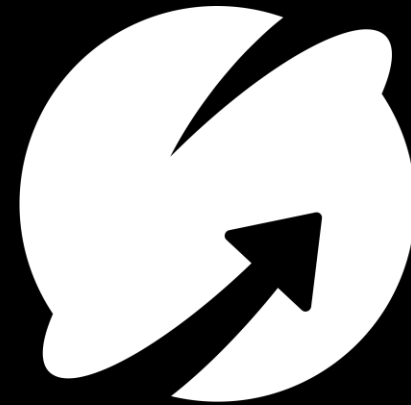


IMS Open Database You Need to Know What Application Developers Do Not Know



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)



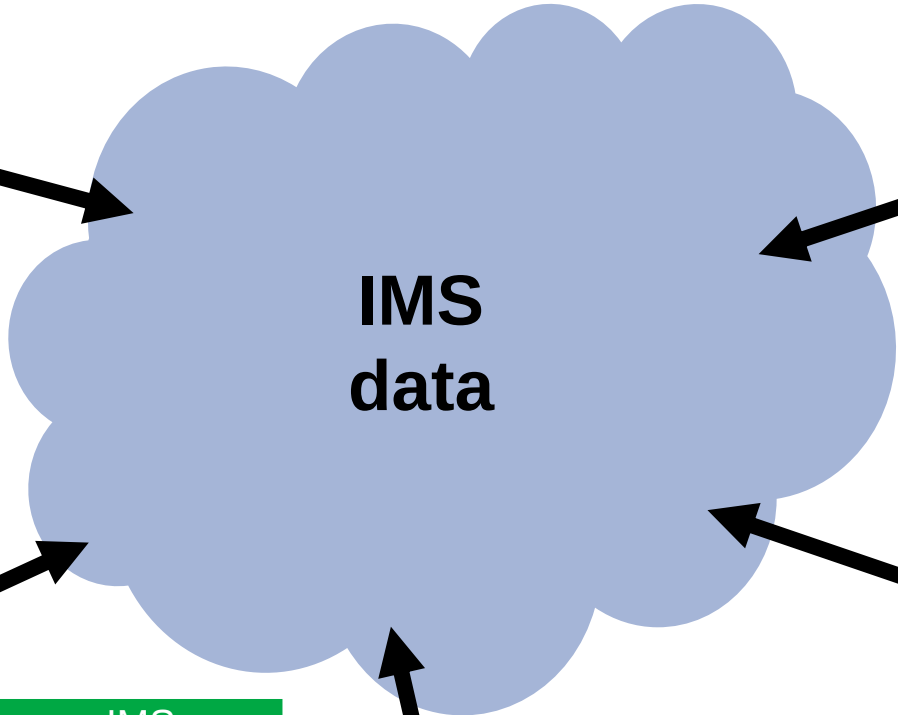
Web-enabled IMS applications



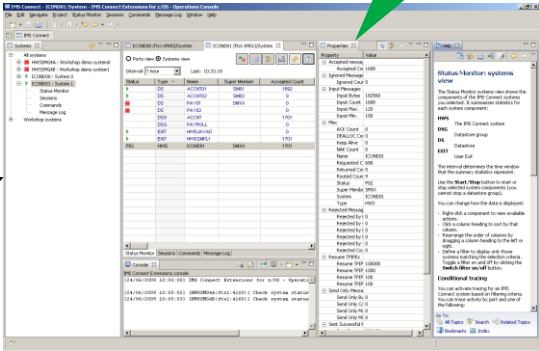
IMS Enterprise Suite Mobile Feature Pack



z/OS Connect



IMS Enterprise Suite Explorer for Development

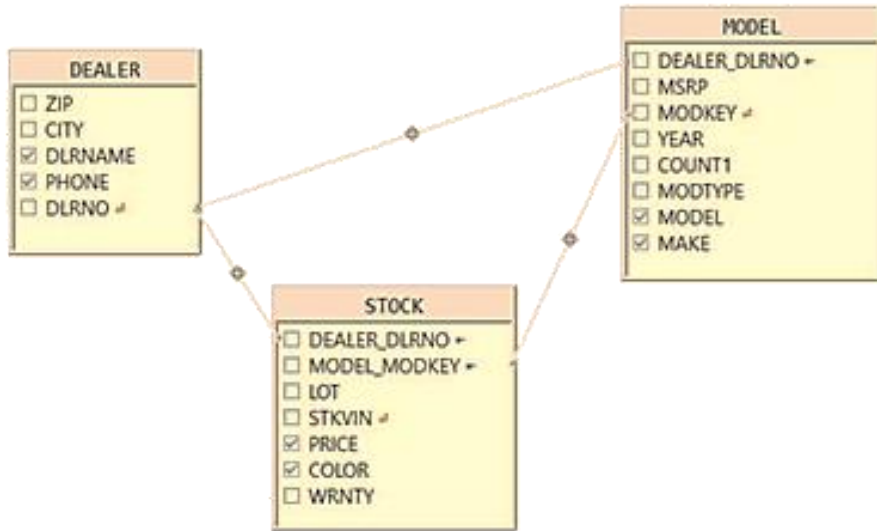


IBM Cloud



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.DLRNO = AUTOLPCB.MODEL.DEALER_DLRNO  
AND AUTOLPCB.STOCK.MODEL_MODKEY = AUTOLPCB.MODEL.MODKEY
```

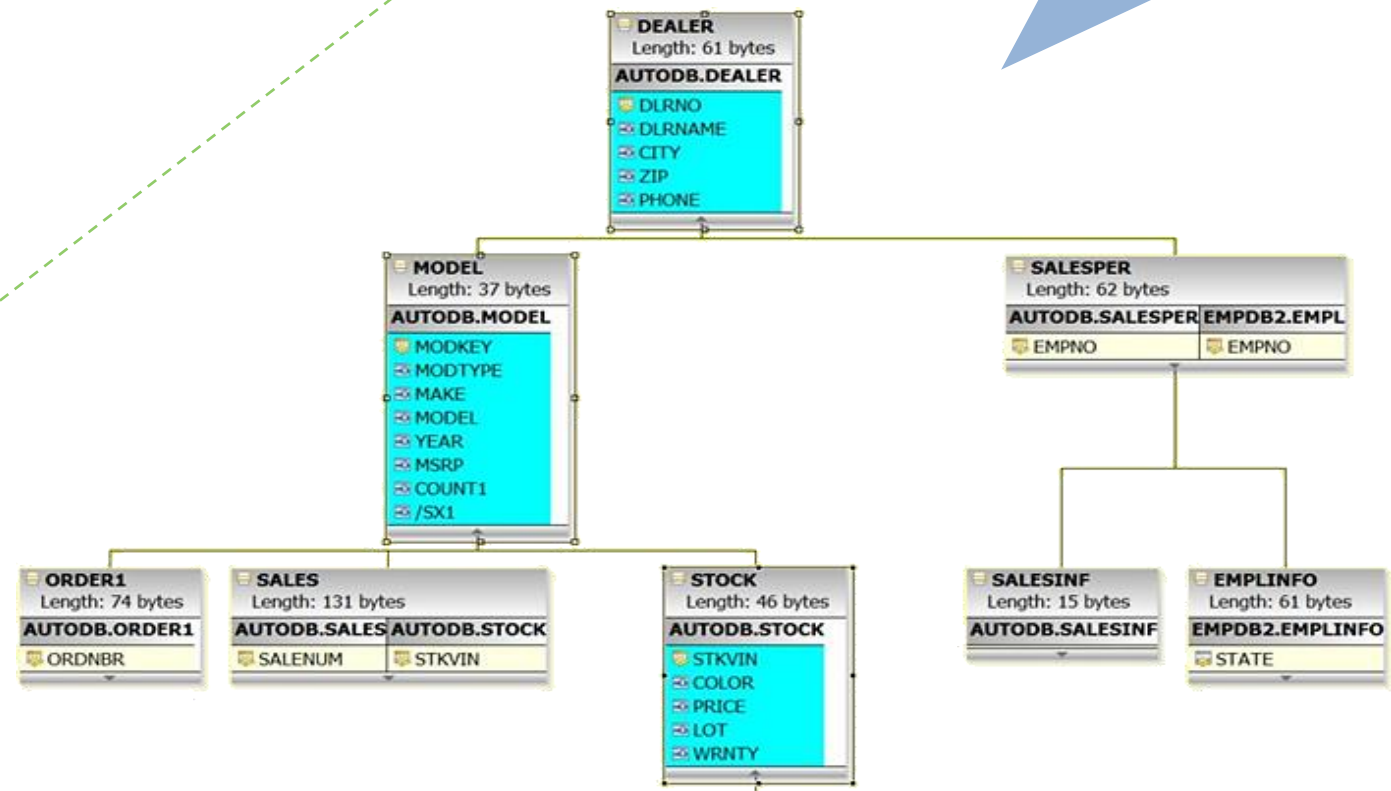


Application Developer

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

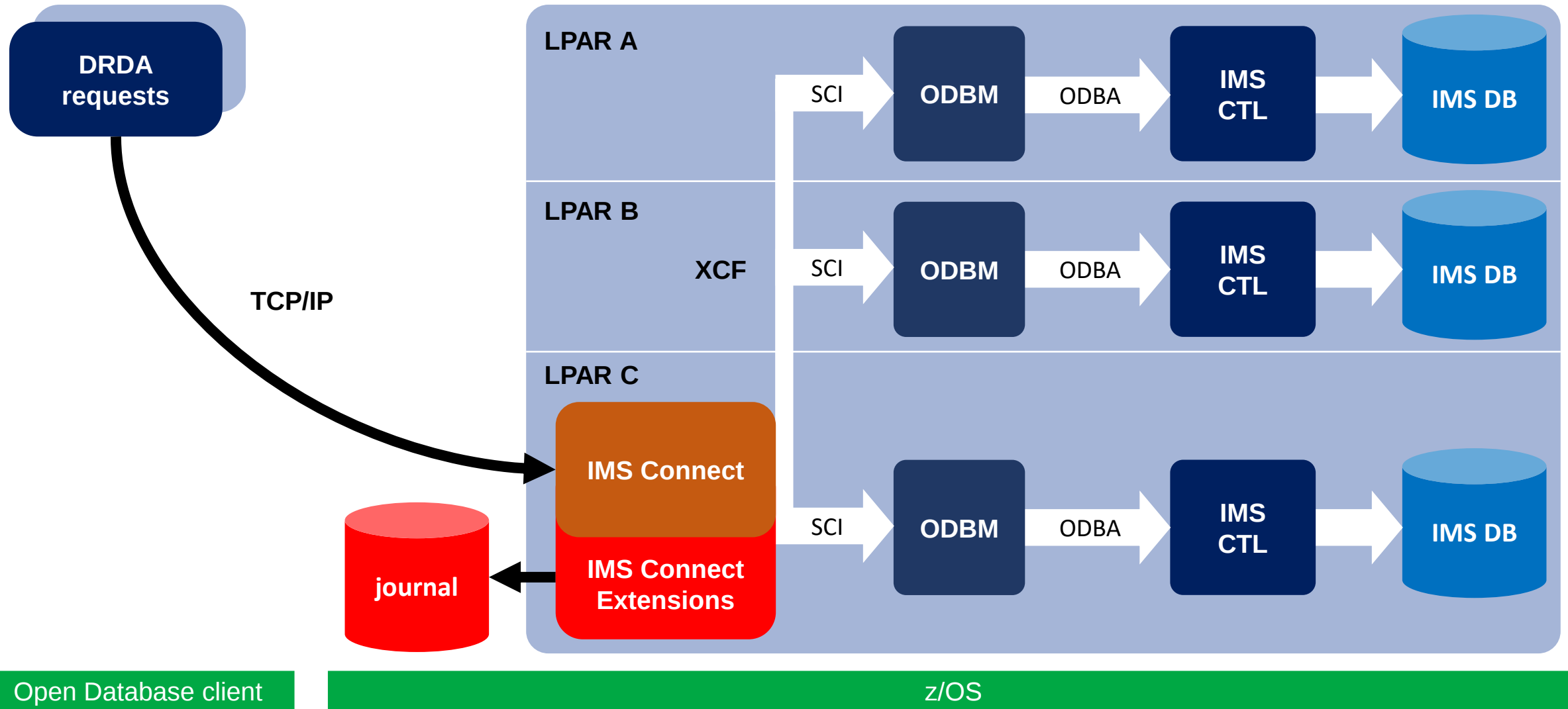
DRDA (Distributed Relational Database Architecture)

- 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



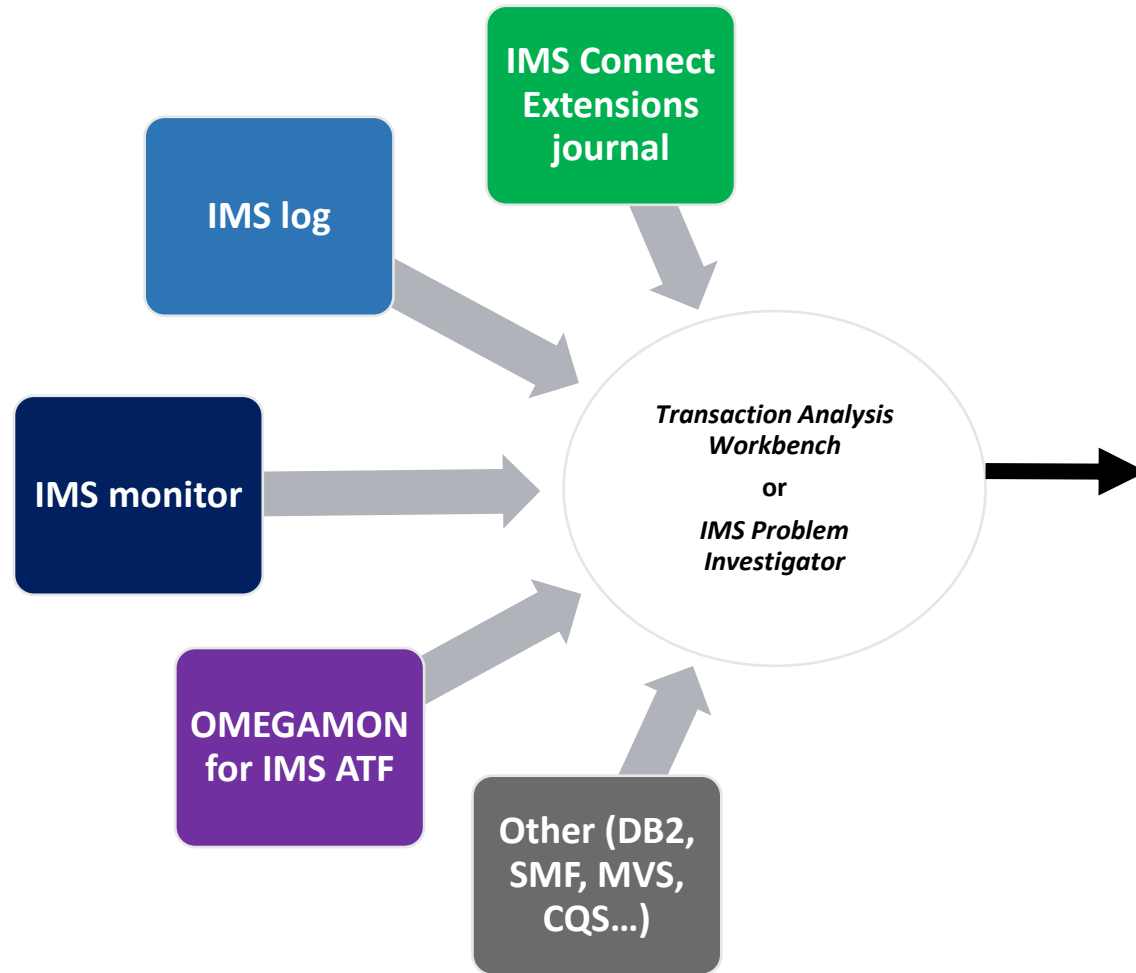
Tools used in the following examples

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

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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 ODBMSG                           +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	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	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	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 ODBMSG	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 ODBMSG	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 ODBMSG	10.03.34.926046

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 Tracking

/ 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

Format the record

Zoom to learn more

```
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 **
```

DSSChain... 40

DSSType.... 01

File Menu Help

Field Zoom

```
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

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... 0000000000000F0
 Date... 2017-02-10 Friday Time... 14.37.06.041083.894

Data stream structure header (DSSHDR)

+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

EXCSAT command
(X'1041')

https://www.ibm.com/support/knowledgecenter/SSEPH2_14.1.0/com.ibm.im.s14.doc.apr/ims_ddm_excSAT.htm

+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'

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

+0056 Object..... 1147 SRVCLSNM-Server Class Name
 +0056 Length..... +7 CP..... 1147 Data..... 'DFS'

***** End of data *****

IBM
IMS Tools

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

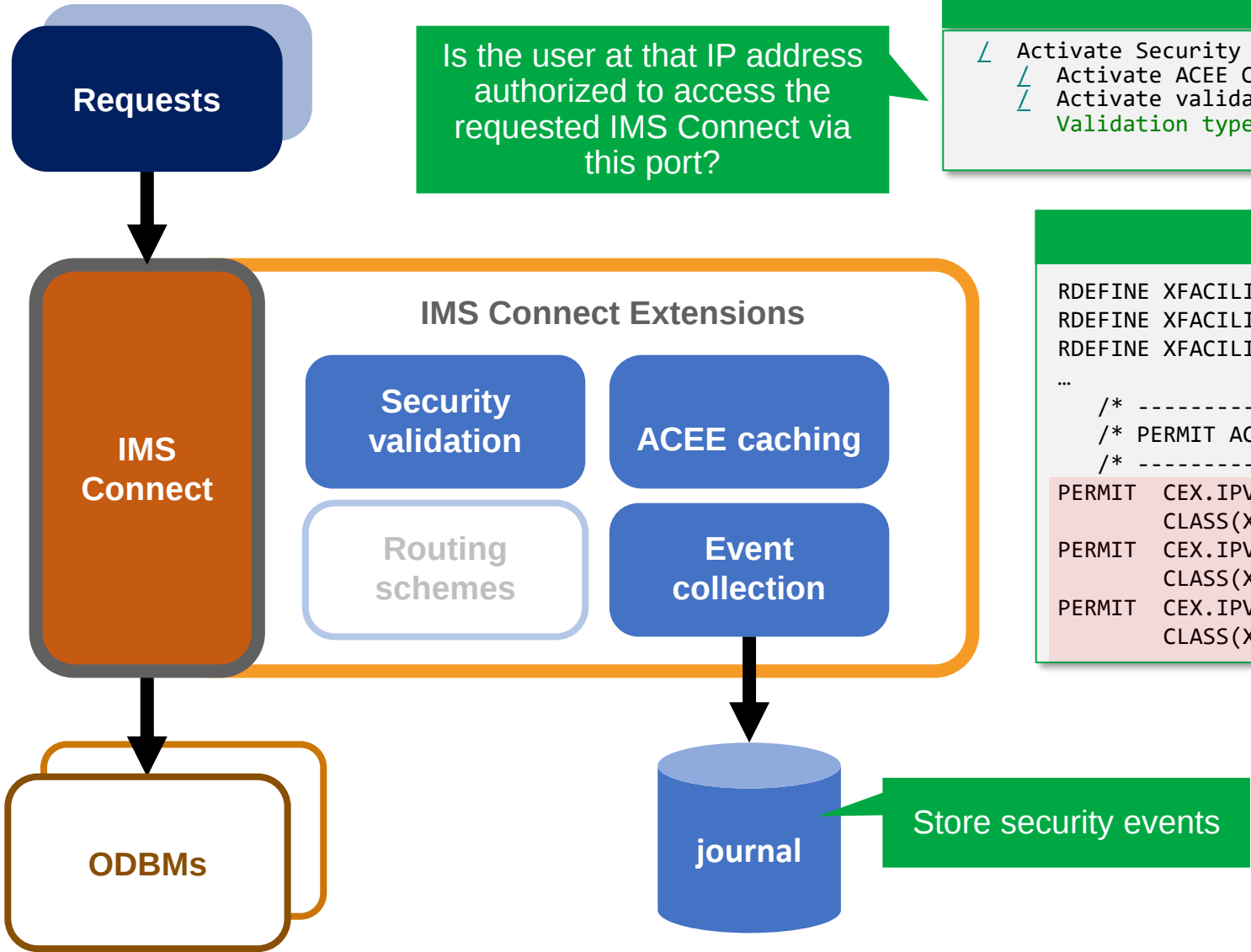
+0041	SVRCOD.....	00	Severity code
Off	INFO.....	00	Informational only
Off	WARNING....	04	Warning
On	ERROR.....	08	Error
Off	SEVERE.....	10	Severe
Off	ACCDMG.....	20	Access damage
Off	PRMDMG.....	40	Permanent damage
Off	SESDMG.....	80	Session damage

+0020	Object.....	1218	MGRDEPRM-Manager Dependency Error
+0020	Length.....	+95	CP..... 1218
+0024	Object.....	119B	DEPERECD-Manager Dependency Error
+0024	Length.....	+5	CP..... 119B Data .. 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
+0010	C9E240D5	D640D6C4	C2D440C1 E5C1C9D3
+0020	C1C2D3C5	40C6D6D9	40C4C1E3 C1C2C1E2
+0030	C540C1C3	C3C5E2E2	5E40D77E F4F8F8F5
+0040	F5404040	6B40D47E	D4D9C3E5

*HWSK2915E THERE *
IS NO ODBM AVAIL
ABLE FOR DATABAS
E ACCESS; P=4885
*5 , M=MRCV *

‘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



```
IMS Connect Extensions
/ Activate Security
/ Activate ACEE Cache
/ Activate validation
Validation type . . . 2 1. IMS Connect
                        2. IMS Connect + IP Address + Port
```

Ageing interval . . . 30 (Min)
Security class . . . XFACILIT

```
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)
```

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
<u>s</u> 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

+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

+0004	Code...	0040	End SAF call
+0041	STCK...	D1B34CEF9CB60868	LSN.... 000000000000AB8
	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	
+003E	CERE_40_SXT_FLAG1.....	03	CERE_40_SXT_SACT... C8
+0040	CERE_40_SXT_CEX....	00	CERE_40_SXT_DIAG... 40

User ID

Active security features

Request details

+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
+0018	CERE_40_VVRR.....	1410
+001A	CERE_40_APAR_SEQ...	0003
+001F	CERE_40_DIAG.....	40
+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
+003E	CERE_40_SXT_FLAG1.....	41
+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_RPFAMILY.....	'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	* *

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)

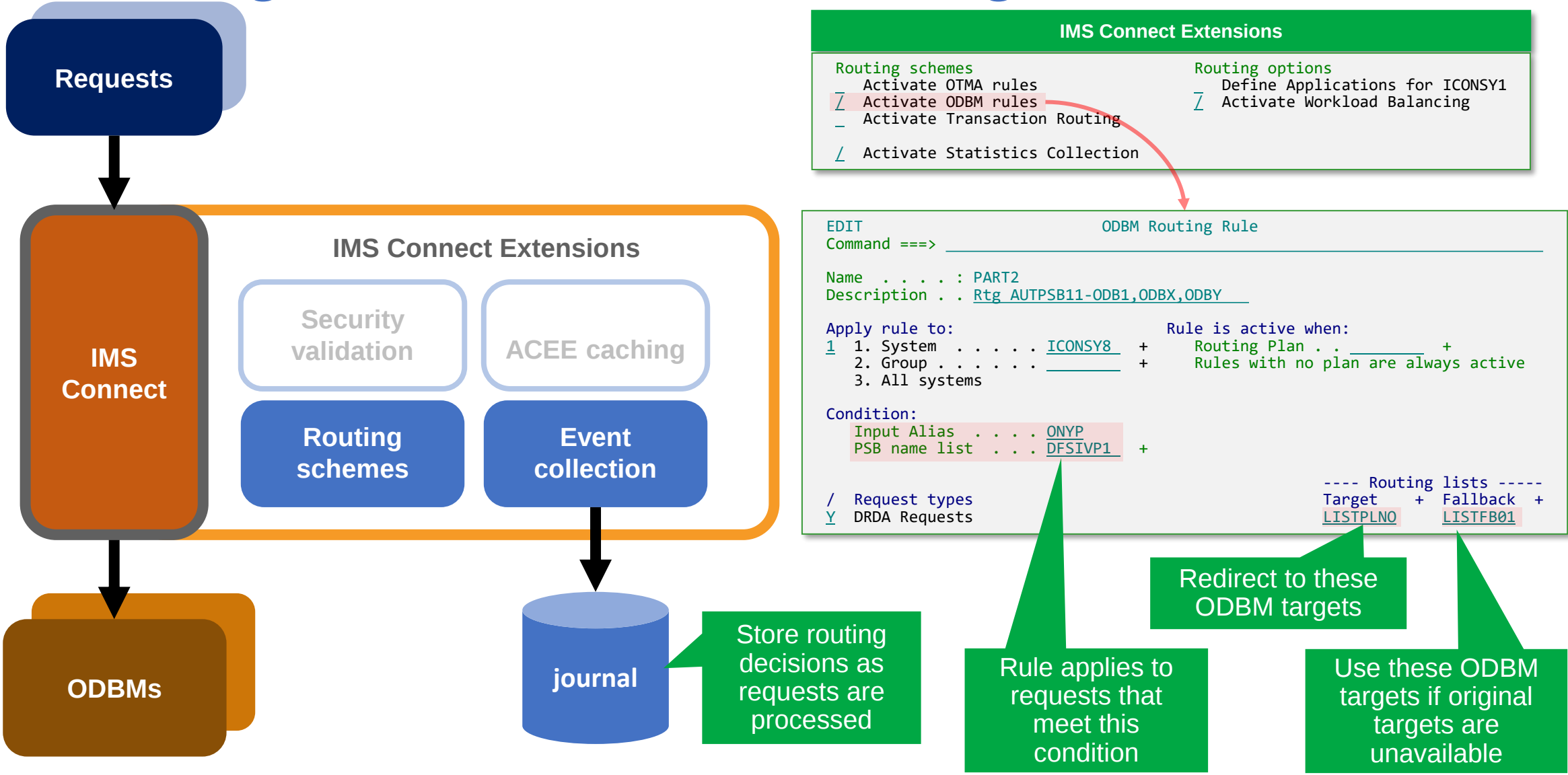
IBM Transaction Analysis Workbench		
005B	DRDA 106E SECCHK-Security Check	02.45.21.964812
0063	ODBM Security Exit called	02.45.21.964823
0040	End SAF call	02.45.21.964896
003F	Begin SAF call	02.45.21.964908
0040	End SAF call	02.45.21.965099
0064	ODBM Security Exit returned	02.45.21.965237
s 005C	DRDA 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

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)

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	10: SEVERE
+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
*+0060		
*+0070		
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Connecting to an ODBM via routing



Open Database request lifecycle:

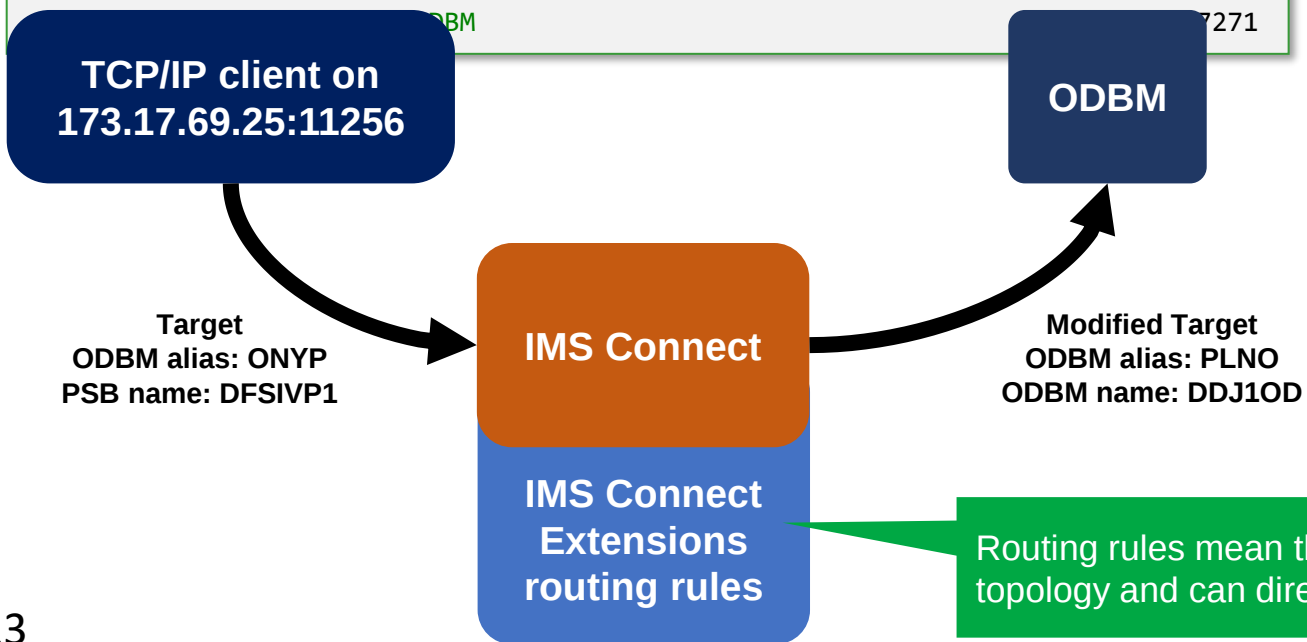
3. Establishing connection to the database (with routing)

```
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_PSNM..... 'DFSIVP1 '
+004E CERE_62_ROUT_EXT_OUT_ALIAS..... 'PLNO'
+0052 CERE_62_ROUT_EXT_OUT_ODBMNM..... 'DDJ10D '
+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 - Demo Group FTS2 - IBM Explorer for z/OS - C:\CEXHOL\CEX\Work...

File Edit Navigate Search Project Status Monitor Run Window Help

Navigation

Enter search value

<All Source Types>

Navigation

- All Sources
- Demo Group FTS2
 - IMS Connect
 - HWSOPGS1 : Demo
 - HWSOPGS2 : Demo

Ports Interval: 20 seconds Other Interval: 20 seconds

Exits Datastores Datastore Groups ODBMs Aliases MSCs

Status	System	Name	Alias
●	HWSOPGS1	DEA10D	ODB1
●	HWSOPGS1	DEA10D	ODBA
●	HWSOPGS1	DEA10D	ODBB
●	HWSOPGS1	DEA20D	ODB1
■	HWSOPGS1	DEA20D	ODBX
●	HWSOPGS1	DEA20D	ODBY

Feb 28, 2017 1:59:07 PM; 1 of 6

Status Monitor Sessions

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
+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
+0010 40C4D361 C9408381 93937EC1 D7E2C240
+0020 86818993 85844B40 40C1C9C2 D9C5E3D9
+0030 D57EF0F0 F0F0F0F1 F0F840C1 C9C2D9C5
+0040 C1E2D57E F0F0F0F0 F0F3F0C3 40C1C9C2
+0050 C5D9D9E7 E37EC3F4 C3F6C5F2 C3F9

*CSL4101E An ODBM*
* DL/I call=APSB *
*failed. AIBRETR*
*N=00000108 AIBRE*
*ASN=0000030C AIB*
*ERRXT=C4C6E2C9 *
```

08 = Error

PSBNAME =
DFSIVP1

AIBretc.... 00000108

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 *EJ10D , 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

Activate OTMA rules

Activate ODBM rules

Activate Transaction Routing

Activate Statistics Collection

Routing options

Define Applications for ICONSY1

Activate Workload Balancing

EDIT ODBM Routing Rule

Command ==>

Name : PART2

Description . . : Rtg_AUTPSB11-ODB1,ODBX,ODBY

Apply rule to:

1. System : ICONSY8 +

2. Group : +

3. All systems

Rule is active when:

Routing Plan . . : WEEKEND +

Rules with no plan are always active

Condition:

Input Alias : ONYP

PSB name list . . . : DFSIVP1 +

/ Request types

Y DRDA Requests

---- Routing lists ----

Target + Fallback +

LISTPLNO LISTFB01

Datastore \$

Target Controls:

Capacity weight rating . . : 60

Datastore \$\$

Target Controls:

Capacity weight rating . . : 20

Datastore \$\$\$

Target Controls:

Capacity weight rating . . : 20

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

Associate rule with a plan.
Use command to activate a plan.

Period	Red (%)	Yellow (%)	Green (%)
Peak	50	30	20
Off-peak	20	40	40
Weekend	20	20	60

```
graph TD;
    IMSConnect[IMS Connect] --> IMSConnectExtensions[IMS Connect Extensions];
    IMSConnectExtensions --> IMSA[IMSA $];
    IMSConnectExtensions --> IMSB[IMSB $$];
    IMSConnectExtensions --> IMSC[IMSC $$$];
```

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IMS Open Database

IBM
IMS Tools

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 ODBMSG 12.31.15.345023
```

```
+0004 Code... 00AA ODBM Trace: Message sent to ODBM
+0111 STCK... D228BD585AB6BCA6 LSN.... 00000000000013F
      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 ODBMSG 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
```

Warning

```
+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'
```

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 OPNQRYM-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 OPNQRYM-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/docs/en/ims/15.5.0?topic=apis-drda-ddm-command-architecture-reference>
- DRDA V5 Vol. 3: Distributed Data Management Architecture
<https://publications.opengroup.org/c114>
- Capturing DRDA/DDM events for later analysis
<https://www.ibm.com/docs/en/ims-cex/3.1.0?topic=collection-types-event-record>
- Browsing and analyzing logs containing DRDA/DDM events
<https://www.ibm.com/docs/en/taw/1.3.0?topic=bl-browsing-logs-in-your-personal-ad-hoc-list>



For More Information

- IMS Tools website
www.ibm.com/it-infrastructure/z/ims/tools
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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

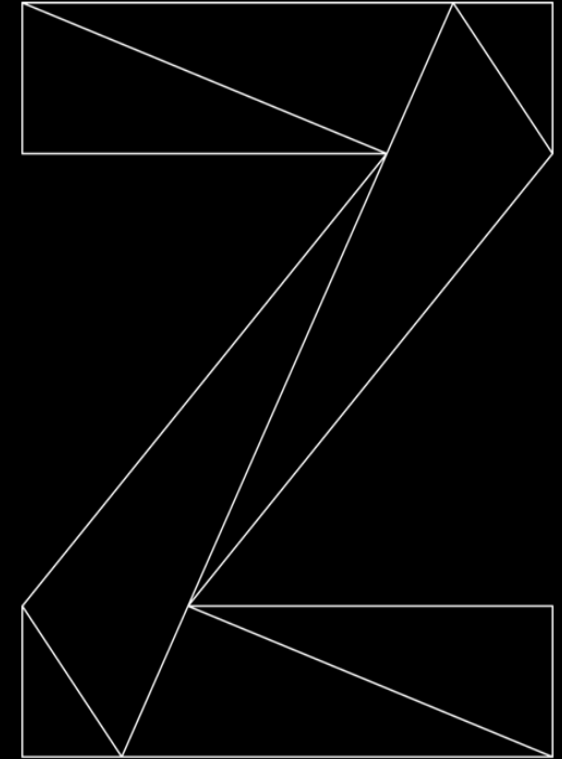
Tamil

ありがとうございました

Japanese

ขอบพระคุณ

Thai



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