IMS Connect Reimagined: Leveraging SQL to Access IMS Data in Today’s Digital Ecosystem

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IMS Connect Reimagined
LEVERAGING SQL TO ACCESS IMS DATA
IN TODAY'S DIGITAL ECOSYSTEM

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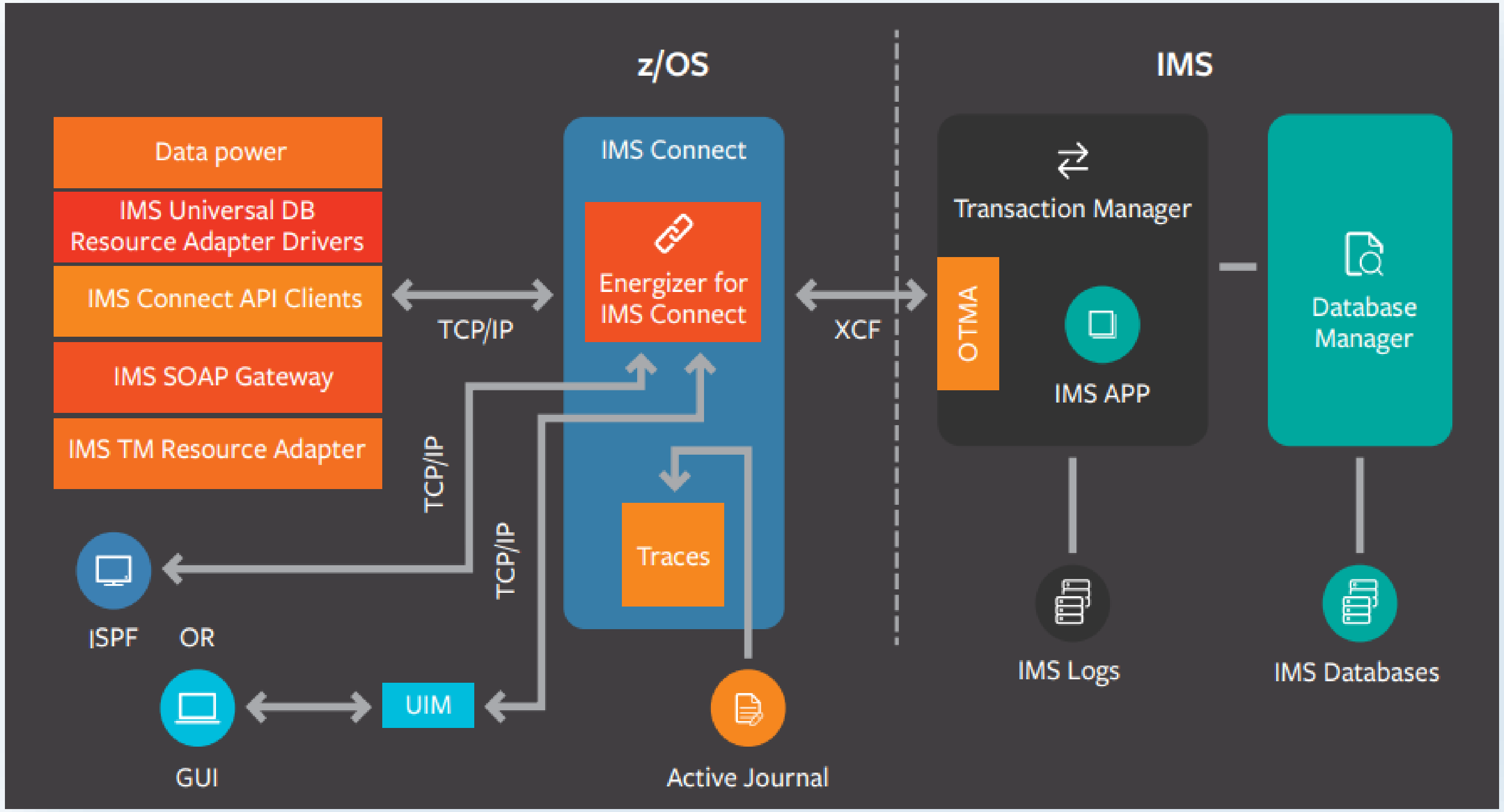
Topics

1. IMS Connect
2. Transaction Access
3. Data Access to IMS
4. Events and Traces
5. Common Challenges in SLDC
6. Evolving IMS Connect Environment

IMS Connect

- IMS Connect is a component of IBM® IMS™ (Information Management System) family of products. IMS Connect serves as a gateway that allows applications to interact with IMS databases and transactions using standard communication protocols like TCP/IP and HTTP

- This enables seamless integration of IMS-based applications with modern technologies and provides access to IMS transactions and data from a wide range of platforms and devices

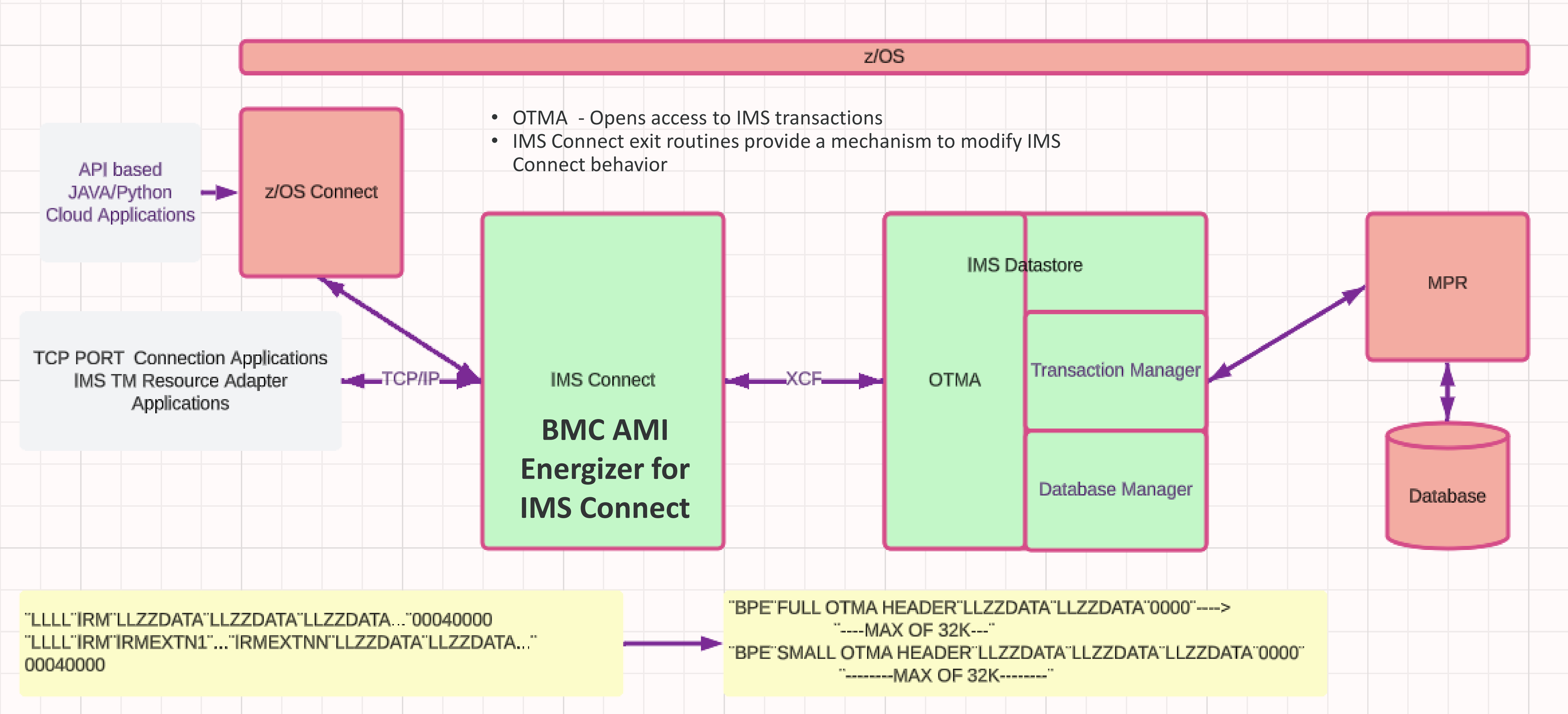


Transaction Access

Transaction Access

- Support for the growth of evolving technologies without modifying IMS applications in mainframe using Open Transaction Manage Access (OTMA)
- OTMA uses cross-coupling facility (XCF) to send and receive messages
- One IMS Connect can connect to multiple IMS control regions in multiple XCF groups
- One IMS control region can connect to multiple IMS Connects
- IMS Connect and IMS can be on different LPARs in the same Sysplex

Transaction Access Environment



- OTMA - Opens access to IMS transactions
- IMS Connect exit routines provide a mechanism to modify IMS Connect behavior

z/OS

API based
JAVA/Python
Cloud Applications

z/OS Connect

TCP PORT Connection Applications
IMS TM Resource Adapter
Applications

TCP/IP

IMS Connect

BMC AMI Energizer for IMS Connect

XCF

IMS Datastore

OTMA

Transaction Manager

Database Manager

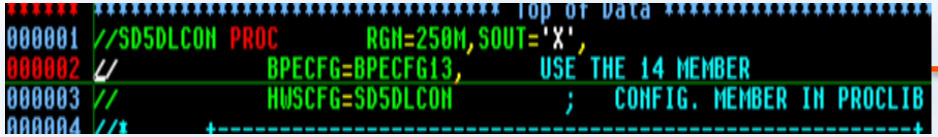
MPR

Database

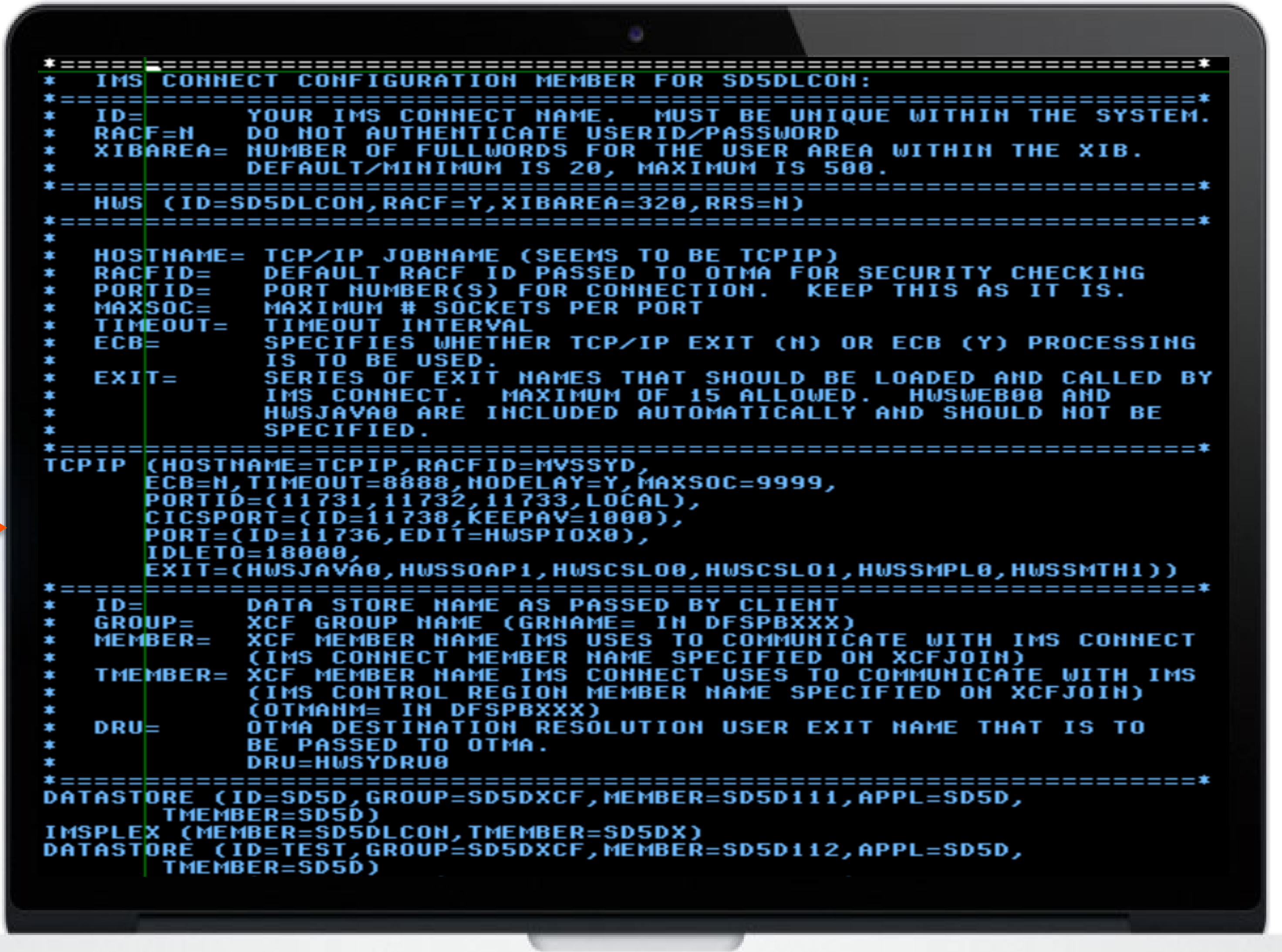
¨LLLL¨IRM¨LLZZDATA¨LLZZDATA¨LLZZDATA...¨00040000
¨LLLL¨IRM¨IRMEXTN1¨...¨IRMEXTNN¨LLZZDATA¨LLZZDATA...¨
00040000

¨BPE¨FULL OTMA HEADER¨LLZZDATA¨LLZZDATA¨0000¨---->
¨----MAX OF 32K---¨
¨BPE¨SMALL OTMA HEADER¨LLZZDATA¨LLZZDATA¨LLZZDATA¨0000¨
¨--------MAX OF 32K--------¨

Configuration HWSHWS00



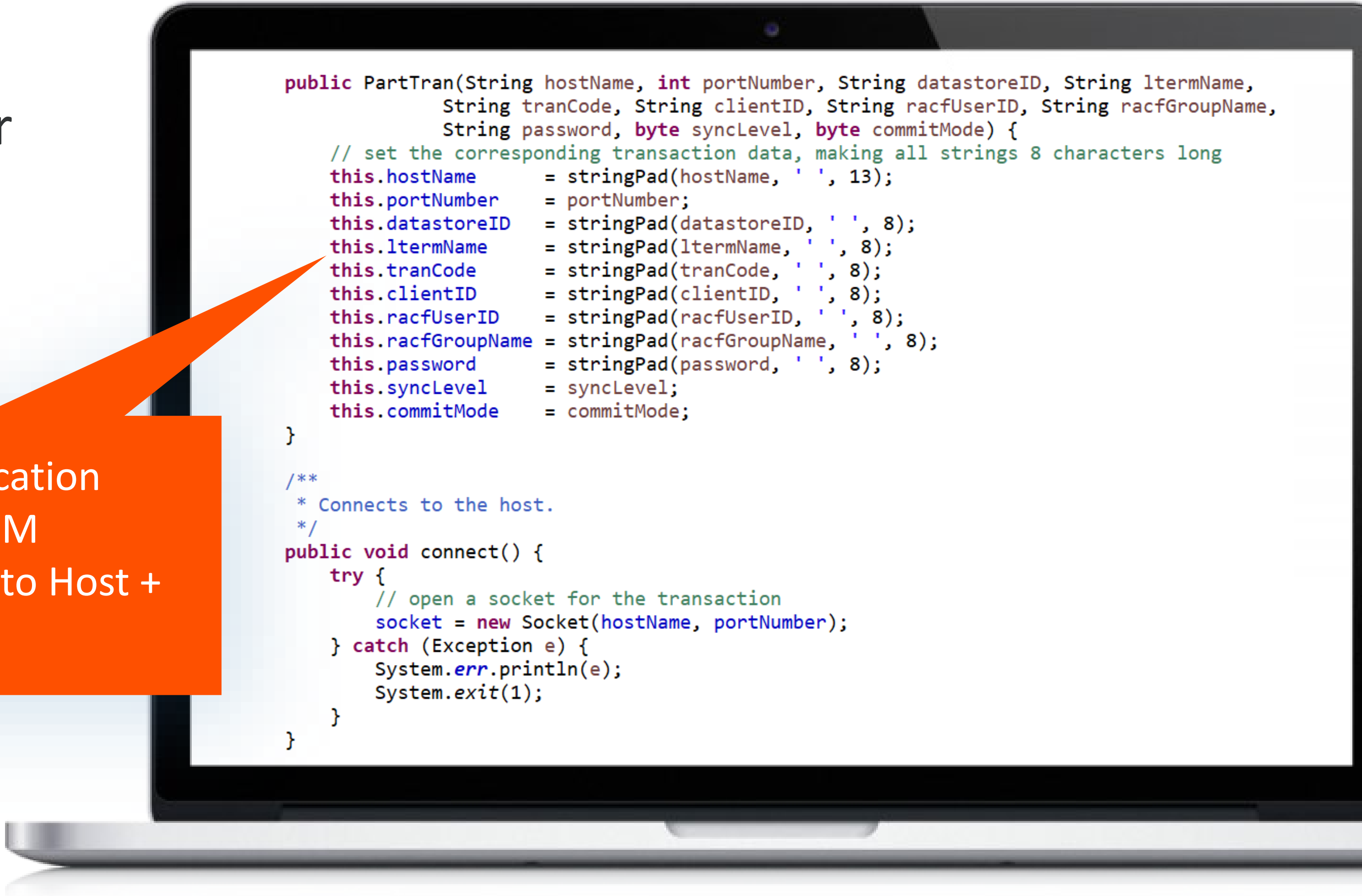
```
****** ***************************** Top of Data ******************************
//SD5DLCON PROC        RGN=250M,SOUT='X',
//              BPECFG=BPECFG13,        USE THE 14 MEMBER
//              HWSCFG=SD5DLCON            ;   CONFIG. MEMBER IN PROCLIB
//*        +-----------------------------------------------------+
```



```
*=====================================================================*
*   IMS CONNECT CONFIGURATION MEMBER FOR SD5DLCON:
*=====================================================================*
*   ID=        YOUR IMS CONNECT NAME.  MUST BE UNIQUE WITHIN THE SYSTEM.
*   RACF=N     DO NOT AUTHENTICATE USERID/PASSWORD
*   XIBAREA=   NUMBER OF FULLWORDS FOR THE USER AREA WITHIN THE XIB.
*              DEFAULT/MINIMUM IS 20, MAXIMUM IS 500.
*=====================================================================*
    HWS (ID=SD5DLCON,RACF=Y,XIBAREA=320,RRS=N)
*=====================================================================*
*
*   HOSTNAME=  TCP/IP JOBNAME (SEEMS TO BE TCPIP)
*   RACFID=    DEFAULT RACF ID PASSED TO OTMA FOR SECURITY CHECKING
*   PORTID=    PORT NUMBER(S) FOR CONNECTION.  KEEP THIS AS IT IS.
*   MAXSOC=    MAXIMUM # SOCKETS PER PORT
*   TIMEOUT=   TIMEOUT INTERVAL
*   ECB=       SPECIFIES WHETHER TCP/IP EXIT (N) OR ECB (Y) PROCESSING
*              IS TO BE USED.
*   EXIT=      SERIES OF EXIT NAMES THAT SHOULD BE LOADED AND CALLED BY
*              IMS CONNECT.  MAXIMUM OF 15 ALLOWED.  HWSWEB00 AND
*              HWSJAVA0 ARE INCLUDED AUTOMATICALLY AND SHOULD NOT BE
*              SPECIFIED.
*=====================================================================*
TCPIP  (HOSTNAME=TCPIP,RACFID=MVSSYD,
       ECB=N,TIMEOUT=8888,NODELAY=Y,MAXSOC=9999,
       PORTID=(11731,11732,11733,LOCAL),
       CICSPORT=(ID=11738,KEEPAV=1000),
       PORT=(ID=11736,EDIT=HWSPIOX0),
       IDLETO=18000,
       EXIT=(HWSJAVA0,HWSSOAP1,HWSCSL00,HWSCSL01,HWSSMPL0,HWSSMTH1))
*=====================================================================*
*   ID=        DATA STORE NAME AS PASSED BY CLIENT
*   GROUP=     XCF GROUP NAME (GRNAME= IN DFSPBXXX)
*   MEMBER=    XCF MEMBER NAME IMS USES TO COMMUNICATE WITH IMS CONNECT
*              (IMS CONNECT MEMBER NAME SPECIFIED ON XCFJOIN)
*   TMEMBER=   XCF MEMBER NAME IMS CONNECT USES TO COMMUNICATE WITH IMS
*              (IMS CONTROL REGION MEMBER NAME SPECIFIED ON XCFJOIN)
*              (OTMANM= IN DFSPBXXX)
*   DRU=       OTMA DESTINATION RESOLUTION USER EXIT NAME THAT IS TO
*              BE PASSED TO OTMA.
*              DRU=HWSYDRU0
*=====================================================================*
DATASTORE (ID=SD5D,GROUP=SD5DXCF,MEMBER=SD5D111,APPL=SD5D,
       TMEMBER=SD5D)
IMSPLEX (MEMBER=SD5DLCON,TMEMBER=SD5DX)
DATASTORE (ID=TEST,GROUP=SD5DXCF,MEMBER=SD5D112,APPL=SD5D,
       TMEMBER=SD5D)
```

Transaction Access Using JAVA Program

- IMS ships a Java library, imsudb.jar
- IMS TM Resource Adapter
- IRM using socket connections



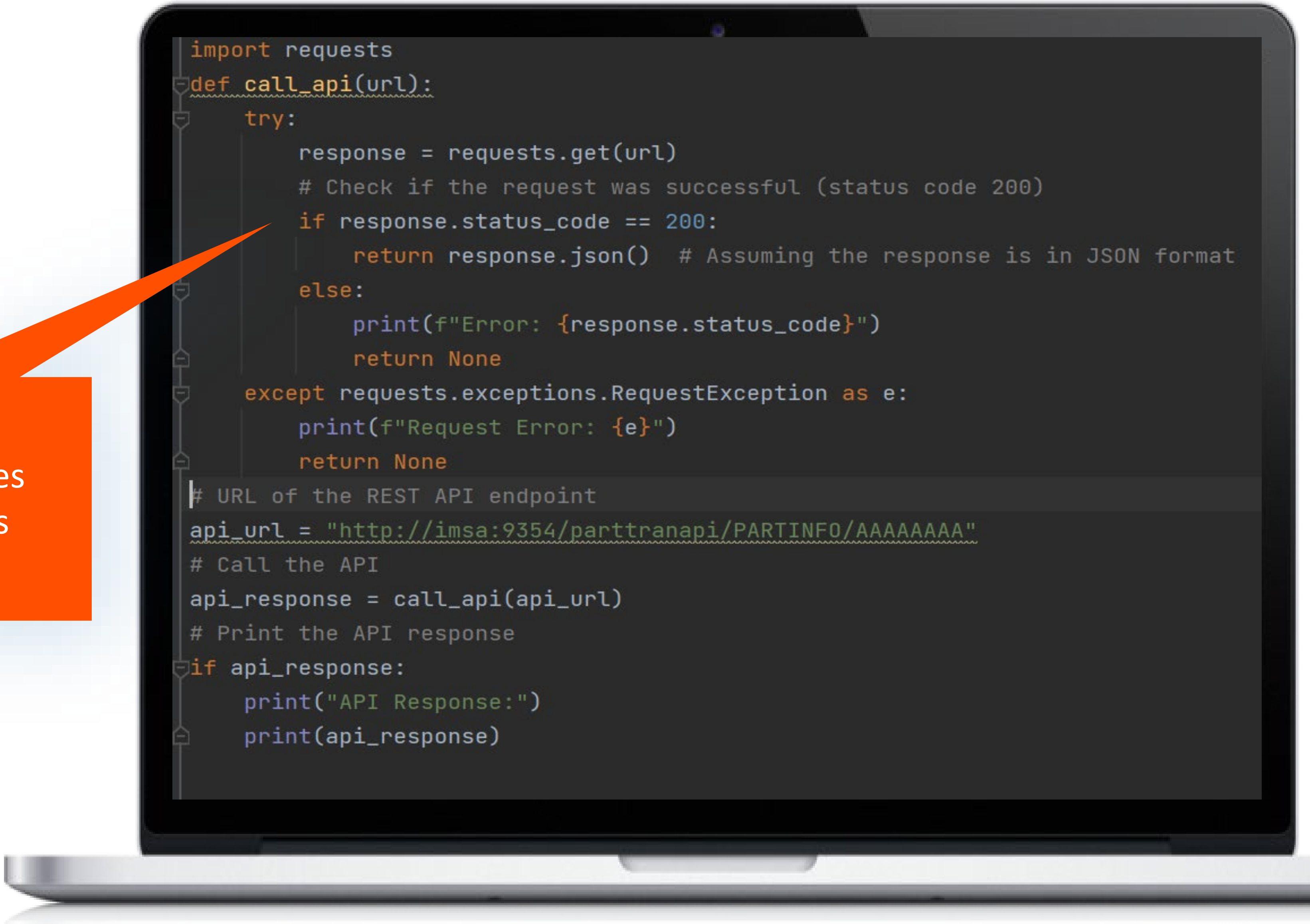
```java
public PartTran(String hostName, int portNumber, String datastoreID, String ltermName,
              String tranCode, String clientID, String racfUserID, String racfGroupName,
              String password, byte syncLevel, byte commitMode) {
    // set the corresponding transaction data, making all strings 8 characters long
    this.hostName       = stringPad(hostName, ' ', 13);
    this.portNumber     = portNumber;
    this.datastoreID    = stringPad(datastoreID, ' ', 8);
    this.ltermName      = stringPad(ltermName, ' ', 8);
    this.tranCode       = stringPad(tranCode, ' ', 8);
    this.clientID       = stringPad(clientID, ' ', 8);
    this.racfUserID     = stringPad(racfUserID, ' ', 8);
    this.racfGroupName  = stringPad(racfGroupName, ' ', 8);
    this.password       = stringPad(password, ' ', 8);
    this.syncLevel      = syncLevel;
    this.commitMode     = commitMode;
}

/**
 * Connects to the host.
 */
public void connect() {
    try {
        // open a socket for the transaction
        socket = new Socket(hostName, portNumber);
    } catch (Exception e) {
        System.err.println(e);
        System.exit(1);
    }
}
```

JAVA based application building LLZZ + IRM message to send to Host + Port over TCP/IP

Transaction Access Using REST API and Python

REST API created to access existing IMS transaction

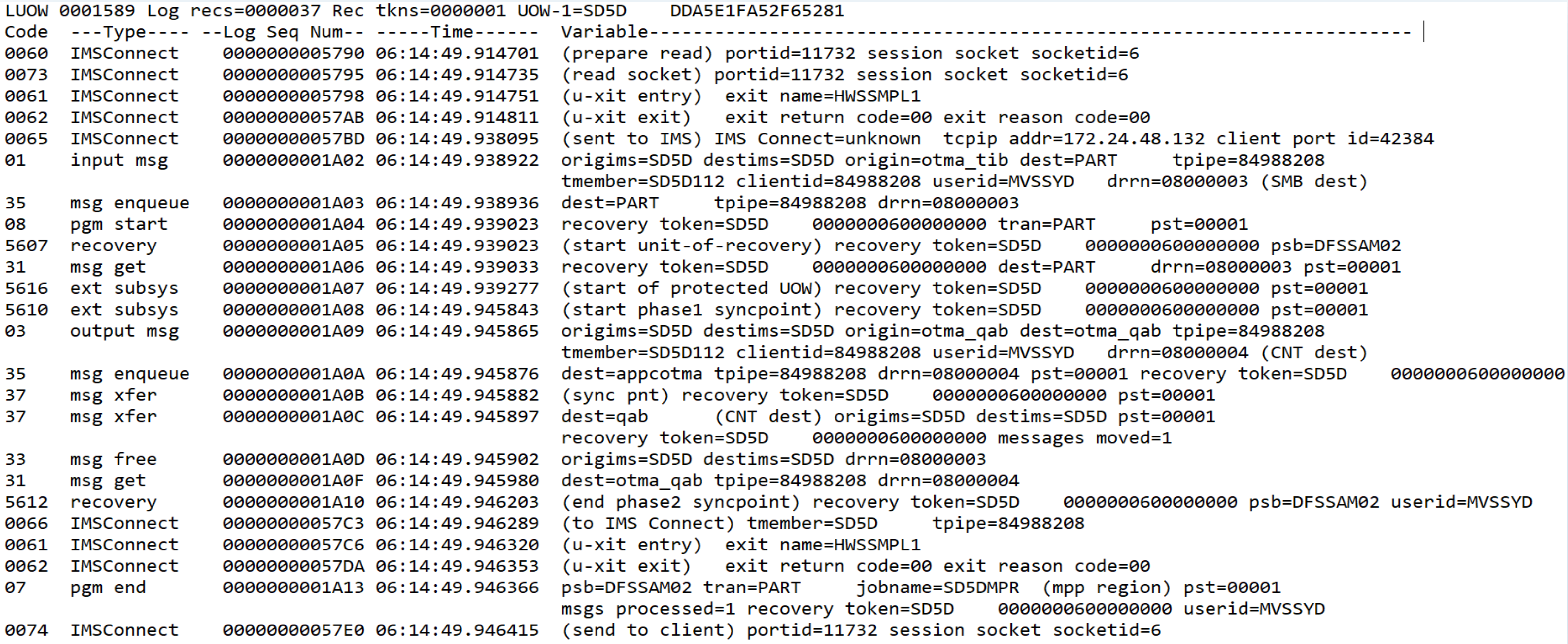
Python based application executes REST API and prints response



```
import requests
def call_api(url):
    try:
        response = requests.get(url)
        # Check if the request was successful (status code 200)
        if response.status_code == 200:
            return response.json()  # Assuming the response is in JSON format
        else:
            print(f"Error: {response.status_code}")
            return None
    except requests.exceptions.RequestException as e:
        print(f"Request Error: {e}")
        return None
# URL of the REST API endpoint
api_url = "http://imsa:9354/parttranapi/PARTINFO/AAAAAAAA"
# Call the API
api_response = call_api(api_url)
# Print the API response
if api_response:
    print("API Response:")
    print(api_response)
```

Problem Diagnosis and Message Flow

Snap from BMC AMI LOG Analyzer SUMMARY=ALL LUOWDETAIL=ALL report

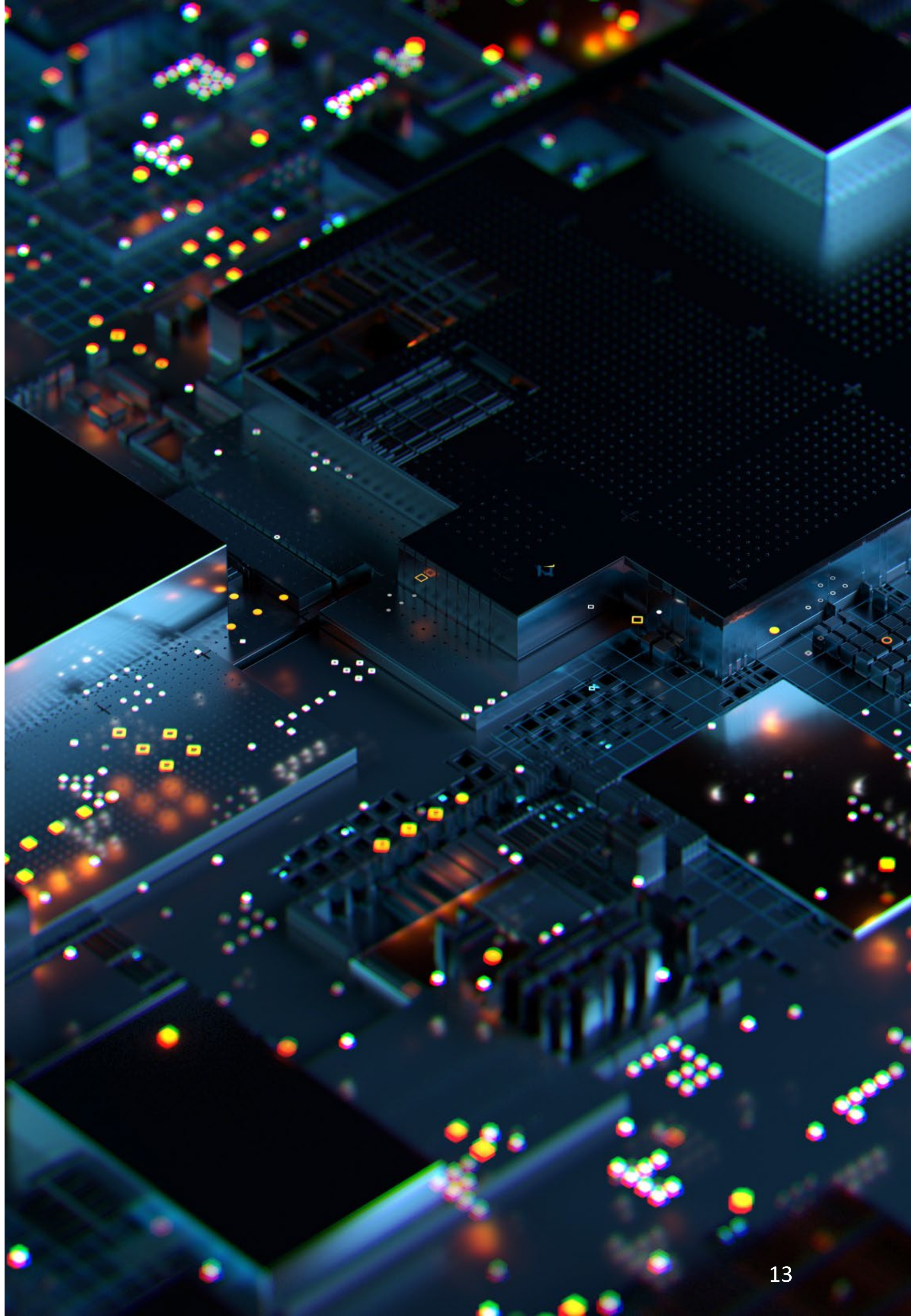


```
LUOW 0001589 Log recs=0000037 Rec tkns=0000001 UOW-1=SD5D    DDA5E1FA52F65281
Code  ---Type---- --Log Seq Num-- -----Time------  Variable----------------------------------------------------------------------
0060  IMSConnect    0000000005790 06:14:49.914701  (prepare read) portid=11732 session socket socketid=6
0073  IMSConnect    0000000005795 06:14:49.914735  (read socket) portid=11732 session socket socketid=6
0061  IMSConnect    0000000005798 06:14:49.914751  (u-xit entry)  exit name=HWSSMPL1
0062  IMSConnect    00000000057AB 06:14:49.914811  (u-xit exit)   exit return code=00 exit reason code=00
0065  IMSConnect    00000000057BD 06:14:49.938095  (sent to IMS) IMS Connect=unknown  tcpip addr=172.24.48.132 client port id=42384
01    input msg     0000000001A02 06:14:49.938922  origims=SD5D destims=SD5D origin=otma_tib dest=PART     tpipe=84988208
                                                   tmember=SD5D112 clientid=84988208 userid=MVSSYD   drrn=08000003 (SMB dest)
35    msg enqueue   0000000001A03 06:14:49.938936  dest=PART     tpipe=84988208 drrn=08000003
08    pgm start     0000000001A04 06:14:49.939023  recovery token=SD5D    0000000600000000 tran=PART     pst=00001
5607  recovery      0000000001A05 06:14:49.939023  (start unit-of-recovery) recovery token=SD5D    0000000600000000 psb=DFSSAM02
31    msg get       0000000001A06 06:14:49.939033  recovery token=SD5D    0000000600000000 dest=PART     drrn=08000003 pst=00001
5616  ext subsys    0000000001A07 06:14:49.939277  (start of protected UOW) recovery token=SD5D    0000000600000000 pst=00001
5610  ext subsys    0000000001A08 06:14:49.945843  (start phase1 syncpoint) recovery token=SD5D    0000000600000000 pst=00001
03    output msg    0000000001A09 06:14:49.945865  origims=SD5D destims=SD5D origin=otma_qab dest=otma_qab tpipe=84988208
                                                   tmember=SD5D112 clientid=84988208 userid=MVSSYD   drrn=08000004 (CNT dest)
35    msg enqueue   0000000001A0A 06:14:49.945876  dest=appcotma tpipe=84988208 drrn=08000004 pst=00001 recovery token=SD5D    0000000600000000
37    msg xfer      0000000001A0B 06:14:49.945882  (sync pnt) recovery token=SD5D    0000000600000000 pst=00001
37    msg xfer      0000000001A0C 06:14:49.945897  dest=qab      (CNT dest) origims=SD5D destims=SD5D pst=00001
                                                   recovery token=SD5D    0000000600000000 messages moved=1
33    msg free      0000000001A0D 06:14:49.945902  origims=SD5D destims=SD5D drrn=08000003
31    msg get       0000000001A0F 06:14:49.945980  dest=otma_qab tpipe=84988208 drrn=08000004
5612  recovery      0000000001A10 06:14:49.946203  (end phase2 syncpoint) recovery token=SD5D    0000000600000000 psb=DFSSAM02 userid=MVSSYD
0066  IMSConnect    00000000057C3 06:14:49.946289  (to IMS Connect) tmember=SD5D     tpipe=84988208
0061  IMSConnect    00000000057C6 06:14:49.946320  (u-xit entry)  exit name=HWSSMPL1
0062  IMSConnect    00000000057DA 06:14:49.946353  (u-xit exit)   exit return code=00 exit reason code=00
07    pgm end       0000000001A13 06:14:49.946366  psb=DFSSAM02 tran=PART     jobname=SD5DMPR  (mpp region) pst=00001
                                                   msgs processed=1 recovery token=SD5D    0000000600000000 userid=MVSSYD
0074  IMSConnect    00000000057E0 06:14:49.946415  (send to client) portid=11732 session socket socketid=6
```

Open Data Access to IMS Databases

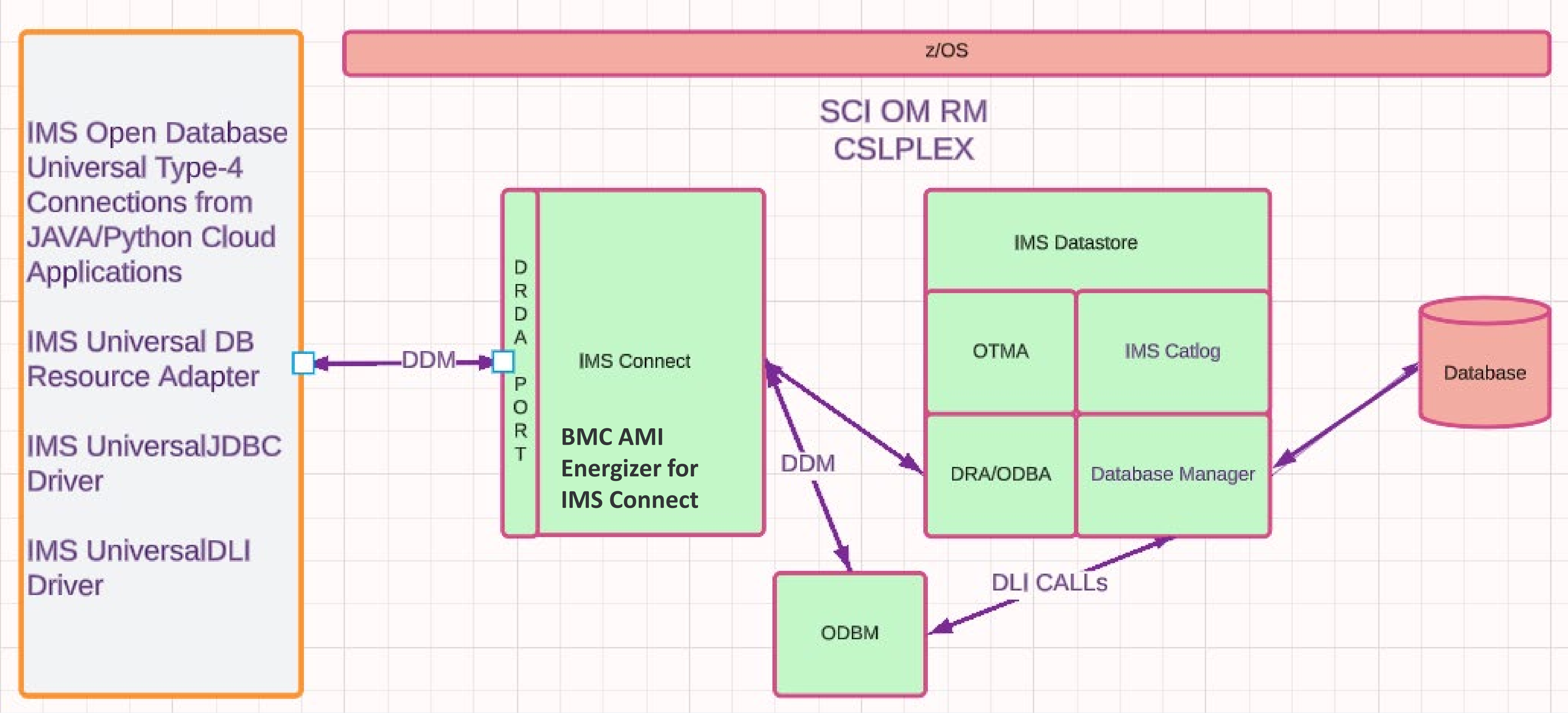
Data Access

- Access to online IMS databases from anywhere in the enterprise
- Open Stack application developers can use relational interfaces without changing the IMS applications and database
- Distributed Data Management (DDM)
- ODBM
  - ODBM receives database connection requests from IMS Connect as DDM commands
  - Translates incoming database requests from the DDM protocol into DLI calls expected by IMS
  - Translates responses to the client into the DDM protocol



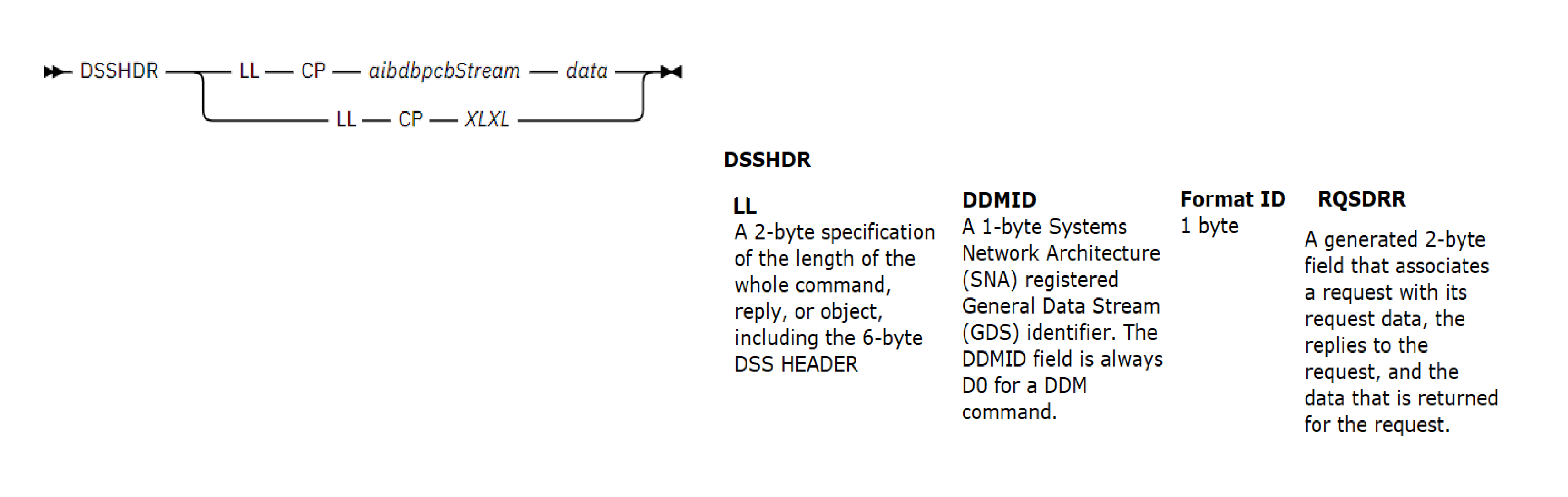
Data Access Environment

Distributed Relational Database Architecture (DRDA)



Message Format

DDM commands, reply messages, and chained objects begin with a 6-byte data stream structure header (DSSHDR), followed in order by a 2-byte binary integer that defines the length of the term (LL), and a 2-byte hexadecimal codepoint (CP) that uniquely identifies the DDM term and data.



DSSHDR

LL
A 2-byte specification of the length of the whole command, reply, or object, including the 6-byte DSS HEADER

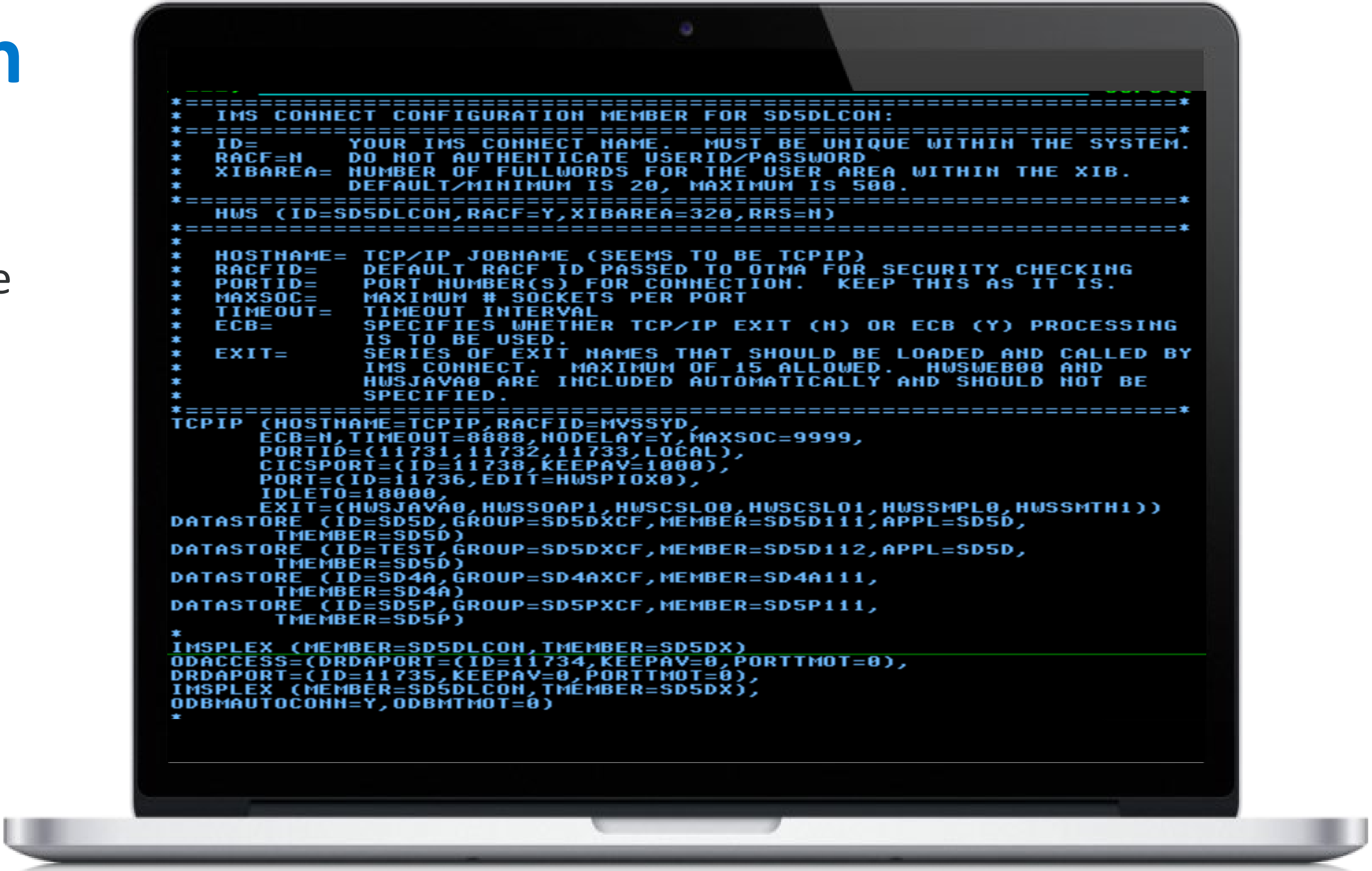
DDMID
A 1-byte Systems Network Architecture (SNA) registered General Data Stream (GDS) identifier. The DDMID field is always D0 for a DDM command.

Format ID
1 byte

RQSDRR
A generated 2-byte field that associates a request with its request data, the replies to the request, and the data that is returned for the request.

Data Access Configuration

- IMS Connect
  ODBM address space
- CSL PLEX
- IMS Catalog

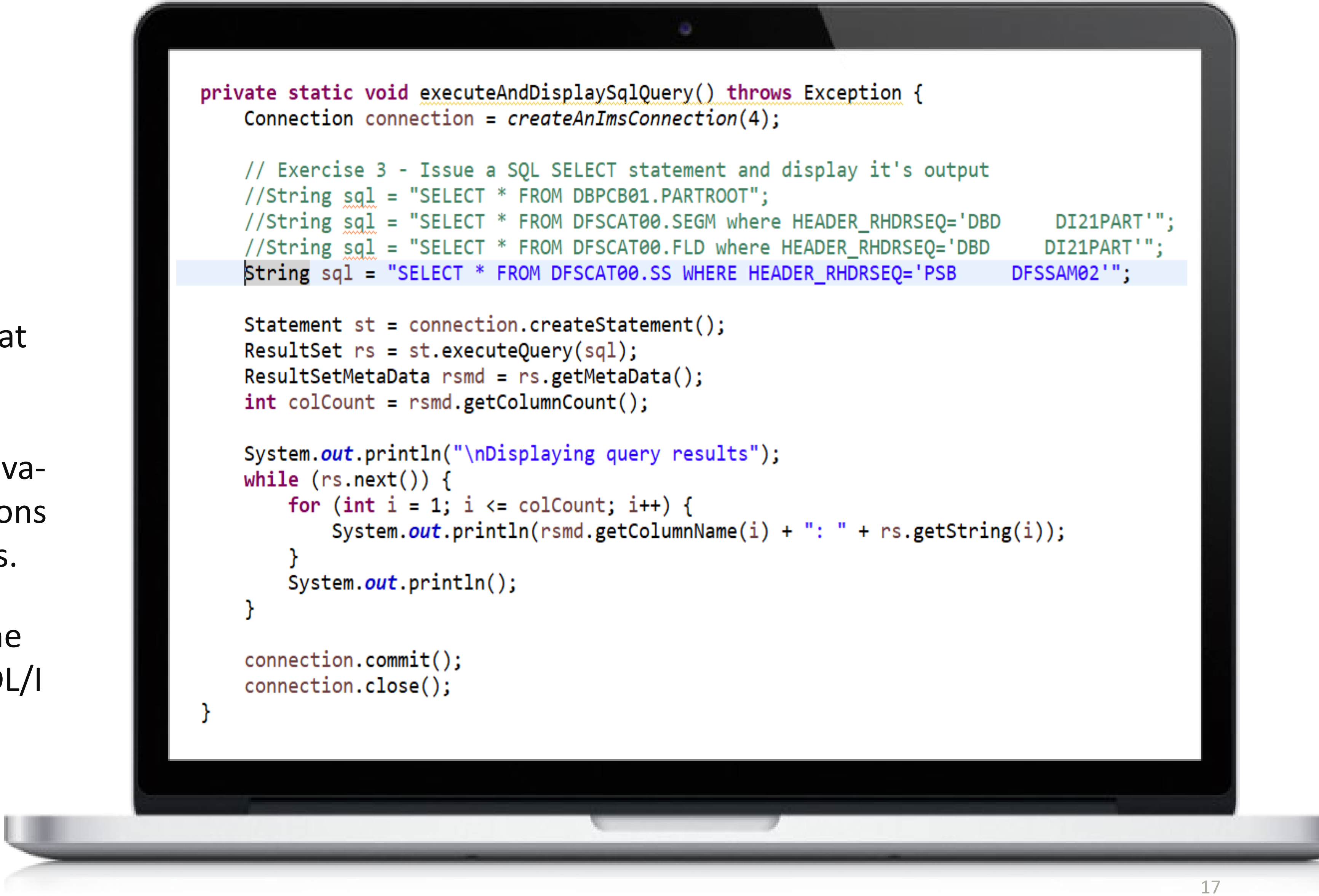


```
*=====================================================================*
*   IMS CONNECT CONFIGURATION MEMBER FOR SD5DLCON:
*=====================================================================*
*   ID=      YOUR IMS CONNECT NAME.  MUST BE UNIQUE WITHIN THE SYSTEM.
*   RACF=N   DO NOT AUTHENTICATE USERID/PASSWORD
*   XIBAREA= NUMBER OF FULLWORDS FOR THE USER AREA WITHIN THE XIB.
*            DEFAULT/MINIMUM IS 20, MAXIMUM IS 500.
*=====================================================================*
    HWS (ID=SD5DLCON,RACF=Y,XIBAREA=320,RRS=N)
*=====================================================================*
*
*   HOSTNAME= TCP/IP JOBNAME (SEEMS TO BE TCPIP)
*   RACFID=   DEFAULT RACF ID PASSED TO OTMA FOR SECURITY CHECKING
*   PORTID=   PORT NUMBER(S) FOR CONNECTION.  KEEP THIS AS IT IS.
*   MAXSOC=   MAXIMUM # SOCKETS PER PORT
*   TIMEOUT=  TIMEOUT INTERVAL
*   ECB=      SPECIFIES WHETHER TCP/IP EXIT (N) OR ECB (Y) PROCESSING
*             IS TO BE USED.
*   EXIT=     SERIES OF EXIT NAMES THAT SHOULD BE LOADED AND CALLED BY
*             IMS CONNECT.  MAXIMUM OF 15 ALLOWED.  HWSWEB00 AND
*             HWSJAVA0 ARE INCLUDED AUTOMATICALLY AND SHOULD NOT BE
*             SPECIFIED.
*=====================================================================*
TCPIP (HOSTNAME=TCPIP,RACFID=MVSSYD,
      ECB=N,TIMEOUT=8888,NODELAY=Y,MAXSOC=9999,
      PORTID=(11731,11732,11733,LOCAL),
      CICSPORT=(ID=11738,KEEPAV=1000),
      PORT=(ID=11736,EDIT=HWSPIOX0),
      IDLETO=18000,
      EXIT=(HWSJAVA0,HWSSOAP1,HWSCSL00,HWSCSL01,HWSSMPL0,HWSSMTH1))
DATASTORE (ID=SD5D,GROUP=SD5DXCF,MEMBER=SD5D111,APPL=SD5D,
       TMEMBER=SD5D)
DATASTORE (ID=TEST,GROUP=SD5DXCF,MEMBER=SD5D112,APPL=SD5D,
       TMEMBER=SD5D)
DATASTORE (ID=SD4A,GROUP=SD4AXCF,MEMBER=SD4A111,
       TMEMBER=SD4A)
DATASTORE (ID=SD5P,GROUP=SD5PXCF,MEMBER=SD5P111,
       TMEMBER=SD5P)
*
IMSPLEX (MEMBER=SD5DLCON,TMEMBER=SD5DX)
ODACCESS=(DRDAPORT=(ID=11734,KEEPAV=0,PORTTMOT=0),
DRDAPORT=(ID=11735,KEEPAV=0,PORTTMOT=0),
IMSPLEX (MEMBER=SD5DLCON,TMEMBER=SD5DX),
ODBMAUTOCONN=Y,ODBMTMOT=0)
*
```

Data Access Using JDBC Type-4 Connection

java.sql.* is a package in the Java Standard Edition (Java SE) library that provides classes and interfaces for database access using JDBC (Java Database Connectivity). JDBC is a Java-based API that allows Java applications to interact with relational databases.

Access IMS data using imsudb.jar the JDBC interface interprets SQL into DL/I requests

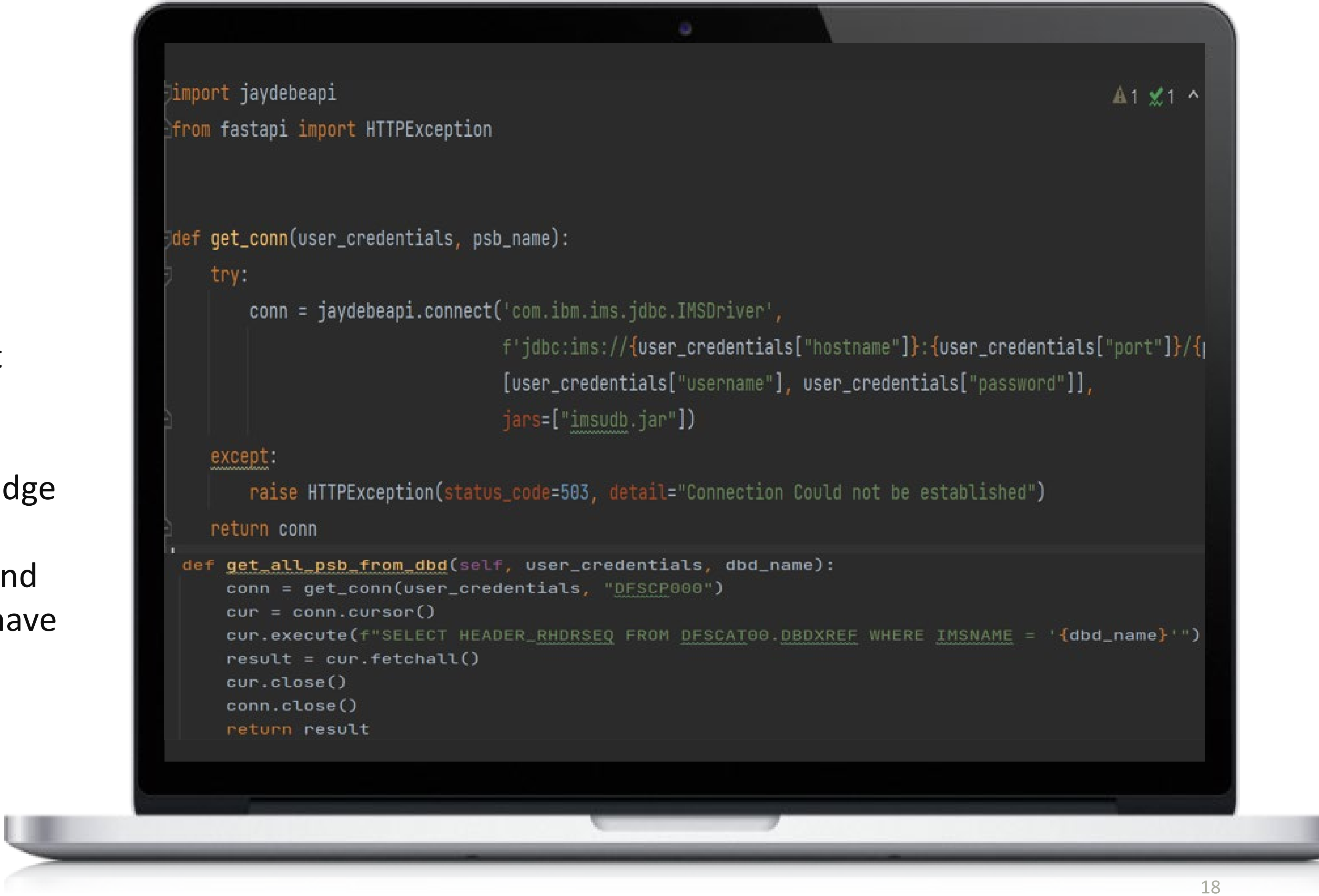


```java
private static void executeAndDisplaySqlQuery() throws Exception {
    Connection connection = createAnImsConnection(4);

    // Exercise 3 - Issue a SQL SELECT statement and display it's output
    //String sql = "SELECT * FROM DBPCB01.PARTROOT";
    //String sql = "SELECT * FROM DFSCAT00.SEGM where HEADER_RHDRSEQ='DBD     DI21PART'";
    //String sql = "SELECT * FROM DFSCAT00.FLD where HEADER_RHDRSEQ='DBD     DI21PART'";
    String sql = "SELECT * FROM DFSCAT00.SS WHERE HEADER_RHDRSEQ='PSB     DFSSAM02'";

    Statement st = connection.createStatement();
    ResultSet rs = st.executeQuery(sql);
    ResultSetMetaData rsmd = rs.getMetaData();
    int colCount = rsmd.getColumnCount();

    System.out.println("\nDisplaying query results");
    while (rs.next()) {
        for (int i = 1; i <= colCount; i++) {
            System.out.println(rsmd.getColumnName(i) + ": " + rs.getString(i));
        }
        System.out.println();
    }

    connection.commit();
    connection.close();
}
```

Data Access Using Python

JDBC connection using python jaydebeapi

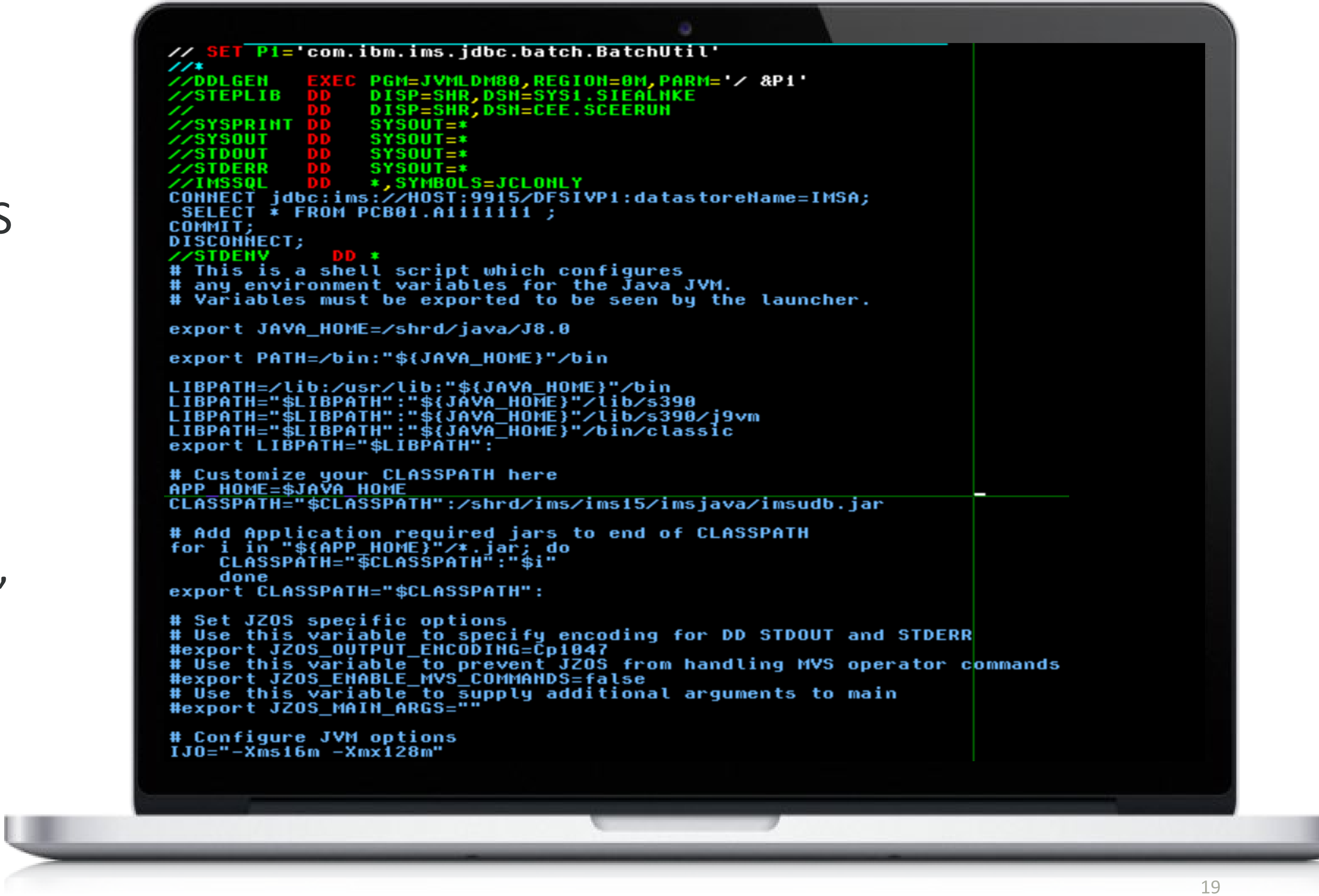
jaydebeapi is a Python module that allows Python programs to interact with Java JDBC (Java Database Connectivity) drivers. It acts as a bridge between Python and Java, enabling Python applications to connect to and communicate with databases that have JDBC drivers.



```
import jaydebeapi
from fastapi import HTTPException


def get_conn(user_credentials, psb_name):
    try:
        conn = jaydebeapi.connect('com.ibm.ims.jdbc.IMSDriver',
                                  f'jdbc:ims://{user_credentials["hostname"]}:{user_credentials["port"]}/{
                                  [user_credentials["username"], user_credentials["password"]],
                                  jars=["imsudb.jar"])
    except:
        raise HTTPException(status_code=503, detail="Connection Could not be established")
    return conn
 def get_all_psb_from_dbd(self, user_credentials, dbd_name):
     conn = get_conn(user_credentials, "DFSCP000")
     cur = conn.cursor()
     cur.execute(f"SELECT HEADER_RHDRSEQ FROM DFSCAT00.DBDXREF WHERE IMSNAME = '{dbd_name}'")
     result = cur.fetchall()
     cur.close()
     conn.close()
     return result
```

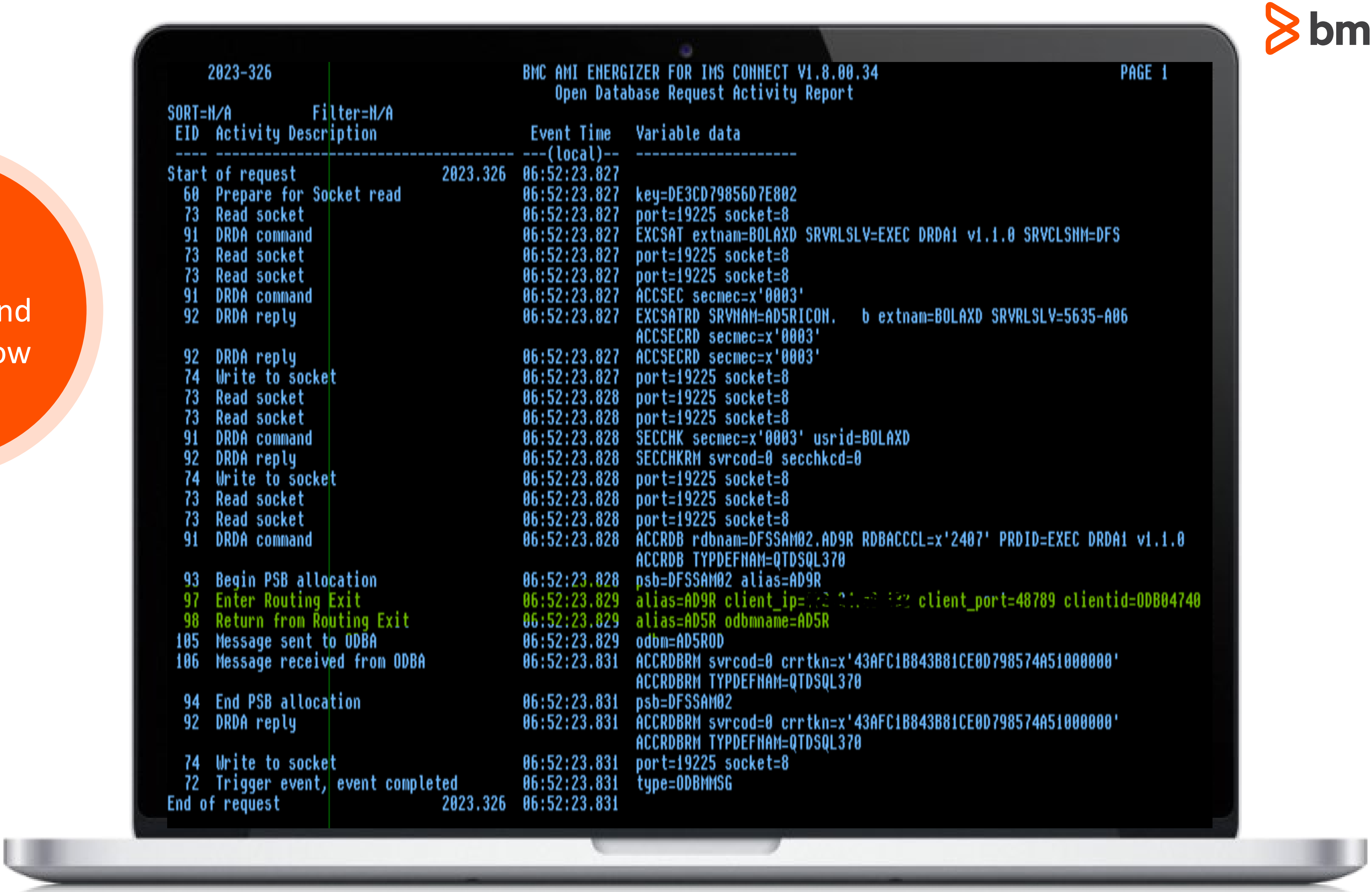
JZOS Batch Launcher

- JVMLDM80 is the name of the 31bit Java 8.0 JZOS Batch Launcher. If you want to use the 64bit Java 8.0 JZOS Batch Launcher you need to specify JVMLDM86
- Ensure that JAVA_HOME, PATH and LIBPATH settings point to corresponding Java SDK



```
// SET P1='com.ibm.ims.jdbc.batch.BatchUtil'
//*
//DDLGEN    EXEC PGM=JVMLDM80,REGION=0M,PARM='/ &P1'
//STEPLIB   DD   DISP=SHR,DSN=SYS1.SIEALNKE
//          DD   DISP=SHR,DSN=CEE.SCEERUN
//SYSPRINT  DD   SYSOUT=*
//SYSOUT    DD   SYSOUT=*
//STDOUT    DD   SYSOUT=*
//STDERR    DD   SYSOUT=*
//IMSSQL    DD   *,SYMBOLS=JCLONLY
CONNECT jdbc:ims://HOST:9915/DFSIVP1:datastoreName=IMSA;
 SELECT * FROM PCB01.A1111111 ;
COMMIT;
DISCONNECT;
//STDENV      DD *
# This is a shell script which configures
# any environment variables for the Java JVM.
# Variables must be exported to be seen by the launcher.

export JAVA_HOME=/shrd/java/J8.0

export PATH=/bin:"${JAVA_HOME}"/bin

LIBPATH=/lib:/usr/lib:"${JAVA_HOME}"/bin
LIBPATH="$LIBPATH":"${JAVA_HOME}"/lib/s390
LIBPATH="$LIBPATH":"${JAVA_HOME}"/lib/s390/j9vm
LIBPATH="$LIBPATH":"${JAVA_HOME}"/bin/classic
export LIBPATH="$LIBPATH":

# Customize your CLASSPATH here
APP_HOME=$JAVA_HOME
CLASSPATH="$CLASSPATH":/shrd/ims/ims15/imsjava/imsudb.jar

# Add Application required jars to end of CLASSPATH
for i in "${APP_HOME}"/*.jar; do
    CLASSPATH="$CLASSPATH":"$i"
    done
export CLASSPATH="$CLASSPATH":

# Set JZOS specific options
# Use this variable to specify encoding for DD STDOUT and STDERR
#export JZOS_OUTPUT_ENCODING=Cp1047
# Use this variable to prevent JZOS from handling MVS operator commands
#export JZOS_ENABLE_MVS_COMMANDS=false
# Use this variable to supply additional arguments to main
#export JZOS_MAIN_ARGS=""

# Configure JVM options
IJO="-Xms16m -Xmx128m"
```

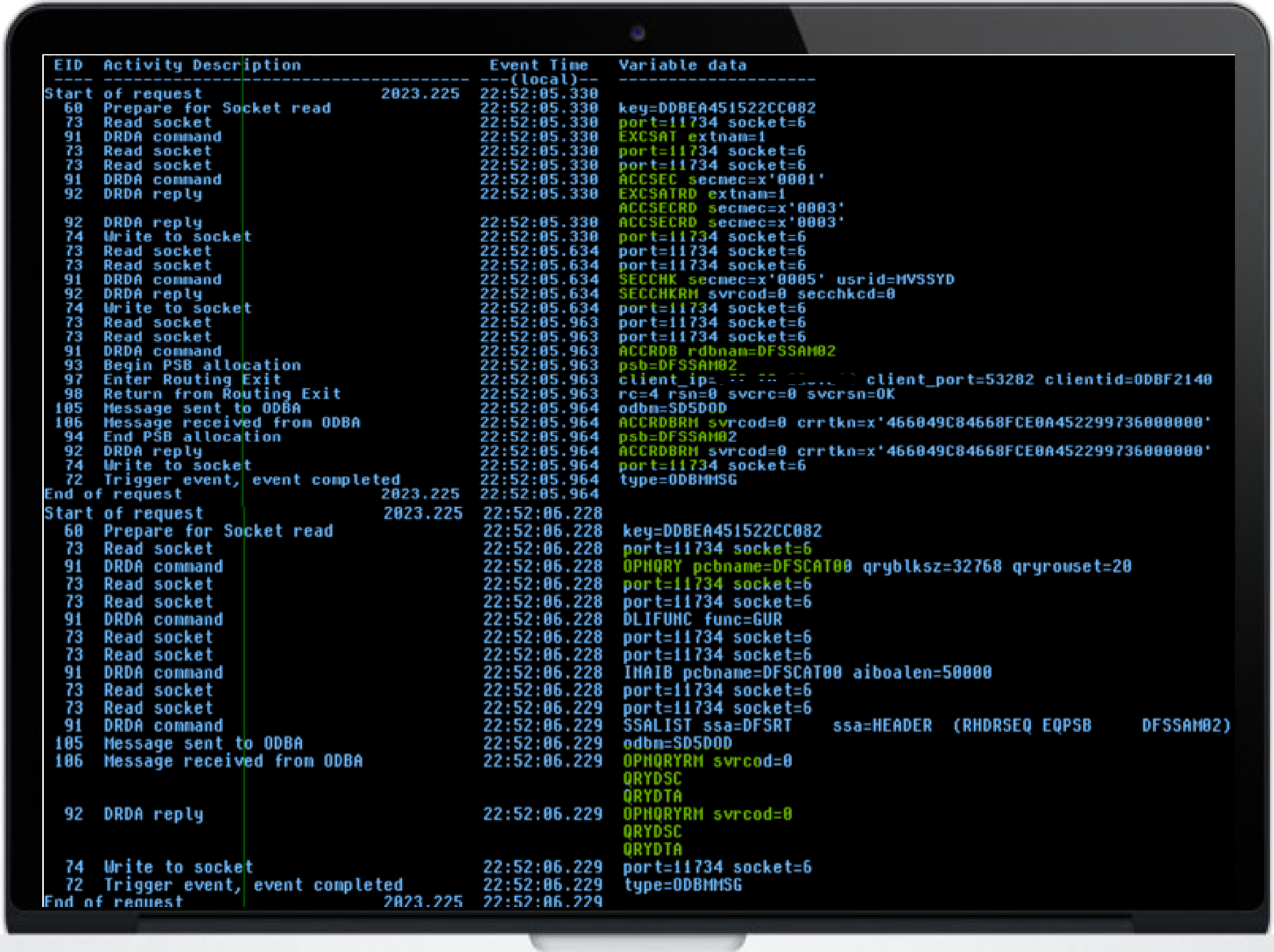
Problem Diagnosis and Message flow



```
     2023-326                               BMC AMI ENERGIZER FOR IMS CONNECT V1.8.00.34                              PAGE 1
                                                Open Database Request Activity Report
SORT=N/A          Filter=N/A
 EID  Activity Description                   Event Time   Variable data
 ---- ------------------------------------- ---(local)--  --------------------
Start of request                  2023.326  06:52:23.827
  60  Prepare for Socket read               06:52:23.827  key=DE3CD79856D7E802
  73  Read socket                           06:52:23.827  port=19225 socket=8
  91  DRDA command                          06:52:23.827  EXCSAT extnam=BOLAXD SRVRLSLV=EXEC DRDA1 v1.1.0 SRVCLSNM=DFS
  73  Read socket                           06:52:23.827  port=19225 socket=8
  73  Read socket                           06:52:23.827  port=19225 socket=8
  91  DRDA command                          06:52:23.827  ACCSEC secmec=x'0003'
  92  DRDA reply                            06:52:23.827  EXCSATRD SRVNAM=AD5RICON.   b extnam=BOLAXD SRVRLSLV=5635-A06
                                                          ACCSECRD secmec=x'0003'
  92  DRDA reply                            06:52:23.827  ACCSECRD secmec=x'0003'
  74  Write to socket                       06:52:23.827  port=19225 socket=8
  73  Read socket                           06:52:23.828  port=19225 socket=8
  73  Read socket                           06:52:23.828  port=19225 socket=8
  91  DRDA command                          06:52:23.828  SECCHK secmec=x'0003' usrid=BOLAXD
  92  DRDA reply                            06:52:23.828  SECCHKRM svrcod=0 secchkcd=0
  74  Write to socket                       06:52:23.828  port=19225 socket=8
  73  Read socket                           06:52:23.828  port=19225 socket=8
  73  Read socket                           06:52:23.828  port=19225 socket=8
  91  DRDA command                          06:52:23.828  ACCRDB rdbnam=DFSSAM02.AD9R RDBACCCL=x'2407' PRDID=EXEC DRDA1 v1.1.0
                                                          ACCRDB TYPDEFNAM=QTDSQL370
  93  Begin PSB allocation                  06:52:23.828  psb=DFSSAM02 alias=AD9R
  97  Enter Routing Exit                    06:52:23.829  alias=AD9R client_ip=[redacted] client_port=48789 clientid=ODB04740
  98  Return from Routing Exit              06:52:23.829  alias=AD5R odbmname=AD5R
 105  Message sent to ODBA                  06:52:23.829  odbm=AD5ROD
 106  Message received from ODBA            06:52:23.831  ACCRDBRM svrcod=0 crrtkn=x'43AFC1B843B81CE0D798574A51000000'
                                                          ACCRDBRM TYPDEFNAM=QTDSQL370
  94  End PSB allocation                    06:52:23.831  psb=DFSSAM02
  92  DRDA reply                            06:52:23.831  ACCRDBRM svrcod=0 crrtkn=x'43AFC1B843B81CE0D798574A51000000'
                                                          ACCRDBRM TYPDEFNAM=QTDSQL370
  74  Write to socket                       06:52:23.831  port=19225 socket=8
  72  Trigger event, event completed        06:52:23.831  type=ODBMMSG
End of request                    2023.326  06:52:23.831
```

bmc

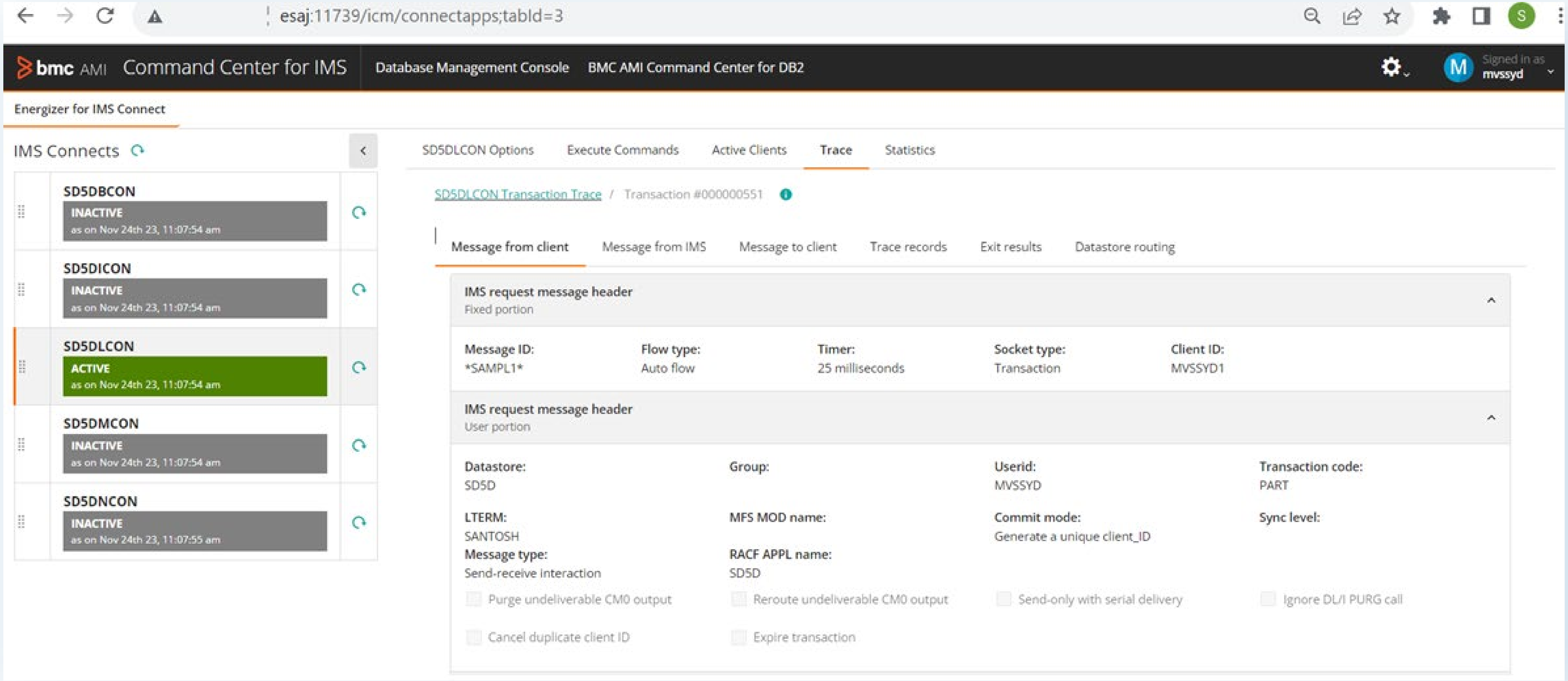
Problem Diagnosis and Message flow



```
 EID  Activity Description                            Event Time     Variable data
 ---- -------------------------------------------- ---(local)--   ---------------------
Start of request                          2023.225  22:52:05.330
  60  Prepare for Socket read                       22:52:05.330   key=DDBEA451522CC082
  73  Read socket                                   22:52:05.330   port=11734 socket=6
  91  DRDA command                                  22:52:05.330   EXCSAT extnam=1
  73  Read socket                                   22:52:05.330   port=11734 socket=6
  73  Read socket                                   22:52:05.330   port=11734 socket=6
  91  DRDA command                                  22:52:05.330   ACCSEC secmec=x'0001'
  92  DRDA reply                                    22:52:05.330   EXCSATRD extnam=1
                                                                   ACCSECRD secmec=x'0003'
  92  DRDA reply                                    22:52:05.330   ACCSECRD secmec=x'0003'
  74  Write to socket                               22:52:05.330   port=11734 socket=6
  73  Read socket                                   22:52:05.634   port=11734 socket=6
  73  Read socket                                   22:52:05.634   port=11734 socket=6
  91  DRDA command                                  22:52:05.634   SECCHK secmec=x'0005' usrid=MVSSYD
  92  DRDA reply                                    22:52:05.634   SECCHKRM svrcod=0 secchkcd=0
  74  Write to socket                               22:52:05.634   port=11734 socket=6
  73  Read socket                                   22:52:05.963   port=11734 socket=6
  73  Read socket                                   22:52:05.963   port=11734 socket=6
  91  DRDA command                                  22:52:05.963   ACCRDB rdbnam=DFSSAM02
  93  Begin PSB allocation                          22:52:05.963   psb=DFSSAM02
  97  Enter Routing Exit                            22:52:05.963   client_ip=[redacted] client_port=53282 clientid=ODBF2140
  98  Return from Routing Exit                      22:52:05.963   rc=4 rsn=0 svcrc=0 svcrsn=OK
 105  Message sent to ODBA                          22:52:05.964   odbm=SD5DOD
 106  Message received from ODBA                    22:52:05.964   ACCRDBRM svrcod=0 crrtkn=x'466049C84668FCE0A452299736000000'
  94  End PSB allocation                            22:52:05.964   psb=DFSSAM02
  92  DRDA reply                                    22:52:05.964   ACCRDBRM svrcod=0 crrtkn=x'466049C84668FCE0A452299736000000'
  74  Write to socket                               22:52:05.964   port=11734 socket=6
  72  Trigger event, event completed                22:52:05.964   type=ODBMMSG
End of request                            2023.225  22:52:05.964
Start of request                          2023.225  22:52:06.228
  60  Prepare for Socket read                       22:52:06.228   key=DDBEA451522CC082
  73  Read socket                                   22:52:06.228   port=11734 socket=6
  91  DRDA command                                  22:52:06.228   OPNQRY pcbname=DFSCAT00 qryblksz=32768 qryrowset=20
  73  Read socket                                   22:52:06.228   port=11734 socket=6
  73  Read socket                                   22:52:06.228   port=11734 socket=6
  91  DRDA command                                  22:52:06.228   DLIFUNC func=GUR
  73  Read socket                                   22:52:06.228   port=11734 socket=6
  73  Read socket                                   22:52:06.228   port=11734 socket=6
  91  DRDA command                                  22:52:06.228   INAIB pcbname=DFSCAT00 aiboalen=50000
  73  Read socket                                   22:52:06.228   port=11734 socket=6
  73  Read socket                                   22:52:06.229   port=11734 socket=6
  91  DRDA command                                  22:52:06.229   SSALIST ssa=DFSRT    ssa=HEADER  (RHDRSEQ EQPSB     DFSSAM02)
 105  Message sent to ODBA                          22:52:06.229   odbm=SD5DOD
 106  Message received from ODBA                    22:52:06.229   OPNQRYRM svrcod=0
                                                                   QRYDSC
                                                                   QRYDTA
  92  DRDA reply                                    22:52:06.229   OPNQRYRM svrcod=0
                                                                   QRYDSC
                                                                   QRYDTA
  74  Write to socket                               22:52:06.229   port=11734 socket=6
  72  Trigger event, event completed                22:52:06.229   type=ODBMMSG
End of request                            2023.225  22:52:06.229
```

BMC AMI Energizer for IMS Connect Traces

Traces in BMC AMI Command Center for IMS



SD5DBCON
INACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DICON
INACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DLCON
ACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DMCON
INACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DNCON
INACTIVE
as on Nov 24th 23, 11:07:55 am

SD5DLCON Transaction Trace / Transaction #000000551

IMS request message header
Fixed portion

Message ID:	Flow type:	Timer:	Socket type:	Client ID:
SAMPL1	Auto flow	25 milliseconds	Transaction	MVSSYD1

IMS request message header
User portion

Datastore:	Group:	Userid:	Transaction code:
SD5D		MVSSYD	PART
LTERM:	**MFS MOD name:**	**Commit mode:**	**Sync level:**
SANTOSH		Generate a unique client_ID	
Message type:	**RACF APPL name:**		
Send-receive interaction	SD5D		

☐ Purge undeliverable CM0 output ☐ Reroute undeliverable CM0 output ☐ Send-only with serial delivery ☐ Ignore DL/I PURG call

☐ Cancel duplicate client ID ☐ Expire transaction

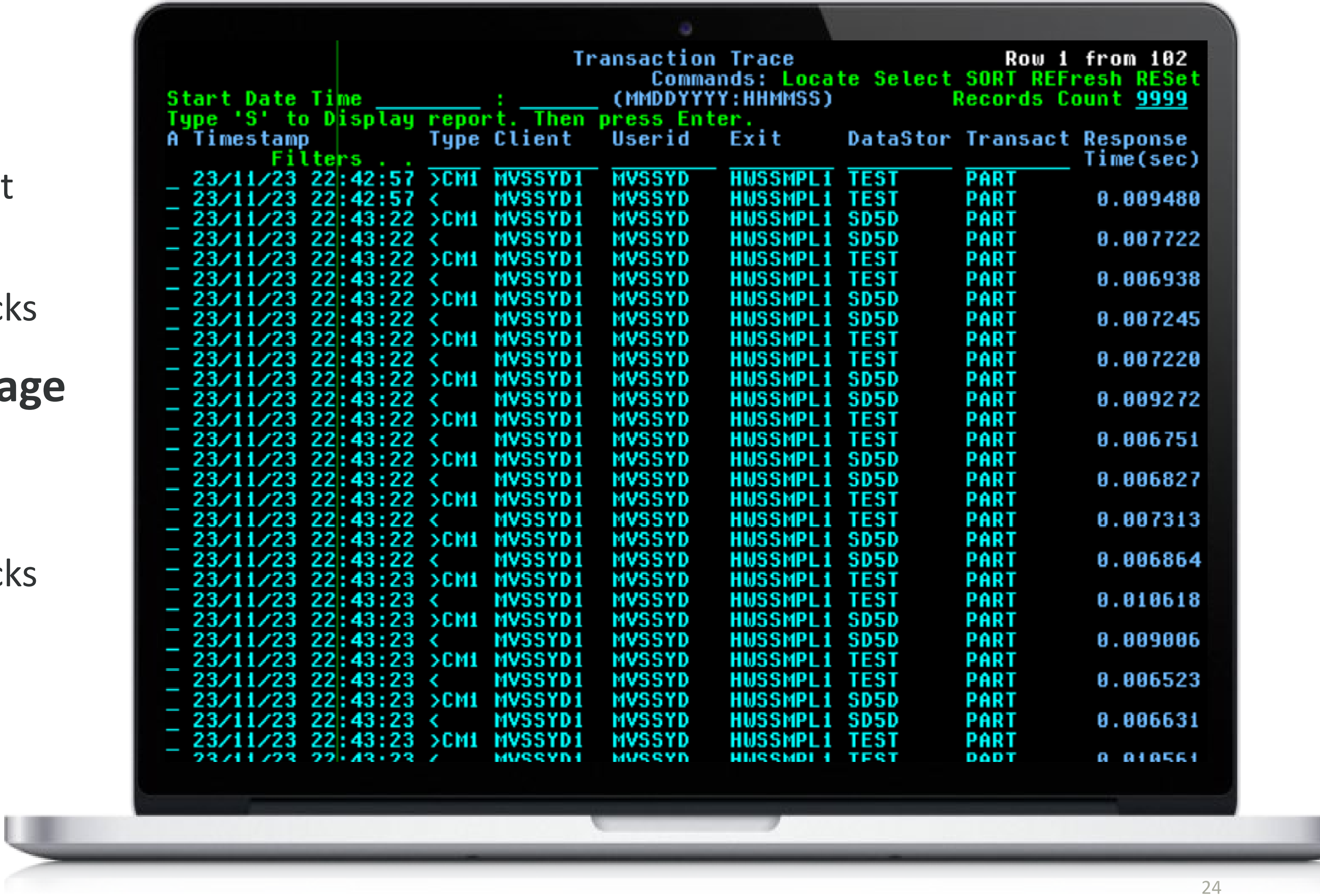
Transaction Traces

Inbound message

- CM1 Message from Client
- Message to IMS
- IMS Connect control blocks

Outbound response message

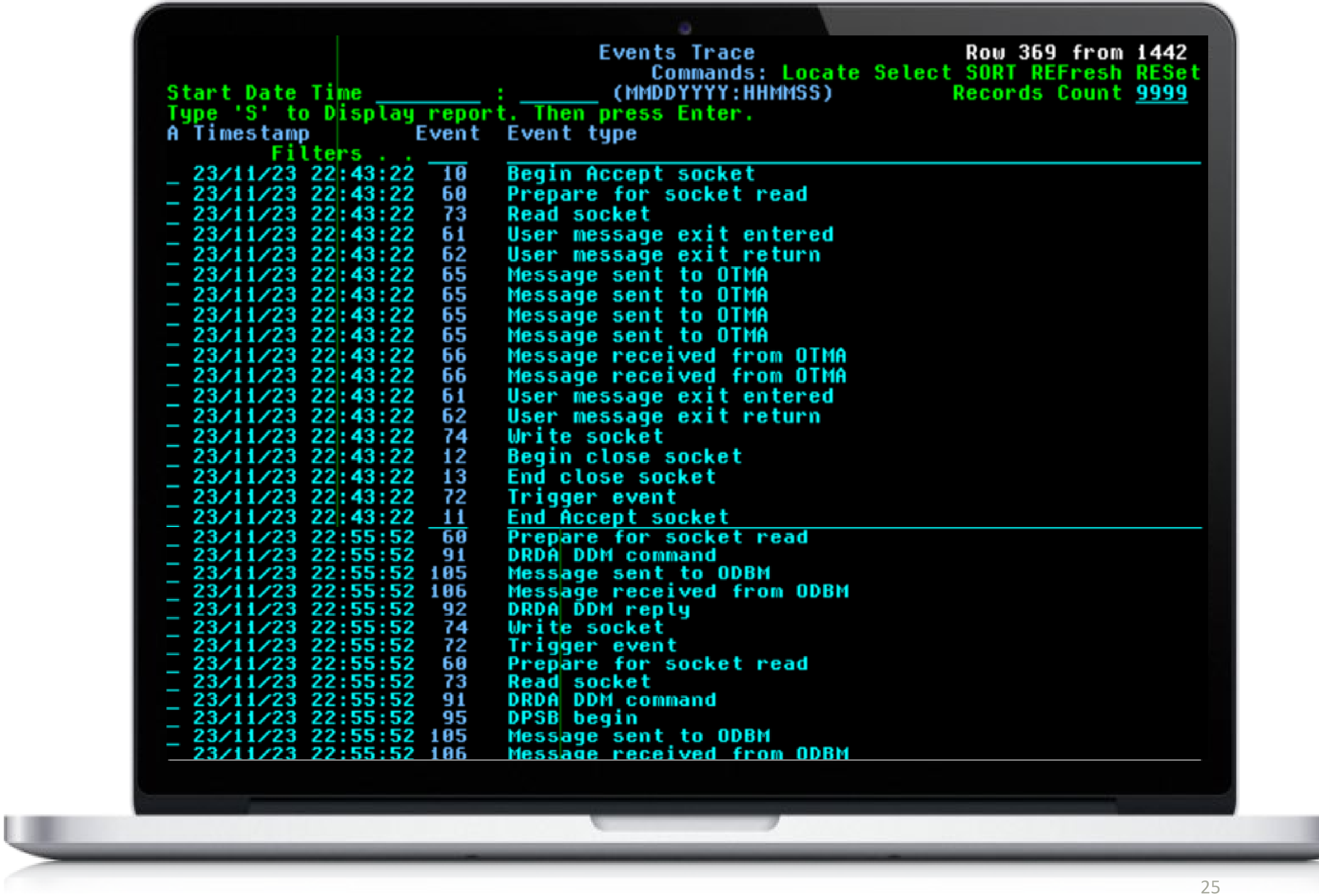
- Message from IMS
- Message to Client
- IMS Connect control blocks



```
                                   Transaction Trace                 Row 1 from 102
                                         Commands: Locate Select SORT REFresh RESet
Start Date Time ________ : ______ (MMDDYYYY:HHMMSS)              Records Count 9999
Type 'S' to Display report. Then press Enter.
A Timestamp         Type Client   Userid   Exit     DataStor Transact Response
        Filters . . ____ ________ ________ ________ ________ ________ Time(sec)
_ 23/11/23 22:42:57 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
_ 23/11/23 22:42:57 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.009480
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART      0.007722
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.006938
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART      0.007245
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.007220
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART      0.009272
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.006751
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART      0.006827
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.007313
_ 23/11/23 22:43:22 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART
_ 23/11/23 22:43:22 <    MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART      0.006864
_ 23/11/23 22:43:23 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
_ 23/11/23 22:43:23 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.010618
_ 23/11/23 22:43:23 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART
_ 23/11/23 22:43:23 <    MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART      0.009006
_ 23/11/23 22:43:23 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
_ 23/11/23 22:43:23 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.006523
_ 23/11/23 22:43:23 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART
_ 23/11/23 22:43:23 <    MVSSYD1  MVSSYD   HWSSMPL1 SD5D     PART      0.006631
_ 23/11/23 22:43:23 >CM1 MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART
  23/11/23 22:43:23 <    MVSSYD1  MVSSYD   HWSSMPL1 TEST     PART      0.010561
```

Event Traces

- Events occurred during execution of transaction
- Events occurred during execution of SQL
- Displays information at interface entry and exit points



```
                               Events Trace                       Row 369 from 1442
                                   Commands: Locate Select SORT REFresh RESet
Start Date Time ________ : ______ (MMDDYYYY:HHMMSS)         Records Count 9999
Type 'S' to Display report. Then press Enter.
A Timestamp             Event   Event type
          Filters . .   ____    _________________________________________________
_ 23/11/23 22:43:22  10   Begin Accept socket
_ 23/11/23 22:43:22  60   Prepare for socket read
_ 23/11/23 22:43:22  73   Read socket
_ 23/11/23 22:43:22  61   User message exit entered
_ 23/11/23 22:43:22  62   User message exit return
_ 23/11/23 22:43:22  65   Message sent to OTMA
_ 23/11/23 22:43:22  65   Message sent to OTMA
_ 23/11/23 22:43:22  65   Message sent to OTMA
_ 23/11/23 22:43:22  65   Message sent to OTMA
_ 23/11/23 22:43:22  66   Message received from OTMA
_ 23/11/23 22:43:22  66   Message received from OTMA
_ 23/11/23 22:43:22  61   User message exit entered
_ 23/11/23 22:43:22  62   User message exit return
_ 23/11/23 22:43:22  74   Write socket
_ 23/11/23 22:43:22  12   Begin close socket
_ 23/11/23 22:43:22  13   End close socket
_ 23/11/23 22:43:22  72   Trigger event
_ 23/11/23 22:43:22  11   End Accept socket
_ 23/11/23 22:55:52  60   Prepare for socket read
_ 23/11/23 22:55:52  91   DRDA DDM command
_ 23/11/23 22:55:52 105   Message sent to ODBM
_ 23/11/23 22:55:52 106   Message received from ODBM
_ 23/11/23 22:55:52  92   DRDA DDM reply
_ 23/11/23 22:55:52  74   Write socket
_ 23/11/23 22:55:52  72   Trigger event
_ 23/11/23 22:55:52  60   Prepare for socket read
_ 23/11/23 22:55:52  73   Read socket
_ 23/11/23 22:55:52  91   DRDA DDM command
_ 23/11/23 22:55:52  95   DPSB begin
_ 23/11/23 22:55:52 105   Message sent to ODBM
_ 23/11/23 22:55:52 106   Message received from ODBM
```

OTMA and ODBM Interfaces Challenges in SLDC Phases

Problem identification during development and testing phases of SDLC

Open Stack Developer, QA

- Was connection successful to TEST system?
- Where in the IMS system, input request message (IRM) errored?
- Locating return code and reason code for failed messages

TEST and Production System Workload Management

IMS System programmer/Admin

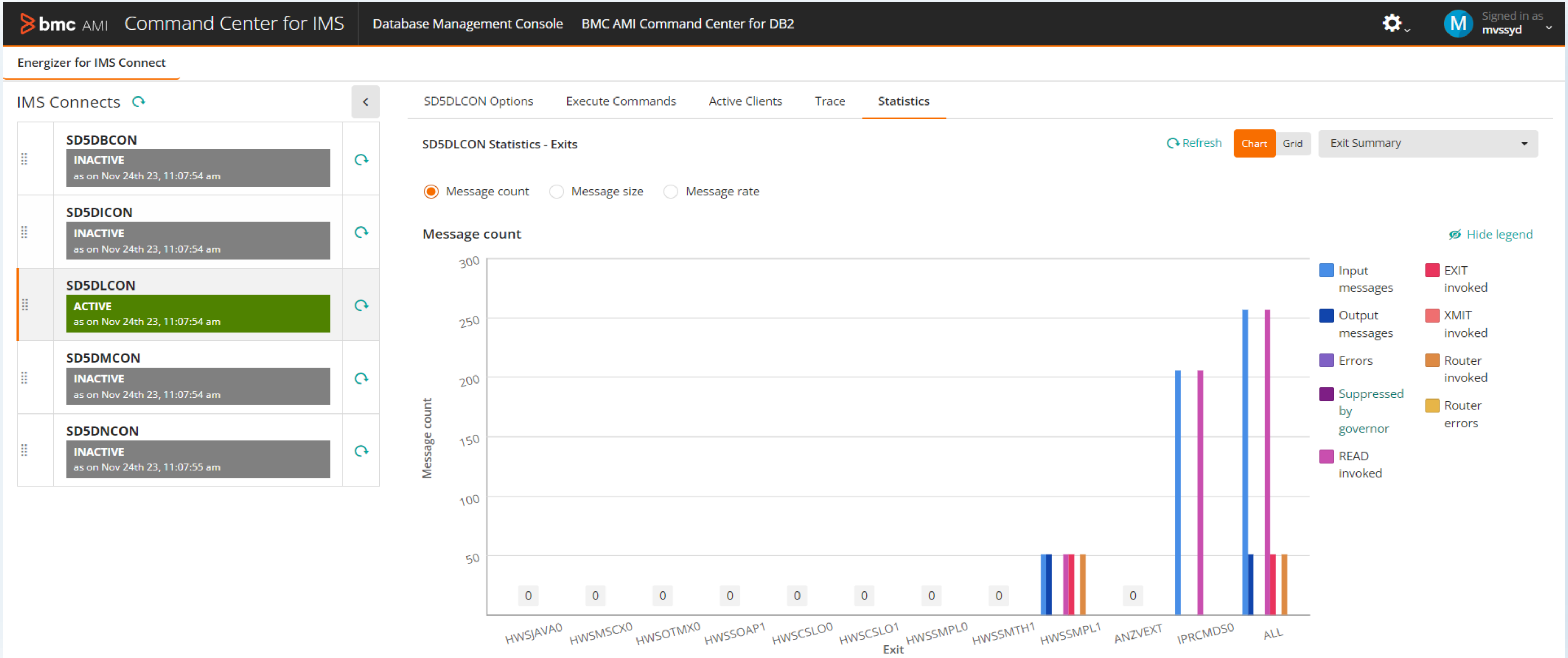
- Are Input request messages routing to appropriate IMS datastore?
- Is workload balanced across the available IMS datastores?
- Is TEST system available to developers and QA's with no downtime during test cycles? Ad-hoc changes to environment are done while IMS Connect, ODBM are up and running
- PROD system is prime responsibility. Is there a mechanism in place to trace any failures that might occur and can be fixed?
- Changes to PROD IMS Connect environment with no downtime

Evolving IMS Connect Environment

IMS Connect Data to AI Models

- Real time access to BMC AMI Energizer for IMS Connect events and traces
- Data train from BMC AMI Datastream for IMS
- Offline access to JSON, CSV formatted journal reports such as transaction response time, Connection History, SQL activity through ODBM etc.
- Transaction and event traces data in BMC AMI Energizer for IMS Connect journal reports can be used in Descriptive, Predictive and Prescriptive Analytics
- Steps in Data mining: Understand Business and Data, Prepare data from existing reports on mainframe, Create AI Model

BMC AMI Command Center for IMS



bmc AMI Command Center for IMS | Database Management Console | BMC AMI Command Center for DB2

Signed in as mvssyd

Energizer for IMS Connect

IMS Connects

SD5DBCON
INACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DICON
INACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DLCON
ACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DMCON
INACTIVE
as on Nov 24th 23, 11:07:54 am

SD5DNCON
INACTIVE
as on Nov 24th 23, 11:07:55 am

SD5DLCON Options | Execute Commands | Active Clients | Trace | Statistics

SD5DLCON Statistics - Exits

Refresh | Chart | Grid | Exit Summary

● Message count ○ Message size ○ Message rate

Message count

Hide legend

Parting Thoughts

- Security and Data Recovery were among the top priorities of extra-large organizations in a recent BMC survey
- IT Execs have the highest value perception within organizations toward integrating and automating database changes in a CI/CD pipeline
- Different personas have different goals
- Shift-left DBA / Developer collaboration that provides:
  - **Developers** with self-serve capabilities and tools to include database changes as part of the DevOps process.
  - **DBAs** benefit from DevOps automation and best practices while ensuring database changes follow data management best practices and comply with current standards.

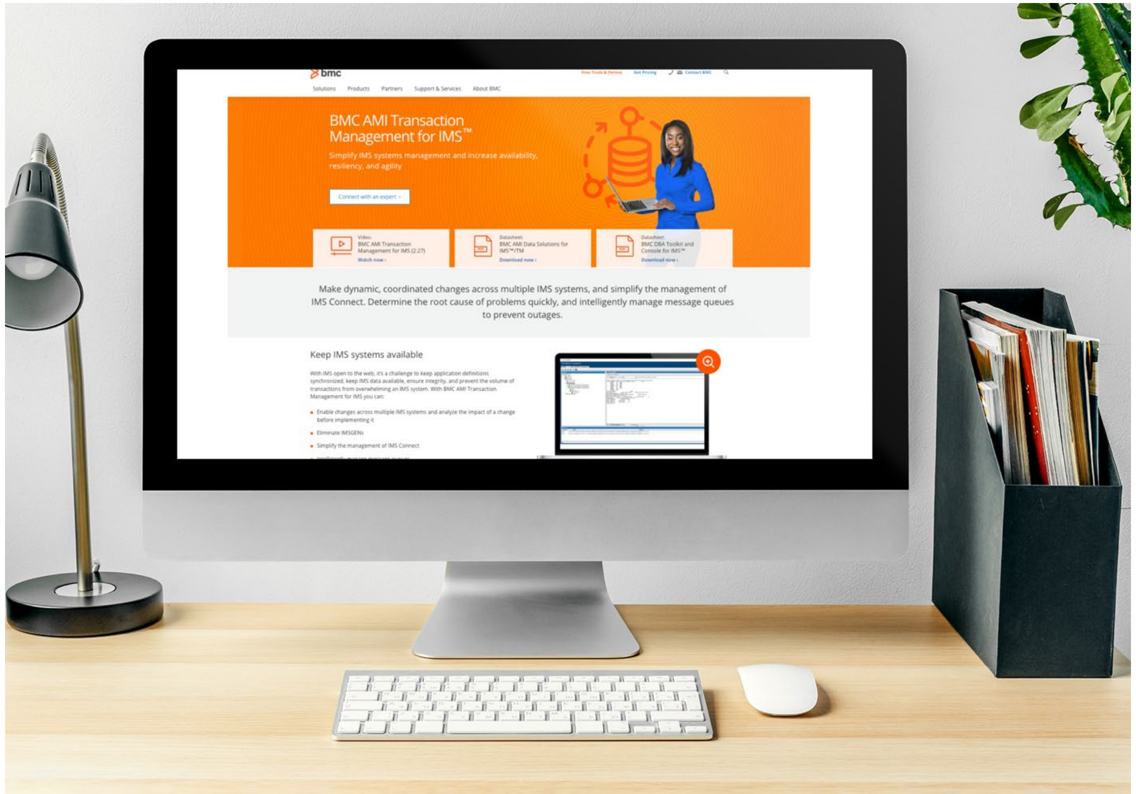
Learn more at bmc.com

BMC AMI Energizer for IMS

Part of the BMC AMI Transaction Management for IMS™

If you would like more information about the topics discussed today, then please contact product owner at BMC Software John O'Dowd john_odowd@bmc.com or David Schipper david_schipper@bmc.com so we can arrange workshops and targeted sessions.

Documentation: https://docs.bmc.com/docs/



BMC AMI Transaction Management for IMS™

Simplify IMS systems management and increase availability, resiliency, and agility

Video: BMC AMI Transaction Management for IMS (2:27)

Datasheet: BMC AMI Data Solutions for IMS™/TM

Datasheet: BMC DBA Toolkit and Console for IMS™

Make dynamic, coordinated changes across multiple IMS systems, and simplify the management of IMS Connect. Determine the root cause of problems quickly, and intelligently manage message queues to prevent outages.

Keep IMS systems available

With IMS open to the web, it's a challenge to keep application definitions synchronized, keep IMS data available, ensure integrity, and prevent the volume of transactions from overwhelming an IMS system. With BMC AMI Transaction Management for IMS you can:

- Enable changes across multiple IMS systems and analyze the impact of a change before implementing it
- Eliminate IMSGENs
- Simplify the management of IMS Connect

Slides and the video will be posted online at
https://itech-ed.com/virtualims/

Please email me for any follow up questions
santosh_dorge@bmc.com