IMS Open Database You Need to Know What Application Developers Do Not Know

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IBM

IMS **Tools**

for z/OS

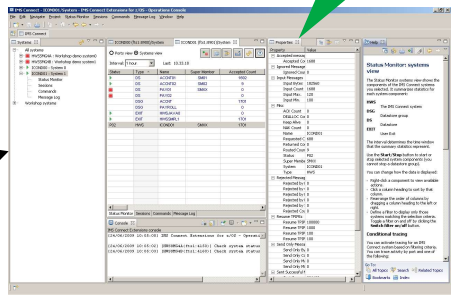
Agenda

- Open Database environment
  - IMS Connect
  - Open Database Manager (ODBM)
  - DRDA and DDM requests
- Open Database request lifecycle
  1. Start OD conversation
  2. Security clearance
  3. Establish connection to DB
  4. Access the DB
  5. Commit
  6. Finalize connection
- When things go wrong
  - ODBM not available
  - Security issues
  - Request routing issues
  - Allocate PSB (database stopped)
  - IMS-specific DDM parameters
  - Rollback commit
- Open Database management
  - Client connections
  - Managing ODBMs
  - Workload balancing
- Summary and further reading

Open Database environment

IBM Mobile Foundation (Worklight)

IMS Enterprise Suite Explorer for Development



IMS data

Web-enabled IMS applications

IBM Cloud

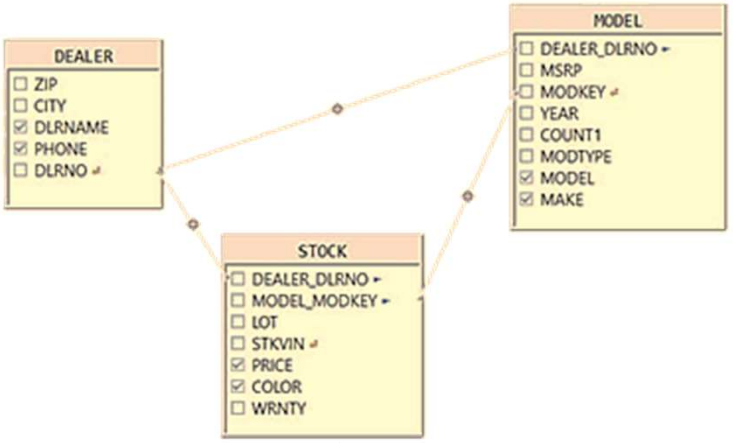
IBM Cloud

IMS Enterprise Suite Mobile Feature Pack

z/OS Connect

Client applications and IMS: Developers speaking different languages

```
SELECT AUTOLPCB.DEALER.DLRNAME, AUTOLPCB.DEALER.PHONE, AUTOLPCB.MODEL.MODEL,
  AUTOLPCB.MODEL.MAKE, AUTOLPCB.STOCK.PRICE, AUTOLPCB.STOCK.COLOR
  FROM AUTOLPCB.DEALER JOIN AUTOLPCB.STOCK ON AUTOLPCB.DEALER.DLRNO = AUTOLPCB.STOCK.DEALER_DLRNO JOIN AUTOLPCB.MODEL ON AUTOLPCB.DEALER.[
    AND AUTOLPCB.STOCK.MODEL_MODKEY = AUTOLPCB.MODEL.MODKEY
```

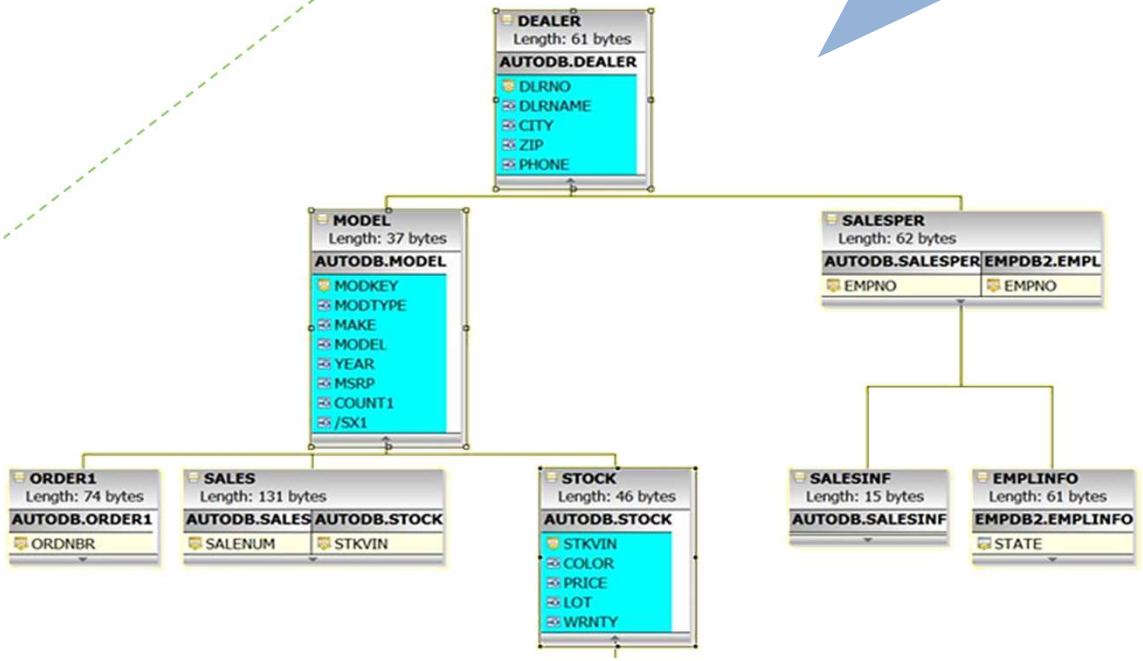


Application Developer

Relational databases
Tables
SQL (Structured Query Language)

IMS Administrator

Hierarchical databases
Segments
SSAs (Segment search arguments)



IMS Connect communications protocols

IRM (IMS request message)

- **Traditional IMS Connect workload**
- Client message header communicates protocol options to IMS Connect
- Allowed access to IMS transactions

DRDA (Distributed Relational Database Architecture)

- Describes the contents of data objects that flow on messages between client and IMS Connect
- **DDM** (Distributed Data Management architecture) describes the **commands**, **parameters**, **data objects** and **messages**
- Client application requests can (optionally) specify an **ODBM alias name** to IMS Connect (otherwise, messages are routed in "round robin" fashion by IMS Connect – but you can get advanced routing and load balancing through **IMS Connect Extensions**)
- Well-established standard published by **The Open Group** (http://www.opengroup.org/)

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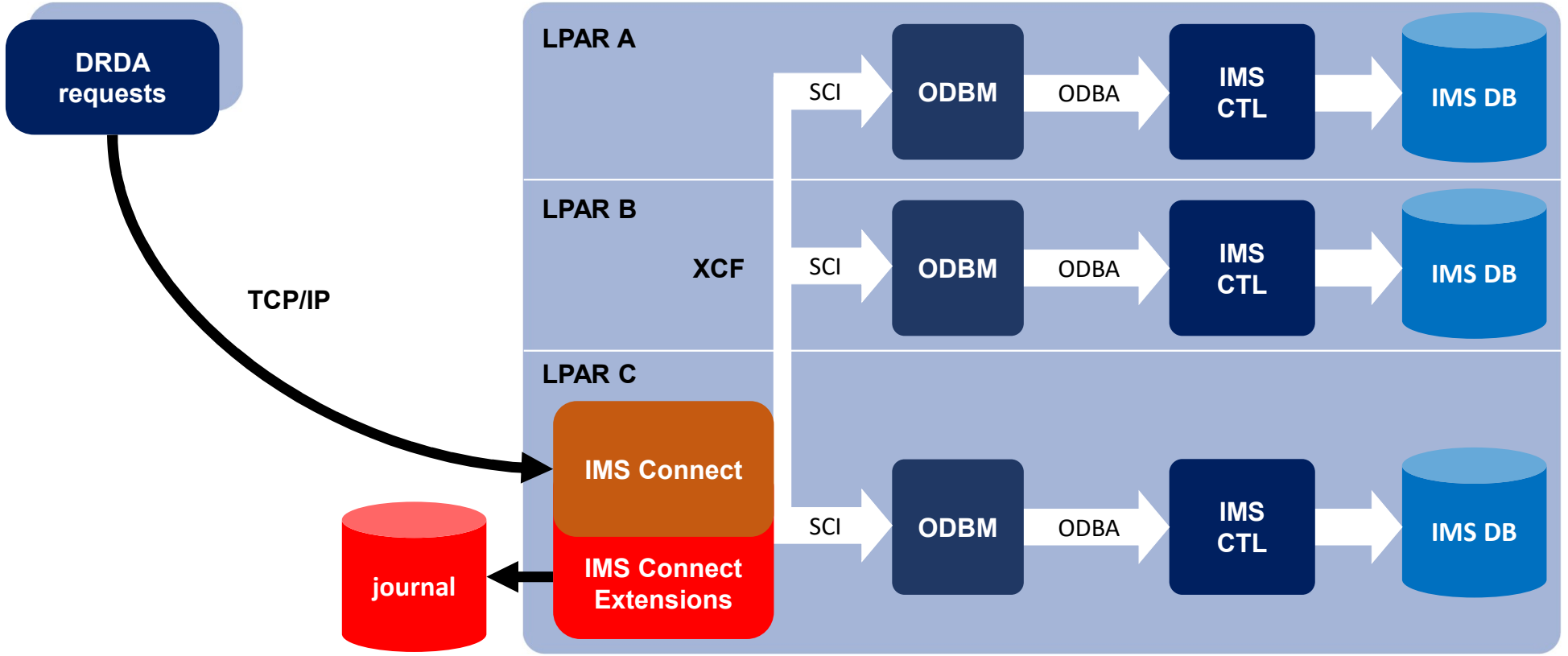
Open Database environment



IMS components for Open Database

IMS Connect

- Supports **Open Database** DRDA client requests over **TCP/IP**
- Instrumentation points (HWSTECL)
- Exit points for customizing security and workload routing (HWSAUTH0 and HWSROUT0)
- **IMS Connect Extensions** adds events journal, routing, workload balancing, security, and more

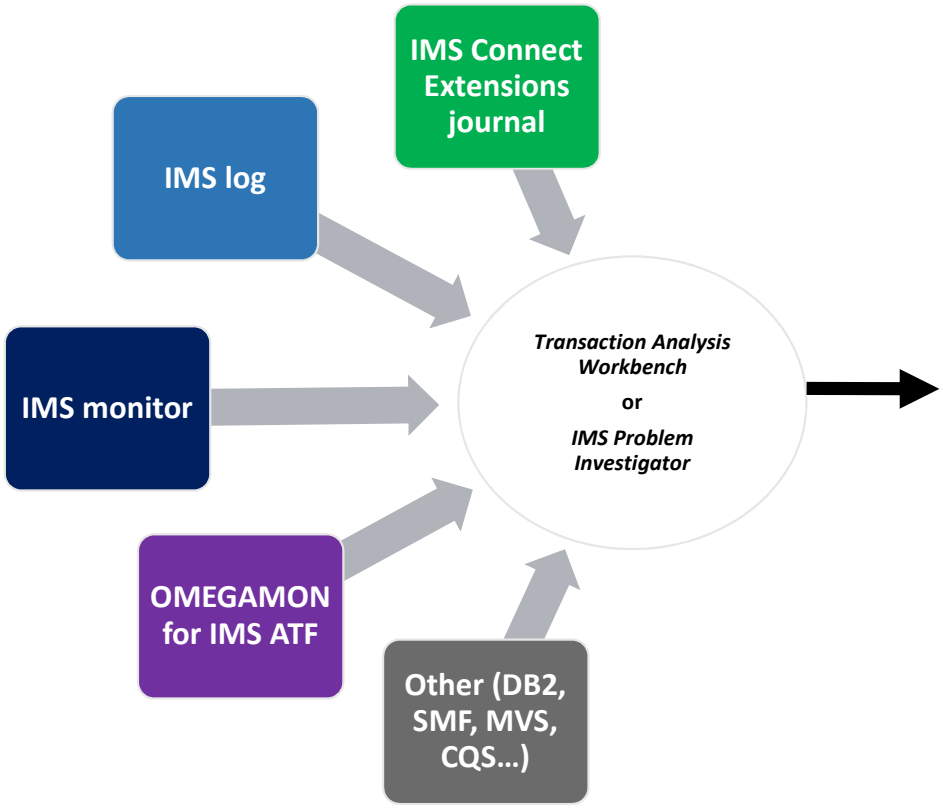
Open Database Manager (ODBM)

- Part of **Common Service Layer (CSL)**
- A path between **IMS Connect** and one or more **IMS datastores**
- Uses the **ODBA (Open Database Access)** callable interface to communicate with IMS
- Each IMS datastore may have one or more **Open Database aliases**
- May have **multiple ODBM address spaces** for each IMS Connect

Tools used in the following examples

Function	Tool	Method
Capture IMS Connect events	IMS Connect Extensions journal	https://www.ibm.com/support/knowledgecenter/SSAVHV_3.1.0/cexu-events-config.html
Capture OMEGAMON ATF event records	Tivoli OMEGAMON XE for IMS	https://www.ibm.com/support/knowledgecenter/SSXS8U_5.5.0/com.ibm.omegamon_ims.doc/welcome.htm
Analyze IMS Connect Extensions journals (including DDM objects) and IMS logs	IBM Transaction Analysis Workbench ad-hoc log browser	https://www.ibm.com/support/knowledgecenter/en/SSKKZM_1.3.0/fuwutsk_browsing_logs_ad_hoc.htm
	IMS Problem Investigator log browser	https://www.ibm.com/support/knowledgecenter/en/SSAVJ9_2.5.0/alzu-cex.html

Example: DRDA request




```
__ 003C Prepare READ Socket                                    13.16.53.026908
__ 0049 READ Socket                                                  +0.000118
__ 005B DRDA 1041 EXCSAT-Exchange Server Attributes                  +0.000125
__ 0049 READ Socket                                                  +0.000151
__ 005B DRDA 106D ACCSEC-Access Security                             +0.000182
__ 005C DRDA 1443 EXCSATRD-Server Attributes Reply Data              +0.000204
__ 004A WRITE Socket                                                 +0.000310
__ 0049 READ Socket                                                  +0.854012
__ 005B DRDA 106E SECCHK-Security Check                              +0.854020
__ 0063 ODBM Security Exit called                                    +0.854053
__ 0064 ODBM Security Exit returned                                  +0.854126
__ 005C DRDA 1219 SECCHKRM-Security Check Reply Message              +0.854142
__ 004A WRITE Socket                                                 +0.854230
__ 0049 READ Socket                                                  +1.022542
__ 005B DRDA 2001 ACCRDB-Access RDB                                  +1.022551
__ 005D ODBM begin Allocate PSB (APSB) Program=AUTPSB11              +1.022572
__ 0061 ODBM Routing Exit called                                     +1.022582
__ 0062 ODBM Routing Exit returned                                   +1.022740
__ 00AA ODBM Trace: Message sent to ODBM                             +1.022880
__ 0069 Message sent to ODBM                                         +1.022887
__ 06   BMP Scheduling start TranCode=ODBA02CD Region=0004           +1.024870
__ 4E02 BMP Scheduling start Region=0004                             +1.024873
__ 08   Application Start Program=AUTPSB11 Region=0004               +1.025814
__ 5607 Start of UOR Program=AUTPSB11 Region=0004                    +1.025815
__ 5616 Start of protected UOW Region=0004                           +1.026013
__ 4E03 BMP Scheduling end TranCode=ODBA02CD Region=0004             +1.026018
__ 00AA ODBM Trace: Message received from ODBM                       +1.028028
__ 006A Message received from ODBM                                   +1.028043
__ 005E ODBM end Allocate PSB (APSB) Program=AUTPSB11                +1.029573
__ 005C DRDA 2201 ACCRDBRM-Access RDB Reply Message                  +1.029600
__ 004A WRITE Socket                                                 +1.031028
__ 0048 Trigger Event for ODBMMSG                                    +1.031063
__ 003C Prepare READ Socket                                          +1.051454
__ 0049 READ Socket                                                  +1.051540
__ 005B DRDA 200C OPNQRY-Open Query                                  +1.051546
__ 0049 READ Socket                                                  +1.051605
__ 005B DRDA CC05 DLIFUNC-DL/I function                              +1.051635
__ 0049 READ Socket                                                  +1.051658
__ 005B DRDA CC01 INAIB-AIB data                                     +1.051689
__ 0049 READ Socket                                                  +1.051712
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data        +1.051742
__ 0049 READ Socket                                                  +1.051787
__ 005B DRDA CC06 SSALIST-List of segment search argument            +1.051795
__ 00AA ODBM Trace: Message sent to ODBM                             +1.052210
__ 0069 Message sent to ODBM                                         +1.052221
__ 01   DLI GHU Database=AUTOLDB SC='  ' Elapse=0.000364             +1.052811
__ 4E60 DLI Call start Region=0004                                   +1.052816
__ 4E62 DLA00 start Database=AUTOLDB Region=0004 Func=GU             +1.052873
__ 4E63 DLA00 end Region=0004 Seg=DEALER   SC='  '                   +1.053029
__ 4E61 DLI Call end Region=0004                                     +1.053165
__ 00AA ODBM Trace: Message received from ODBM                       +1.053760
__ 006A Message received from ODBM                                   +1.053771
__ 005C DRDA 2205 OPNQRYRM-Open Query Complete                       +1.053915
```

Open database request lifecycle (1)

1. Start Open Database conversation:
- Initiate a request to access an IMS database and identify requestor (EXCSAT / EXCSATRD)
- Determine type of security checking performed (ACCSEC / ACCSECRD)

2. Security clearance (SECCHK / SECCHKRD)
- Authenticate the user with RACF or other security product
- Check client access (does user and/or IP address have authority?)

3. Establishing connection to database (ACCRDB / ACCRDBRM)
- Make routing decisions based on availability, capacity, and by PSB name
- Allocate program specification block (PSB) via ODBM

IBM Transaction Analysis Workbench

003C	Prepare READ Socket		10.03.34.289664
0049	READ Socket		10.03.34.289702
005B	DRDA 1041 EXCSAT-Exchange Server Attributes		10.03.34.289707
0049	READ Socket	1	10.03.34.289720
005B	DRDA 106D ACCSEC-Access Security		10.03.34.289737
005C	DRDA 1443 EXCSATRD-Server Attributes Reply Data		10.03.34.289763
005C	DRDA 14AC ACCSECRD-Access Security Reply Data		10.03.34.289767
004A	WRITE Socket		10.03.34.289865
0049	READ Socket		10.03.34.290776
005B	DRDA 106E SECCHK-Security Check		10.03.34.290802
0063	ODBM Security Exit called	2	10.03.34.290836
0064	ODBM Security Exit returned		10.03.34.290960
005C	DRDA 1219 SECCHKRM-Security Check Reply Message		10.03.34.290965
004A	WRITE Socket		10.03.34.290998
0049	READ Socket		10.03.34.670977
005B	DRDA 2001 ACCRDB-Access RDB		10.03.34.671028
005D	ODBM begin Allocate PSB (APSB) Program=AUTPSB11		10.03.34.671037
0061	ODBM Routing Exit called		10.03.34.671049
0062	ODBM Routing Exit returned		10.03.34.671199
00AA	ODBM Trace: Message sent to ODBM	3	10.03.34.671374
0069	Message sent to ODBM		10.03.34.671379
00AA	ODBM Trace: Message received from ODBM		10.03.34.736171
006A	Message received from ODBM		10.03.34.736180
005E	ODBM end Allocate PSB (APSB) Program=AUTPSB11		10.03.34.736261
005C	DRDA 2201 ACCRDBRM-Access RDB Reply Message		10.03.34.736282
004A	WRITE Socket		10.03.34.736381
0048	Trigger Event for ODBMMSG		10.03.34.736398

Open database request lifecycle (2)

4. Accessing the database:
- Start read request (OPENQRY)
  - Specify DL/I function (DLIFUNC)
  - Specify AIB data (INAIB) – PCB name at a minimum
  - Specify fields to retrieve (RTRVFLD) – CP, offset, length
  - Qualify the DLI/ call with segment search arguments (SSALIST)
- Send the request to ODBM
- Receive response from ODBM
- Complete the request (OPENQRYRD)

5. Commit all work performed for the current unit of work (RDBCMM / ENDUOWRM)

6. Finalize connection to database
- Deallocate PSB (DEALLOCDB / DEALLOCDBRM)

```
0049 READ Socket                                          10.03.34.739696
005B DRDA 200C OPNQRY-Open Query                          10.03.34.739700
0049 READ Socket                                          10.03.34.739713
005B DRDA CC05 DLIFUNC-DL/I function                      10.03.34.739729
0049 READ Socket                                          10.03.34.739742
005B DRDA CC01 INAIB-AIB data                             10.03.34.739755
0049 READ Socket                                          10.03.34.739768
005B DRDA CC04 RTRVFLD-Field client wants to retrieve data 10.03.34.739785
0049 READ Socket                                          10.03.34.739794
005B DRDA CC04 RTRVFLD-Field client wants to retrieve data 10.03.34.739811
0049 READ Socket                                          10.03.34.739823
005B DRDA CC06 SSALIST-List of segment search argument    10.03.34.739841
00AA ODBM Trace: Message sent to ODBM                     10.03.34.739918
0069 Message sent to ODBM                                 10.03.34.739926
00AA ODBM Trace: Message received from ODBM               10.03.34.916775
006A Message received from ODBM                           10.03.34.916792
005C DRDA 2205 OPNQRYRM-Open Query Complete               10.03.34.916882
004A WRITE Socket                                         10.03.34.917015
0048 Trigger Event for ODBMMSG                            10.03.34.917028
003C Prepare READ Socket                                  10.03.34.919183
005B DRDA 200E RDBCMM-RDB Commit Unit of Work             10.03.34.919196
00AA ODBM Trace: Message sent to ODBM                     10.03.34.919311
0069 Message sent to ODBM                                 10.03.34.919319
00AA ODBM Trace: Message received from ODBM               10.03.34.924186
006A Message received from ODBM                           10.03.34.924191
005C DRDA 220C ENDUOWRM-End Unit of Work Condition        10.03.34.924255
004A WRITE Socket                                         10.03.34.924336
0048 Trigger Event for ODBMMSG                            10.03.34.924345
003C Prepare READ Socket                                  10.03.34.925132
0049 READ Socket                                          10.03.34.925153
005B DRDA C801 DEALLOCDB-Deallocate PSB                   10.03.34.925157
005F ODBM begin Deallocate PSB (DPSB)                     10.03.34.925162
00AA ODBM Trace: Message sent to ODBM                     10.03.34.925255
0069 Message sent to ODBM                                 10.03.34.925260
00AA ODBM Trace: Message received from ODBM               10.03.34.925953
006A Message received from ODBM                           10.03.34.925957
0060 ODBM end Deallocate PSB (DPSB)                       10.03.34.925991
005C DRDA CA01 DEALLOCDBRM-Name of deallocated PSB        10.03.34.925999
004A WRITE Socket                                         10.03.34.926038
0048 Trigger Event for ODBMMSG                            10.03.34.926046
```

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DDM

- Distributed Data Management (DDM) architecture
- Used to communicate data management requests
- Requests contained within an object mapped onto a data stream
- Three layers
  - Layer A: Communications management services (flow protocols)
  - Layer B: Agent services (parsing)
  - Layer C: Data management services
- Data Stream Structures (DSS) are how the DDM architecture sees each communication facility

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DRDA requests and responses

DDM (**distributed data management**) commands. 'Code points' show flow of DRDA requests and responses

```
VIEW                              Filter                    Row 1 of 3 More:
Command ===> ____________________________________________________ Scroll ===>

Specify filtering criteria then press EXIT (F3) to apply the filter.

Filter  . . . . . DRDAEVTS  +
Description . . . DRDA Requests and responses          _  Activate Tracki

/ Log Code + Exc Description
_ CON 005B       ODBM DRDA command issued
                 Level  1   Conditions  No   Form  ________ + REXX  _____
-------------------------------------------------------------------------
_ CON 005C       ODBM DRDA command reply
                 Level  1   Conditions  No   Form  ________ + REXX  _____
-------------------------------------------------------------------------
_ CON 00AA       ODBM Send/Receive Trace
                 Level  1   Conditions  No   Form  ________ + REXX  _____
-------------------------------------------------------------------------
```

IBM Transaction Analysis Workbench

```
  File  Mode  Filter  Time  Labels  Options  Help
-------------------------------------------------------------------------------
BROWSE    CEX999.MKT366A.IMSEXP.AUTODB                Record 00000082 More: < >
Command ===> ____________________________________________ Scroll ===> PAGE
        Navigate < 00.00.01.000000 >      Date/Time 2017-02-10 14.18.04.357187
/  ---- Filtering ----------------------    Friday 2017-02-10 Time (LOCAL)
__ 005B DRDA 1041 EXCSAT-Exchange Server Attributes                14.37.06.041083
__ 005B DRDA 106D ACCSEC-Access Security                           14.37.06.041127
__ 005C DRDA 1443 EXCSATRD-Server Attributes Reply Data            14.37.06.041152
__ 005C DRDA 14AC ACCSECRD-Access Security Reply Data              14.37.06.041153
__ 005B DRDA 106E SECCHK-Security Check                            14.37.06.044108
__ 005C DRDA 1219 SECCHKRM-Security Check Reply Message            14.37.06.044266
__ 005B DRDA 1041 EXCSAT-Exchange Server Attributes                14.38.15.105913
__ 005B DRDA 106D ACCSEC-Access Security                           14.38.15.105964
__ 005C DRDA 1443 EXCSATRD-Server Attributes Reply Data            14.38.15.105986
__ 005C DRDA 14AC ACCSECRD-Access Security Reply Data              14.38.15.105990
__ 005B DRDA 106E SECCHK-Security Check                            14.38.15.108115
__ 005C DRDA 1219 SECCHKRM-Security Check Reply Message            14.38.15.108248
__ 005B DRDA 2001 ACCRDB-Access RDB                                14.38.15.110831
__ 00AA ODBM Trace: Message sent to ODBM                           14.38.15.115530
__ 00AA ODBM Trace: Message received from ODBM                     14.38.15.182813
. . .
```

These code points include:

- DRDA code points defined by **The Open Group**
- IMS-specific code points

DDM command structure

All DDM commands, reply messages, and chained objects begin with a 6-byte data stream structure header (DSSHDR)

Browse DDM header and objects using IBM Transaction Analysis Workbench or IMS Problem Investigator…

Part	Field	Size
DSSHDR (data stream structure header)	LL (Length of command)	2 bytes
	DDMID (identifier registered with Systems Network Architecture (SNA))	1 byte (Always 'D0' for a DDM command)
	DSSFMT (Format ID)	1 byte: • Bits 0-3: DSS chaining and error handling • Bits 4-7: DSS type (Request, Reply, Object, or Encrypted Object)
	RQSCRR (Correlation identifier – ties together the request, the request data, the reply, and the reply data)	2 bytes
DDM command object(s)	LL (Length)	2 bytes
	CP (hexadecimal code point – identifies the command)	2 bytes
	Data (if required by CP type)	Variable

Open Database request lifecycle:
1. Start Open Database conversation

```
 s 005B DRDA 1041 EXCSAT-Exchange Server Attributes          14.37.06.041083
   005B DRDA 106D ACCSEC-Access Security                     14.37.06.041127
   005C DRDA 1443 EXCSATRD-Server Attributes Reply Data      14.37.06.041152
```

IBM Transaction Analysis Workbench

```
BROWSE     CEX999.MKT366A.IMSEXP.AUTODB                          Record 00000082 Line 00000000
Command ===>                                                     Scroll ===> PAGE
Form    ===>          +     Use Form in Filter                   Format ===> STD
************************************************************ Top of data ************************************************************
+0004  Code... 005B  DRDA 1041 EXCSAT-Exchange Server Attributes
+005D  STCK... D21379C46C8FBE50      LSN.... 00000000000000F0
       Date... 2017-02-10 Friday     Time... 14.37.06.041083.894

+0000  CERE_5B_LL......... 006D                    CERE_5B_ZZ......... 0000                    CERE_5B_RECID...... A0
+0005  CERE_5B_EVTID...... 5B  CERE_5B_PFXLL...... 0014                    CERE_5B_EFLAG...... 08  CERE_5B_VER#....... 24
+000A  CERE_5B_TASKID..... ID of task recording event
+000A  CERE_5B_COL#....... 01  CERE_5B_TKS#....... 0B
+000C  CERE_5B_EVKEY...... D21379C46C088743        CERE_5B_VAR_LL..... 0006                    CERE_5B_VAR_APAR... 0001
+0018  CERE_5B_VAR_CODEPOINT...... 1041

+001A  DSSHDR..... DSS header for DDM command
+001A  DSSlen..... +67         DDMID...... D0          FormatID... 41        DSSChain... 40        DSSType.... 01
+001E  RQSCRR..... 0001

+0020  Object..... 1041 EXCSAT-Exchange Server Attributes
+0020  Length..... +61         CP......... 1041

+0024  Object..... 115E EXTNAM-External Name
+0024  Length..... +7          CP......... 115E        Data....... '225'

+002B  Object..... 116D SRVNAM-Server Name
+002B  Length..... +10         CP......... 116D        Data....... 'ABCDE9

+0035  Object..... 115A SRVRLSLV-Server Product Release Level
+0035  Length..... +33         CP......... 115A        Data....... 'OD-ICO

+0056  Object..... 1147 SRVCLSNM-Server Class Name
+0056  Length..... +7          CP......... 1147        Data....... 'DFS'
************************************************************ End of data **
```

Format the record

Zoom to learn more

```
Field Zoom
  File  Menu  Help
BROWSE     CEX999.MKT366A.IMSEXP.AUTODB                          Line 00000000
Command ===>                                                     Scroll ===> PAGE
****************************** Top of data ******************************
+001D  DSSChain... 40    Data Stream Structure (DSS) Flag: the left half
                         byte of FormatID

 Off   Unused..... 80    Unused.
 On    Chained.... 40    1 Indicates that the DSS is chained to the next
                         DSS, 0 indicates no chaining.
 Off   Continue... 20    1 indicates to continue when errors occur, 0
                         indicates otherwise.
 Off   SameCORR... 10    1 indicates that the next DSS has the same
                         request correlator,
                         0 indicates otherwise. If bit 1 is 0, bit 3 is
                         also 0.
```

DRDA DDM command architecture reference
https://www.ibm.com/support/knowledgecenter/SSEPH2_14.1.0/com.ibm.ims14.doc.apr/ims_ddm_architecture.htm

IBM Transaction Analysis Workbench

```
BROWSE     CEX999.MKT366A.IMSEXP.AUTODB                                                                  Record 00000082 Line 00000000
Command ===> ____________________________________________________________________________________________ Scroll ===> PAGE
Form    ===>          +     Use Form in Filter                                                          Format ===> STD
*********************************************************** Top of data ***********************************************************
+0004  Code... 005B  DRDA 1041 EXCSAT-Exchange Server Attributes
+005D  STCK... D21379C46C8FBE50      LSN.... 00000000000000F0
       Date... 2017-02-10 Friday     Time... 14.37.06.041083.894

+0000  CERE_5B_LL......... 006D                       CERE_5B_ZZ......... 0000                               CERE_5B_RECID...... A0
+0005  CERE_5B_EVTID...... 5B   CERE_5B_PFXLL...... 0014                       CERE_5B            .... 08   CERE_5B_VER#....... 24
+000A  CERE_5B_TASKID..... ID of task recording event
+000A  CERE_5B_COL#....... 01   CERE_5B_TKS#....... 0B
+000C  CERE_5B_EVKEY...... D21379C46C088743           CERE_5B_VAR_LL..... 0006                               CERE_5B_VAR_APAR... 0001
+0018  CERE_5B_VAR_CODEPOINT...... 1041

+001A  DSSHDR..... DSS header for DDM command
+001A  DSSlen..... +67         DDMID...... D0         FormatID... 41          DSSChain... 40          DSSType.... 01
+001E  RQSCRR..... 0001

+0020  Object..... 1041 EXCSAT-Exchange Server Attributes
+0020  Length..... +61         CP......... 1041

+0024  Object..... 115E EXTNAM-External Name
+0024  Length..... +7          CP......... 115E       Data....... '225'

+002B  Object..... 116D SRVNAM-Server Name
+002B  Length..... +10         CP......... 116D       Data....... 'ABCDE9'

+0035  Object..... 115A SRVRLSLV-Server Product Release Level
+0035  Length..... +33         CP......... 115A       Data....... 'OD-ICON 1 OD-ODBM 1,2,3,4,5,6'

+0056  Object..... 1147 SRVCLSNM-Server Class Name
+0056  Length..... +7          CP......... 1147       Data....... 'DFS'
*********************************************************** End of data ***********************************************************
```

Data stream structure header (DSSHDR)

EXCSAT command (X’1041’)
https://www.ibm.com/support/knowledgecenter/SSEPH2_14.1.0/com.ibm.ims14.doc.apr/ims_ddm_excsat.htm

DSS command objects (length, code point (CP), data)

Open Database request lifecycle:
1. Start Open Database conversation (ODBM not available)

```
    Code Description                    Date 2015-05-25 Monday     Time (LOCAL)
/   ──── ──────────────────────────────────────────────────────────────────────
__  003C Prepare READ Socket                                      14.23.38.042689
__  0049 READ Socket                                             14.23.38.042721
__  005B DRDA 1041 EXCSAT-Exchange Server Attributes             14.23.38.042731
__  0049 READ Socket                                             14.23.38.042756
__  005B DRDA 106D ACCSEC-Access Security                        14.23.38.042771
_s  005C DRDA 1218 MGRDEPRM-Manager Dependency Error             14.23.38.042799
__  004A WRITE Socket                                            14.23.38.042819
__  0047 Session Error                                           14.23.38.042825
__  000C Begin CLOSE Socket                                      14.23.38.042841
__  000D End CLOSE Socket                                        14.23.38.042944
```

IMS Connect message HWSK2915E
Potential causes:

- No ODBM available.
- All ODBMs do not have associated aliases.
- No ODBM has suitable release level of handshaking.

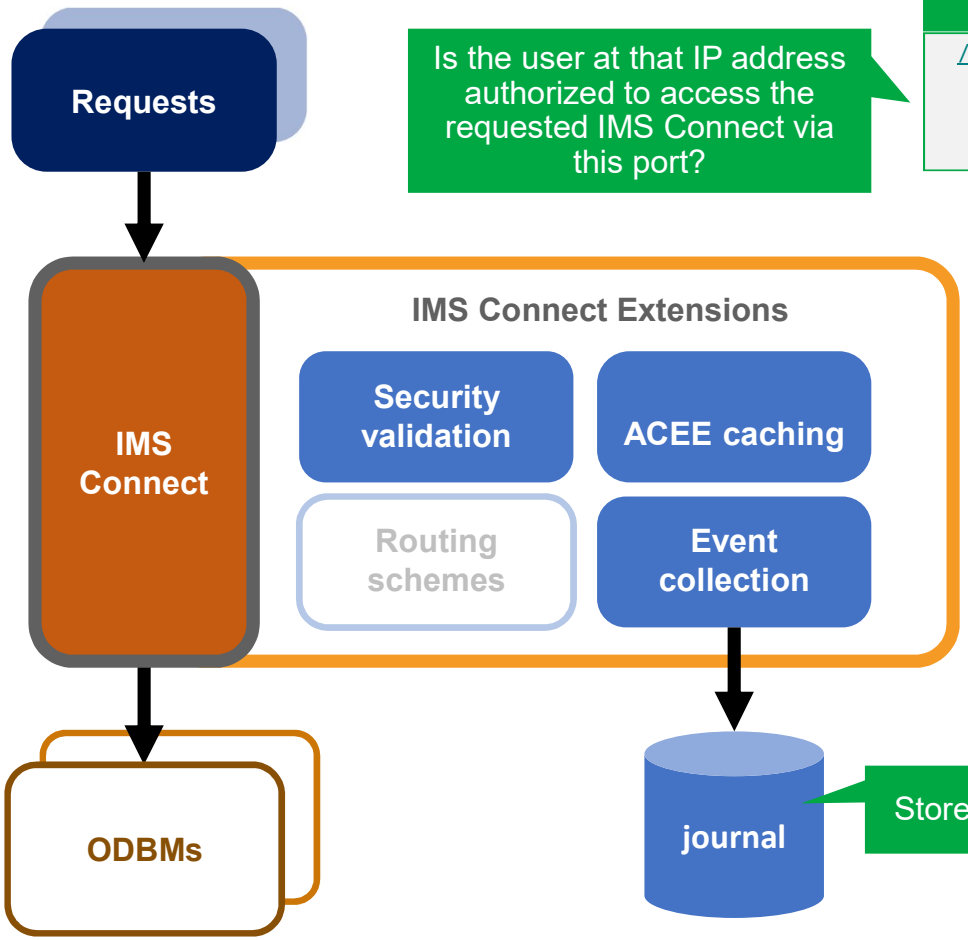
https://www.ibm.com/support/knowledgecenter/SSEPH2_14.1.0/com.ibm.ims14.doc.msgs/msgs/hwsk2915e.htm

```
+0020  Object..... 1218 MGRDEPRM-Manager Dependency Er
+0020  Length..... +95          CP......... 1218

+0024  Object..... 119B DEPERRCD-Manager Dependency Erro
+0024  Length..... +5           CP......... 119B        Da          .. 01

+0029  Object..... 1149 SVRCOD-Severity Code
+0029  Length..... +6           CP......... 1149
+002D  Data....... severity code
+002E  SVRCOD..... 08

+002F  Object..... 1153 SRVDGN-Server Diagnostic Information
+002F  Length..... +80          CP......... 1153
+0033  Data....... Object data
       +0000  C8E6E2D2 F2F9F1F5 C540E3C8 C5D9C540   *HWSK2915E THERE *
       +0010  C9E240D5 D640D6C4 C2D440C1 E5C1C9D3   *IS NO ODBM AVAIL*
       +0020  C1C2D3C5 40C6D6D9 40C4C1E3 C1C2C1E2   *ABLE FOR DATABAS*
       +0030  C540C1C3 C3C5E2E2 5E40D77E F4F8F8F5   *E ACCESS; P=4885*
       +0040  F5404040 6B40D47E D4D9C3E5            *5    , M=MRCV    *
```

```
+0041  SVRCOD..... 00   Severity code

 Off   INFO....... 00   Informational only
 Off   WARNING.... 04   Warning
 On    ERROR...... 08   Error
 Off   SEVERE..... 10   Severe
 Off   ACCDMG..... 20   Access damage
 Off   PRMDMG..... 40   Permanent damage
 Off   SESDMG..... 80   Session damage
```

'SVRCOD', DRDA, Version 4, Volume 3 Distributed Data Management (DDM) Architecture, *The Open Group*, page 865 – *or simply point and shoot on* SVRCOD *to see the same information in IBM Transaction Analysis Workbench*

Security validation



Is the user at that IP address authorized to access the requested IMS Connect via this port?

IMS Connect Extensions

```
/  Activate Security                          Ageing interval . . . 30    (Min)
/  Activate ACEE Cache                        Security class  . . . XFACILIT
/  Activate validation
   Validation type . . 2   1. IMS Connect
                           2. IMS Connect + IP Address + Port
```

RACF example

```
RDEFINE XFACILIT CEX.IPV4.ZZSEC01.129.042.060.025.08801  UACC(NONE)
RDEFINE XFACILIT CEX.IPV4.ZZSEC01.129.042.060.030.*      UACC(NONE)
RDEFINE XFACILIT CEX.IPV4.ZZSEC01.*.*.*.*.48801          UACC(NONE)
…
   /* ---------------------------------- */
   /* PERMIT ACCESS                      */
   /* ---------------------------------- */
PERMIT  CEX.IPV4.ZZSEC01.129.042.060.025.08801            -
        CLASS(XFACILIT) ID(CEXGRPI) ACCESS(READ)
PERMIT  CEX.IPV4.ZZSEC01.129.042.060.030.*                -
        CLASS(XFACILIT) ID(CEXGRPI) ACCESS(READ)
PERMIT  CEX.IPV4.ZZSEC01.*.*.*.*.48801                    -
        CLASS(XFACILIT) ID(USRID01) ACCESS(READ)
```

Store security events

AllowList: only allow certain IP addresses access through IMS Connect

Open Database request lifecycle: 2. Security clearance (cache hit)

IBM Transaction Analysis Workbench

```
__ 005B DRDA 106E SECCHK-Security Check                    02.45.21.964812
__ 0063 ODBM Security Exit called                          02.45.21.964823
_s 0040 End SAF call                                       02.45.21.964896
__ 003F Begin SAF call                                     02.45.21.964908
__ 0040 End SAF call                                       02.45.21.965099
__ 0064 ODBM Security Exit returned                        02.45.21.965237
__ 005C DRDA 1219 SECCHKRM-Security Check Reply Message    02.45.21.965259
__ 004A WRITE Socket                                       02.45.21.965284
__ 0047 Session Error                                      02.45.21.965292
__ 000C Begin CLOSE Socket                                 02.45.21.965304
__ 000D End CLOSE Socket                                   02.45.21.965428
__ 0048 Trigger Event for CLOSE                            02.45.21.965440
```

```
+0004  Code... 0040  End SAF call
+0041  STCK... D1B34CEF9CB60868      LSN.... 0000000000000AB8
       Date... 2016-11-26 Saturday   Time... 02.45.21.964896.525

+0000  CERE_40_LL......... 0051
+0002  CERE_40_ZZ......... 0000                        CERE_40_RECID...... A0
+0005  CERE_40_EVTID...... 40  CERE_40_PFXLL...... 0014
+0008  CERE_40_EFLAG...... 00  CERE_40_VER#....... 24
+000A  CERE_40_TASKID..... ID of task recording event
+000A  CERE_40_COL#....... 01  CERE_40_TKS#....... 00
+000C  CERE_40_EVKEY...... 'EVNT    '

+0014  CERE_40_SLL........ Security Facility Information block
+0014  CERE_40_SLL........ 0024                      CERE_40_BLKID...... 03
+0018  CERE_40_VVRR....... 1410
+001A  CERE_40_APAR_SEQ... 0003                      CERE_40_FLAG1...... 03
+001F  CERE_40_DIAG....... 40  CERE_40_RQ_USERID.......... 'CEX002  '
+0028  CERE_40_RQ_CLASS... 0000000000000000
+0030  CERE_40_RQ_RC...... 00000000
+0034  CERE_40_RQ_REA..... 00000000

+0038  SAF_EXTENSION...... Variable extension to SAF events
+0038  CERE_40_SXT_LL..... 0009
+003A  CERE_40_SXT_APAR... 0002
+003C  CERE_40_SXT_CNTL1.......... 00      CERE_40_SXT_SACT... C8
+003E  CERE_40_SXT_FLAG1.......... 03      CERE_40_SXT_DIAG... 40
+0040  CERE_40_SXT_CEX.... 00
```

User ID

Active security features

Request details

```
+003E  CERE_40_SXT_FLAG1.......... 03   Flag field 1

 Off   CERE_40_SXT_FL1_VERIFY..... 80   Request is verify
 Off   CERE_40_SXT_FL1_FAUTH...... 40   Request is fastauth
 Off   CERE_40_SXT_FL1_DEL........ 20   Request is delete
 Off   CERE_40_SXT_FL1_LIST....... 10   Request is list
 Off   CERE_40_SXT_FL1_NEWPASS.... 04   Request is new password
 On    CERE_40_SXT_FL1_CACHEHIT... 02   Request satisfied by Cache hit
 On    CERE_40_SXT_FL1_ISSBYCEX... 01   Request issued by CEX
```

ACEE cache hit

```
+003D  CERE_40_SXT_SACT... C8   Security flag providing information about
                                the security features that are active.

 On    CERE_40_SXT_SA_ACEE........ 80   IMS Connect extensions ACEE
                                        caching feature is active.
 On    CERE_40_SXT_SA_IPCK........ 40   IMS Connect extensions IP address
                                        checking feature is active.
 Off   CERE_40_SXT_SA_APPL........ 20   IMS Connect extensions
                                        application checking feature is
                                        active.
 Off   CERE_40_SXT_SA_CHDEV....... 10   IMS Connect extensions ACEE
                                        caching feature has been
                                        deactivated due to an error.
 On    CERE_40_SXT_SA_ENF71....... 08   IMS Connect extensions is
                                        listening on the ENF interface
                                        for event 71.
```

Open Database request lifecycle: 2. Security clearance (FASTAUTH)

IBM Transaction Analysis Workbench

```
__ 005B DRDA 106E SECCHK-Security Check                    02.45.21.964812
__ 0063 ODBM Security Exit called                          02.45.21.964823
__ 0040 End SAF call                                       02.45.21.964896
__ 003F Begin SAF call                                     02.45.21.964908
_s 0040 End SAF call                                       02.45.21.965099
__ 0064 ODBM Security Exit returned                        02.45.21.965237
__ 005C DRDA 1219 SECCHKRM-Security Check Reply Message    02.45.21.965259
__ 004A WRITE Socket                                       02.45.21.965284
__ 0047 Session Error                                      02.45.21.965292
__ 000C Begin CLOSE Socket                                 02.45.21.965304
__ 000D End CLOSE Socket                                   02.45.21.965428
__ 0048 Trigger Event for CLOSE                            02.45.21.965440
```

```
+0004  Code... 0040  End SAF call
+0014  CERE_40_SLL........ Security Facility Information block
+0014  CERE_40_SLL........ 0024                    CERE_40_BLKID...... 03
+0018  CERE_40_VVRR...... 1410
+001A  CERE_40_APAR_SEQ... 0003                    CERE_40_FLAG1...... 41
+001F  CERE_40_DIAG...... 40  CERE_40_RQ_USERID.......... 'CEX002  '
+0028  CERE_40_RQ_CLASS... 'XFACILIT'
+0030  CERE_40_RQ_RC...... 00000008
+0034  CERE_40_RQ_REA..... 00000008

+0038  SAF_EXTENSION...... Variable extension to SAF events
+0038  CERE_40_SXT_LL..... 0009
+003A  CERE_40_SXT_APAR... 0002
+003C  CERE_40_SXT_CNTL1.......... 40          CERE_40_SXT_SACT... C8
+003E  CERE_40_SXT_FLAG1.......... 41          CERE_40_SXT_DIAG... 40
+0040  CERE_40_SXT_CEX.... 00

+0041  IP_PROFILE......... Variable extension to SAF events
+0041  CERE_40_SXT_IPPRFLL........ 0044
+0043  CERE_40_SXT_IPA_APAR....... 0001
+0045  CERE_40_SXT_RPEYEC......... 'CEX.'
+0049  CERE_40_SXT_RPFAMLY........ 'IPV4.'
+004E  CERE_40_SXT_RPVARID........ IP profile variable data
      +0000  D8C1C1C3 C6C7F1C1 4BF1F7F2 4BF0F1F7   *QAACFG1A.172.017*
      +0010  4BF0F6F9 4BF0F3F0 4BF0F8F8 F0F14040   *.069.030.08801  *
      +0020  40404040 40404040 40404040 40404040   *                *
      +0030  40404040 4040                         *                *
```

User ID

SAF class name

Active security features

Request details

FASTAUTH issued by IMS Connect Extensions

```
+003E  CERE_40_SXT_FLAG1.......... 41   Flag field 1

 Off   CERE_40_SXT_FL1_VERIFY..... 80   Request is verify
 On    CERE_40_SXT_FL1_FAUTH...... 40   Request is fastauth
 Off   CERE_40_SXT_FL1_DEL........ 20   Request is delete
 Off   CERE_40_SXT_FL1_LIST....... 10   Request is list
 Off   CERE_40_SXT_FL1_NEWPASS.... 04   Request is new password
 Off   CERE_40_SXT_FL1_CACHEHIT... 02   Request satisfied by Cache hit
 On    CERE_40_SXT_FL1_ISSBYCEX... 01   Request issued by CEX
```

```
+003D  CERE_40_SXT_SACT... C8   Security flag providing information about
                                the security features that are active.

 On    CERE_40_SXT_SA_ACEE........ 80   IMS Connect extensions ACEE
                                        caching feature is active.
 On    CERE_40_SXT_SA_IPCK........ 40   IMS Connect extensions IP address
                                        checking feature is active.
 Off   CERE_40_SXT_SA_APPL........ 20   IMS Connect extensions
                                        application checking feature is
                                        active.
 Off   CERE_40_SXT_SA_CHDEV....... 10   IMS Connect extensions ACEE
                                        caching feature has been
                                        deactivated due to an error.
 On    CERE_40_SXT_SA_ENF71....... 08   IMS Connect extensions is
                                        listening on the ENF interface
                                        for event 71.
```

Open Database request lifecycle:
2. Security clearance (access denied

IBM Transaction Analysis Workbench

```
__ 005B DRDA 106E SECCHK-Security Check                    02.45.21.964812
__ 0063 ODBM Security Exit called                          02.45.21.964823
__ 0040 End SAF call                                       02.45.21.964896
__ 003F Begin SAF call                                     02.45.21.964908
__ 0040 End SAF call                                       02.45.21.965099
__ 0064 ODBM Security Exit returned                        02.45.21.965237
_s 005C DRDA 1219 SECCHKRM-Security Check Reply Message    02.45.21.965259
__ 004A WRITE Socket                                       02.45.21.965284
__ 0047 Session Error                                      02.45.21.965292
__ 000C Begin CLOSE Socket                                 02.45.21.965304
__ 000D End CLOSE Socket                                   02.45.21.965428
__ 0048 Trigger Event for CLOSE                            02.45.21.965440
```

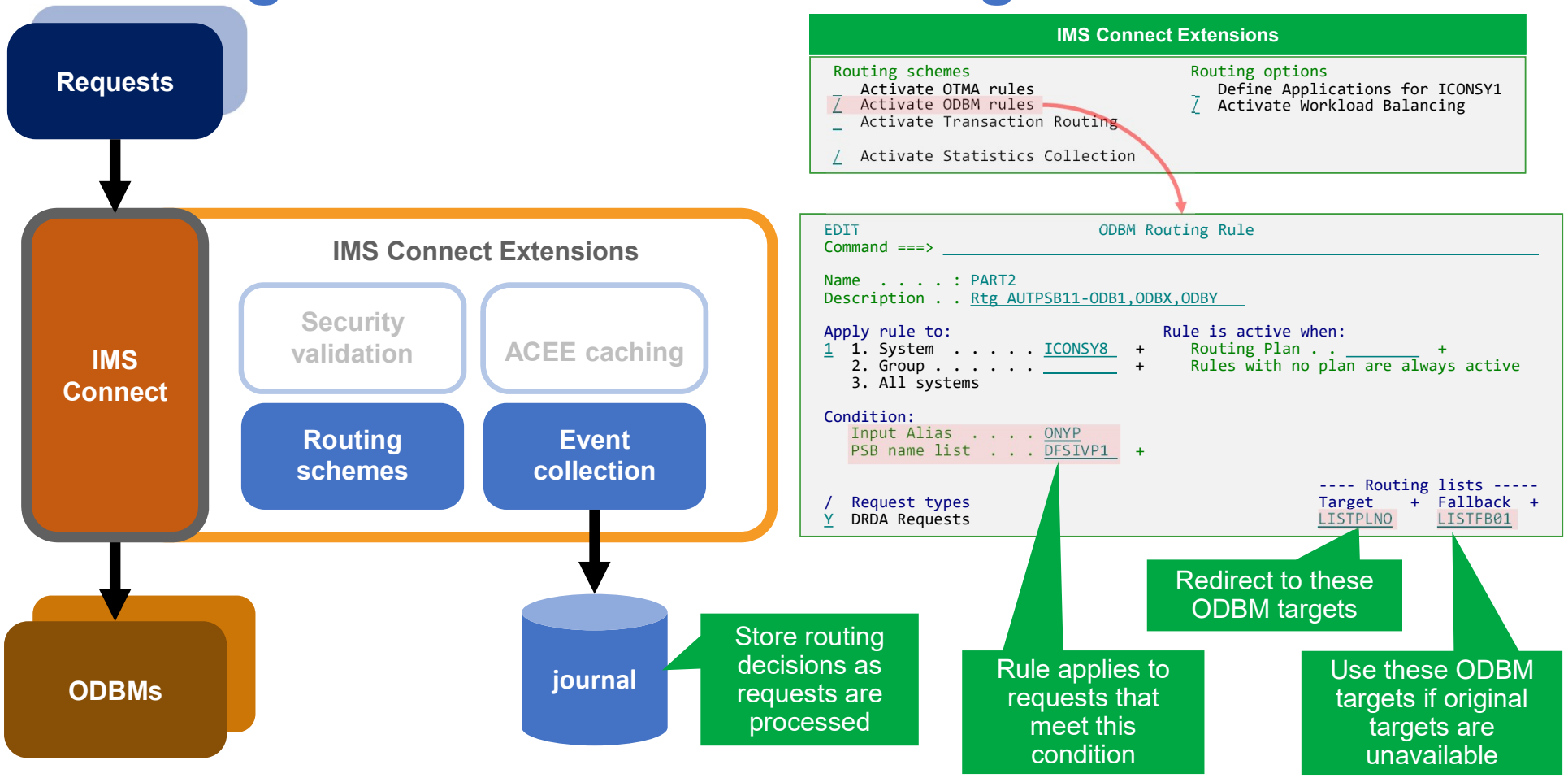
```
 On   INFO_CONT.......... 19   INFO Continue - require more security
                               context information for authentication.

 +0024  Object..... 11A4 SECCHKCD-
Security Check Code
 +0024  Length..... +5          CP......... 11A4

 +0028  Data....... SECCHKCD -
 Security Check Code SYNCTYPE
 +0028  SECCHKCD... 19

 +0029  Object..... 1149 SVRCOD-
Severity Code
 +0029  Length..... +6          CP......... 1149

 +002D  Data....... severity code

 +002E  SVRCOD..... 10

 +002F  Object..... 1153 SRVDGN-
Server Diagnostic Information
 +002F  Length..... +98         CP......... 1153

 +0033  Data....... Object data
        +0000  C8E6E2D2 F2F8F6F5 C540E2C5 C3E4D9C9   *HWSK2865E SECURI
*
        +0010  E3E840E5 C9D6D3C1 E3C9D6D5 5E40D97E   *TY VIOLATION; R=
*
        +0020  F0F1F1F6 6B40C37E D6C4C2F8 F1C3F8F4   *0116, C=ODB81C84
*
        +0030  6B40E47E C3C5E7F0 F0F24040 6B40D9C1   *, U=CEX002  , RA
*
        +0040  C3C6D9C3 7EF0F0F0 F86B40D9 C1C3C6D9   *CFRC=0008, RACFR
*
        +0050  E27EF0F0 F0F06B40 D47ED4D9 C3E5       *S=0000, M=MRCV
*
```

10: SEVERE

IMS Connect message HWSK2865E:

- RACF verification failed for the user ID and password from a client. The user ID and password were contained in the **SECCHK** DDM command.
- Client ID = ODB91C84
- User ID = CEX002
- RACF return code = 8 (The password or password phrase is not authorized)

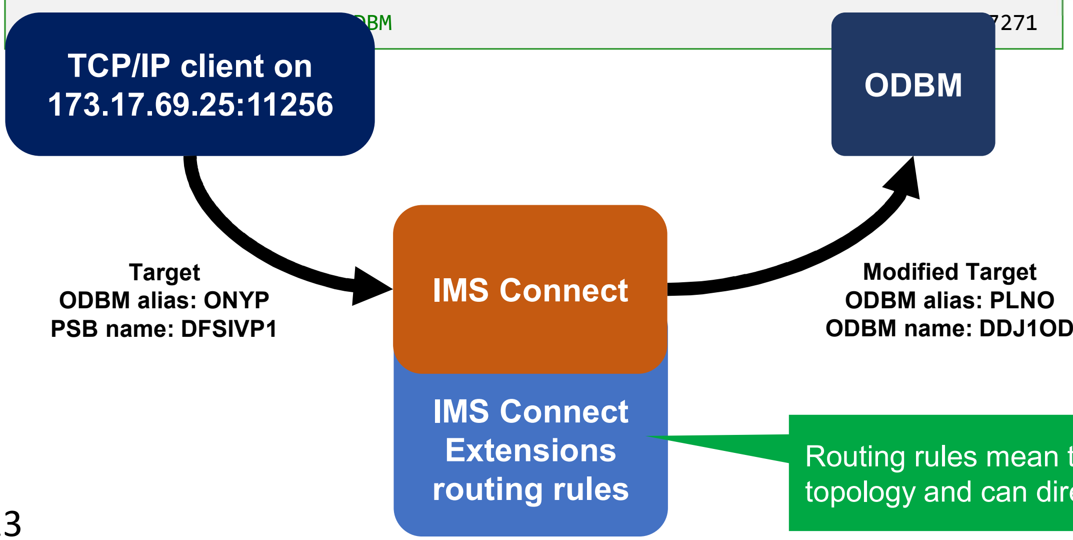
Connecting to an ODBM via routing



Open Database request lifecycle:
3. Establishing connection to the database (with routing)

```
BROWSE    CEX240.QAAUTO.P000000.EVNTLOG(RXORP24A)    Record 00000001 More: < >

Command ===> ________________________________________________ Scroll ===> CSR_

   Forwards / Backwards . . HH.MM.SS.THMIJU    Time of Day . . _______________

   Code Description                        Date 2015-04-
30 Thursday   Time (LOCAL)
/  ____ ______________________________________________ _______________
_
__ 005B DRDA 2001 ACCRDB-
Access RDB                                  06.54.35.107101
__ 005D ODBM begin Allocate PSB (APSB) Program=DFSIVP1          06.54.35.107105

__ 0061 ODBM Routing Exit called                                06.54.35.107112

_s 0062 ODBM Routing Exit returned                              06.54.35.107172
```

```
+0038  CERE_62_ROUT_EXT... DRDA Routing Exit parameter list
+0038  CERE_62_ROUT_EXT_SLL....... 002A
+003A  CERE_62_ROUT_EXT_APAR...... 0001
+003C  CERE_62_ROUT_EXT_PVER...... 00
+003E  CERE_62_ROUT_EXT_FUNC...... 'ROUT'
+0042  CERE_62_ROUT_EXT_IN_ALIAS......... 'ONYP'
+0046  CERE_62_ROUT_EXT_IN_PSBNM......... 'DFSIVP1 '
+004E  CERE_62_ROUT_EXT_OUT_ALIAS........ 'PLNO'
+0052  CERE_62_ROUT_EXT_OUT_ODBMNM........ 'DDJ1OD  '
+005A  CERE_62_ROUT_EXT_RC........ 00000000
+005E  CERE_62_ROUT_EXT_RSN....... 00000000

+0062  CERE_62_SVT........ DRDA Routing Exit Returned event SVT
+0062  CERE_62_SVT_OD_LL.......... 003E
+0064  CERE_62_SVT_OD_APAR........ 0002
+0066  CERE_62_SVT_OD_AFLAG1...... 20
+0067  CERE_62_SVT_OD_TFLAG1...... E0
+0068  CERE_62_SVT_OD_TFLAG2...... 00
+0069  CERE_62_SVT_OD_FLAG1....... 80
+006A  CERE_62_SVT_OD_RES02....... 00
+006B  CERE_62_SVT_OD_RES01....... 00
+006C  CERE_62_SVT_OD_CLIENTID.... 'ODB1A784'
+0074  CERE_62_SVT_OD_OUSERID..... 'CEX001  '
+007C  CERE_62_SVT_OD_OGROUP...... '        '

+0084  CERE_62_SVT_OD_IPV4........ Client ID structure in IPV4 format
+0084  CERE_62_SVT_OD_FAMILY...... +2
+0086  CERE_62_SVT_OD_PORT........ +11256
       CERE_62_SVT_OD_IPA......... '173.17.69.25'
+008C  CERE_62_SVT_OD_RES......... 00000000
```



Routing rules mean that clients do not need to know anything about the IMS topology and can direct workload based on logical rather than physical locations.

Open Database request lifecycle:
3. Establishing connection to the database (no ODBM)

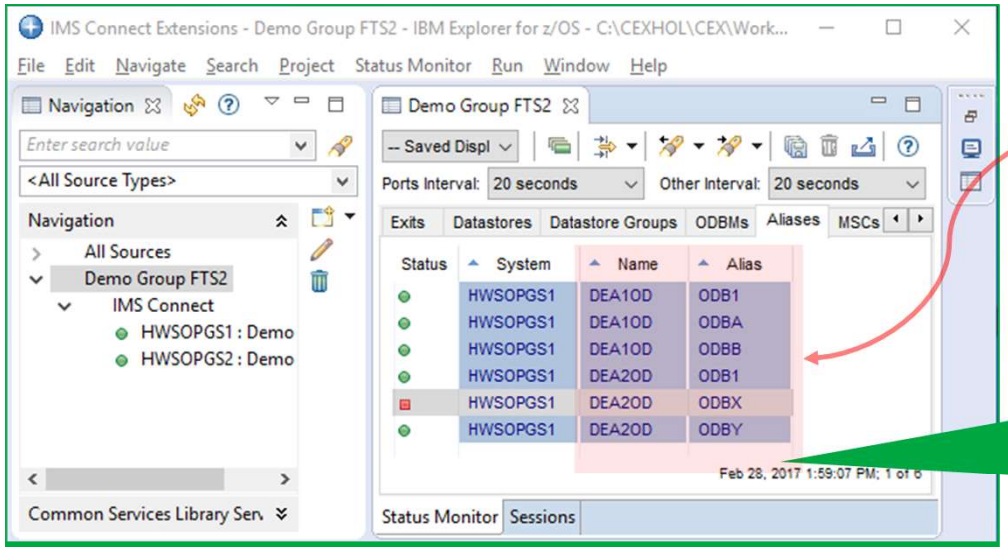
PSBNAME = DFSIVP1
Alias = WIBB

IMS Problem Investigator

```
/    Code Description                    Date 2015-05-25 Monday    Time (LOCAL)
__ 005B DRDA 2001 ACCRDB-Access RDB                                14.36.26.386732
__ 005D ODBM begin Allocate PSB (APSB) Program=DFSIVP1             14.36.26.386741
__ 0061 ODBM Routing Exit called                                   14.36.26.386752
__ 0062 ODBM Routing Exit returned                                 14.36.26.386786
_s 005C DRDA 2211 RDBNFNRM-RDB Not Found                           14.36.26.386813
__ 0047 Session Error                                              14.36.26.386856
__ 000C Begin CLOSE Socket                                         14.36.26.386877
__ 000D End CLOSE Socket                                           14.36.26.386982
__ 0048 Trigger Event for CLOSE                                    14.36.26.386994
```

```
+0020  Object..... 2211 RDBNFNRM-RDB Not Found
+0020  Length..... +167        CP......... 2211

+0024  Object..... 2110 RDBNAM-Relational Database Name
+0024  Length..... +16         CP......... 2110
+0028  Data....... 'DFSIVP1.WIBB'

+0034  Object..... 1149 SVRCOD-Severity Code
+0034  Length..... +6          CP......... 1149
+0038  Data....... severity code
+0039  SVRCOD..... 08

+003A  Object..... 1153 SRVDGN-Server Diagnostic Information
+003A  Length..... +136        CP......... 1153
+003E  Data....... Object data
       +0000  C8E6E2D2 F2F8F7F5 E640D5D6 40D6C4C2   *HWSK2875W NO ODB*
       +0010  D440C9E2 40C1E5C1 C9D3C1C2 D3C540C6   *M IS AVAILABLE F*
       +0020  D6D940D4 C5E2E2C1 C7C540D9 D6E4E3C9   *OR MESSAGE ROUTI*
       +0030  D5C75E40 C37ED6C4 C2F8F5F0 F0F46B40   *NG; C=ODB85004, *
       +0040  C9D4E2C1 7EE6C9C2 C26B40D7 7EF4F8F8   *IMSA=WIBB, P=488*
       +0050  F5F54040 406B40C9 D4E2C1F1 7EE6C9C2   *55    , IMSA1=WIB*
       +0060  C26B40D6 C4C2D47E 40404040 40404040   *B, ODBM=         *
       +0070  6B40D97E C9D4E2C1 D5C6D5C4 6B40D47E   *, R=IMSANFND, M=*
       +0080  D4D9C3E5                              *MRCV             *
```

08 = Error



IMS Connect Extensions Operations Console

The requested PSB name and alias does not exist!

CHECK?

IMS Connect message HWSK2875W.
Potential causes:

- The IMS is not associated with any ODBM known to IMS Connect (not found)
- The IMS is unavailable (inactive)

Open Database request lifecycle:
3. Establishing connection to the database (PSB stopped)

IMS Problem Investigator

```
   Code Description                    Date 2015-04-30 Thursday  Time (Relative)
/  ──── ──────────────────────────────────────────────────────── ──────────────
__ 005B DRDA 1041 EXCSAT-Exchange Server Attributes              09.23.37.107554
__ 0049 READ Socket                                                    +0.000012
__ 005B DRDA 106D ACCSEC-Access Security                               +0.000033
__ 005C DRDA 1443 EXCSATRD-Server Attributes Reply Data                +0.000052
__ 005C DRDA 14AC ACCSECRD-Access Security Reply Data                  +0.000059
__ 004A WRITE Socket                                                   +0.000089
__ 0049 READ Socket                                                    +0.034254
__ 005B DRDA 106E SECCHK-Security Check                                +0.034302
__ 0063 ODBM Security Exit called                                      +0.034317
__ 0064 ODBM Security Exit returned                                    +0.034369
__ 003F Begin SAF call                                                 +0.034378
__ 0040 End SAF call                                                   +0.035442
__ 003F Begin SAF call                                                 +0.035530
__ 0040 End SAF call                                                   +0.035537
__ 005C DRDA 1219 SECCHKRM-Security Check Reply Message                +0.035545
__ 004A WRITE Socket                                                   +0.035593
__ 0049 READ Socket                                                    +0.053281
__ 005B DRDA 2001 ACCRDB-Access RDB                                    +0.053323
__ 005D ODBM begin Allocate PSB (APSB) Program=DFSIVP1                 +0.053331
__ 0061 ODBM Routing Exit called                                       +0.053342
__ 0062 ODBM Routing Exit returned                                     +0.053378
__ 00AA ODBM Trace: Message sent to ODBM                               +0.053495
__ 0069 Message sent to ODBM                                           +0.053502
__ 00AA ODBM Trace: Message received from ODBM                         +0.056351
__ 006A Message received from ODBM                                     +0.056359
_s 005C DRDA 221A RDBAFLRM-RDB Access Failed Reply Message             +0.056404
__ 004A WRITE Socket                                                   +0.056456
__ 0048 Trigger Event for ODBMMSG                                      +0.056475
__ 003C Prepare READ Socket                                            +0.078201
__ 0047 Session Error                                                  +0.078213
__ 000C Begin CLOSE Socket                                             +0.078225
__ 000D End CLOSE Socket                                               +0.078370
__ 0048 Trigger Event for CLOSE                                        +0.078382
```

```
+0020  Object..... 221A RDBAFLRM-RDB Access Failed Reply Message
+0020  Length..... +142        CP......... 221A

+0024  Object..... 1149 SVRCOD-Severity Code
+0024  Length..... +6          CP......... 1149
+0028  Data....... severity code
+0029  SVRCOD..... 08

+002A  Object..... 2110 RDBNAM-Relational Database Name
+002A  Length..... +12         CP......... 2110
+002E  Data....... 'DFSIVP1 '

+0036  Object..... CC02 OUTAIBDBPCB-Concat of AIB and DBPCB data structures
+0036  Length..... +22         CP......... CC02
+003A  AIB........ aibStream
+003A  AIBflag.... 00           AIBused.... +0          AIBretc.... 00000108
+0043  AIBreas.... 0000030C     AIBerrc.... C4C6E2C9
+004B  DBPCB...... dbpcbStream
+004B  DBPflag.... FF

+004C  Object..... 1153 SRVDGN-Server Diagnostic Information
+004C  Length..... +98         CP......... 1153
+0050  Data....... Object data
       +0000  C3E2D3F4 F1F0F1C5 40C19540 D6C4C2D4   *CSL4101E An ODBM*
       +0010  40C4D361 C9408381 93937EC1 D7E2C240   * DL/I call=APSB *
       +0020  86818993 85844B40 40C1C9C2 D9C5E3D9   *failed.  AIBRETR*
       +0030  D57EF0F0 F0F0F0F1 F0F840C1 C9C2D9C5   *N=00000108 AIBRE*
       +0040  C1E2D57E F0F0F0F0 F0F3F0C3 40C1C9C2   *ASN=0000030C AIB*
       +0050  C5D9D9E7 E37EC3F4 C3F6C5F2 C3F9       *ERRXT=C4C6E2C9  *
```

08 = Error

PSBNAME = DFSIVP1

X'108'/X'30C'

Common Service Layer (ODBM) message CSL4101E

- Failed DL/I call made by ODBM = APSB (Allocate PSB)
- AIB return and reason codes (AIBRETR/AIBREASN) = X'108'/X'30C' ('PSB is marked permanently bad')

Open Database request lifecycle:
3. Establishing connection to the database (client timeout)

IMS Problem Investigator

```
   Code Description                    Date 2015-05-25 Monday Time (LOCAL)
/  ____ ___________________________________________________ _______________
__ 005B DRDA 1041 EXCSAT-Exchange Server Attributes          13.29.22.455027
__ 0049 READ Socket                                          13.29.22.455046
__ 0049 READ Socket                                          13.29.22.455059
__ 005B DRDA 106D ACCSEC-Access Security                     13.29.22.455066
__ 005C DRDA 1443 EXCSATRD-Server Attributes Reply Data      13.29.22.455083
__ 005C DRDA 14AC ACCSECRD-Access Security Reply Data        13.29.22.455090
__ 004A WRITE Socket                                         13.29.22.455103
__ 0049 READ Socket                                          13.29.22.490119
__ 0049 READ Socket                                          13.29.22.490148
__ 005B DRDA 106E SECCHK-Security Check                      13.29.22.490151
__ 0063 ODBM Security Exit called                            13.29.22.490189
__ 0064 ODBM Security Exit returned                          13.29.22.490323
__ 003F Begin SAF call                                       13.29.22.490332
__ 0040 End SAF call                                         13.29.22.493816
__ 003F Begin SAF call                                       13.29.22.493828
__ 0040 End SAF call                                         13.29.22.493830
__ 005C DRDA 1219 SECCHKRM-Security Check Reply Message      13.29.22.493838
__ 004A WRITE Socket                                         13.29.22.493877
__ 0049 READ Socket                                          13.29.22.514918
__ 0049 READ Socket                                          13.29.22.514947
__ 005B DRDA 2001 ACCRDB-Access RDB                          13.29.22.514955
__ 005D ODBM begin Allocate PSB (APSB) Program=DFSIVP1       13.29.22.514967
__ 0061 ODBM Routing Exit called                             13.29.22.514981
__ 0062 ODBM Routing Exit returned                           13.29.22.515023
__ 00AA ODBM Trace: Message sent to ODBM                     13.29.22.516839
__ 0069 Message sent to ODBM                                 13.29.22.516847
__ 0045 Time-out                                             13.32.42.517315
_s 005C DRDA 1232 AGNPRMRM-Permanent Agent Error             13.32.42.517363
__ 004A WRITE Socket                                         13.32.42.517655
__ 0047 Session Error                                        13.32.42.518456
__ 000C Begin CLOSE Socket                                   13.32.42.518499
__ 000D End CLOSE Socket                                     13.32.42.518602
```

```
+001A  DSSHDR..... DSS header for DDM command
+001A  DSSlen..... +157        DDMID...... D0          FormatID... 02
+001D  Type....... 02          RQSCRR..... 0001

+0020  Object..... 1232 AGNPRMRM-Permanent Agent Error
+0020  Length..... +151        CP......... 1232

+0024  Object..... 1149 SVRCOD-Severity Code
+0024  Length..... +6          CP......... 1149
+0028  Data....... severity code
+0029  SVRCOD..... 10

+002A  Object..... 2110 RDBNAM-Relational Database Name
+002A  Length..... +11         CP......... 2110        Data....... 'DFSIVP1'

+0035  Object..... 1153 SRVDGN-Server Diagnostic Information
+0035  Length..... +130        CP......... 1153
+0039  Data....... Object data
       +0000  C8E6E2D1 F2F5F3F0 E640C140 C3D6D5D5   *HWSJ2530W A CONN*
       +0010  C5C3E3C9 D6D540C6 D6D940C1 40C3D3C9   *ECTION FOR A CLI*
       +0020  C5D5E340 C1C3C3C5 E2E2C9D5 C740C9D4   *ENT ACCESSING IM*
       +0030  E240C4C2 40E3C9D4 C5C440D6 E4E35E40   *S DB TIMED OUT; *
       +0040  C3D3C9C5 D5E37EF4 F8F8F5F5 4040406D   *CLIENT=48855    *
       +0050  D6C4C2F2 F1F9F8F6 5E40D6C4 C2D47EC4   *ODB21986; ODBM=D*
       +0060  C5D1F1D6 C440406B 40C3D77E C1C3C3D9   *EJ1OD  , CP=ACCR*
       +0070  C4C24040 40406B40 D47ED4C3 E5C3       *DB    , M=MCVC  *
```

PSBNAME = DFSIVP1

IMS Connect message HWSJ2530W

- Connection for client ID ‘ODB21986’ on port 48855 timed out before IMS Connect received a response to DDM command ACCRDB (Access RDB) from ODBM DEJ10D

Balancing Open Database workloads to reduce running costs

IMS Connect Extensions

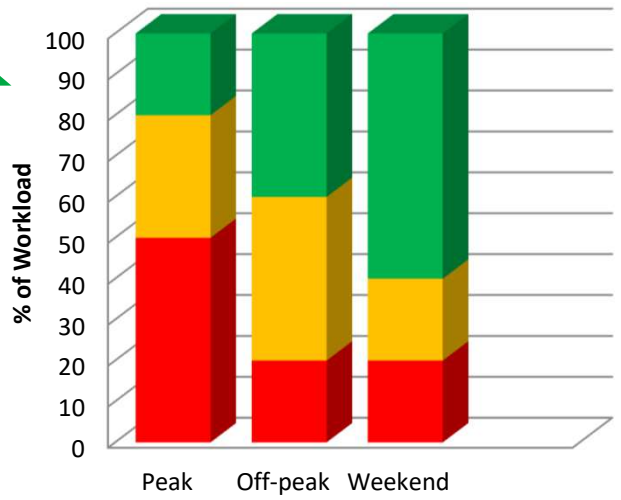
```
Routing schemes                          Routing options
  _ Activate OTMA rules                    _ Define Applications for ICONSY1
  / Activate ODBM rules                    / Activate Workload Balancing
  _ Activate Transaction Routing

  / Activate Statistics Collection
```

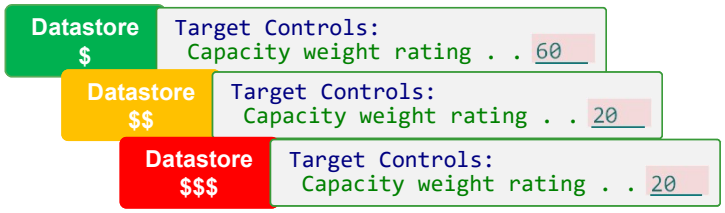
```
EDIT                          ODBM Routing Rule
Command ===> ____________________________________________________________

Name  . . . . : PART2
Description . . Rtg AUTPSB11-ODB1,ODBX,ODBY

Apply rule to:                          Rule is active when:
1  1. System  . . . . . ICONSY8   +        Routing Plan . . WEEKEND   +
   2. Group . . . . . . _______   +        Rules with no plan are always active
   3. All systems

Condition:
   Input Alias  . . . . ONYP
   PSB name list  . . . DFSIVP1   +

                                          ---- Routing lists -----
/  Request types                          Target    +  Fallback  +
Y  DRDA Requests                          LISTPLNO     LISTFB01
```

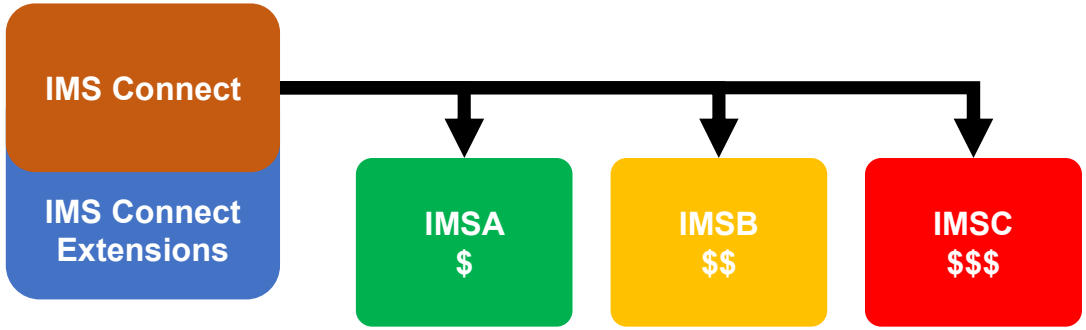
Reduce costs by moving to cheaper datastores during off-peak and weekend timeslots

Associate rule with a plan.

Use command to activate a plan.







Open database request lifecycle:
4. Access the database (request)

IBM Transaction Analysis Workbench

```
__ 005B DRDA 200C OPNQRY-Open Query                              12.31.15.343991
__ 0049 READ Socket                                              12.31.15.344004
__ 0049 READ Socket                                              12.31.15.344017
__ 005B DRDA CC05 DLIFUNC-DL/I function                          12.31.15.344021
__ 0049 READ Socket                                              12.31.15.344030
__ 0049 READ Socket                                              12.31.15.344043
__ 005B DRDA CC01 INAIB-AIB data                                 12.31.15.344047
__ 0049 READ Socket                                              12.31.15.344059
__ 0049 READ Socket                                              12.31.15.344068
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data    12.31.15.344072
__ 0049 READ Socket                                              12.31.15.344085
__ 0049 READ Socket                                              12.31.15.344107
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data    12.31.15.344110
__ 0049 READ Socket                                              12.31.15.344120
__ 0049 READ Socket                                              12.31.15.344132
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data    12.31.15.344136
__ 0049 READ Socket                                              12.31.15.344145
__ 0049 READ Socket                                              12.31.15.344158
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data    12.31.15.344162
__ 0049 READ Socket                                              12.31.15.344171
__ 0049 READ Socket                                              12.31.15.344188
__ 005B DRDA CC06 SSALIST-List of segment search argument        12.31.15.344188
_s 00AA ODBM Trace: Message sent to ODBM                         12.31.15.344235
__ 0069 Message sent to ODBM                                     12.31.15.344239
__ 00AA ODBM Trace: Message received from ODBM                   12.31.15.344868
__ 006A Message received from ODBM                               12.31.15.344873
__ 005C DRDA 2205 OPNQRYRM-Open Query Complete                   12.31.15.344937
__ 004A WRITE Socket                                             12.31.15.345014
__ 0048 Trigger Event for ODBMMSG                                12.31.15.345023
```

```
+0004  Code... 00AA  ODBM Trace: Message sent to ODBM
+0111  STCK... D228BD585AB6BCA6      LSN.... 000000000000013F
       Date... 2017-02-27 Monday     Time... 12.31.15.344235.790

+0038  Object..... 200C OPNQRY-Open Query
+0038  Length..... +38         CP......... 200C

+0042  Object..... C907 PCBNAME-PCB name
+0042  Length..... +12         CP......... C907        Data....... 'AUTOLPCB'

+0064  Object..... CC05 DLIFUNC-DL/I function
+0064  Length..... +12         CP......... CC05        Data....... 'RETRIEVE'

+0076  Object..... CC01 INAIB-AIB data
+0076  Length..... +24         CP......... CC01

+007A  Object..... C901 AIBRSNM1-PCB Name
+007A  Length..... +12         CP......... C901        Data....... 'AUTOLPCB'

+0094  Object..... CC04 RTRVFLD-Field client wants to retrieve data from
+0094  Length..... +12         CP......... CC04
+0098  Data....... 0000003F00000018
. . . (data is truncated)

+00DC  Object..... CC06 SSALIST-List of segment search argument
+00DC  Length..... +53         CP......... CC06

+00E0  Object..... C905 SSACOUNT-Number of segment search arguments
+00E0  Length..... +6          CP......... C905        Data....... 0003

+00E6  Object..... C906 SSA-Segment search argument
+00E6  Length..... +15         CP......... C906
+00EA  Data....... 'DEALER  *D '

+00F5  Object..... C906 SSA-Segment search argument
+00F5  Length..... +15         CP......... C906
+00F9  Data....... 'MODEL   *D '

+0104  Object..... C906 SSA-Segment search argument
+0104  Length..... +13         CP......... C906
+0108  Data....... 'SALES      '
```

Record offset: 0000003F
Field Length: 00000018

IMS Connect Extensions 00AA “ODBM Trace event” encapsulates all the important information being sent to ODBM using IMS-specific code points
https://www.ibm.com/support/knowledgecenter/en/SSEPH2_14.1.0/com.ibm.ims14.doc.apr/ims_ddm_architecture.htm

Open database request lifecycle:
4. Access the database (response)

IBM Transaction Analysis Workbench

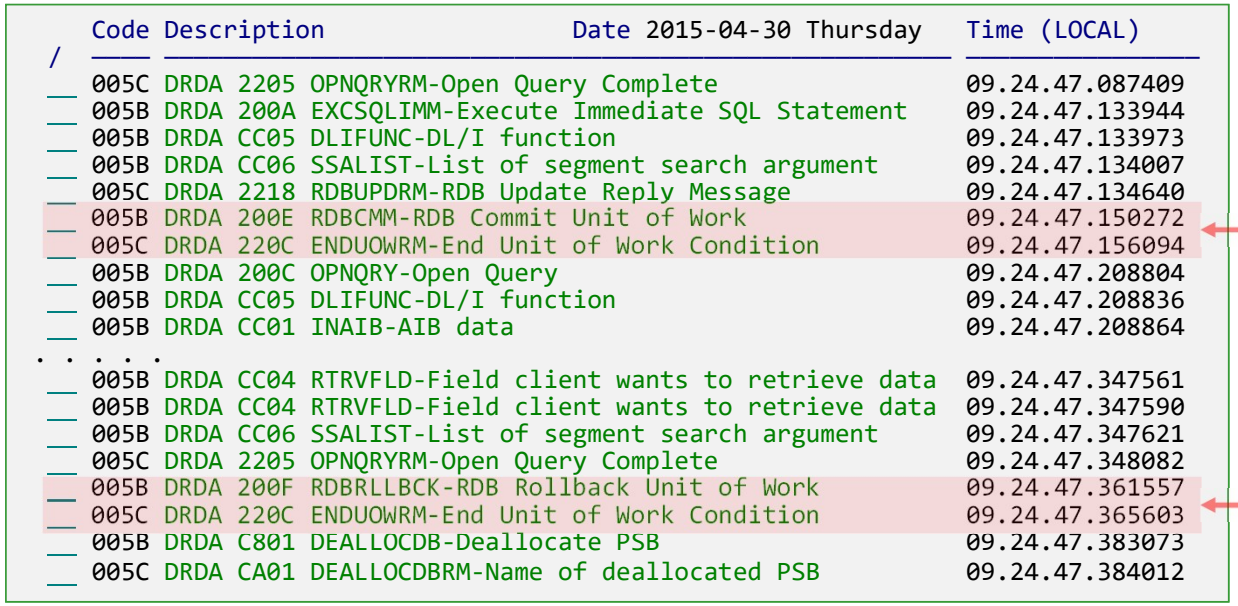
```
__ 005B DRDA 200C OPNQRY-Open Query                                  12.31.15.343991
__ 0049 READ Socket                                                  12.31.15.344004
__ 0049 READ Socket                                                  12.31.15.344017
__ 005B DRDA CC05 DLIFUNC-DL/I function                              12.31.15.344021
__ 0049 READ Socket                                                  12.31.15.344030
__ 0049 READ Socket                                                  12.31.15.344043
__ 005B DRDA CC01 INAIB-AIB data                                     12.31.15.344047
__ 0049 READ Socket                                                  12.31.15.344059
__ 0049 READ Socket                                                  12.31.15.344068
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data        12.31.15.344072
__ 0049 READ Socket                                                  12.31.15.344085
__ 0049 READ Socket                                                  12.31.15.344107
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data        12.31.15.344110
__ 0049 READ Socket                                                  12.31.15.344120
__ 0049 READ Socket                                                  12.31.15.344132
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data        12.31.15.344136
__ 0049 READ Socket                                                  12.31.15.344145
__ 0049 READ Socket                                                  12.31.15.344158
__ 005B DRDA CC04 RTRVFLD-Field client wants to retrieve data        12.31.15.344162
__ 0049 READ Socket                                                  12.31.15.344171
__ 0049 READ Socket                                                  12.31.15.344188
__ 005B DRDA CC06 SSALIST-List of segment search argument            12.31.15.344188
__ 00AA ODBM Trace: Message sent to ODBM                             12.31.15.344235
__ 0069 Message sent to ODBM                                         12.31.15.344239
_s 00AA ODBM Trace: Message received from ODBM                       12.31.15.344868
__ 006A Message received from ODBM                                   12.31.15.344873
__ 005C DRDA 2205 OPNQRYRM-Open Query Complete                       12.31.15.344937
__ 004A WRITE Socket                                                 12.31.15.345014
__ 0048 Trigger Event for ODBMMSG                                    12.31.15.345023
```

```
+0004  Code... 00AA  ODBM Trace: Message received from ODBM
+0145  STCK... D228BD585ADE4804      LSN.... 0000000000000141
       Date... 2017-02-27 Monday     Time... 12.31.15.344868.500

+0038  Object..... 2205 OPNQRYRM-Open Query Complete
+0038  Length..... +10         CP......... 2205

+003C  Object..... 1149 SVRCOD-Severity Code
+003C  Length..... +6          CP......... 1149
+0040  Data....... severity code
+0041  SVRCOD..... 00

+0064  Object..... 241B QRYDTA-Query Answer Set Data
+0064  Length..... +157        CP......... 241B
+0068  AIB........ aibStream
+0068  AIBflag.... 00           AIBused.... +229        AIBretc.... 00000000
+0071  AIBreas.... 00000000     AIBerrc.... 00000000
+0079  DBPCB...... dbpcbStream
+0079  DBPflag.... 00           DBflag..... 00          DBname..... 'AUTOLDB '
+0083  SL......... '03'         SC......... '  '        Segment.... 'SALES   '
+008F  KFBAflag... 00           KFBAlen.... +32
+0094  KFBA....... '1234FORD      FOCUS     20021111'
+00B4  IOarea..... IO area
      +0000  F1F2F3F4 E2C1D540 D1D6E2C5 40C6D6D9   *1234SAN JOSE FOR*
      +0010  C4404040 40404040 40404040 40404040   *D                *
      +0020  4040C6D6 D9C44040 40404040 C6D6C3E4   *  FORD      FOCU*
      +0030  E2404040 4040F2F0 F0F2F1F1 F1F1D3C9   *S     20021111LI*
      +0040  C7C8E340 C2D3E4C5 F1F6F0F0 F0         *GHT BLUE16000   *

+0107  Object..... 220B ENDQRYRM-End of Query
+0107  Length..... +62         CP......... 220B

+010B  Object..... 1149 SVRCOD-Severity Code
+010B  Length..... +6          CP......... 1149
+010F  Data....... severity code
+0110  SVRCOD..... 04

+0111  Object..... CC02 OUTAIBDBPCB-Concat of AIB and DBPCB data structures
+0111  Length..... +52         CP......... CC02
+0115  AIB........ aibStream
+0115  AIBflag.... 00           AIBused.... +61         AIBretc.... 00000900
+011E  AIBreas.... 00000000     AIBerrc.... 00000000
+0126  DBPCB...... dbpcbStream
+0126  DBPflag.... 00           DBflag..... 00          DBname..... 'AUTOLDB '
+0130  SL......... '01'         SC......... 'GE'        Segment.... 'DEALER  '
+013C  KFBAflag... 00           KFBAlen.... +4          KFBA....... '9999'
```

Warning

Status code: Segment not found

Open Database request lifecycle
5. Commit all work (or rollback)



	Code	Description	Date 2015-04-30 Thursday	Time (LOCAL)
/				
__	005C	DRDA 2205 OPNQRYRM-Open Query Complete		09.24.47.087409
__	005B	DRDA 200A EXCSQLIMM-Execute Immediate SQL Statement		09.24.47.133944
__	005B	DRDA CC05 DLIFUNC-DL/I function		09.24.47.133973
__	005B	DRDA CC06 SSALIST-List of segment search argument		09.24.47.134007
__	005C	DRDA 2218 RDBUPDRM-RDB Update Reply Message		09.24.47.134640
__	005B	DRDA 200E RDBCMM-RDB Commit Unit of Work		09.24.47.150272
__	005C	DRDA 220C ENDUOWRM-End Unit of Work Condition		09.24.47.156094
__	005B	DRDA 200C OPNQRY-Open Query		09.24.47.208804
__	005B	DRDA CC05 DLIFUNC-DL/I function		09.24.47.208836
__	005B	DRDA CC01 INAIB-AIB data		09.24.47.208864
. .	.	. .		
__	005B	DRDA CC04 RTRVFLD-Field client wants to retrieve data		09.24.47.347561
__	005B	DRDA CC04 RTRVFLD-Field client wants to retrieve data		09.24.47.347590
__	005B	DRDA CC06 SSALIST-List of segment search argument		09.24.47.347621
__	005C	DRDA 2205 OPNQRYRM-Open Query Complete		09.24.47.348082
__	005B	DRDA 200F RDBRLLBCK-RDB Rollback Unit of Work		09.24.47.361557
__	005C	DRDA 220C ENDUOWRM-End Unit of Work Condition		09.24.47.365603
__	005B	DRDA C801 DEALLOCDB-Deallocate PSB		09.24.47.383073
__	005C	DRDA CA01 DEALLOCDBRM-Name of deallocated PSB		09.24.47.384012

DRDA requests to Commit

DRDA requests to Rollback

DRDA responses indicate success or failure

Summary

- Understanding Open Database standards vital to diagnosing problems when they occur
- Expertise required when tracing client requests
  - The client application programmer may only know SQL, but the tools provide insights into how that SQL is translated into DRDA requests and IMS calls
- Tooling can also help you with:
  - Instrumentation and problem diagnosis
  - Security
  - Workload distribution and balancing
  - Automation

IMS and Open Database: further reading

- DRDA DDM command architecture reference (IMS)
  https://www.ibm.com/support/knowledgecenter/SSEPH2_14.1.0/com.ibm.ims14.doc.apr/ims_ddm_architecture.htm
- DRDA V5 Vol. 3: Distributed Data Management Architecture
  https://publications.opengroup.org/c114
- Capturing DRDA/DDM events for later analysis
  http://www.ibm.com/support/knowledgecenter/SSAVHV/welcome
- Browsing and analyzing logs containing DRDA/DDM events
  https://www.ibm.com/support/knowledgecenter/en/SSKKZM_1.3.0/fuwutsk_browsing_logs_ad_hoc.htm

For More Information

- IMS Tools website
  www.ibm.com/it-infrastructure/z/ims/tools
- IMS Tools new functions
  www.ibm.com/support/docview.wss?uid=swg22015506
- IMS Tools Product Documentation
  www.ibm.com/support/docview.wss?uid=swg27020942
- IMS Tools support for IMS V15
  www.ibm.com/support/docview.wss?uid=swg22009341
- IMS Tools support for Managed ACBs
  www.ibm.com/support/docview.wss?uid=ibm10731745
- IMS Tools support for Data Set Encryption
  www.ibm.com/support/docview.wss?uid=ibm107333513
- IMS Tools Youtube Playlist
  www.youtube.com/playlist?list=PLezLS0Tuqb-5DSdF1Locnq5IhTgcX02vf
- IMS new functions
  www.ibm.com/support/knowledgecenter/en/SSEPH2_15.1.0/com.ibm.ims15.doc.rpg/ims_cd_functions.htm
- IBM zITSM newsletter (email every 2 months with summary articles and links to more information)
  http://ibm.biz/zITSMNewsletterSubscribe

धन्यवाद

Hindi

多謝

Traditional

감사합니다

Korean

Спасибо

Russian

Ndzi khense ngopfu

Tsonga

Gracias

Spanish

Thank You

English

Obrigado

Brazilian Portuguese

شكراً

Arabic

Grazie

Italian

Danke

German

多谢

Simplified Chinese

Merci

French

Ke a leboha

Tswana

நன்றி

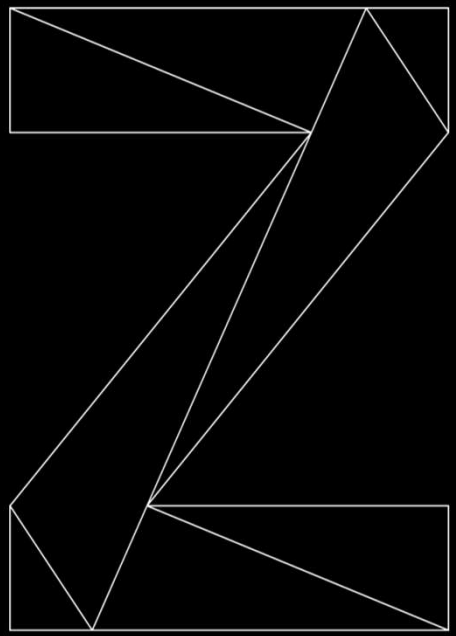
Tamil

ありがとうございました

Japanese

ขอบคุณ

Thai



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