

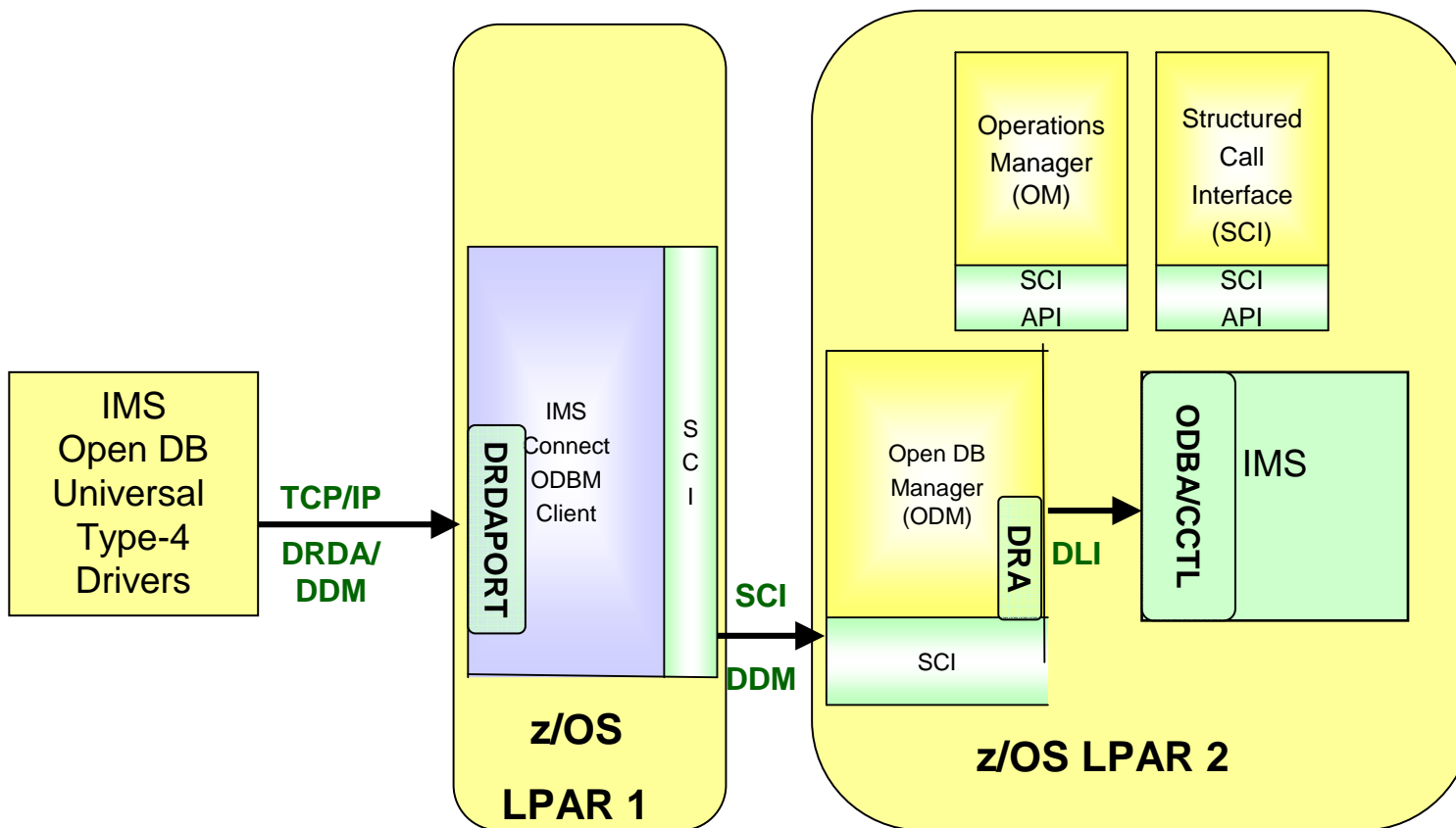
IMS Open Database Best Practices

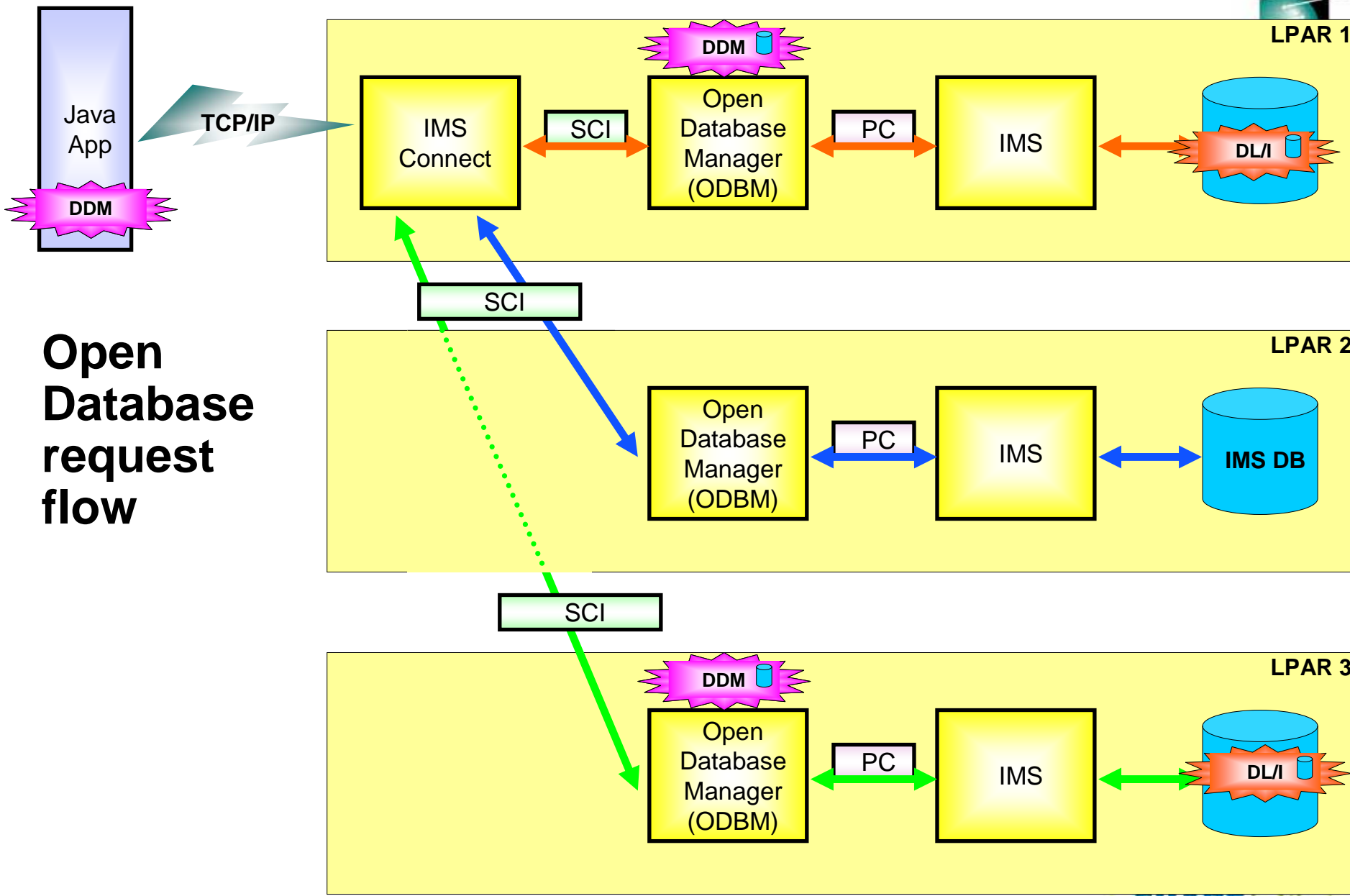
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March 16, 2012
10817 - Birch



Open Database Components





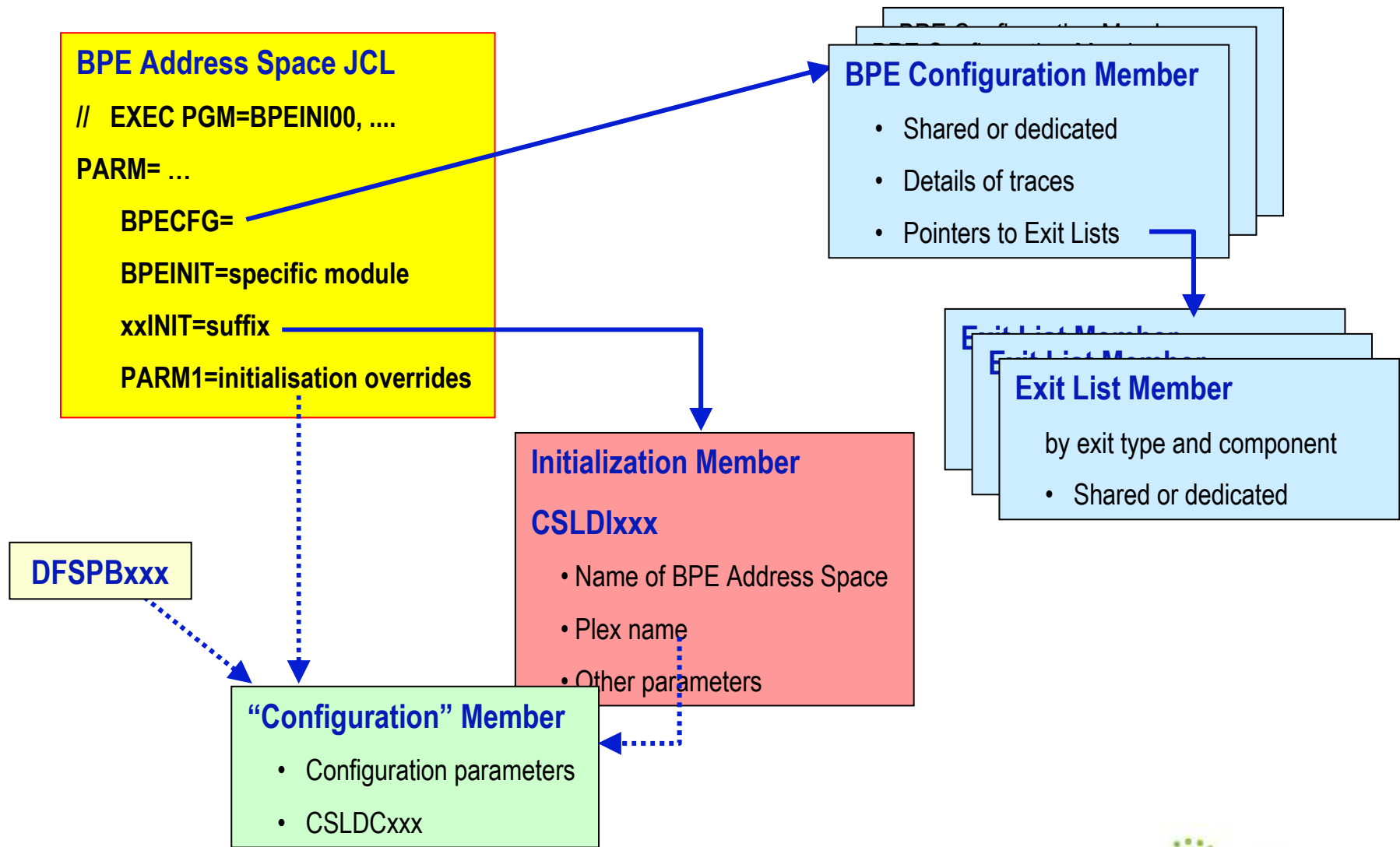
Open Database request flow

CSL IMSplex startup/shutdown



- Start as a z/OS started procedure or as JCL
- Start all SCIs.
- Start all OMs.
- Start CQS if using a resource structure.
- Start all RMs.
- Start all IMS control regions
- Stop all IMS control regions
- Stop all RMs.
- Stop CQS
- Stop all OMs
- Stop all SCIs.
- STOP CSLjob command
 - STOP (P) cslobname
- CSL SHUTDOWN command
 - F scijobname, SHUTDOWN ...
- CSLZSHUT API
 - Programming interface

Reminder of BPE Address Space Setup



ODBM BPE Trace Tables

- CSL
 - used for routines that are common to all CSL managers
- ERR
 - used to trace errors that occur within the ODBM address space
- ODBM
 - used for general ODBM processing flow
- PLEX
 - used for ODBM processing for a specific IMSplex

- **BPE Commands**

```
F ODBM,DISPLAY TRACETABLE NAME(*) OWNER(ODBM)
F ODBM,UPDATE TRACETABLE NAME(*) OWNER(ODBM)
LEVEL(HIGH) EXTERNAL(YES)
```

ODBM BPE Configuration PROCLIB Member Example



```
TRCLEV=(*,LOW,ODBM)          /* DEFAULT ODBM TRACES TO LOW */
TRCLEV=(CSL,HIGH,ODBM)       /* CSL TRACE ON HIGH */
TRCLEV=(ODBM,HIGH,ODBM)     /* ODBM GENERAL TRACE ON HIGH */
TRCLEV=(PLEX,HIGH,ODBM)     /* IMSPLEX TRACE ON HIGH */

#
# USER EXIT LIST PROCLIB MEMBER SPECIFICATION
#

EXITMBR=(CSLEXOB0,BPE)       /* SPECIFY PROCLIB DATASET */
                              /* MEMBER CSLEXOB0 AS BPE'S */
                              /* USER EXIT LIST MEMBER */
EXITMBR=(CSLEXDM0,ODBM)     /* SPECIFY PROCLIB DATASET */
                              /* MEMBER CSLEXDM0 AS ODBM'S */
                              /* USER EXIT LIST MEMBER */
```

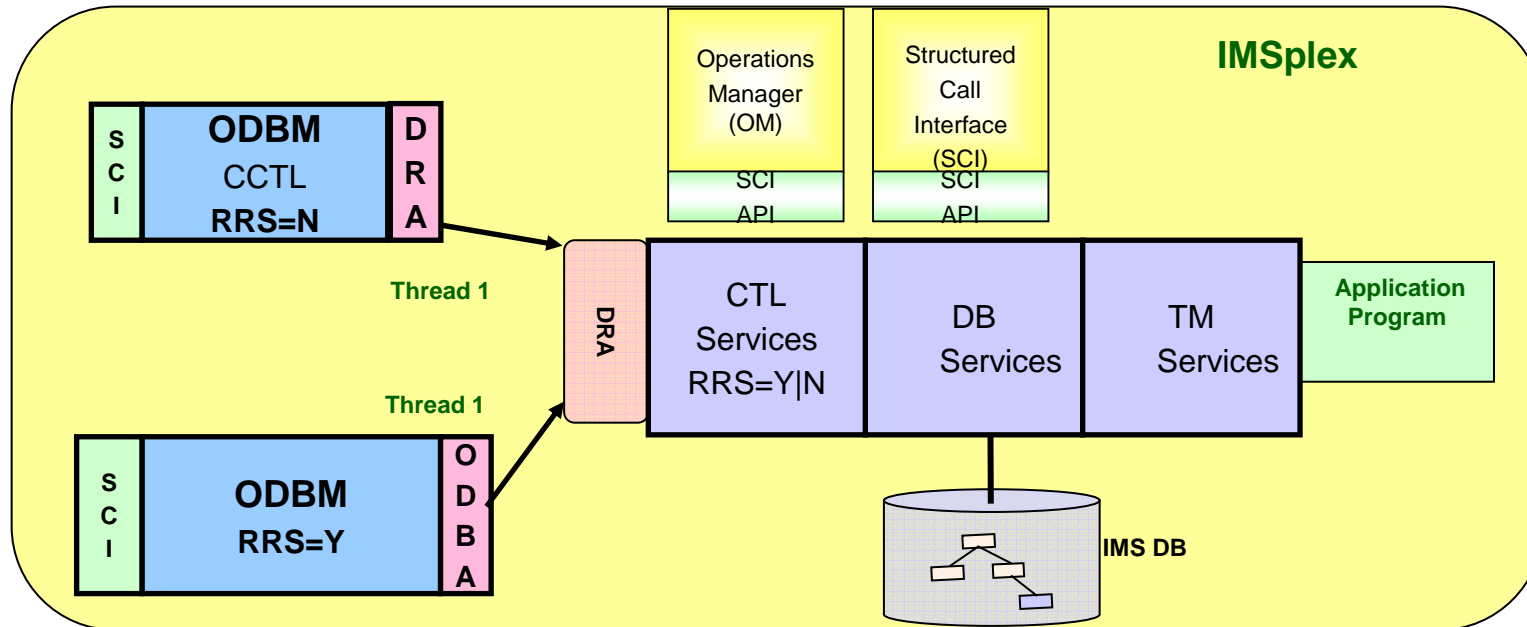
ODBM User Exit List PROCLIB Member

- EXITMBR= specifies PROCLIB member to define ODBM user exits
- User Exit List Statement
 - EXITDEF = (TYPE=type, EXITS=(exitname1, exitname2, ...)
[,ABLIM=limit], COMP=ODBM)
 - TYPE=type (CLNTCONN, INITTERM, INPUT, or OUTPUT)
 - EXITS=(exitname)
 - *list of one or more user exit module names.*
 - ABLIM=limit
 - *limit for the exit type being defined.*
 - *decimal number from 0 to 2147483647*

```
F ODBM,DISPLAY USEREXIT ...
```

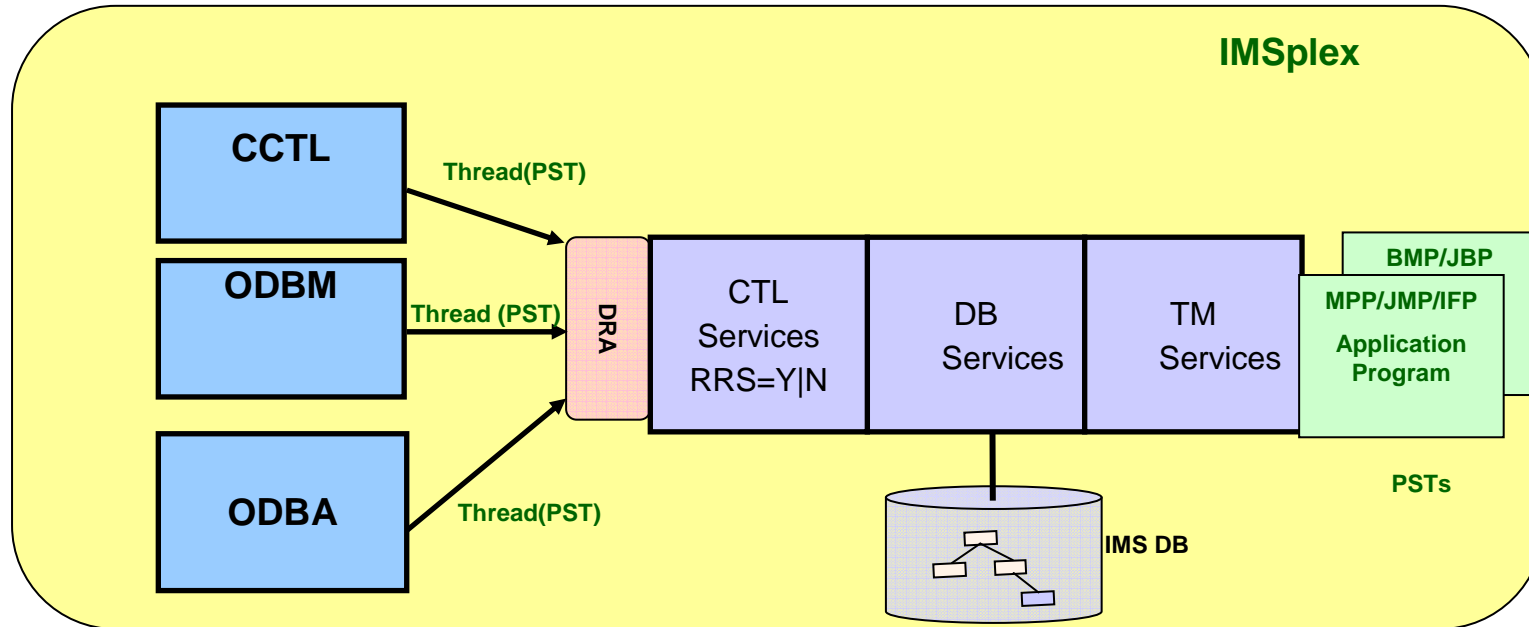
```
F ODBM,REFRESH USEREXIT ...
```


ODBM Interfaces: ODBA and DRA



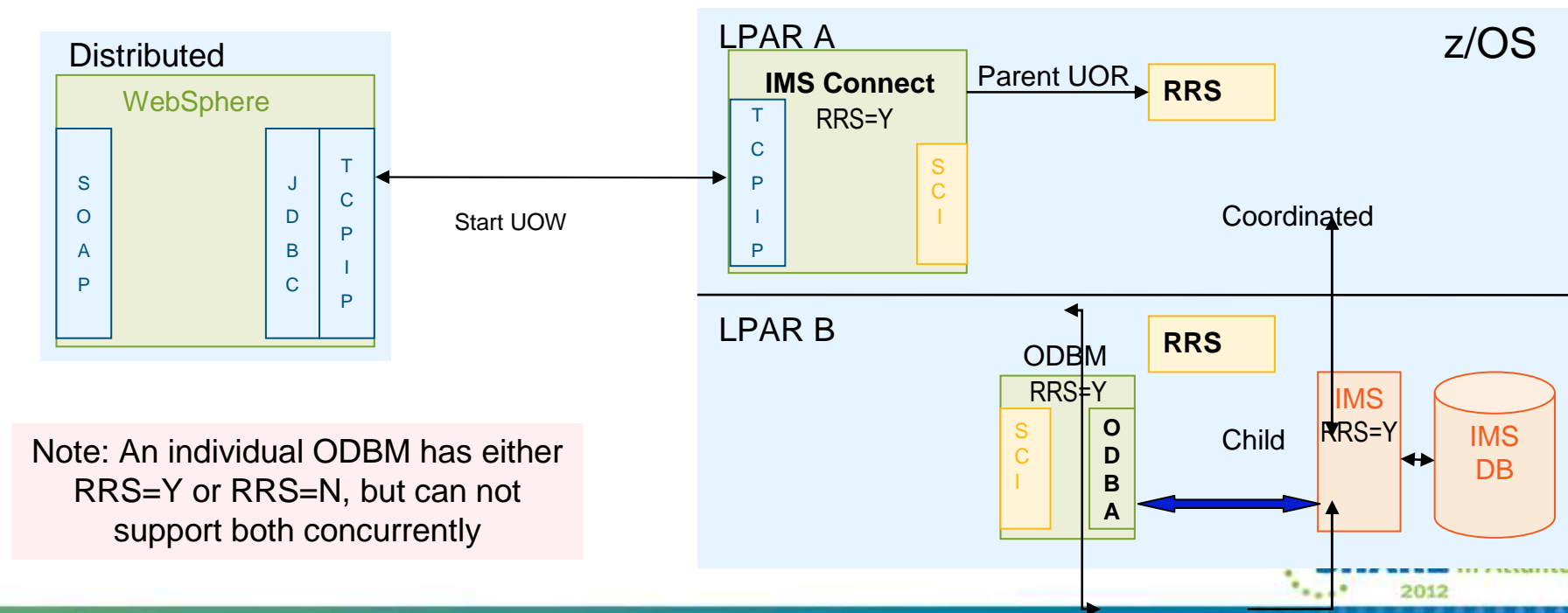
- ODBM can be started with either RRS=Y or RRS=N
- RRS=Y for coordinated update
- RRS=N for inquiry only and use PCB with PROCOPT=G or use for Local transaction

THREADS and PSTs

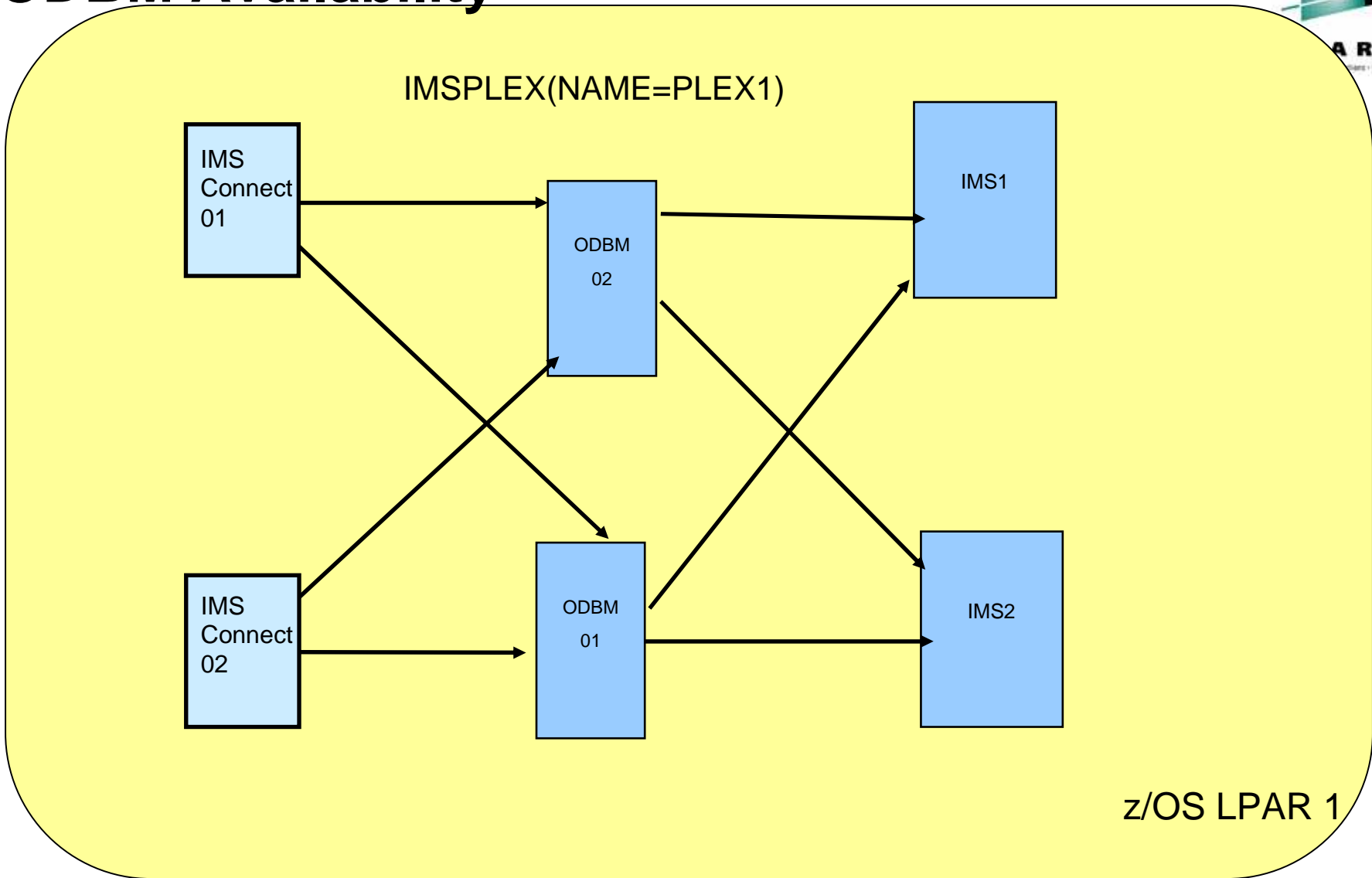


IMS Open Database and Distributed Sync Point

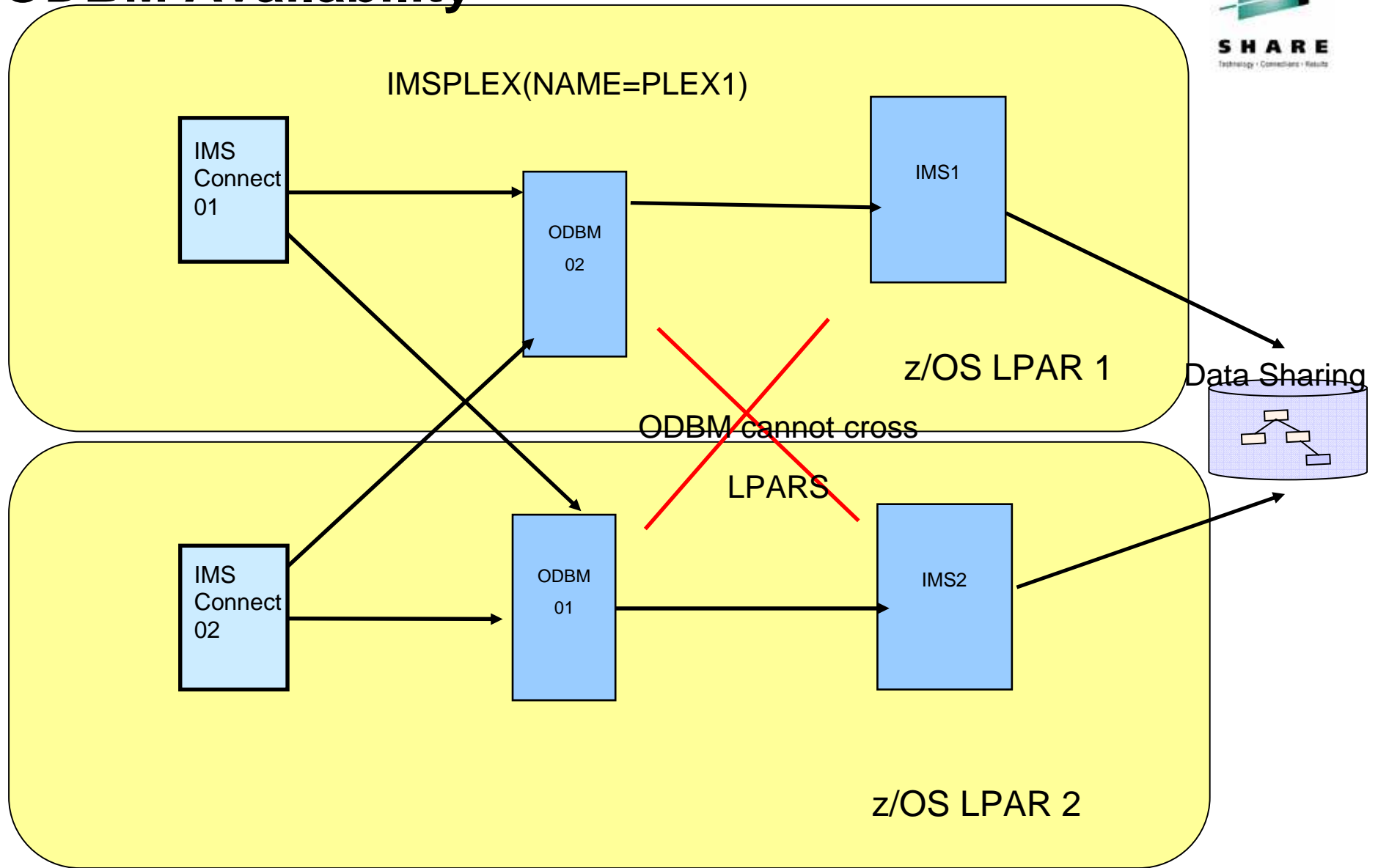
- Use of RRS with ODBM is optional
 - RRS=Y|N parm for ODBM start-up
 - RRS=Y is needed to supported Distributed Two-Phase Commit
 - RRS=Y in IMS Connect and ODBM and IMS Control Region



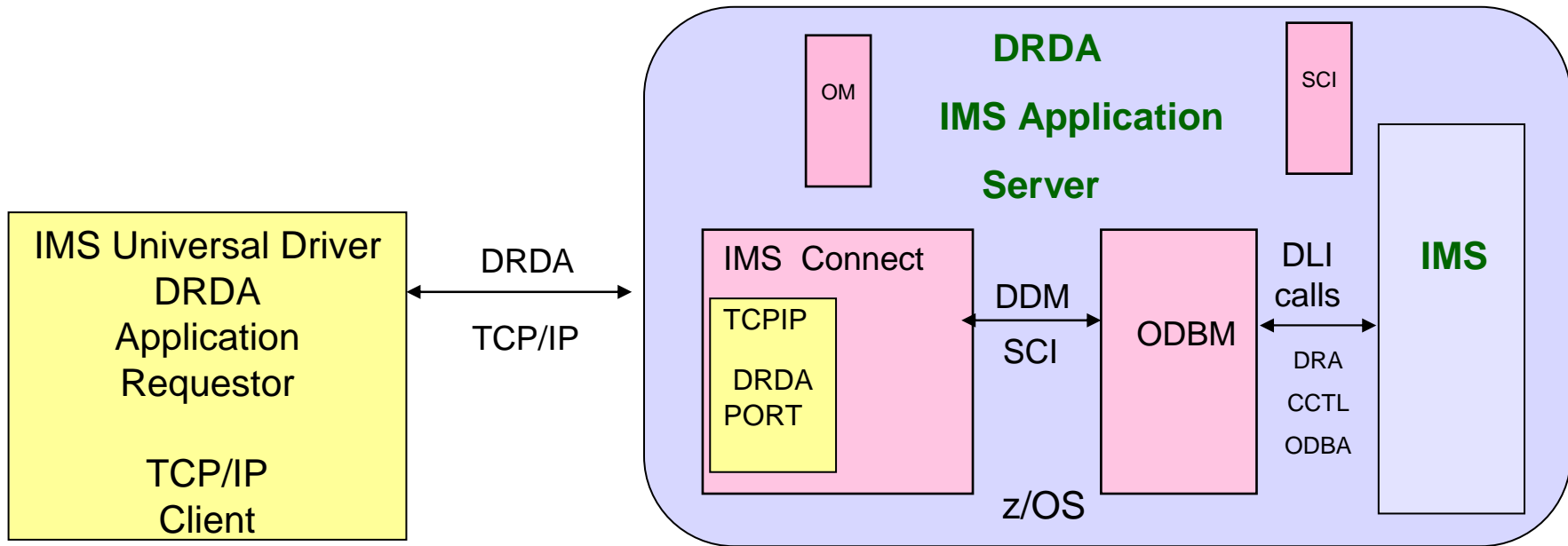
ODBM Availability



ODBM Availability



IMS 11 Connect and ODBM DRDA Server



IMS Connect Startup Proc

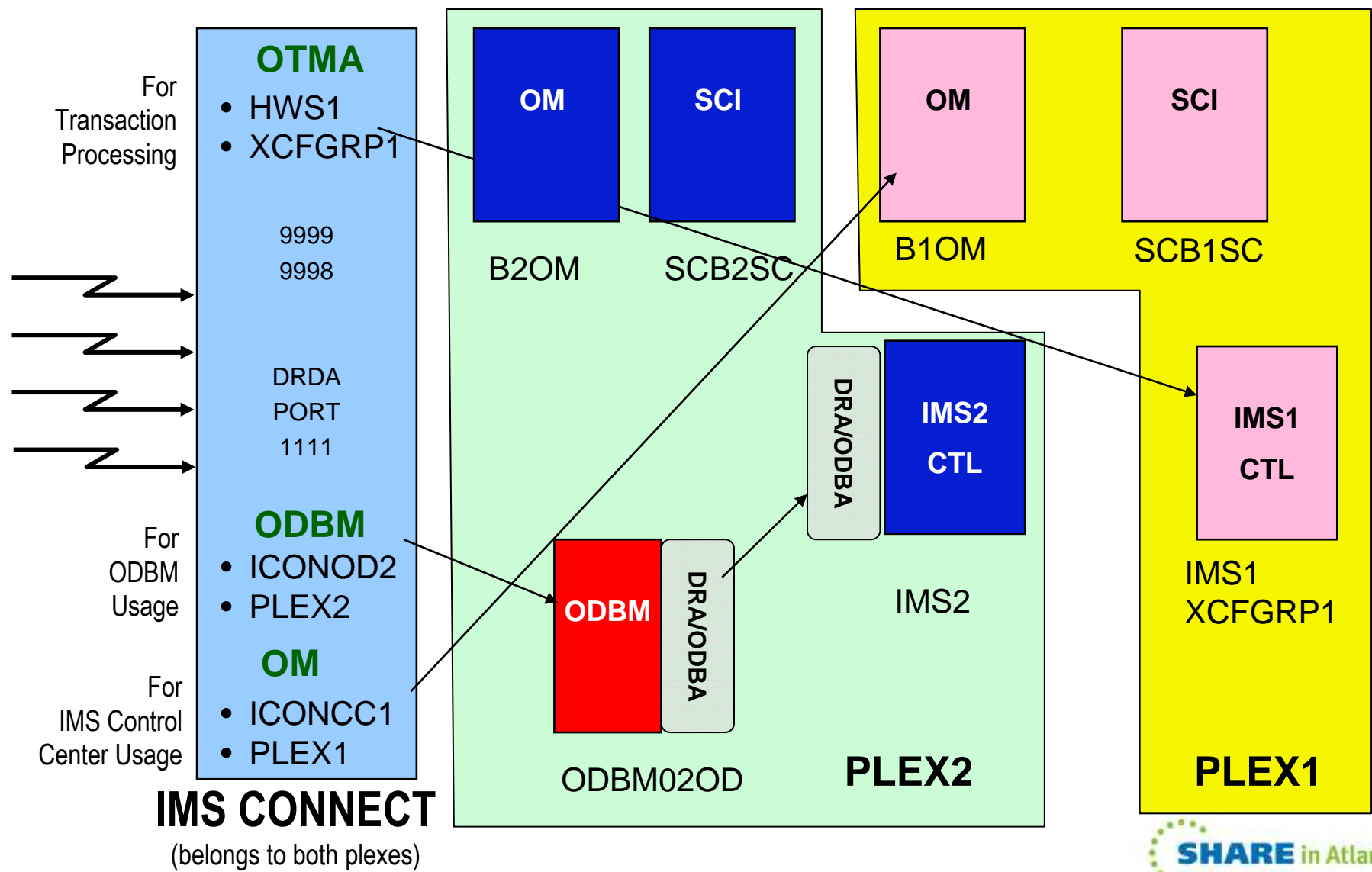


HWSCFG00

* IMS Connect example for IMS Universal drivers
and DRDA client support

```
HWS (ID=IMSCON01,PSWDMC=R,RRS=Y,RACF=Y,XIBAREA=20)
TCPIP (HOSTNAME=ZOSTCPIP,MAXSOC=2000,
ECB=Y,IPV6=Y,NODELAY=Y, RACFID=RACFID)
ODACCESS (DRDAPORT=(ID=1111,KEEPAV=5),
DRDAPORT=(ID=2222,KEEPAV=10,PORTTMOT=500)),
IMSPLEX=(MEMBER=IMSPLEX1,TMEMBER=PLEX1),
ODBMAUTOCONN=Y,ODBMTMOT=50000
```

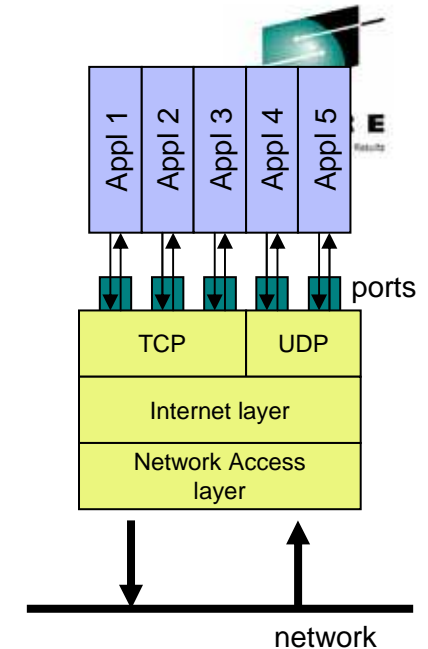
IMS Connect HWSCFGxx Example ...



Configure TCP for z/OS ...

- PROFILE.TCPIP
 - PORT - Reserves a PORT for a specified Jobname

PORT 1111 TCP IMSCON01 NODELAYACKS



PORT portnum TCP imsconnectname NODELAYACKS|DELAYACKS

In general, use NODELAYACKS

- Eliminates delay in sending ACK response back to client
 - “Essential” if an input message is sent with multiple WRITES
- Global default can be set on TCPCONFIG statement

Customizing UNIX System Services

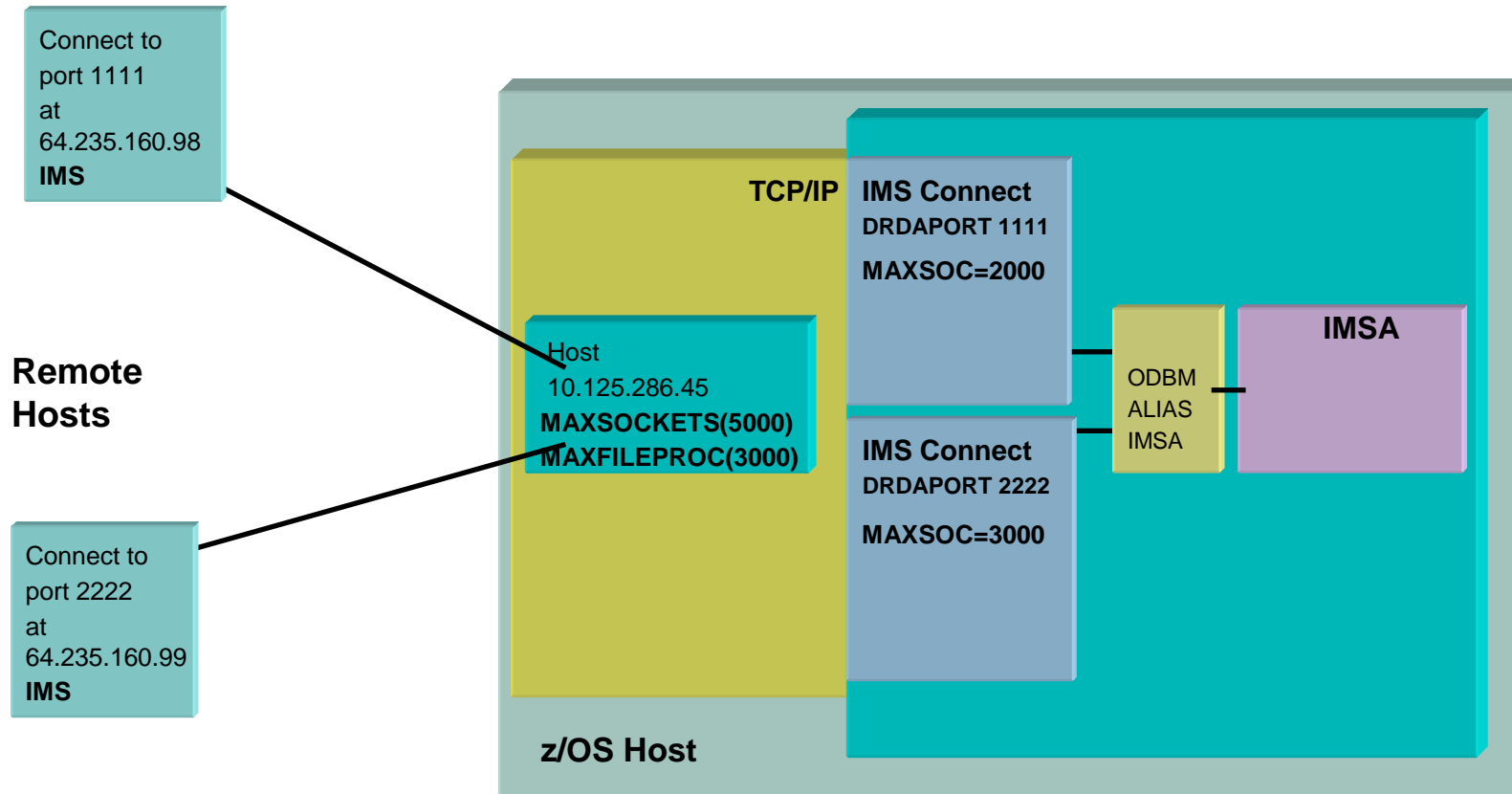


- SYS1.PARMLIB(BPXPRMxx)
 - MAXSOCKETS sets total number active sockets per stack
 - MAXFILEPROC sets total number socket descriptors per process

```
FILESYSTYPE TYPE(INET)
NETWORK DOMAINNAME(AF_INET)
                DOMAINNUMBER(2)
                MAXSOCKETS(4000)
                TYPE(INET)
/*****
MAXFILEPROC(2000)
```

HWS (ID=IMSCON01,)
TCPIP (HOSTNAME=ZOSTCP, **MAXSOC=2000** ...

MAXSOCKETS/MAXFILEPROC Example



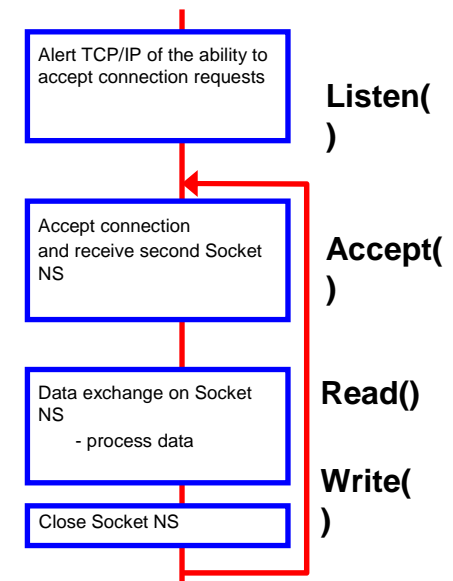
Configure TCP for z/OS ...

- PROFILE.TCPIP

- SOMAXCONN statement to specify the maximum number of connection requests queued for a listening socket.
 - Where queue-size indicates the number of connection requests that can be queued by the system while the IMS Connect has not yet issued the Accept() call

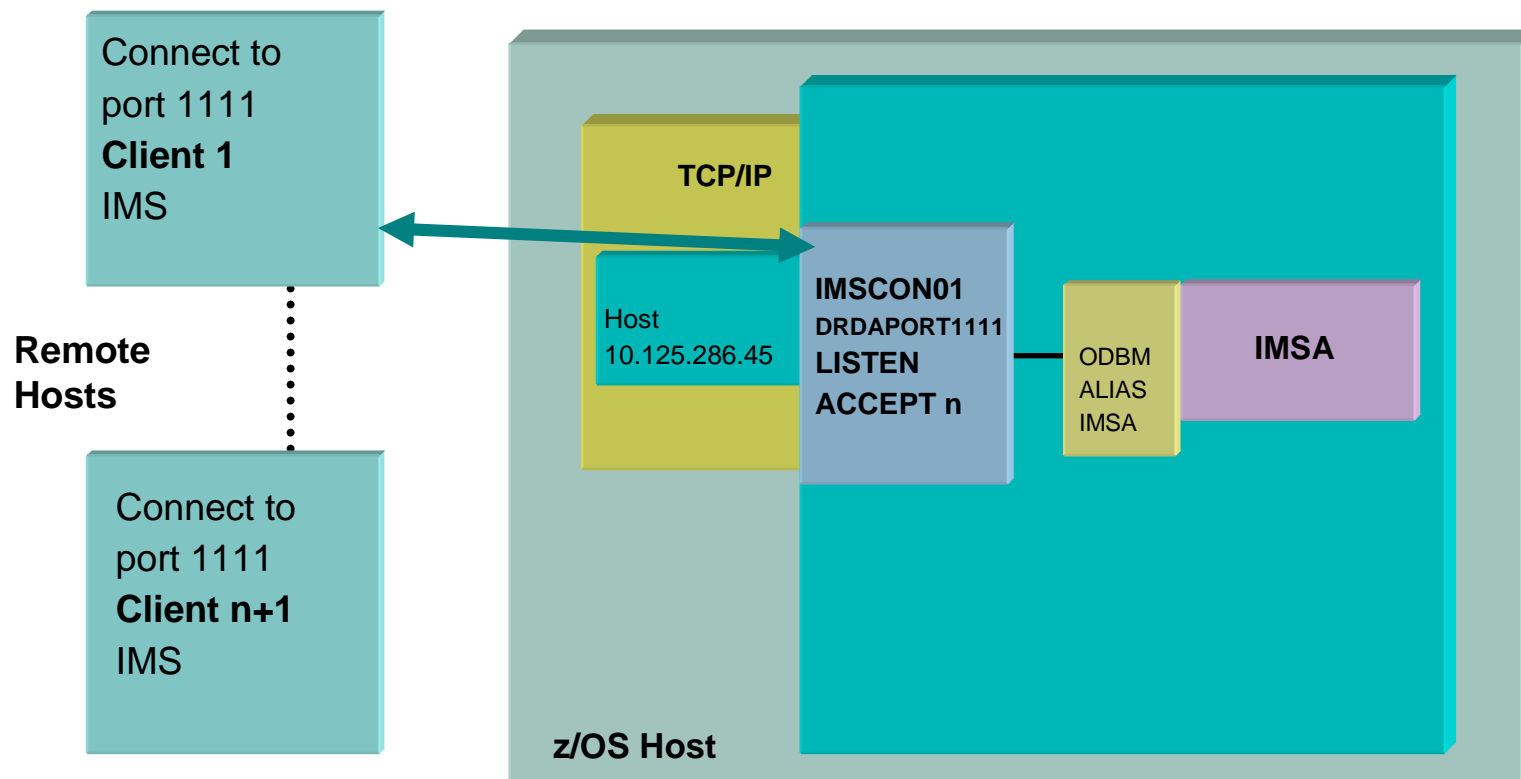
SOMAXCONN 100

SOMAXCONN queue depth –
Default is 10,
Maximum value is 2,147,483,647



- Should be large enough to support the max concurrent requests

SOMAXCONN Example



➔ timeout while "Contacting host".

Configure TCP for z/OS ...

- PROFILE.TCPIP
 - TCPCONFIG statement configures various settings of the TCP layer
 - In particular, use INTERVAL timeout specification if remote client will specify long timeout values on input to IMS Connect (INTERVAL should be greater than IMS Connect timeout)

TCPCONFIG INTERVAL 1440

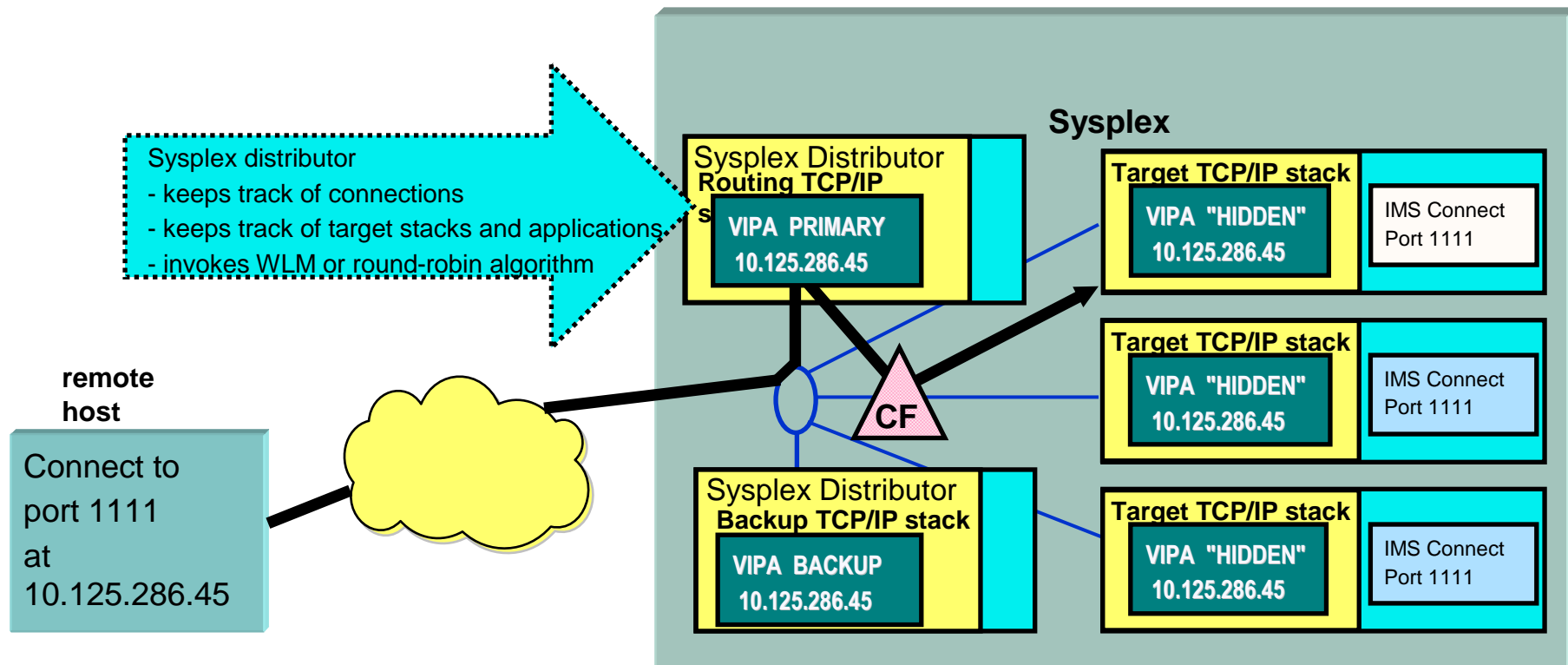
INTERVAL –

- Specifies “keepalive” value in minutes. On an open socket, if there is no activity for more than this period, then a “keepalive” message will be sent to the remote client. If the remote client does not respond, the socket is terminated.
 - Default is 120 minutes, maximum is 35791 minutes
- The keepalive option is enabled by the remote client using setsockopt call

IMS Connect ODACCESS (DRDAPORT=(ID=1111,KEEPAV=5 this overrides TCPIPCONFIG INTERVAL

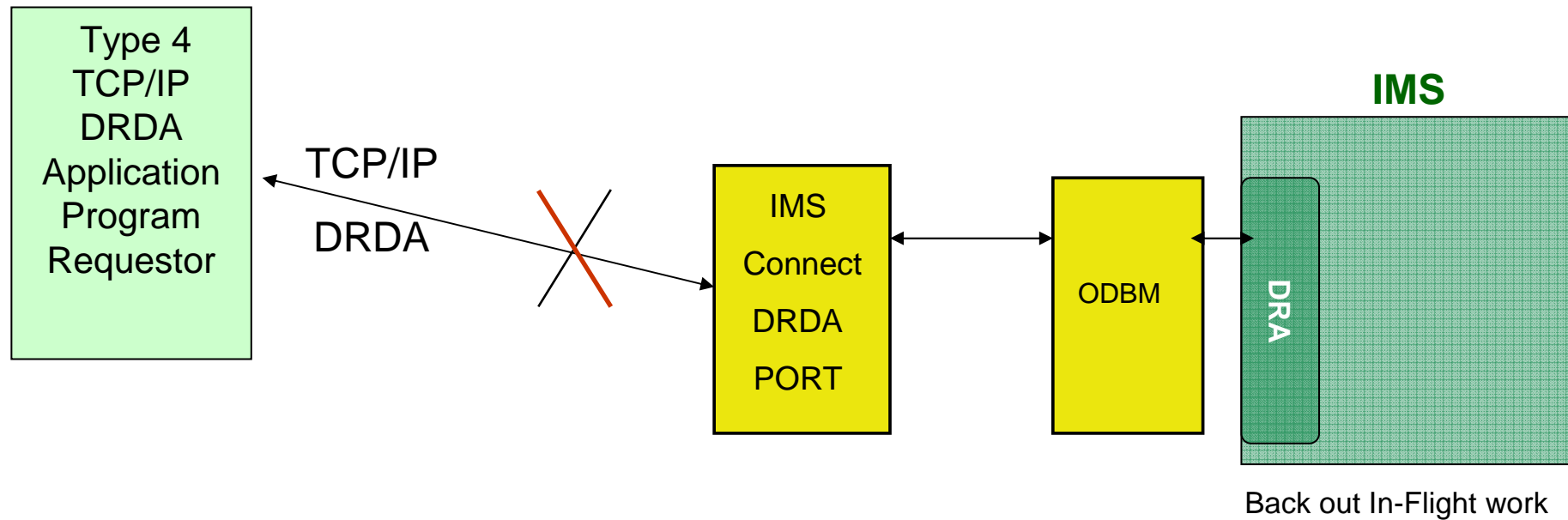
Sysplex Distributor – Distributed DVIPA

- Sysplex function providing a single “Cluster IP address” for a group of Hosts
 - Sysplex-wide VIPA - Workload balancing across multiple servers (WLM or round-robin)
 - Performs a Network Dispatcher type function on the z/Series environment
 - High availability - enhanced Dynamic VIPA and Automatic Takeover



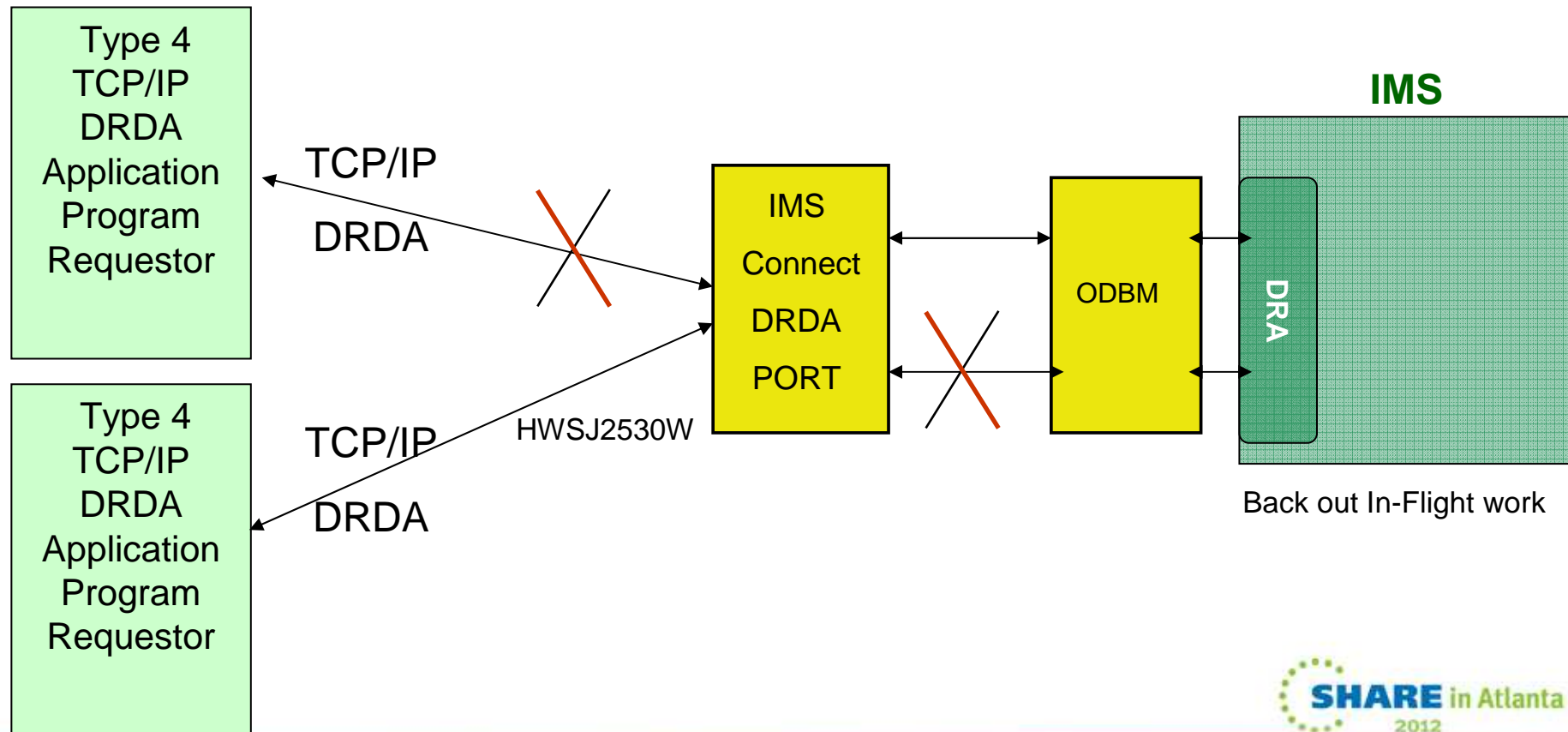
Timeouts

- **PORTTMOT=** Defines the amount of time that IMS Connect waits::
 - An subsequent input messages from TCP/IP client application



Timeouts

- **ODBMTMOT**= Defines the amount of time that IMS Connect waits::
 - A response message on connections with ODBM
 - An initial input message from TCP/IP client application



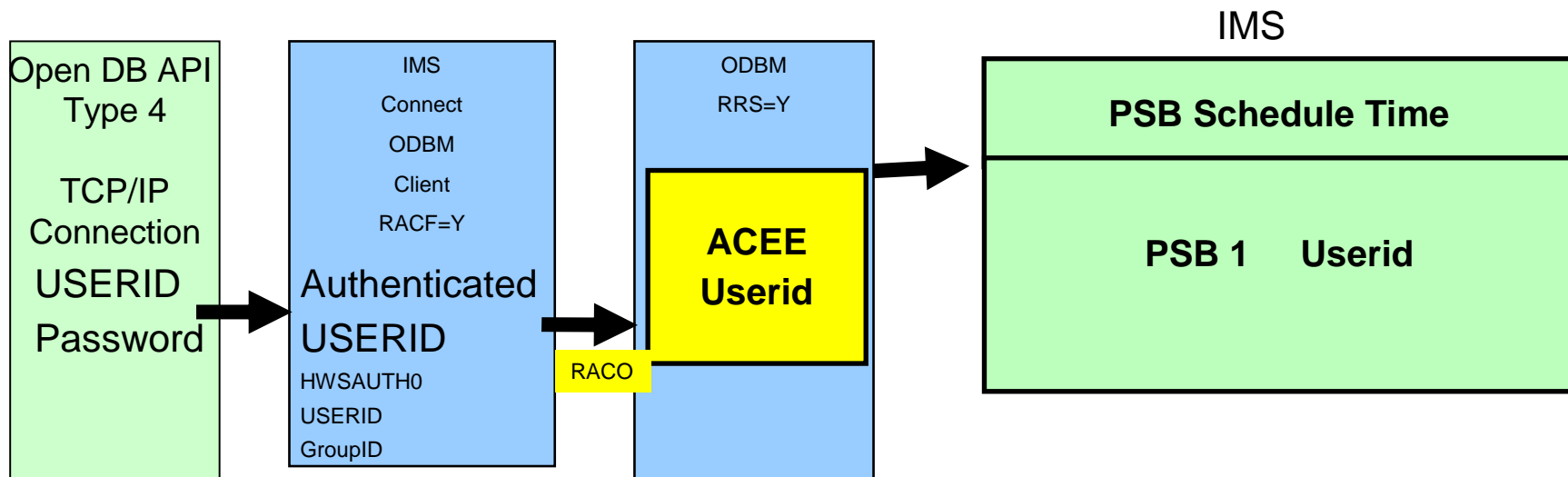
ODBM Security

- ODBM does not perform any user authentication or authorization
 - Assumes the end Client Userid associated with an Allocate PSB request has been authenticated
 - IMS Connect does the authentication
 - IMS does the authorization
 - Checks that the User is authorized to use the PSB when the PSB is allocated
- There are 3 parameters which determine which security, if any, will be used
 - ODBM RRS=Y/N
 - ODBASE=Y/N
 - ISIS=N/R/C/A
- There is an additional parameter to determine which Userid is used
 - IMS Connect RACF=Y/N

SAF APSB Security



- ODBASE=Y
 - ACEE - Authenticated USERID
 - The IMS application group resource class (AIMS or Axxxxxxx)

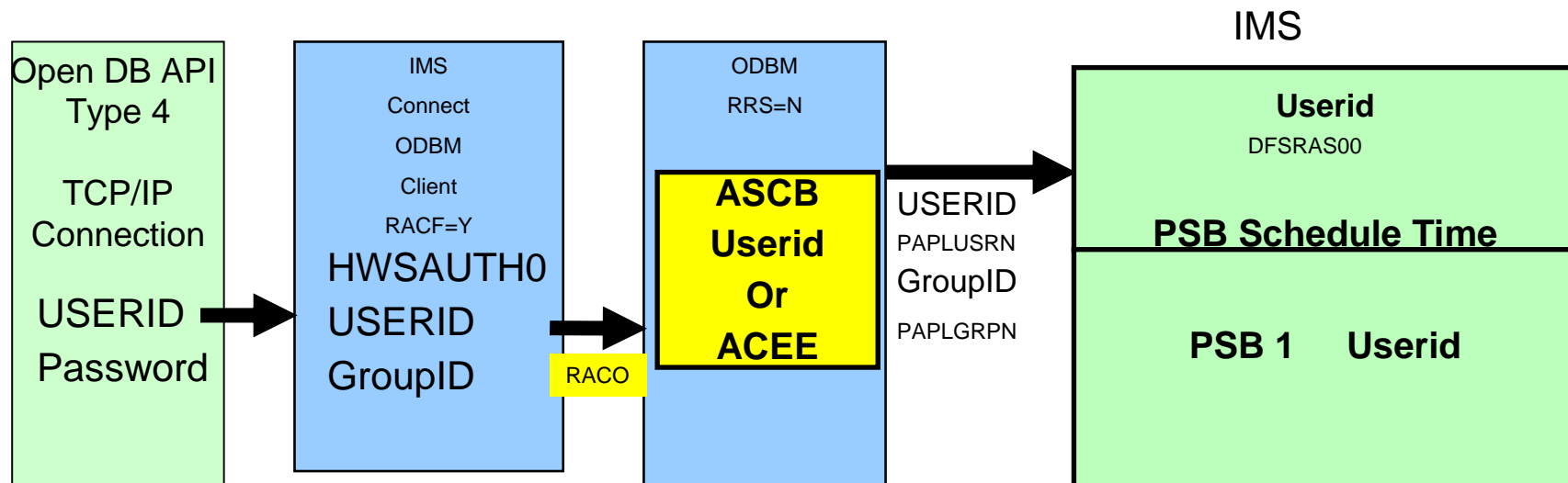


ODBM uses RACO to create ACEE for ODBM Thread TCB
Userid will represent the end client

IMS Connect RACF=N a RACO is not provided IMS uses ODBM Job Card UserID
ACEE for ODBM ASCB

RAS PSB Security

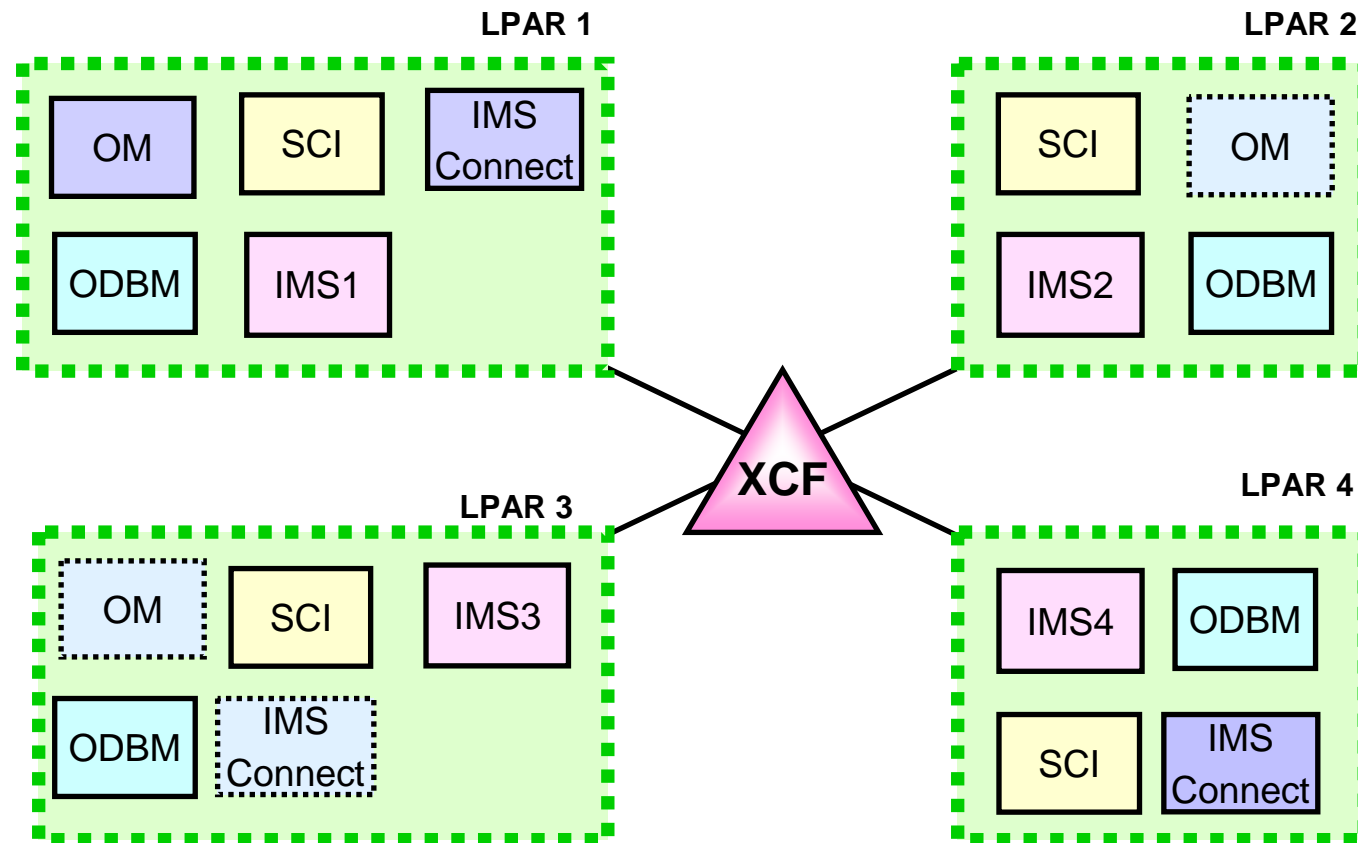
- ISIS=R or A
 - ODBM extracts and passes RACO Userid in PAPL
 - The IMS application group resource class (IIMS or Ixxxxxxx)



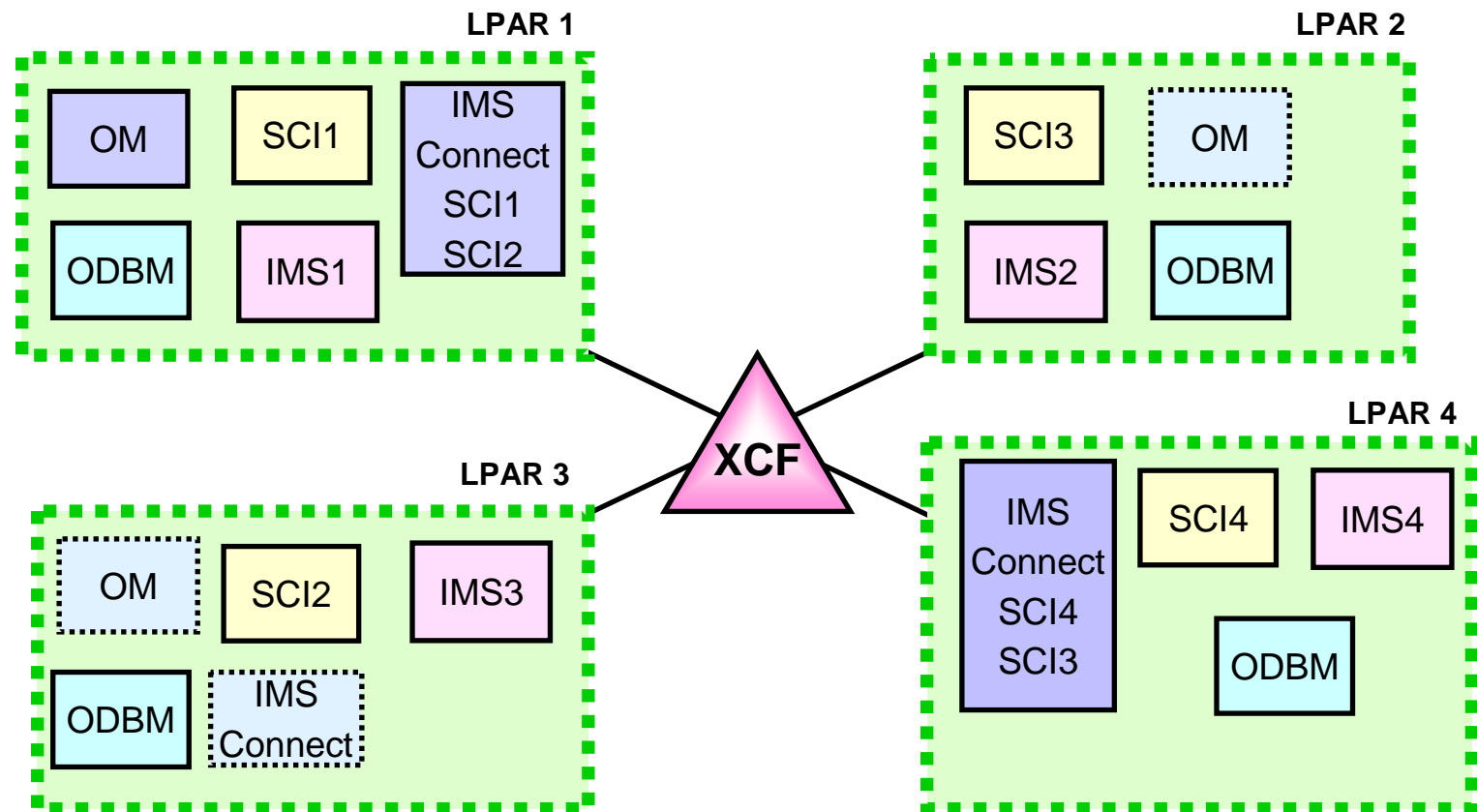
ODBM extracts the UserID from the RACO passes it in PAPL
 UserID will represent the end client

IMS Connect RACF=N a RACO is not provided IMS uses ODBM JOB Card UserID

IMS Connect in a Multi-IMS IMSplex



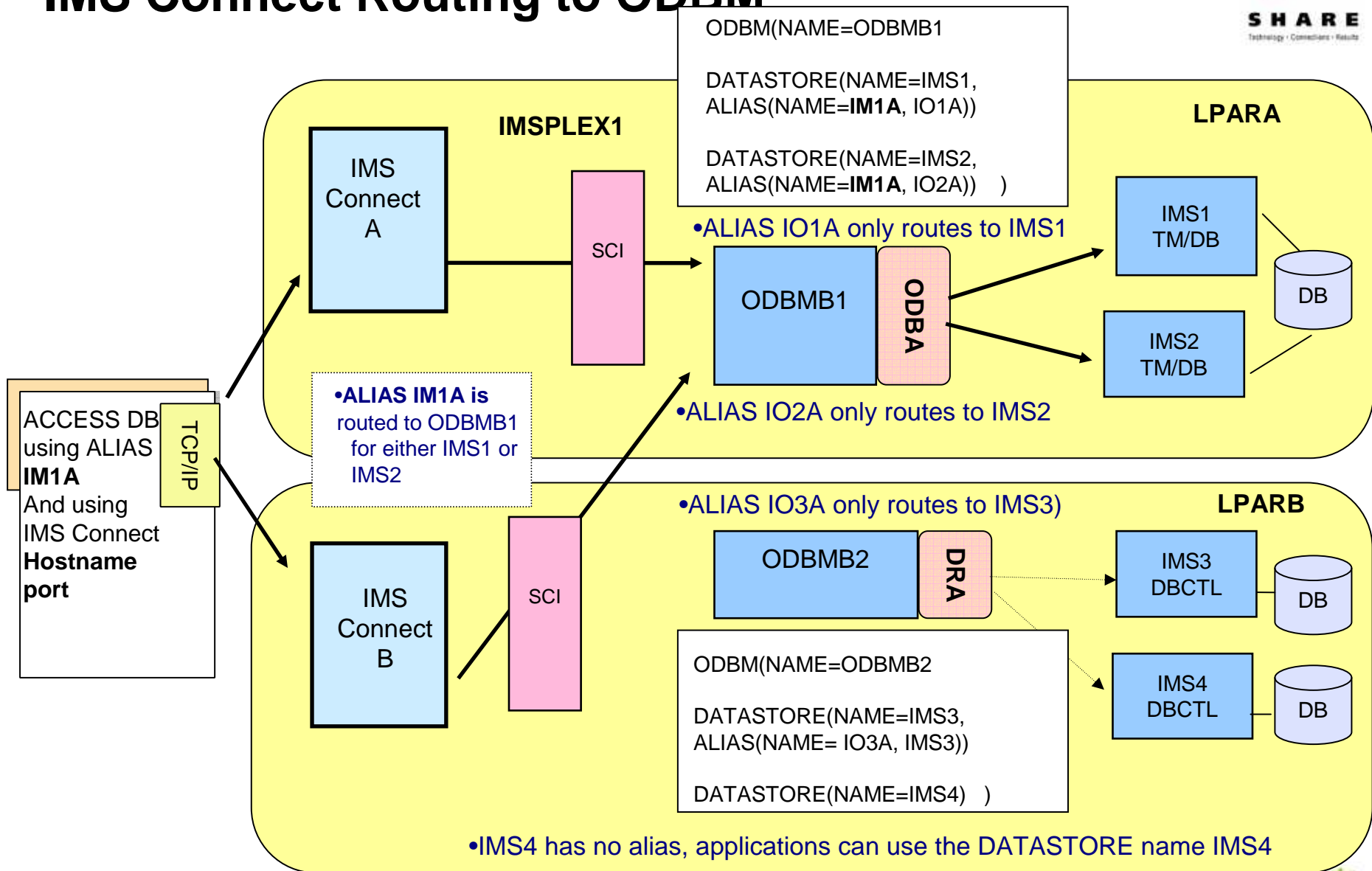
IMS Connect in a Multi-IMSplexs



IMS Connect Routing to ODBM

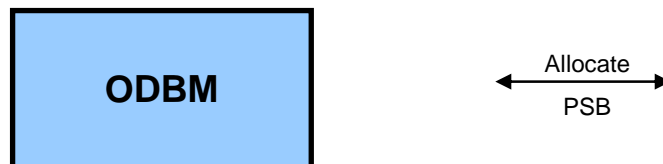
- ODBM Alias Name Routing
 - Alias name is used by IMS Connect DRDA Client application programs
 - Remote applications do not need to know IMSID
 - *But one Alias can be same as IMS ID*
- Remote application can leave alias name blank
 - IMS Connect uses round robin routing across all ODBMs
- Specified Alias can be non-unique
 - Same alias defined for multiple IMS systems
 - IMS Connect uses round robin routing across ODBMs with the alias defined

IMS Connect Routing to ODBM



Connections

- ODBM Alias Name Routing
 - Alias name is used by IMS Connect DRDA Client application programs
 - Remote applications do not need to know IMSID
 - *But one Alias can be same as IMS ID*
- Remote application can leave alias name blank
 - IMS Connect uses round robin routing across all ODBMs
- Specified Alias can be non-unique
 - Same alias defined for multiple IMS systems
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IMS Connect Routing and Security Exits for ODBM



- BPE managed and refreshable User Exits



- **Routing user exit – HWSROUT0**

- Override the IMS Connect selection of an ODBM and/or ALIAS

- **Security user exit – HWSAUTH0**

- Authenticate the input user ID and password or passticket
- Provide the RACF group ID to be authenticated

```
EXITDEF(TYPE=ODBMROUT,EXITS=(HWSROUT0),ABLIM=8,COMP=HWS)
```

```
EXITDEF(TYPE=ODBMAUTH,EXITS=(HWSAUTH0),ABLIM=8,COMP=HWS)
```

IMS Connect Extensions



- Improves the manageability of IMS Connect
- IMS Connect Extensions enhancements for Open Database include:
 - Event collection for ODBM events
 - *Routing of ODBM Allocate PSB requests*
 - *Monitoring of ODBM throughput in GUI or ISPF*
 - *Determination of ODBM resource availability*

IMS Open Database Universal Drivers

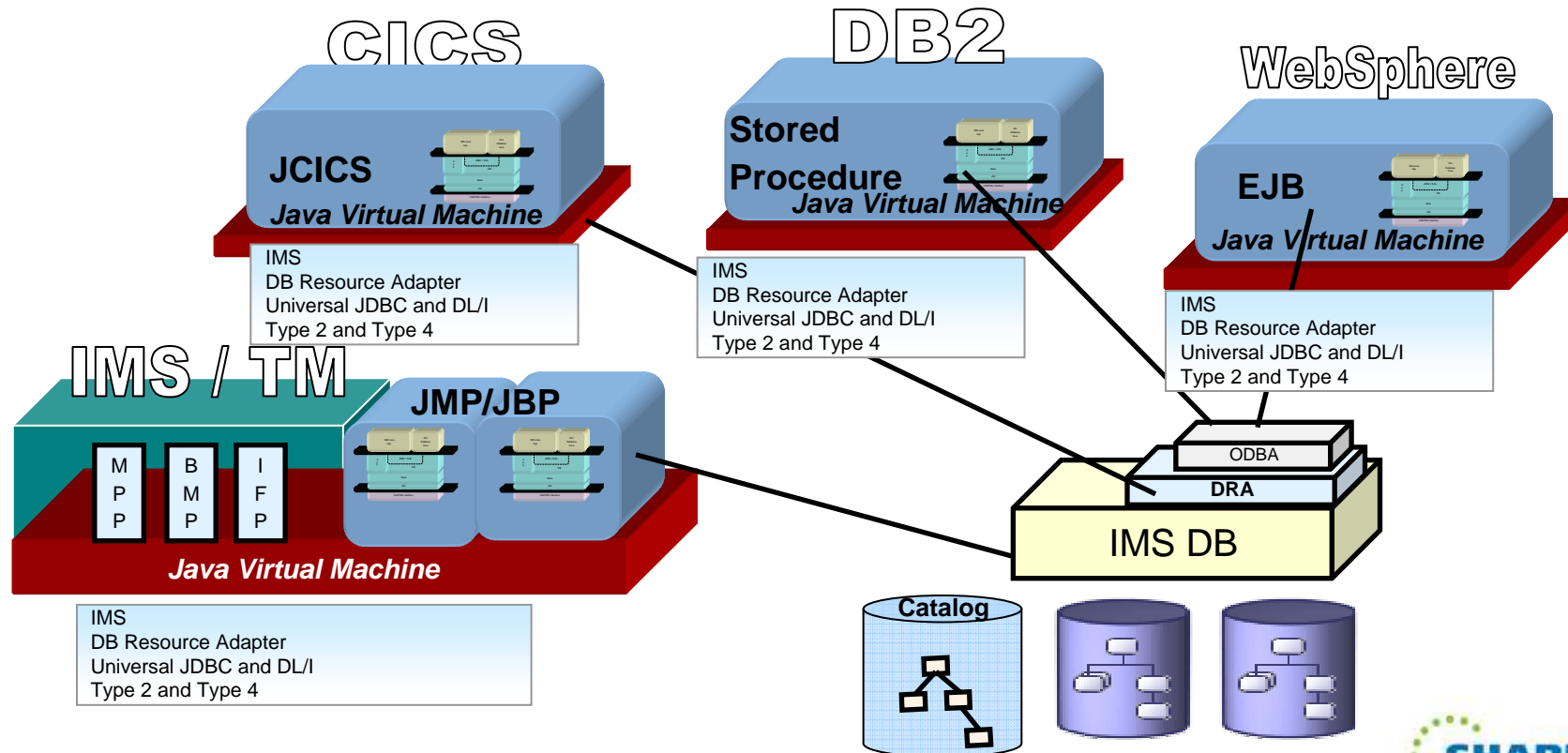


- Different API layers are provided to leverage the DRDA protocol
 - **IMS Universal DB Resource Adapter** - to use JDBC SQL access to IMS data in a JEE environment such as WebSphere Application Server (WAS) on any platform
 - **IMS Universal JDBC driver** - to use JDBC SQL access to IMS data in a Non-JEE environment such as stand-alone java, DB2 SP, IMS TM, CICS
 - **IMS Universal DL/I driver** - to issue calls that are similar to DL/I directly to IMS from a Non-JEE Java environment
 - **RYO** - Use a programming language of your choice to issue DRDA commands directly to IMS Connect
- ***Makes Application development and Connectivity much simpler!***

IMS Solutions for Java Development



- IMS 11 Open Database APIs JDBC 3.0
 - IBM SDK V5 z/OS
 - CICS,DB2,WebSphere
 - IBM SDK V6 z/OS
 - IMS TM
- IMS 9,10 Java Drivers JDBC 2.1
 - IBM SDK V1.3.1 IMS 9
 - IBM SDK V1.4.2 IMS 9
 - IBM SDK V5 z/OS IMS 10



setFetchSize and Network Efficiency



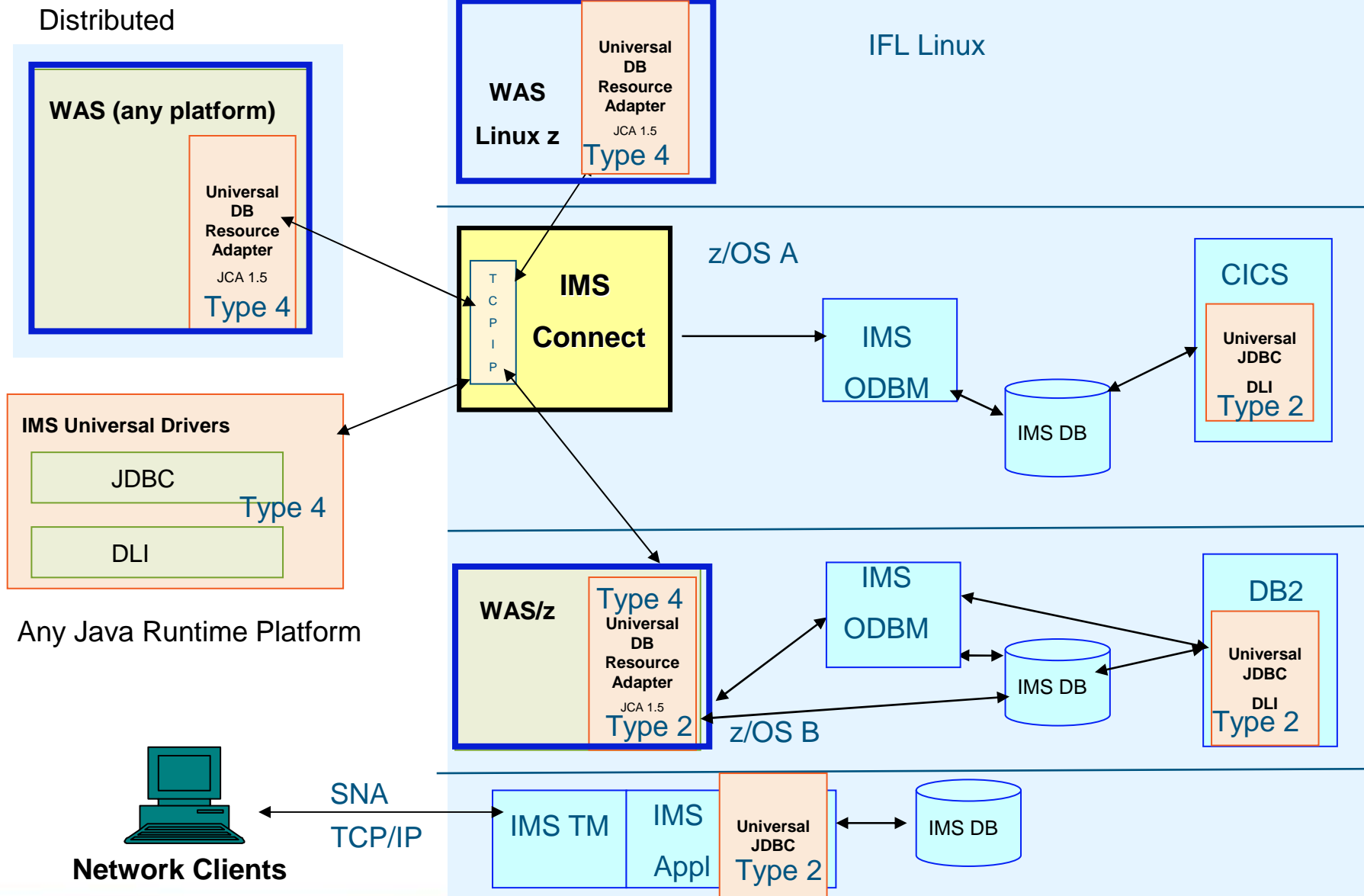
- An application can set the expected or desired number of rows to be returned – default is 1
- Especially relevant for a distributed client to maximize network efficiency
 - The driver will build a request for this number of rows to be returned
 - Send it to ODBM (via IMS Connect) to interact with IMS to retrieve this number of rows (if available)
- One network interaction will retrieve multiple rows
 - If the remote client application continues to ask for more rows, the driver will submit a request for another set of rows to be returned
- This facility is available in all the drivers
 - Universal DB Resource Adapter – for JDBC, and for CCI SQL or DL/1 access
 - Universal JDBC Driver
 - Universal DL/1 Driver

Universal Drivers

System z



E
mult



ODBM Client API

- ODBM Client request flow
 - CSLSCREG – Register to SCI
 - CSLDMREG – Register to ODBM
 - CSLSCRDY – Enable the ODBM client for SCI processing
 - CSLDMI FUNC= – API function calls
 - CSLSCBFR – Release output buffer
 - CSLDMDRG – Deregister from ODBM
 - CSLSCDRG – Deregister from SCI

CSL macros are documented in “IMS Version 11 System Programming APIs”

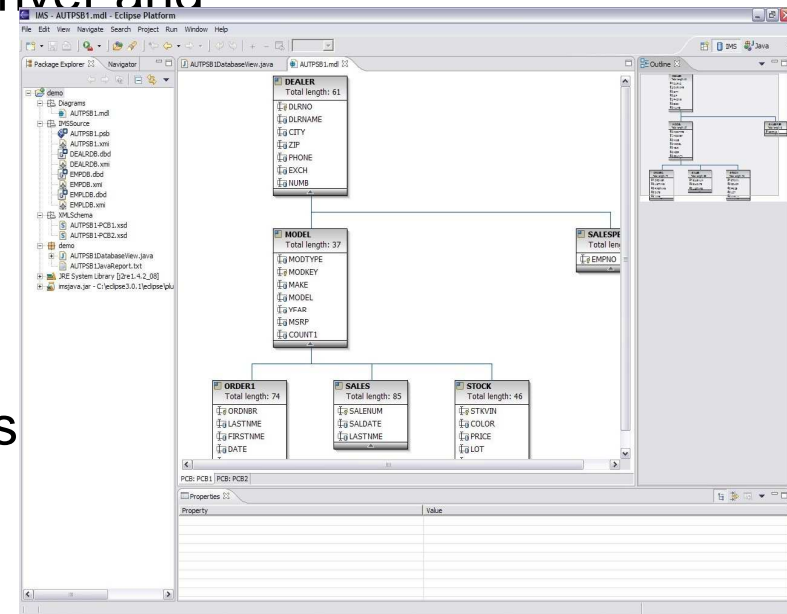
DRDA RYO Client API

- IMS DRDA Client flow
 - Establish TCP/IP connection to IMS Connect (open socket connection)
 - Host IP Address
 - DRDA Port number
 - IMS Alias
 - Allocate PSB (Open Database connection)
 - **ACCRDB** command RDBNAM=PSB
 - Access IMS DB using AIB, PCBNAME,SSALIST.
 - **OPNQRY** command DLIFUNC=GU
 - **EXCSQLIMM** command DLIFUNC=ISRT,REPL,DLET
 - **RDBCMM** command to commit changes
 - Deallocate PSB (Close Database connection)
 - **DEALLOCDB** command RDBNAM=PSB

IMS Enterprise Suite DLIModel Utility Plug-in or IMS Enterprise Suite Explorer



- IMS database visualization tool
 - Visualize an entire IMS PSB
 - Can view and print each PCB individually
 - Hierarchy, segments, fields, types, etc
- IMS database metadata generation tool
 - Generates the necessary metadata that is consumed at runtime by IMS JDBC driver and XML-DB support
 - Database metadata
 - XML schema
- Bottom-up tooling approach
 - Parses PSB and DBD source
 - Optional COBOL copybook definitions
 - An Eclipse 3.x plug-in



Summary



- Open Database Capabilities
 - Supports open-standards for connectivity to online IMS databases
 - Across z/OS LPARs
 - Across networks
 - Direct access from distributed platforms
 - Provides an environment that manages access to online IMS databases
 - Provides Open Database APIs
 - Ease application development access to IMS databases

IMS 11 Open Database

SG24-7856-00

Install IMS Open Database and its prerequisites

Implement Java client access to IMS and DB2 data

Integrate Mash up Center with IMS Open Database

