

# E66

## Technology to Access IMS Databases

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# ■ Terminology and Trademarks

## ■ Terminology

- ▶ RRS - Resource Recovery Services
- ▶ ODBA - Open DataBase Access
- ▶ DRA - Database Resource Adapter
- ▶ AAS - Application Address space
- ▶ AIB - Application Interface Block
- ▶ UR - Unit of Recovery

## Trademarks

**MVS/ESA**

**IMS/ESA\***

**DB2\***

**S/390\***

**ESA/390**

**IBM\***

**IBM COBOL for MVS**

**System/390\***

**CICS**

**CICS/ESA**

\* Trademarks followed by an asterisk (\*) are registered.

## ■ Agenda

### **What is ODBA**

**ODBA Callable Interface connection to IMS DB  
Application Interface Block (AIB) and AERTDLI**

**New and Enhanced calls for ODBA**

**Resource Recovery Services Basic Concepts**

**Examples**

**Setup Process**

**connection**

**security**

**Summary**

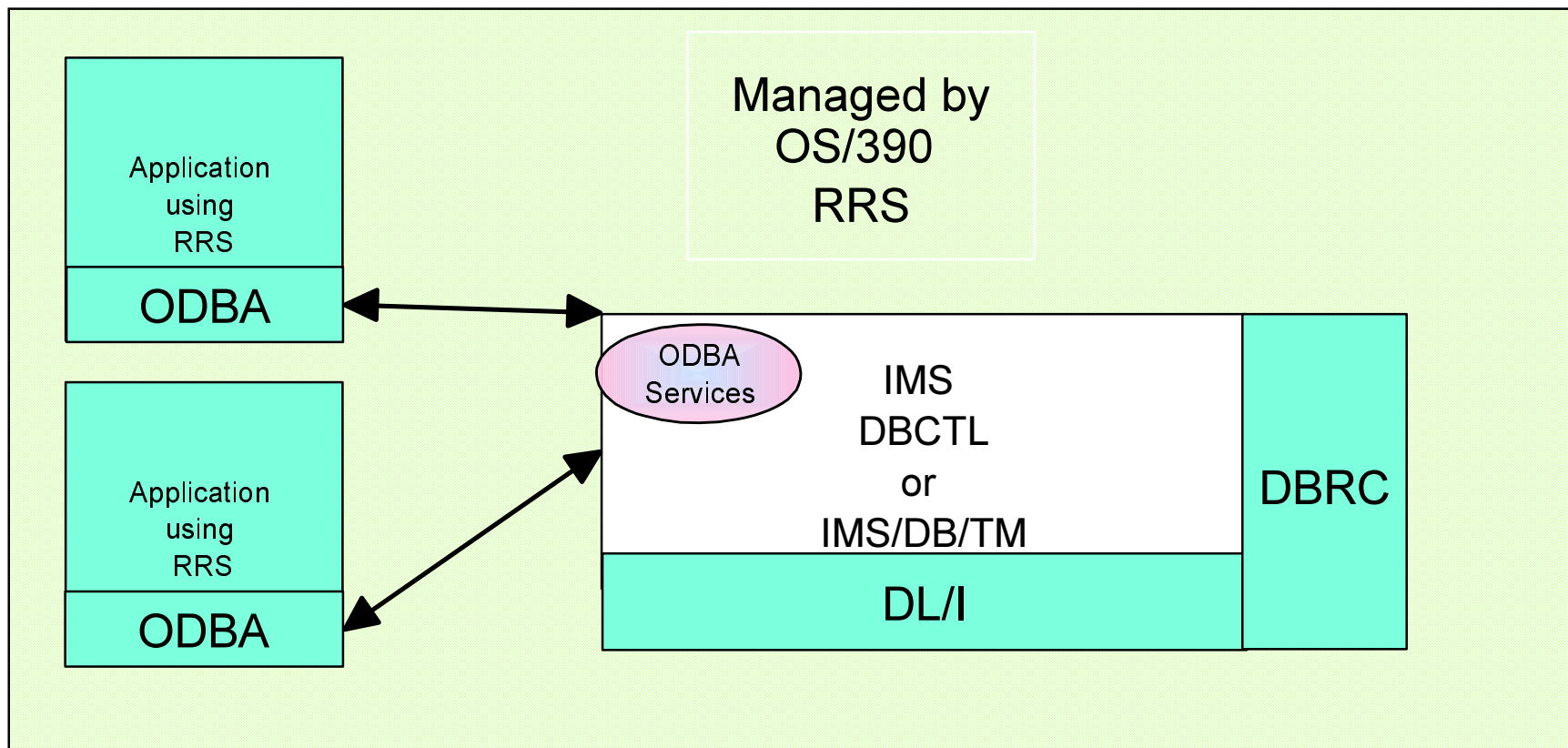
## ■ What is Open Database Access?

**ODBA is a callable interface to access databases managed by the  
IMS DB Manager**

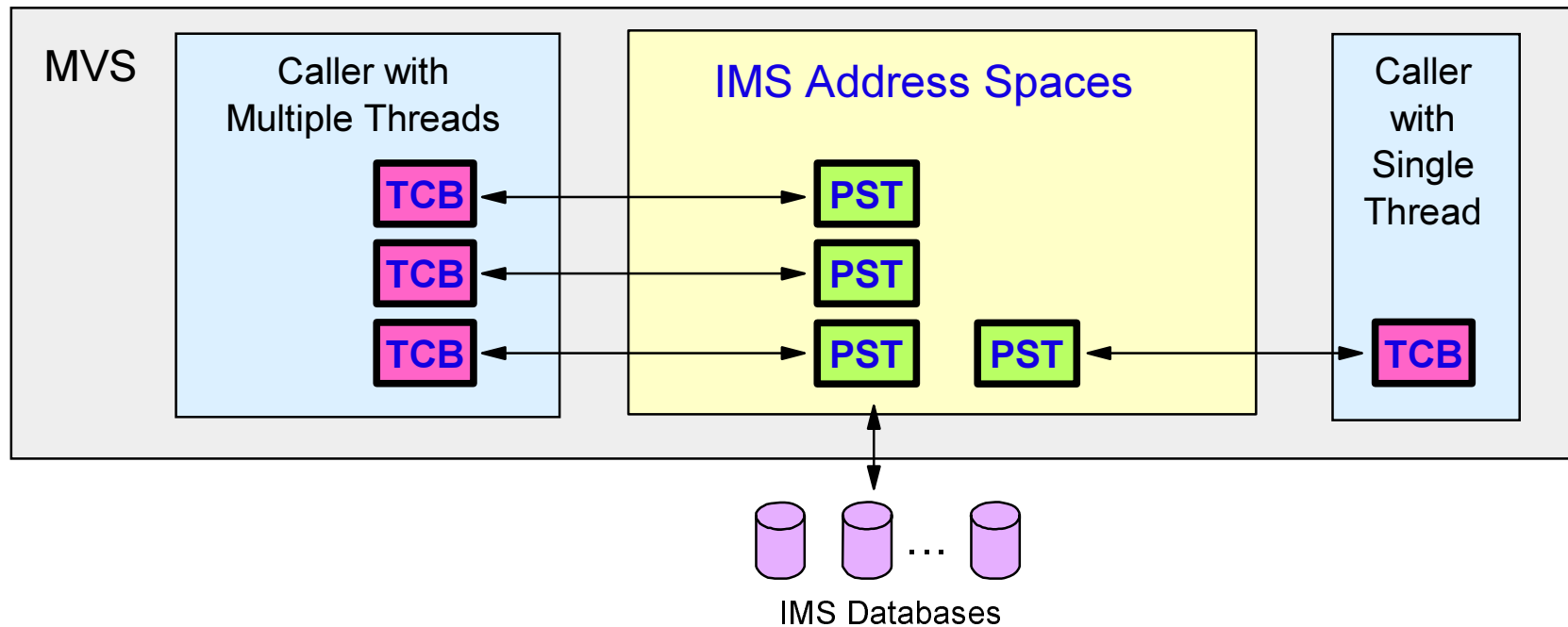
**ODBA allows IMS DB and OS/390 application programs to be  
developed, installed, and maintained independently of each other**

**ODBA provides for failure isolation and independent resource  
recoverability**

# ODBA Callable Interface connection to IMS



# ODBA

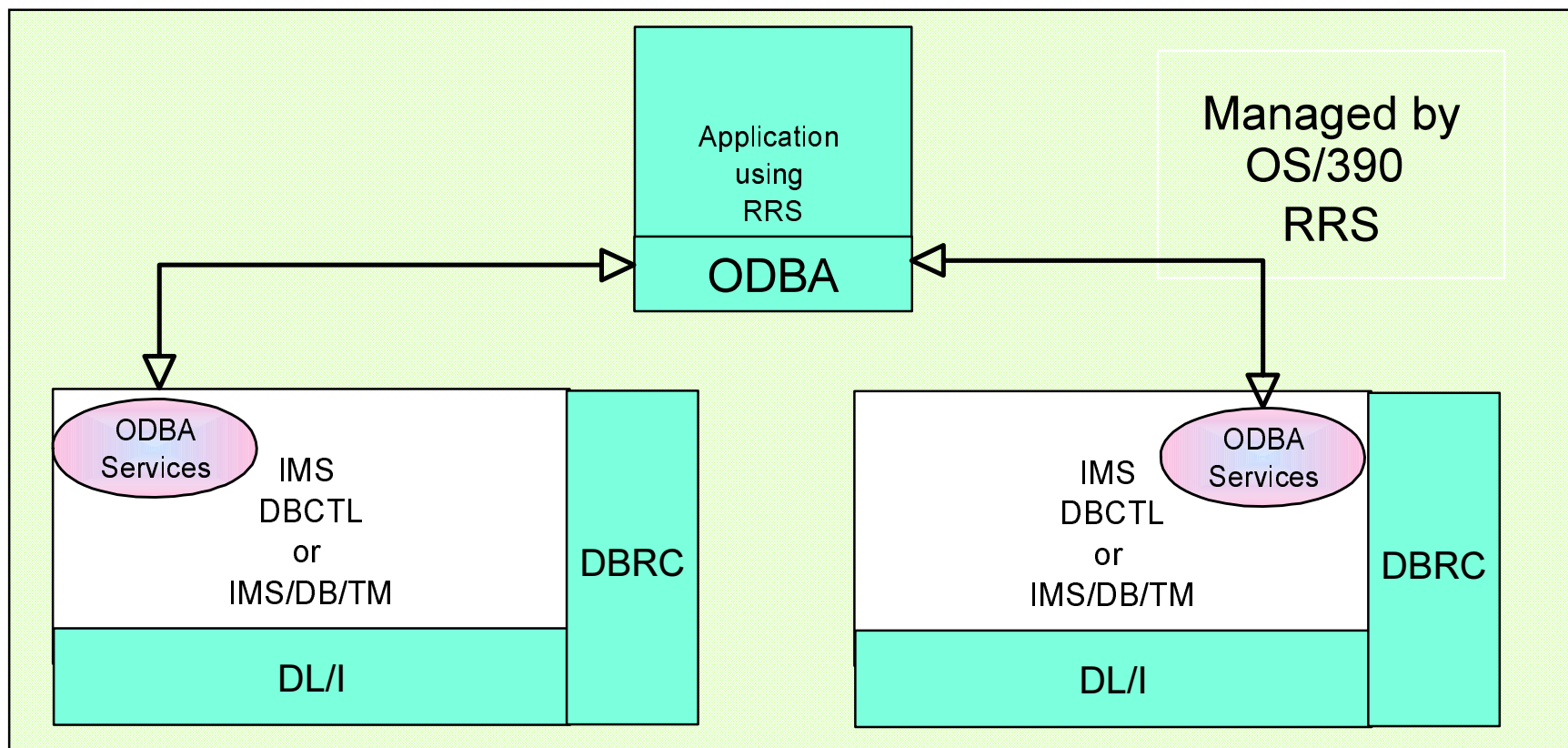


- **Multiple concurrent connections**

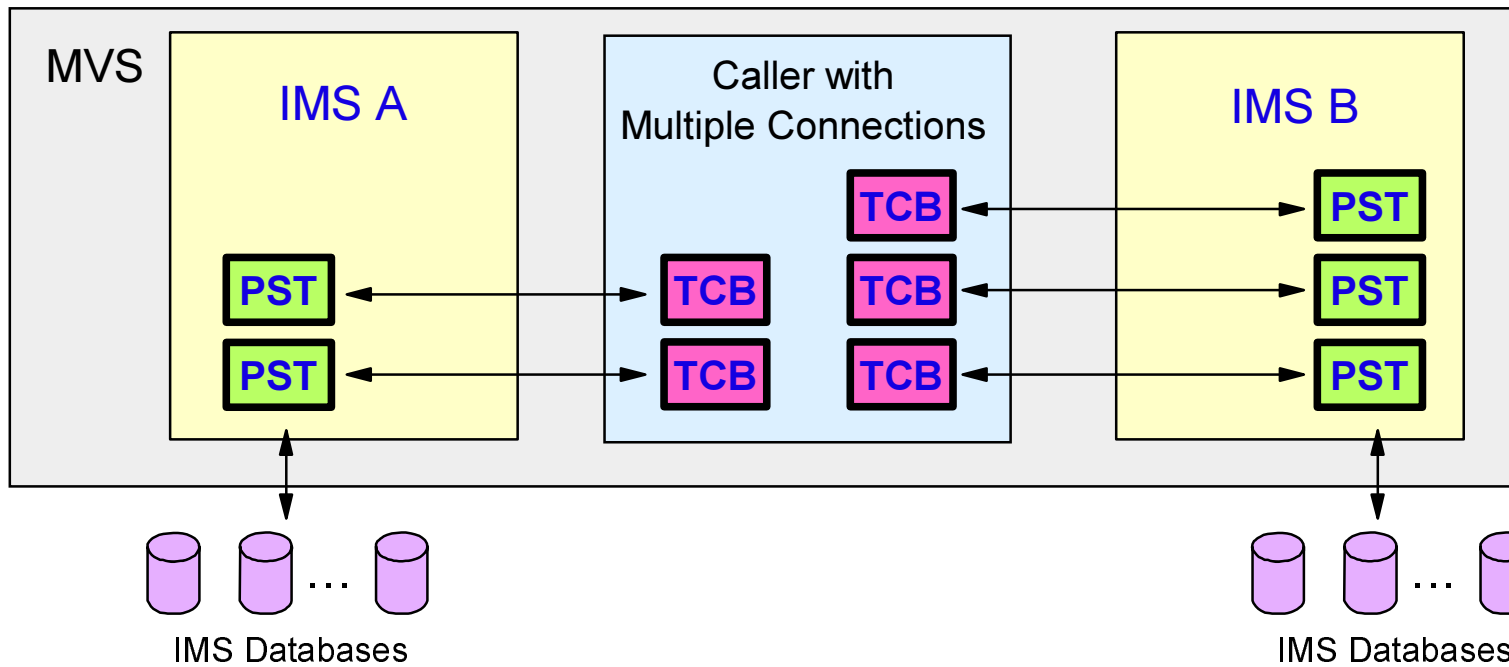
- Connectors may have multiple threads

- Each thread requires a TCB in caller
    - Each thread uses a PST in the control region

# ODBA Callable Interface connection to IMS



# ODBA



- **Connectors may connect to multiple IMS systems**
  - Connections may be concurrent



# ■ Application Interface Block aka...AIB

**Introduced in IMS/ESA V3**

**Extended in IMS/ESA V6**

**Request IMS resource PCB by name**

**AIB in user defined storage**

**Minimum size of 264 for ODBA usage**

## ■ ODBA Application Interface

**New IMS Language Interface module is DFSCDLI0 with alias entry  
point name AERTDLI**

**PCB list is not required at program entry**

**PCB name value is set with label on PCB or PCBNAME=**

# ODBA Calls

- **IMS Calls must use AIB interface with AERTDLI**
  - CIMS
    - Establishes and terminates the connection
  - APSB
    - Allocates a PSB
  - DPSB
    - Deallocates a PSB
  - DLI calls
    - Usual access to databases (GU, GN, ISRT, ...)
- **Synchronization done with SRRCMIT or ATRCMIT**

# DL/I call

Call AERTDLI parmcount, xxxx, AIB, ...

- ▲ parmcount = set to n (optional)
- ▲ xxxx = Call function (required)
- ▲ AIB = Address of AIB
  - (required-must be same as APSB AIB)
  - AIBRSNM1 = 8 character PCB name (required)

## ■ Resource Recovery Services(RRS)

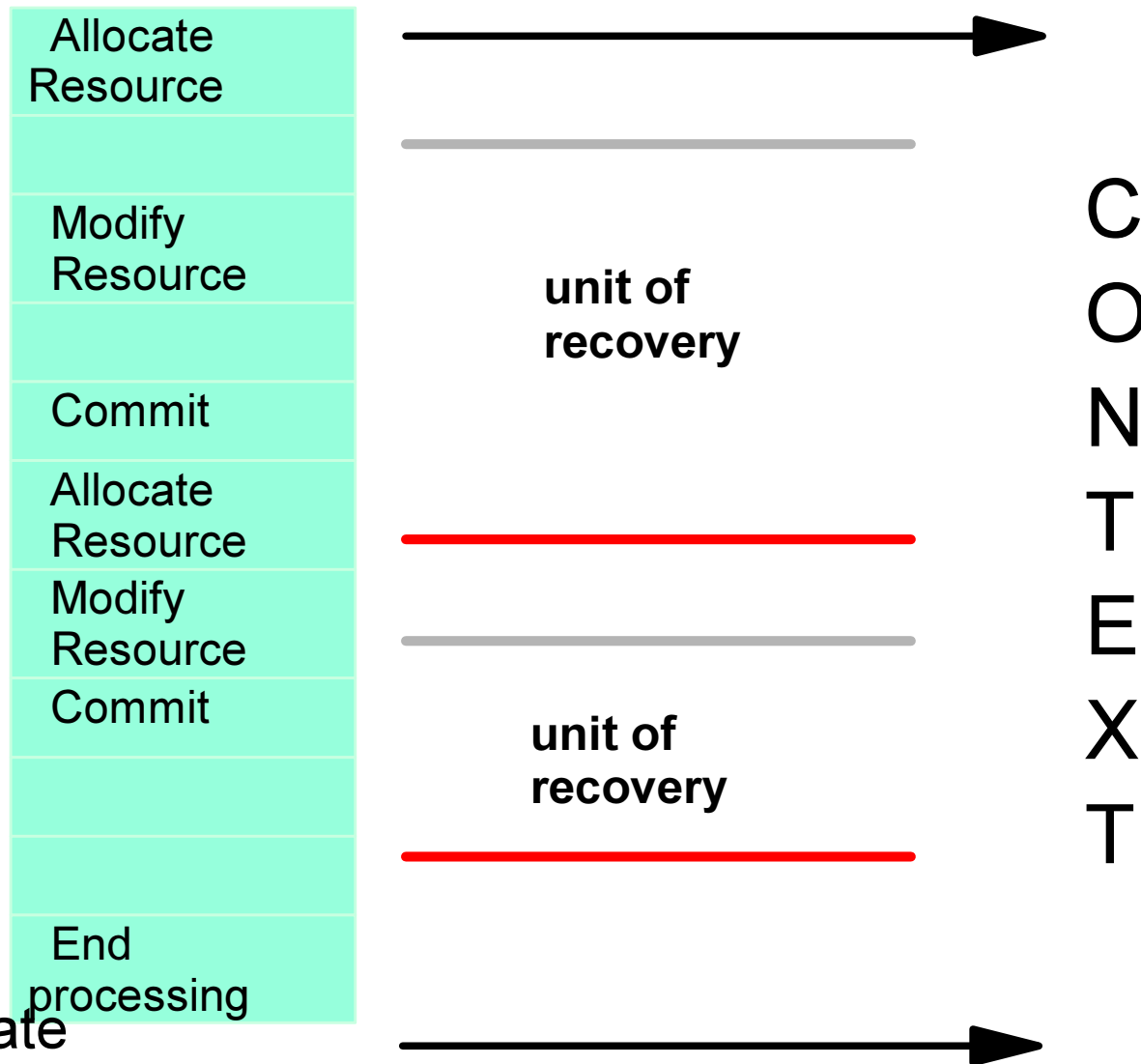
**A sync-point manager to coordinate the two-phase commit process**

**Implementation of the SAA Commit and Backout callable services for us by application programs**

**A mechanism to associate resources with an application instance  
Manages Unit of Recovery(UR)**

# TCB -private start

## Context Example



## ■ RRS Commit & Backout Stubs

**ATRCMIT or SRRCMIT**

**Commit unit of work**

**CALL SRRCMIT(RETCODE)**

**CALL ATRCMIT(RETCODE)**

**ATRBACK or SRRBACK**

**Backout unit of work**

**CALL SRRBACK(RETCODE)**

**CALL ATRBACK(RETCODE)**

**RRS stub code module used to access RRS**

**ATRRCSS from SYS1.CSSLIB**

# Syncpoint Processing ...

## Unit of Work States

### IN-FLIGHT

Work changes in process

### IN-DOUBT

Work changes between Phase 1 and Phase 2

### IN-COMMIT

Work changes are committed

### IN-BACKOUT

Work changes are backed out



## ■ RRS Logging

**Uses System Logger Log Streams**

**System Managed Storage(SMS) must be installed and active**

**RRS coupling facility log streams**

**or as DASD-only log streams**

**RRS hardens information about URs and resource managers in  
RRS logs**

**uses 5 log streams, one for each of its 5 logs**

**System logger allocates VSAM linear data sets for the DASD log  
data sets and DASD staging data sets**

## ■ RRS Logging

**ARCHIVE - archive log (optional)**

**completed UR information**

**RM.DATA - resource manager data log**

**Registered Resource Managers information**

**MAIN.UR - main UR state log**

**current state of active URs**

**DELAYED.UR - delayed UR state log**

**current state of active URs that have been delayed**

**RESTART - restart log**

**incomplete URs information needed for restart**

# ODBA Example - One Thread

- Connector example

- Establishes a connection
- Schedules a PSB
- Does some DLI calls
- Commits the work
- Terminates the PSB
- Terminates the connection

CIMS INIT call for IMSA

APSB call for PSBX

Database calls

CALL AERTDLI(GU,AIB,IOAREA,...)

...

SRRCMIT

DPSB call

CIMS TALL call

# A simple ODBA example

Set AIBSFUNC=INIT

Set AIBRSNM2=IMSA

Call AERTDLI (CIMS,AIB)

Set AIBSFUNC=blanks

Set AIBRSNM1=TPSBNAME

Call AERTDLI (APSB,AIB)

Set AIBRSNM1=DBPCBNME

Call AERTDLI (GU,AIB,IOAREA,...)

Call AERTDLI (ISRT,AIB,IOAREA,...)

Call SRRCMIT (RETCODE)

Set AIBRSNM1=TPSBNAME

Call AERTDLI (DPSB,AIB)

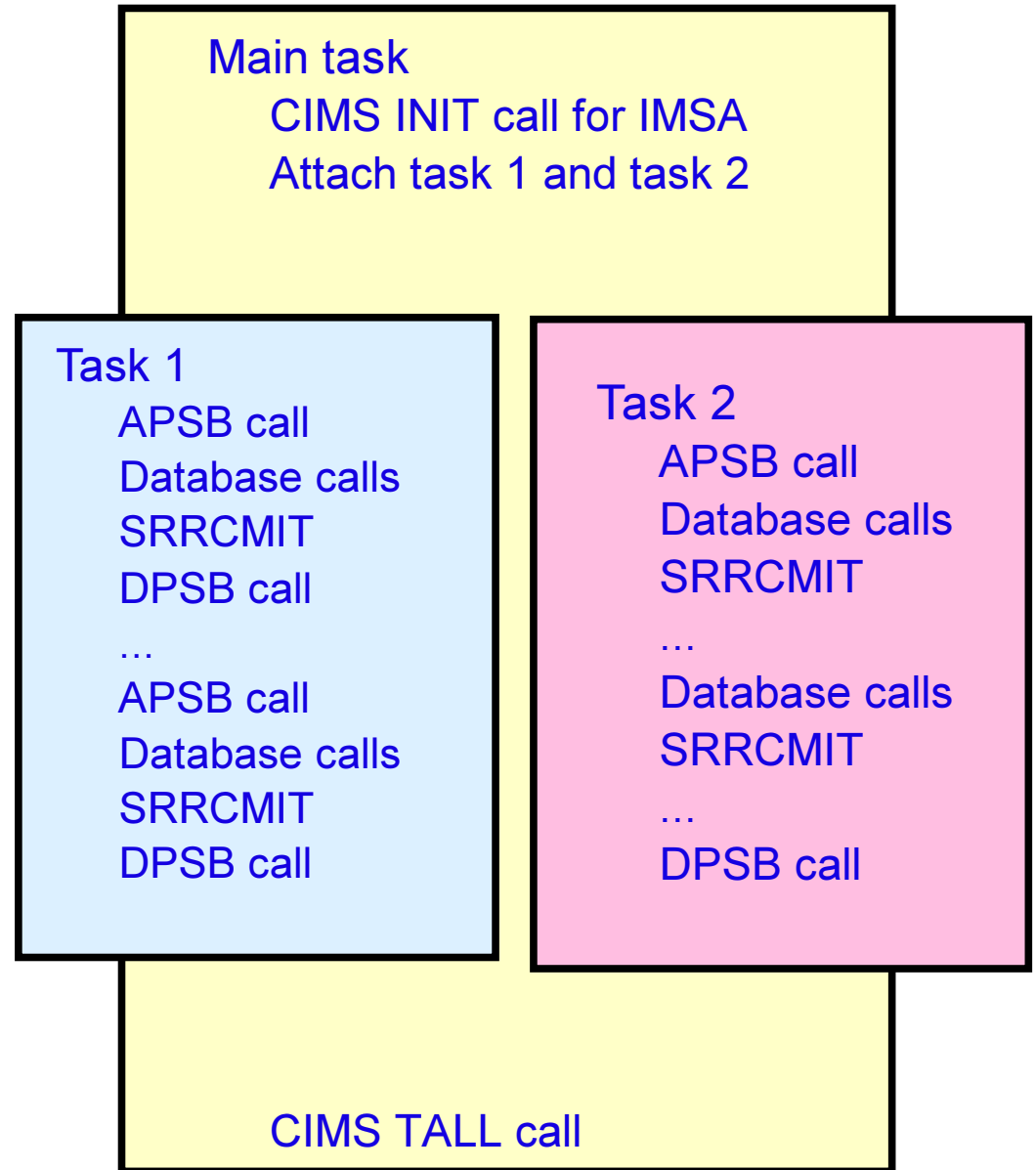
Set AIBSFUNC=TALL

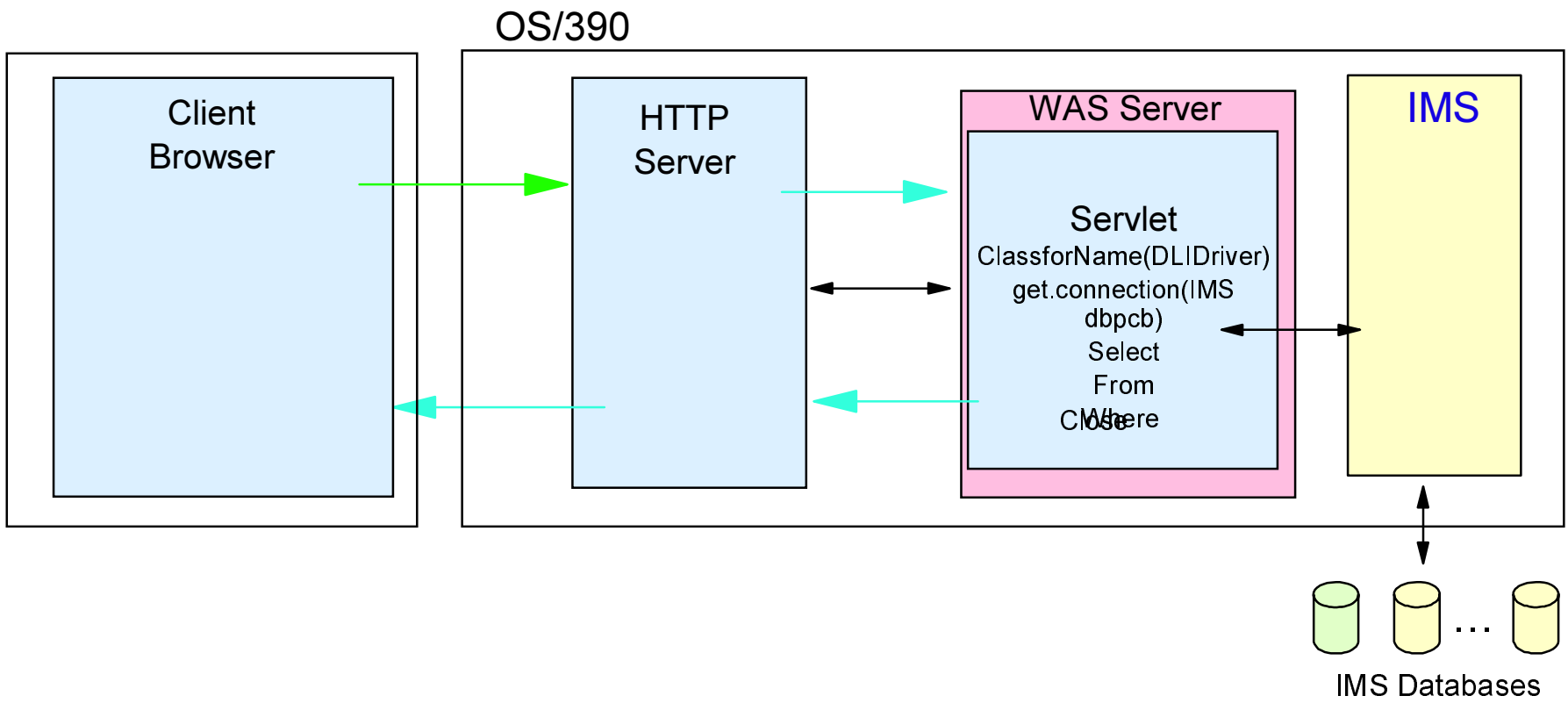
Call AERTDLI (CIMS,AIB)

# ODBA Example - Multiple Threads

- Connector example

- Establishes a connection
- Creates two threads
- Schedules multiple PSBs in task 1
- Commits multiple times in both tasks
- Terminates the connection



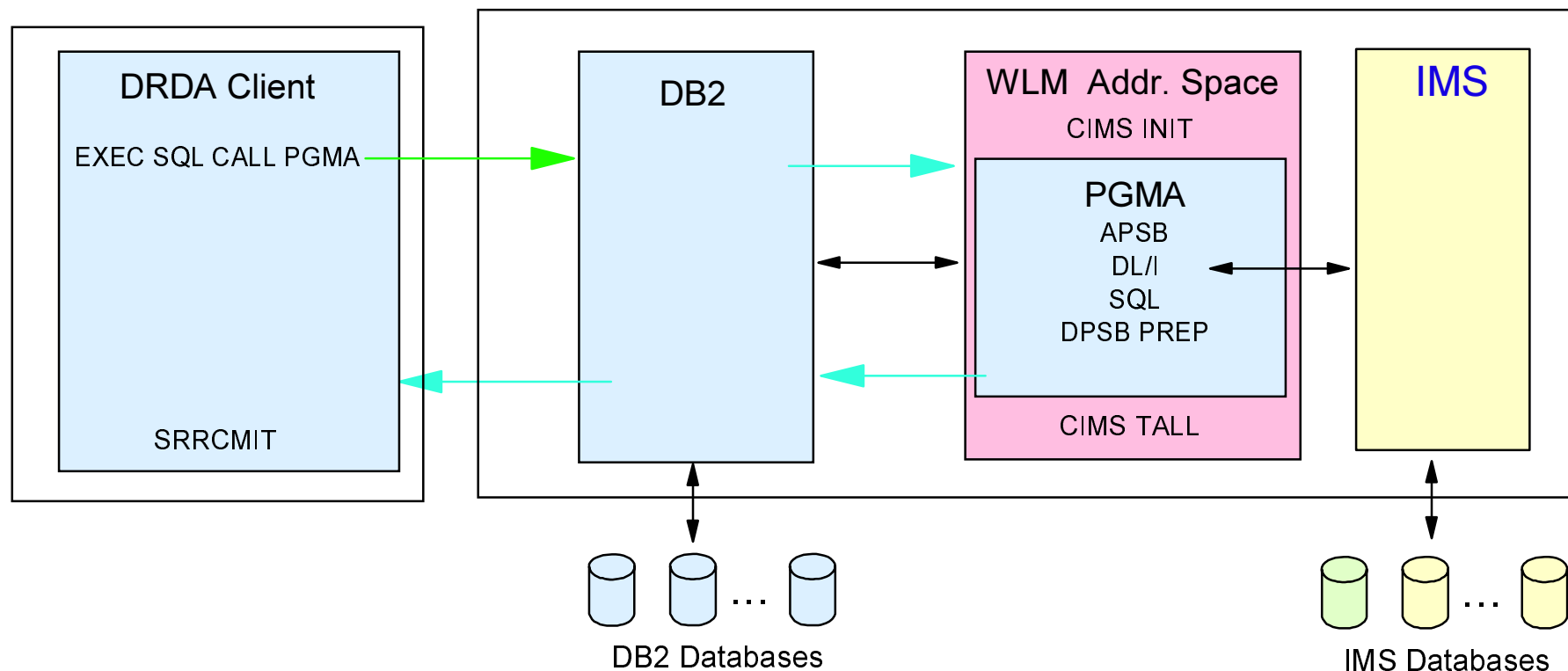


# OS/390 WebSphere Application Server

## Example using IMS Java Classes

# ODBA DB2 Stored Procedure Example

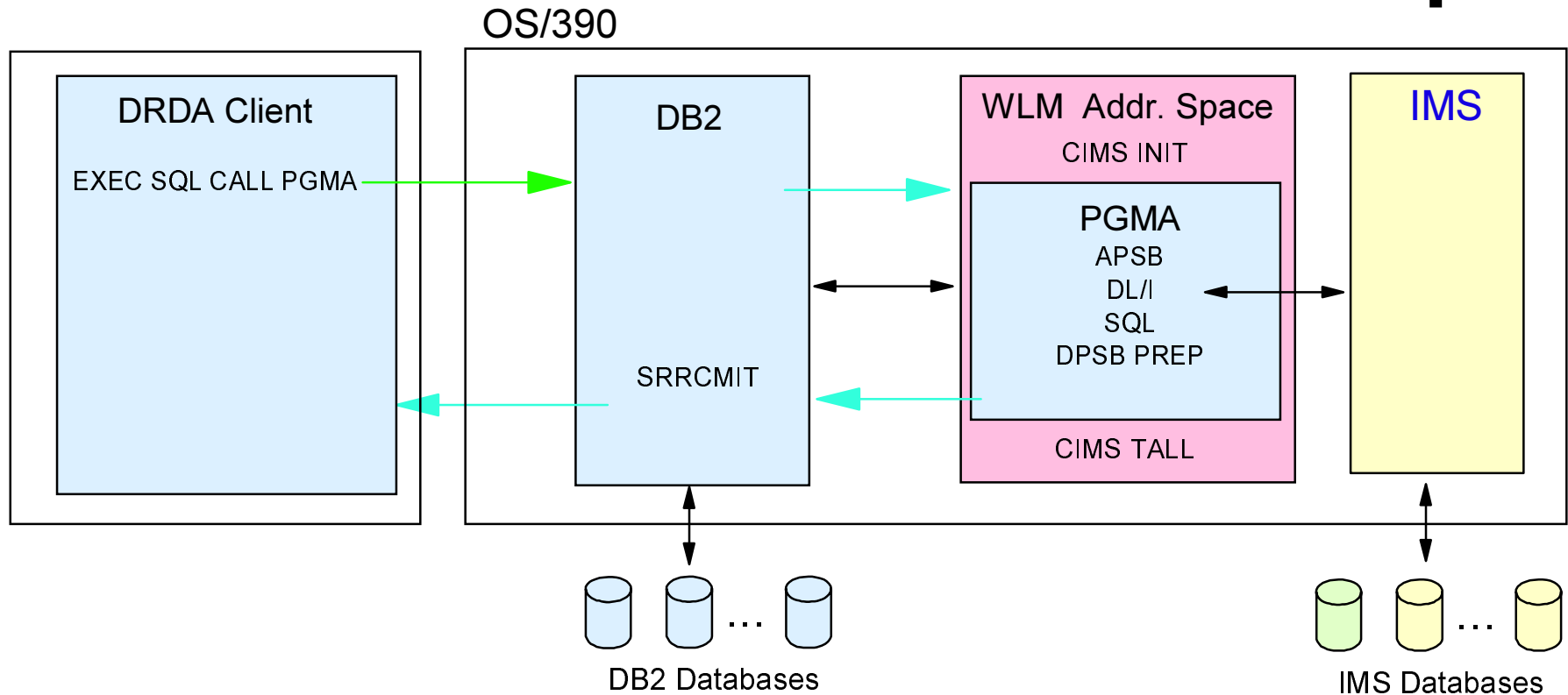
OS/390



## • DB2 stored procedure example

- Requires DB2 Version 5 or later and WLM managed stored procedures address spaces
- DRDA Client issues SQL for stored procedure
- DB2 invokes stored procedure
- Stored procedure does SQL and DL/I calls
- Client program does commit when stored procedure returns
  - or DB2 can issue SRRCMIT

# ODBA DB2 Stored Procedure Example...



- DB2 stored procedure commit processing

- DPSB PREP

- IMS performs Phase One of syncpoint process
- Changes are IN\_DOUBT status

- DB2 invokes SRRCMIT

- RRS drives IMS through Two\_Phase commit



- Setup: DB2 Stored Procedures

**Add DFSRESLB DD statement**

**refers to dataset that contains the IMS ODBA  
modules**

**Concatenate IMS.RESLIB to STEPLIB**

**WLM**

**used to start Stored Procedure address space**

# ■ Setup: DB2 Stored Procedures sample JCL

```
//*****  
//*   JCL FOR RUNNING THE WLM-ESTABLISHED STORED PROCEDURES  
//*   ADDRESS SPACE  
//*   RGN   -- THE MVS REGION SIZE FOR THE ADDRESS SPACE.  
//*   DB2SSN -- THE DB2 SUBSYSTEM NAME.  
//*   APPLENV -- THE MVS WLM APPLICATION ENVIRONMENT  
//*           SUPPORTED BY THIS JCL PROCEDURE.  
//  
//*****  
//DSNWLMS PROC RGN=0K,APPLENV=WLMENVI,DB2SSN=DSNJ  
//IEFPROC EXEC PGM=DSNX9WLM,REGION=&RGN,TIME=NOLIMIT,  
//   PARM='&DB2SSN,1,&APPLENV'  
//STEPLIB DD DISP=SHR,DSN=CEE.SCEERUN  
//   DD DISP=SHR,DSN=DSN610.SDSNLOAD  
//   DD DISP=SHR,DSN=IMS610P.PGMLIB  
//   DD DISP=SHR,DSN=IMS610P.RESLIB  
//DFSRESLB DD DISP=SHR,DSN=IMS610P.RESLIB
```

# ■ DB2 Sample define Stored Procedure

CREATE PROCEDURE

DSN2.JAVASP1(

INOUT COMMAND CHAR(8) CCSID EBCDIC,  
INOUT LAST\_NAME CHAR(20) CCSID EBCDIC,  
INOUT FIRST\_NAME CHAR(20) CCSID EBCDIC,  
INOUT ADDRESS CHAR(30) CCSID EBCDIC,  
INOUT CITY CHAR(20) CCSID EBCDIC,  
INOUT STATE CHAR(7) CCSID EBCDIC,  
INOUT COUNTRY CHAR(20) CCSID EBCDIC,  
INOUT FLAG CHAR(1) CCSID EBCDIC,  
OUT CALL\_STATUS CHAR(40) CCSID EBCDIC,  
OUT AIBRETRN INT,  
OUT AIBREASN INT)

FENCED

RESULT SETS 0

EXTERNAL NAME JAVAPGSP

LANGUAGE COBOL

PARAMETER STYLE GENERAL

NOT DETERMINISTIC

NO SQL

NO DBINFO

NO COLLID

WLM ENVIRONMENT WLMENVI

ASUTIME LIMIT 50

STAY RESIDENT NO

PROGRAM TYPE MAIN

SECURITY DB2

RUN OPTIONS 'TRAP(OFF),RPTOPTS(OFF),TERMTHDAC(QUIET),NONOVR'

COMMIT ON RETURN YES;

# ■ DB2 Sample COBOL code

## PROCEDURE DIVISION

USING IO-COMMAND,IO-LAST-NAME,IO-FIRST-NAME,  
IO-ADDRESS,IO-CITY,IO-STATE,IO-COUNTRY,  
OUT-MESSAGE,OUT-AIBRETRN,OUT-AIBREASN.

MOVE APSBNME to AIBRSNM1.            set PSB NAME in AIB  
MOVE TDBCTLID to AIBRSNM2.           set value for DFSPRP table  
CALL 'AERTDLI' USING APSB, AIB.       allocate the PSB

MOVE DPCBNME to AIBRSNM1            set DB PCB NAME in AIB

CALL 'AERTDLI' USING GET-HOLD-UNIQUE, AIB, IOAREA, SSA

SET ADDRESS OF DBPCB TO AIBRESA1    set address of DBPCB from AIB  
IF DBSTATUS = 'GE'

MOVE APSBNME to AIBRSNM1.           set PSB NAME in AIB  
MOVE SFPREP to AIBSFUNC.            set PREP subfunction in AIB  
CALL 'AERTDLI' USING DPSB, AIB.     deallocate the PSB

## ■ DB2 Stored Procedure Commands

WLM goal mode command to stop procedure

```
VARY WLM,APPLENV=name,QUIESCE
```

WLM goal mode command to reload procedure

```
MVS VARY WLM,APPLENV=applenv,REFRESH
```

WLM compatibility mode command to stop procedure

```
CANCEL address-space-name
```

- **IMS Commands**

**/DIS UOR**

**displays status information about URs  
managed by RRS**

**/CHANGE UOR *nnnn* COMMIT**  
**to make changes permanent**

**/CHANGE UOR *nnnn* ABORT**  
**to backout the changes**

- **Connection Security**

## **ISIS Parameter**

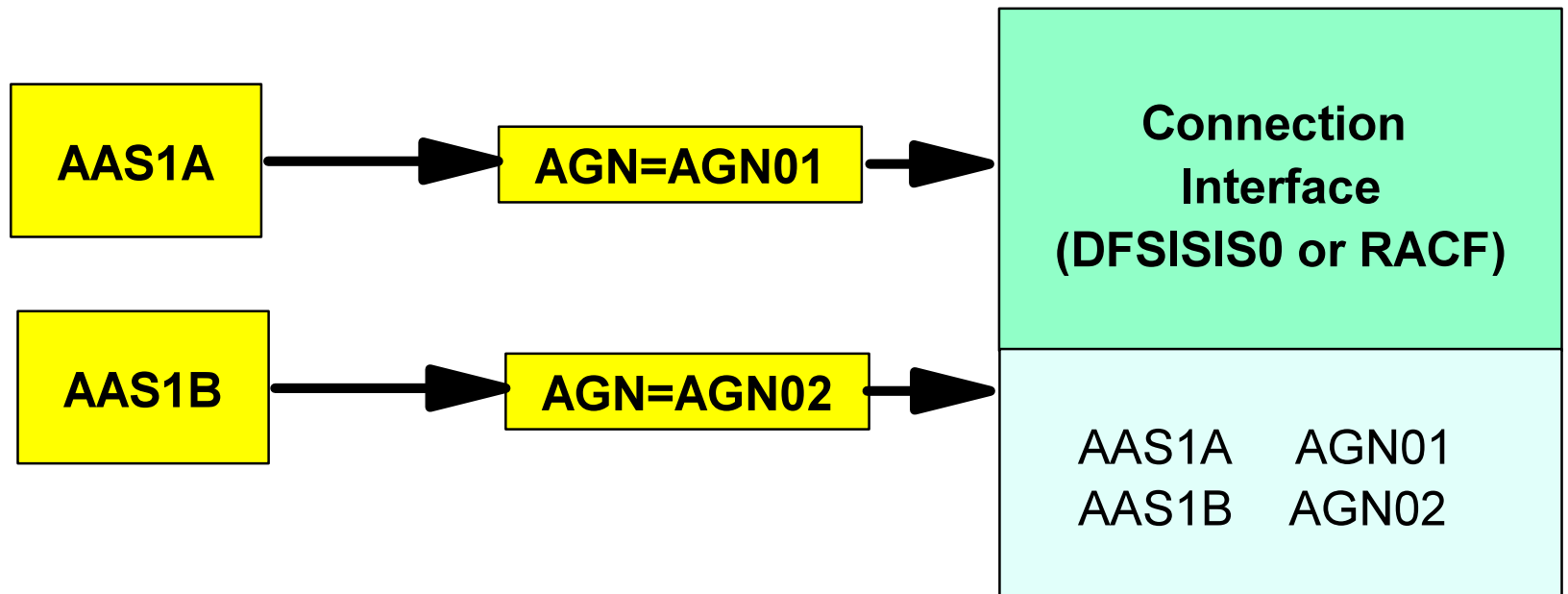
**Select ISIS= 1 - RACF**

**USERID from JOBCARD**

**AGN from Startup Table**

**Select ISIS= 2 - DFSISIS0**

# Connection Security

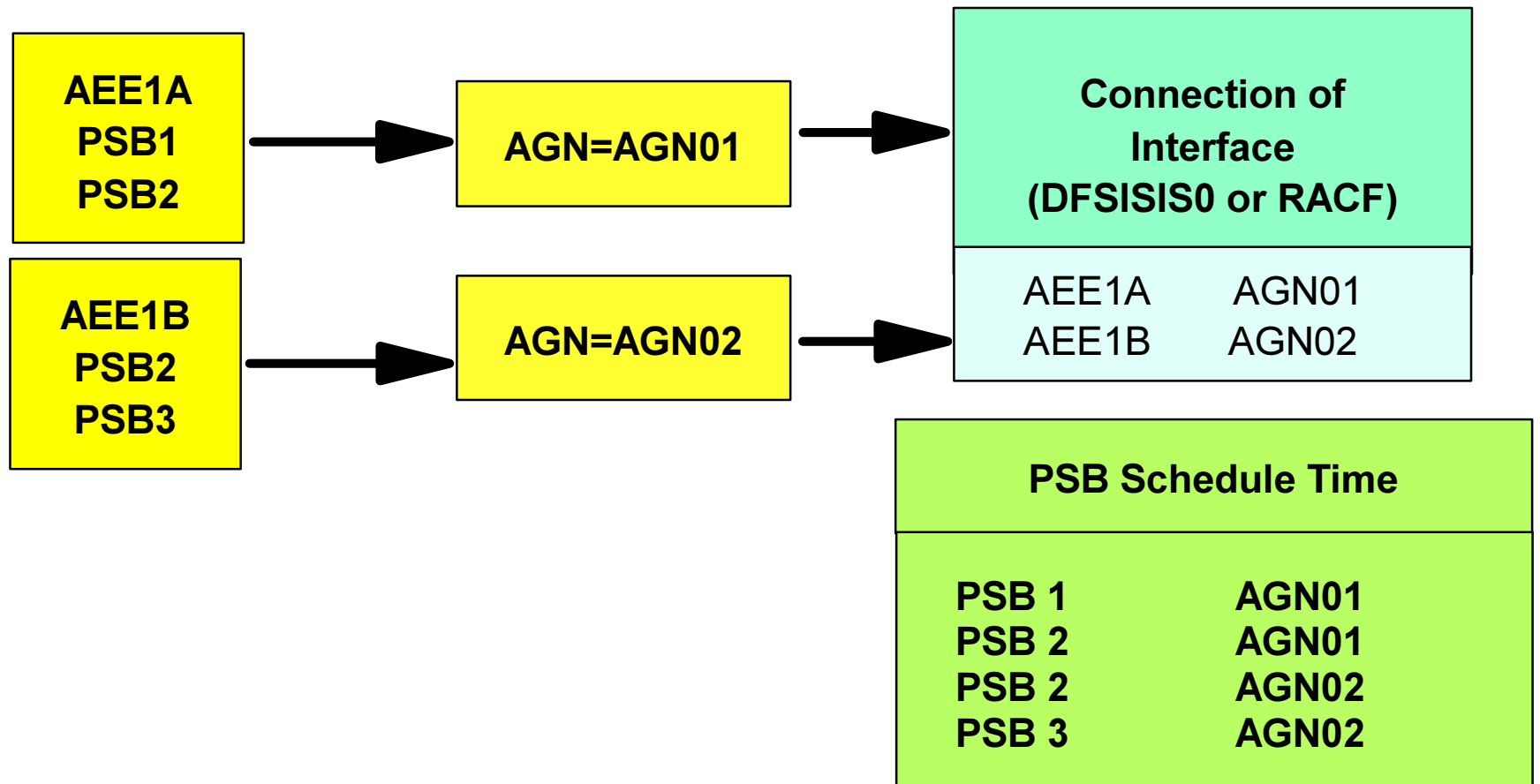




# PSB Security

▲ ISIS=1 or 2

■ AGN



- Summary

**ODBA Interface is a new way to connect to IMS DB.  
AIB only interface.  
RRS is required.**