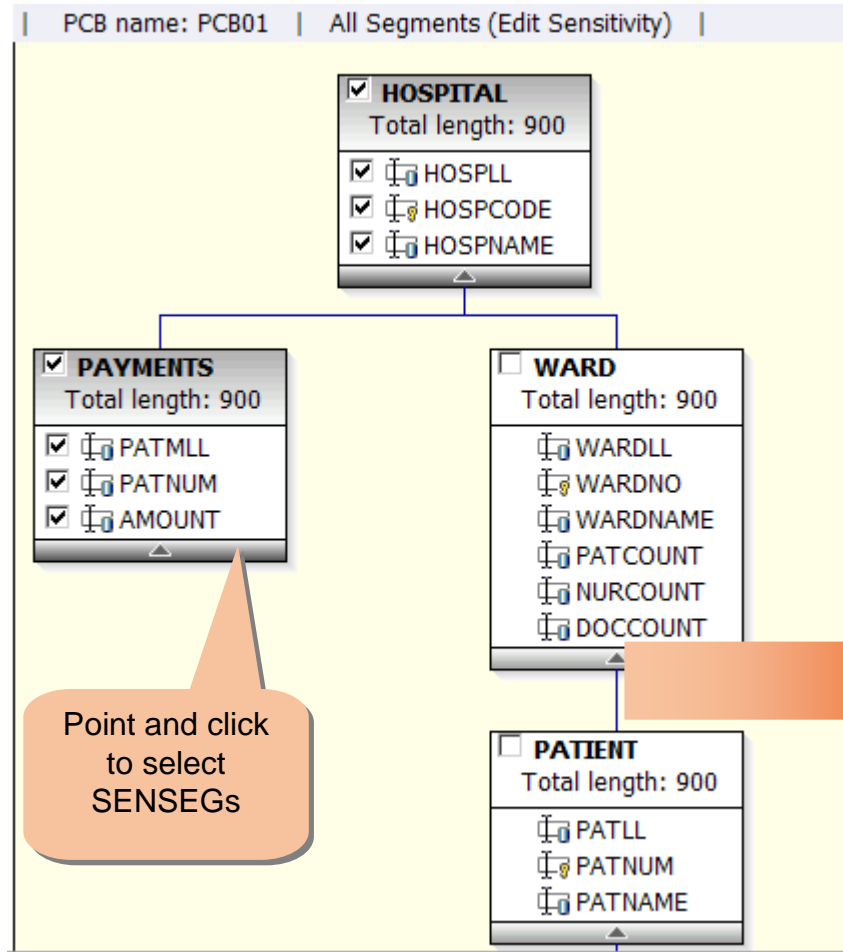
A concatenated segment and its underlying source segments

| Property | Value |
|-------------------------|--|
| 1 - Segment (SEGM) | |
| Alias | |
| Parent segment (PARENT) | DEALER |
| Segment name (NAME) | SALES |
| Source segment (SOURCE) | ((SALES,DATA,AUTODB),(EMPL,DATA,EMPDB2)) |

IMS Enterprise Suite V2.1 Explorer for Development



Build PCB definition



Point and click to select SENSEGs

```

*****
PCB NUMBER 5      DB      DEDBJN21
*****
PCB      TYPE=DB, DBDNAME=DEDBJN21, POS=M, PROCOPT=A, KEYLEI
        PCBNAME=PCB01
SENSEG  NAME=HOSPITAL, PARENT=0
SENSEG  NAME=PAYMENTS, PARENT=HOSPITAL
SENSEG  NAME=WARD, PARENT=HOSPITAL
SENSEG  NAME=PATIENT, PARENT=WARD
SENSEG  NAME=ILLNESS, PARENT=PATIENT
SENSEG  NAME=TREATMNT, PARENT=ILLNESS
SENSEG  NAME=DOCTOR, PARENT=TREATMNT
SENSEG  NAME=BILLING, PARENT=PATIENT
*****
*      PCB NUMBER 6      DB      IVPDB1
*****
  
```

Generated PSB source

IMS Enterprise Suite V2.1 Explorer for Development

Query IMS database with Universal JDBC driver



The screenshot shows the Eclipse IDE interface with the following components:

- Data Project Explorer:** Shows a project named 'Demo' containing SQL Scripts (Script1.sql, Script2.sql, Script3.sql) and XML files.
- SQL Editor:** Contains the following SQL query:


```
SELECT PCB01.HOSPITAL.HOSPNAME, PCB01.PATIENT.PATNAME, PCB01.HOSPITAL.HOSPCODE
FROM PCB01.HOSPITAL, PCB01.PATIENT
```
- SQL Builder:** Shows two tables, 'HOSPITAL' and 'PATIENT', with their respective columns. The 'HOSPITAL' table has columns HOSPCODE, HOSPLL, and HOSPNAME. The 'PATIENT' table has columns HOSPITAL_HOSPC, WARD_WARDNO, PATNUM, PATLL, and PATNAME. The 'HOSPITAL' table is selected.
- SQL Results:** Shows a table with columns: HOSPLL, HOSPCODE, HOSPNAME, HOSPITAL_HOSPCODE, and WARD_WARDNO. The results are as follows:

| HOSPLL | HOSPCODE | HOSPNAME | HOSPITAL_HOSPCODE | WARD_WARDNO |
|--------|----------------|---------------|-------------------|-------------|
| Lv | R.121001000... | GOOD SAMA... | R.1210010000A | 0004 |
| Lv | R.121001000... | GOOD SAMA... | R.1210010000A | 0004 |
| Lv | R.121001000... | GOOD SAMA... | R.1210010000A | 0004 |
| Lv | R.121001000... | GOOD SAMA... | R.1210010000A | 0007 |
| Lv | R.121002000... | SANTA TERE... | R.1210020000A | 0002 |
| Lv | R.121004000... | NEW ENGLA... | R.1210040000A | 0011 |
| Lv | R.121004000... | NEW ENGLA... | R.1210040000A | 0011 |
| Lv | R.121004000... | NEW ENGLA... | R.1210040000A | 0011 |
| Lv | R.121004000... | NEW ENGLA... | R.1210040000A | 0070 |
| Lv | R.121004000... | NEW ENGLA... | R.1210040000A | 0070 |
- Data Source Explorer:** Shows the database structure for 'IMS DB' > 'IMS Hospital' > 'Schemas' > 'PCB01'. It lists various database objects like Tables (BILLING, DOCTOR, HOSPITAL, ILLNESS, PATIENT, PAYMENTS, TREATMNT), Sequences, and Stored Procedures.

Create SQL scripts with Select, Update, Delete, and Insert statements

Build a SQL statement using the SQL Builder with content assistance

View the SQL results

PSB = schema

DB PCB = database

Database segments = tables

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IMS Enterprise Suite V2.1 Explorer for Development Browsing Data Sets and Submitting JCL's



The screenshot displays the IMS Enterprise Suite Explorer interface. The top-left pane shows a tree view of data sets under the qualifier 'MRODER'. A context menu is open over the 'IEBCOPY' data set member, with 'Submit Job' selected. A callout bubble points to this menu with the text 'Browse data sets'. The top-right pane shows the JCL code for the 'IEBCOPY' job, with the line 'COPY INDD= ((INPUT1, R) , OUTDD=OUTPUT1' highlighted. A callout bubble points to this line with the text 'Edit a data set member'. The bottom-left pane shows the 'Jobs' view with a warning message: 'ZNX0001W: Unable to display jobs. JES Interface Level of 1'. A callout bubble points to this message with the text 'View JES output'. The bottom-right pane shows the 'Console' view with the text 'z/OS DSN=MRODER.JCL.CNTL(IEBCOPY) - saved'. The status bar at the bottom indicates 'CNX0100I Connected user MRODER to host stfmvs1.svl.ibm.com on port 21' and 'marilene's machine'.

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Summary



- IMS 12 HALDB Catalog
 - Contains information about IMS program resources, database resources, and relevant application metadata
 - ACBGEN
 - Used to auto-populate the catalog
- IMS Enterprise Suite Explorer for Development
 - Generates DBD/PSB source to populate the catalog