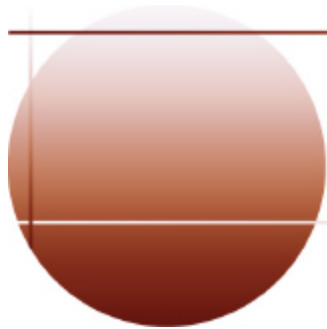


E64

IMS V8 Resource Manager/ Coordinated Online Change

Sandy Stoob

IMS Developer, IBM Silicon Valley Laboratory



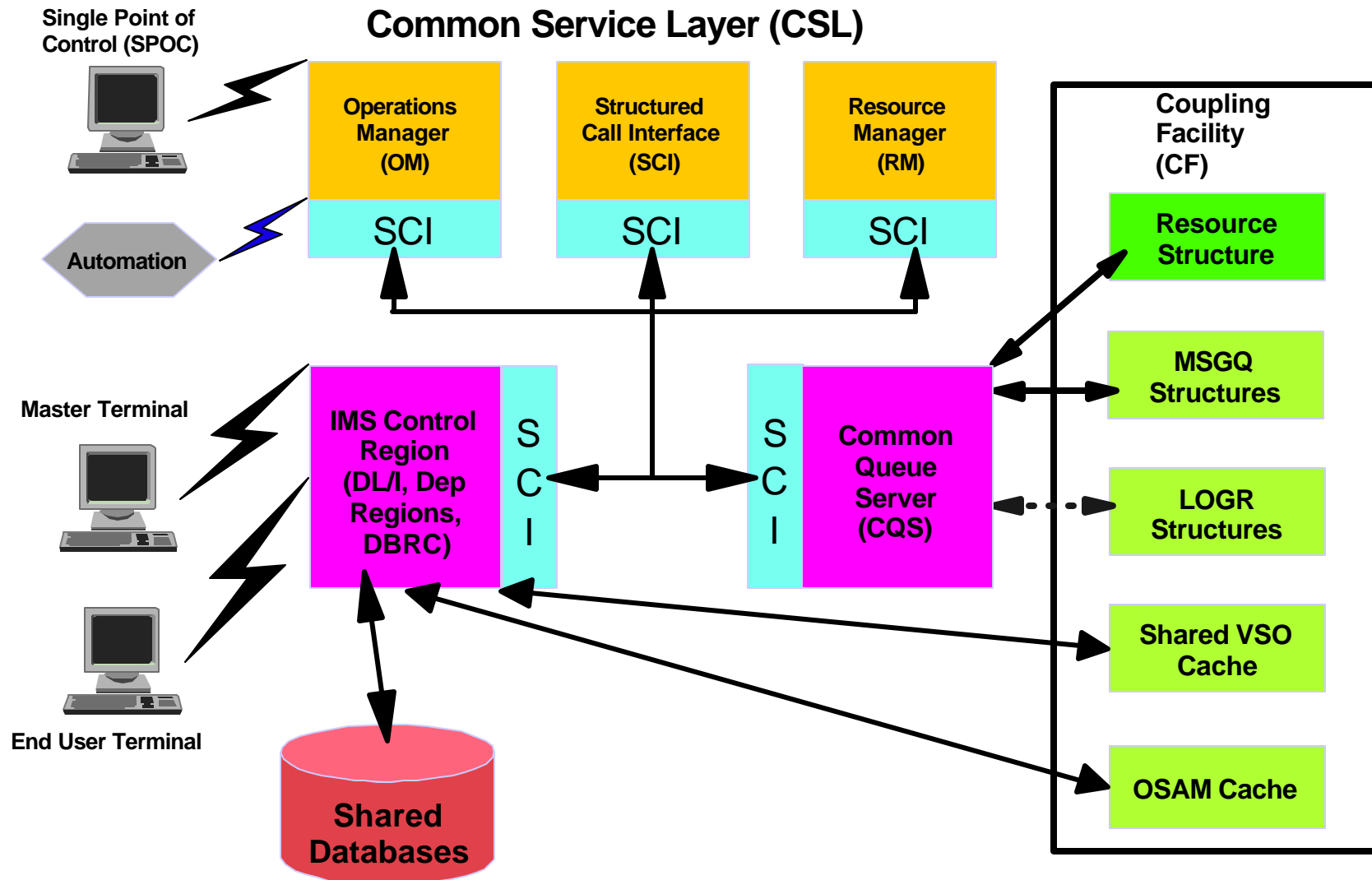
IMS

technical conference

Las Vegas, NV

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IMS V8 IMSplex



Resource Manager (RM)

- One of the new Common Service Layer address spaces that provide infrastructure for systems management in an IMSplex
- Supports a client interface (CSLRMxxx assembler macros) for managing global resources and processes
- Manages global resource information on a Coupling Facility List Structure called a resource structure
- Coordinates IMSplex-wide processes
- Supports user exits for monitoring and tailoring

IMS Functions that Exploit RM

- Resource type consistency
 - ▶ transaction cannot be defined as lterm on another IMS

- Sysplex Terminal Management (STM)
 - ▶ terminal and user state can be resumed on another IMS
 - ▶ name uniqueness (single active lterm/signed on user)

- Global Online Change
(also known as Coordinated Online Change)
 - ▶ resource definition changes coordinated across IMSplex

RM User Exits

- RM client connection user exit
 - ▶ called for client register and client deregister

- BPE initialization/termination user exit (RM)
 - ▶ called for RM initialization and termination
 - ▶ called for IMSplex initialization and termination

- BPE statistics user exit (RM)
 - ▶ provides RM statistics
 - ▶ driven by a timer



RM Resource Structure

- CQS coupling facility (CF) list structure used by RM to manage resources & processes
 - ▶ required for Sysplex Terminal Management
 - ▶ optional for Global Online Change (but recommended)

- Resource structures support the following:
 - ▶ CF duplexing
 - ▶ system-managed rebuild
 - ▶ CQS structure copy
 - ▶ structure alter (manual and automatic)
 - ▶ structure full threshold monitoring
 - ▶ structure repopulation



CFSIZER helps you size a resource structure

- MVS web-based tool

<http://www-1.ibm.com/servers/eserver/zseries/cfsizer/>

- Click on IMS on left panel
- Locate IMS V8 Resource Structure
 - ▶ Calculate resource number and data element number (help available)
 - ▶ Fill in Resource Number or use default 100
 - ▶ Fill in Number of Data Elements or use default 100
 - ▶ Click on submit
- CFSIZER returns recommended structure size and sample CFRM policy statements

QUERY STRUCTURE command

- Structure name
- Structure type (resource)
- List entries allocated and in use
- Data elements allocated and in use
- List entry to data element ratio
- Example

TSO SPOC Input:

```
QUERY STRUCTURE SHOW(STATISTICS)
```

TSO SPOC Output:

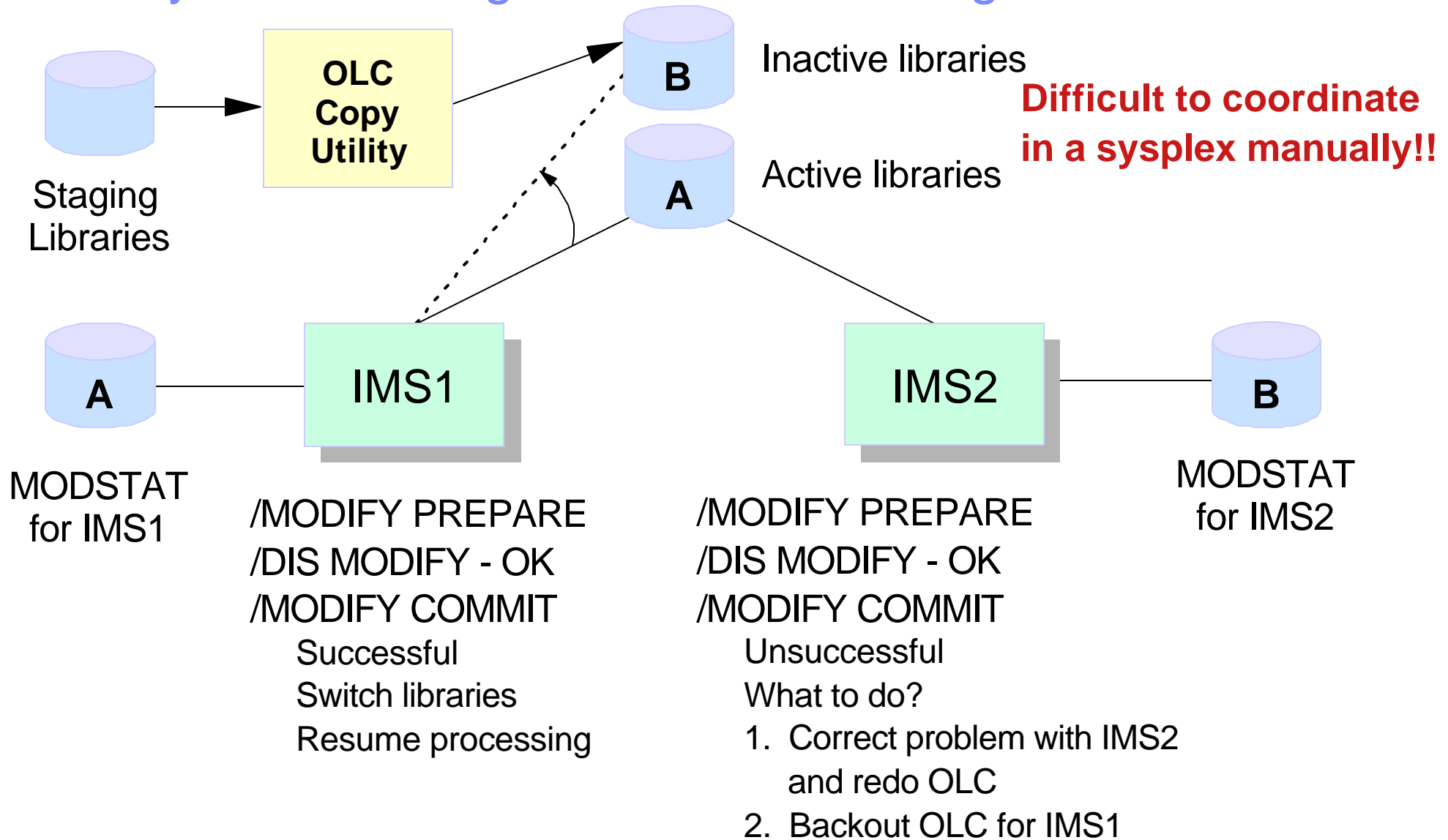
StructureName	MbrName	CC	LeAlloc	LeInuse	ElmAlloc	ElmInuse	LE/EL
IMSRSRC01	RM1RM	0	3577	680	3574	32	0001/00001

Local Online Change Overview

- Resource definitions that can be changed online
 - ▶ ACBLIB DMBs and PSBs
 - ▶ FMTLIB MFS formats
 - ▶ MATRIX SMU security matrices
 - ▶ MODBLKS databases, programs, routing codes, and transactions
- Offline preparation may include MODBLKS gen, DBDGEN, PSBGEN, ACBGEN, MFS format utility
- Online change copy utility (DFSUOCU0) copies staging library to inactive library
- /MODIFY PREPARE command prepares IMS for online change
- /MODIFY COMMIT command switches to inactive libraries



Manually Coordinating Local Online Change



Global Online Change (Coordinated Online Change)

- IMS function to coordinate online change of resource definitions for all the IMSs in the IMSplex
 - ▶ IMS uses RM to coordinate online change prepare, commit, and abort phases

- OLCSTAT dataset contains global online change status
 - ▶ dynamically allocated dataset
 - ▶ shared by IMSs in IMSplex

- Global Online Change Utility (DFSUOLC0) initializes OLCSTAT dataset

Global Online Change Commands

- One INITIATE OLC PHASE(PREPARE) command prepares IMSs for online change
- One INITIATE OLC PHASE(COMMIT) command commits online change on all IMSs
 - ▶ coordinates commit phase 1, commit phase 2, and commit phase 3 on all IMSs
 - ▶ OLCSTAT dataset updated after all IMSs have completed commit phase 1
- One TERMINATE OLC command aborts online change on all IMSs



Global Online Change Benefits

- Improves commands
 - ▶ one INITIATE or TERMINATE command to perform an online change phase
 - ▶ meaningful responses from each IMS including completion code and error text (if applicable)
 - ▶ QUERY MEMBER command displays online change state
- Prevents situation where online change committed on some IMSs, but not committed on others
- Simplifies error handling
 - ▶ INITIATE OLC command to retry
 - ▶ TERMINATE OLC command to abort

Global Online Change Utility (DFSUOLC0)

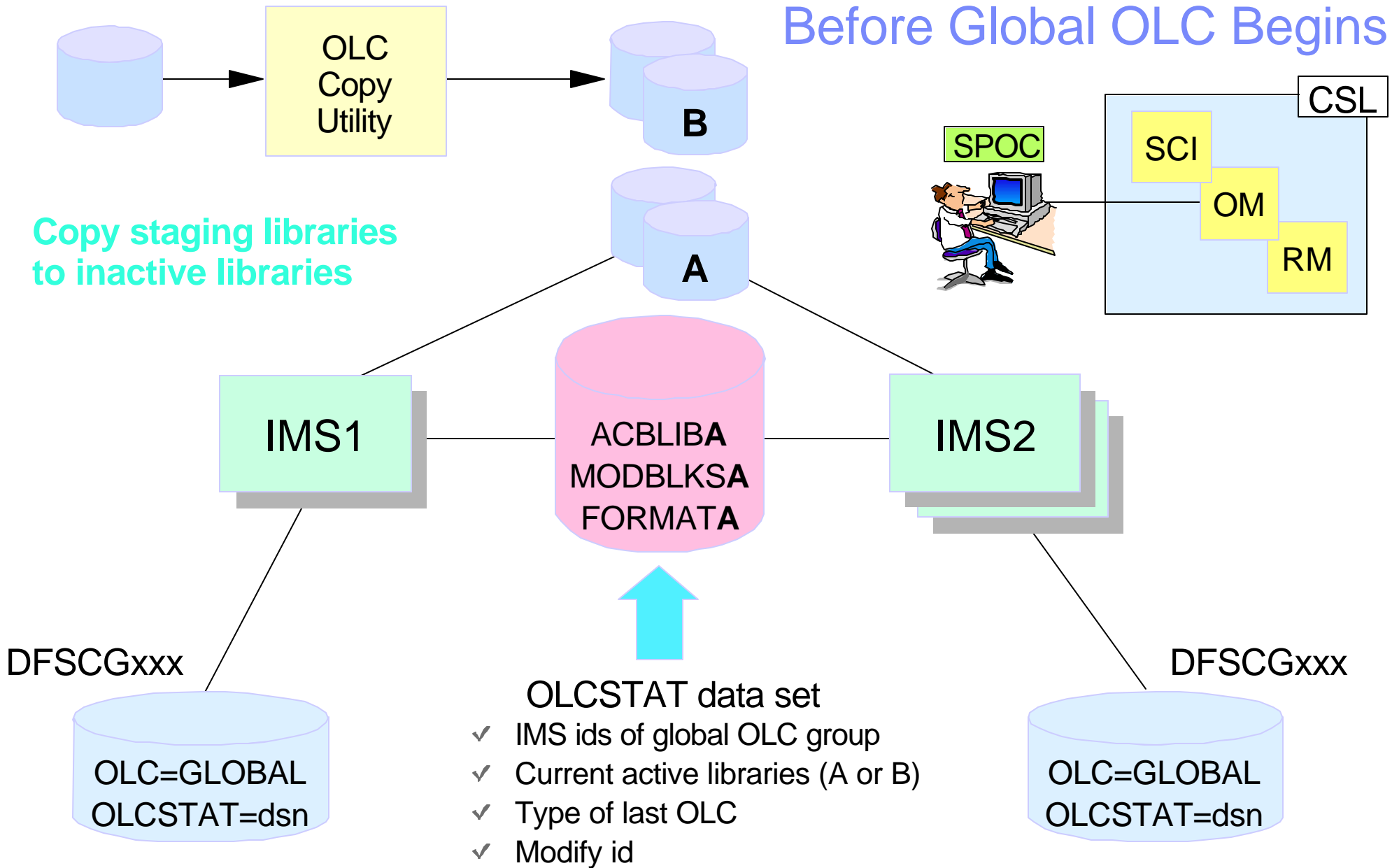
- Utility added to support Global Online Change
 - ▶ initialize OLCSTAT dataset
 - ▶ recreate OLCSTAT dataset after severe error
- Must be run before the 1st IMS coldstarts the 1st time
- **WARNING:** May destroy OLCSTAT dataset contents if run by mistake
- An installation should have a procedure in place to recreate the OLCSTAT dataset after severe error



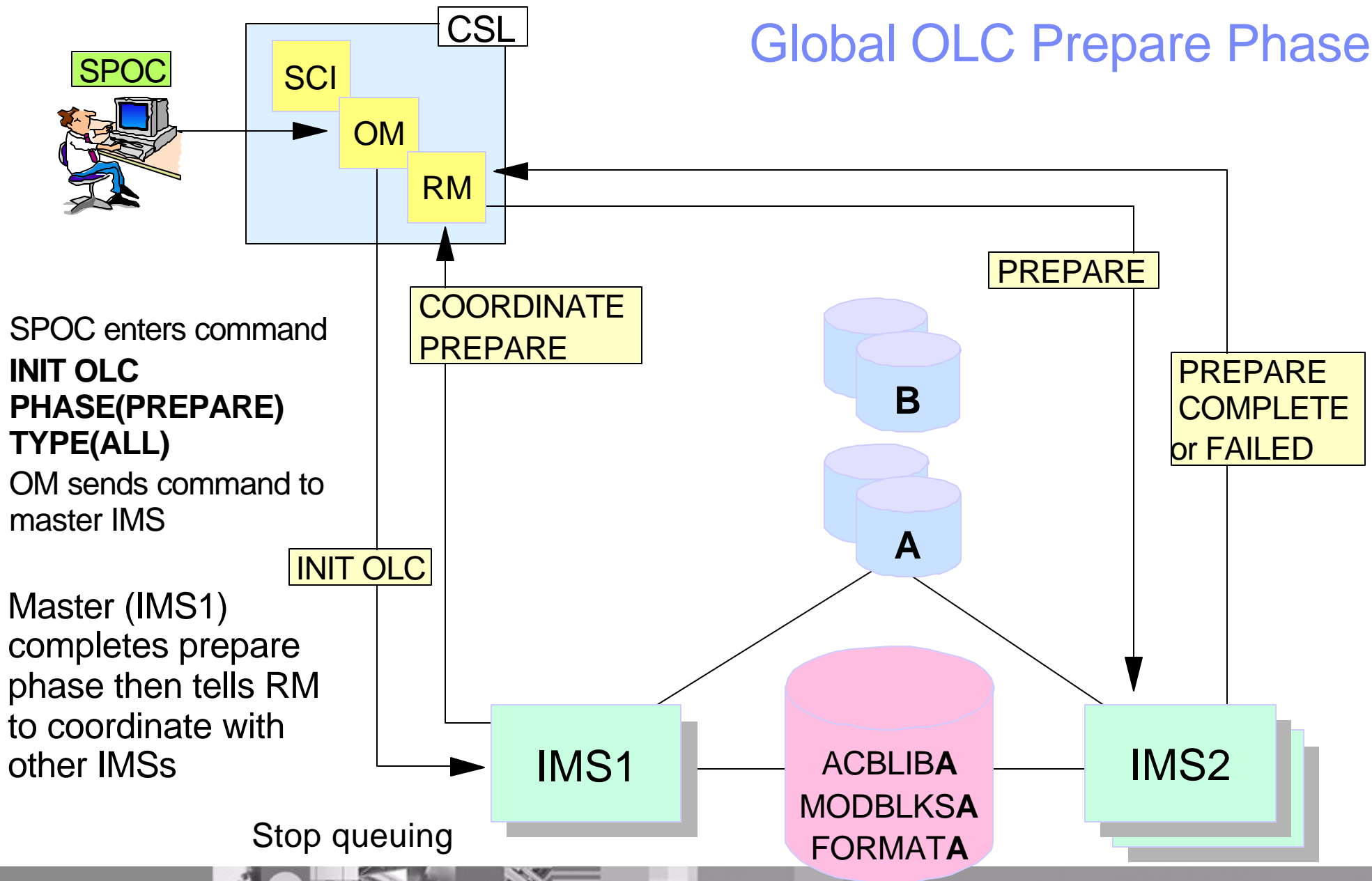
Online Change Copy Utility (DFSUOCU0)

- Existing utility to copy staging library to inactive library
- OLCSTAT DD statement support added to define OLCSTAT dataset for global online change
- OUT=G parameter support added, to specify that the target library is the inactive library determined from the OLCSTAT dataset

Before Global OLC Begins



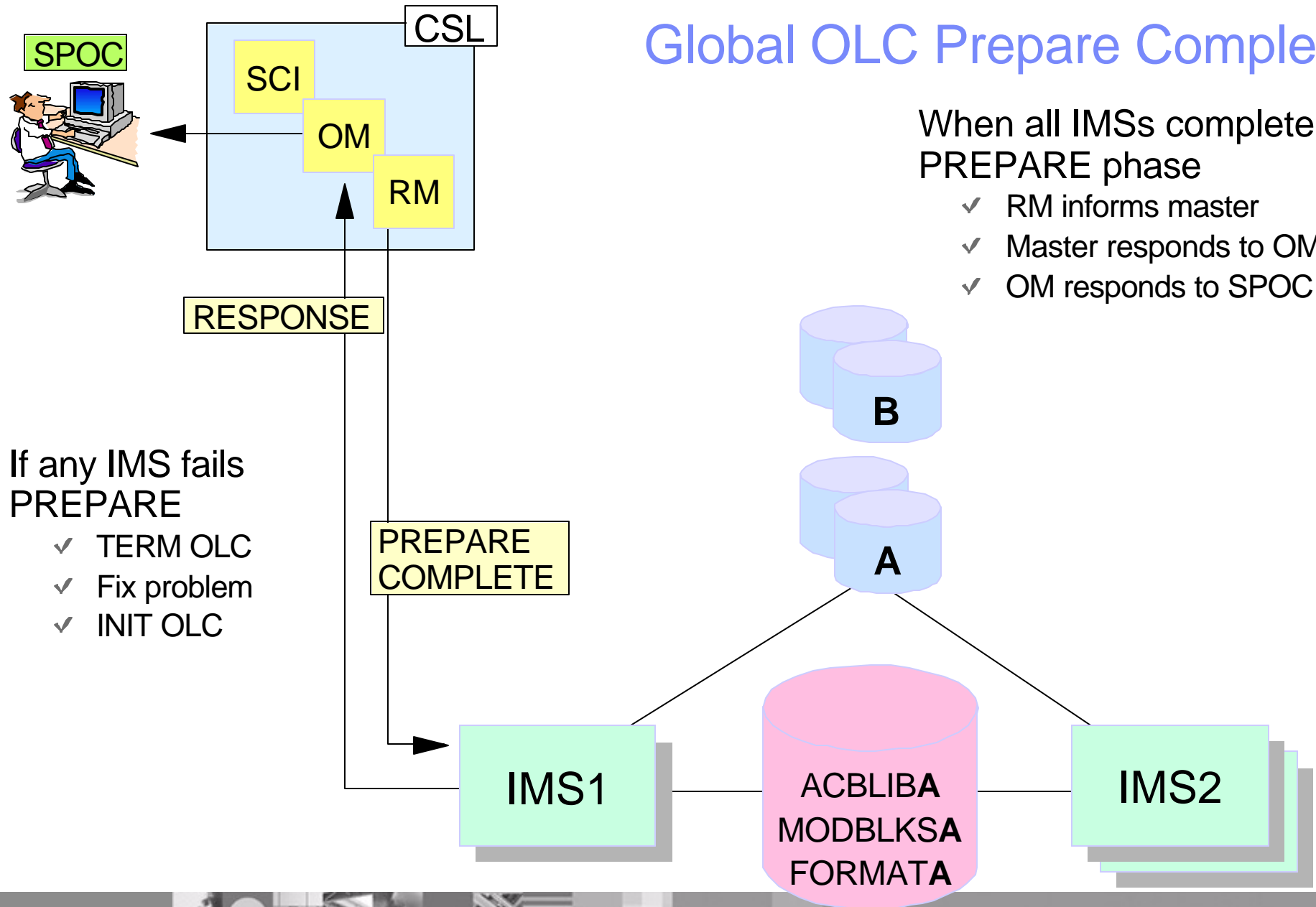
Global OLC Prepare Phase



Global OLC Prepare Complete

When all IMSs complete PREPARE phase

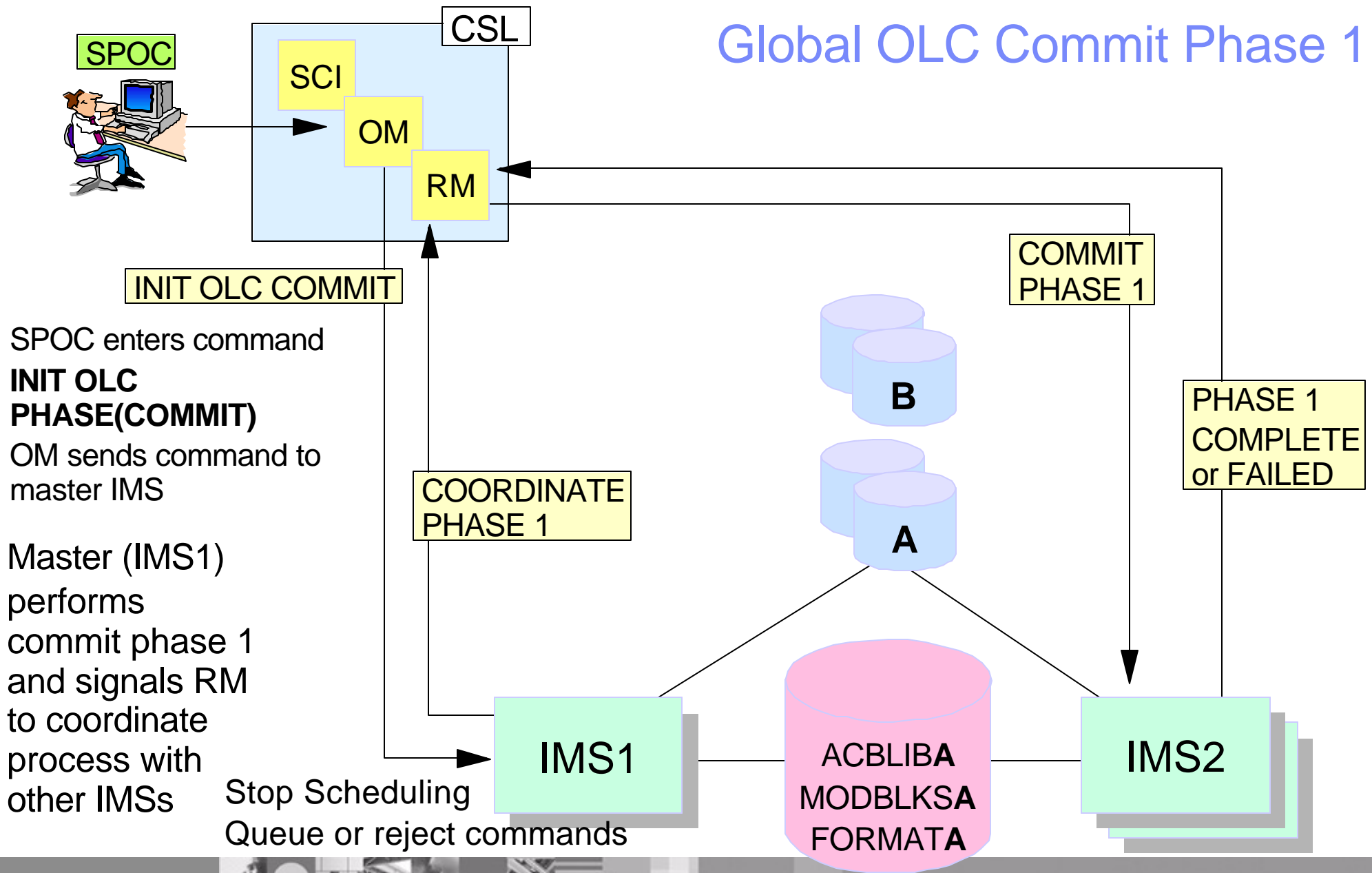
- ✓ RM informs master
- ✓ Master responds to OM
- ✓ OM responds to SPOC



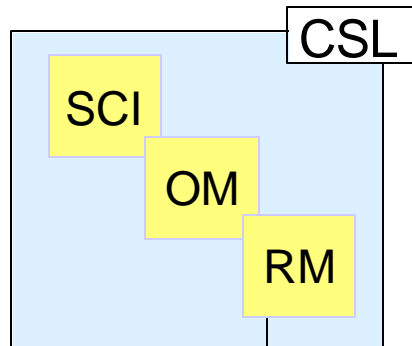
If any IMS fails PREPARE

- ✓ TERM OLC
- ✓ Fix problem
- ✓ INIT OLC

Global OLC Commit Phase 1



Global OLC Commit 1 Complete



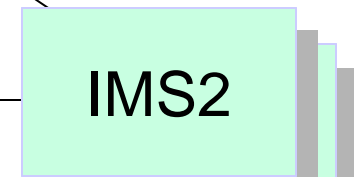
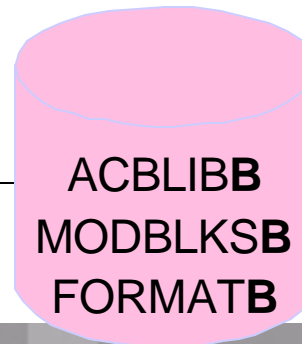
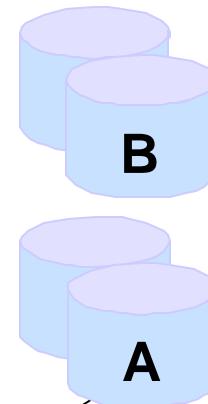
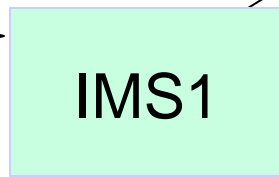
INIT OLC COMMIT

If any IMS fails phase 1

- ✓ Commit aborted
- ✓ Retry commit or terminate OLC

OLC cannot be terminated after OLCSTAT updated

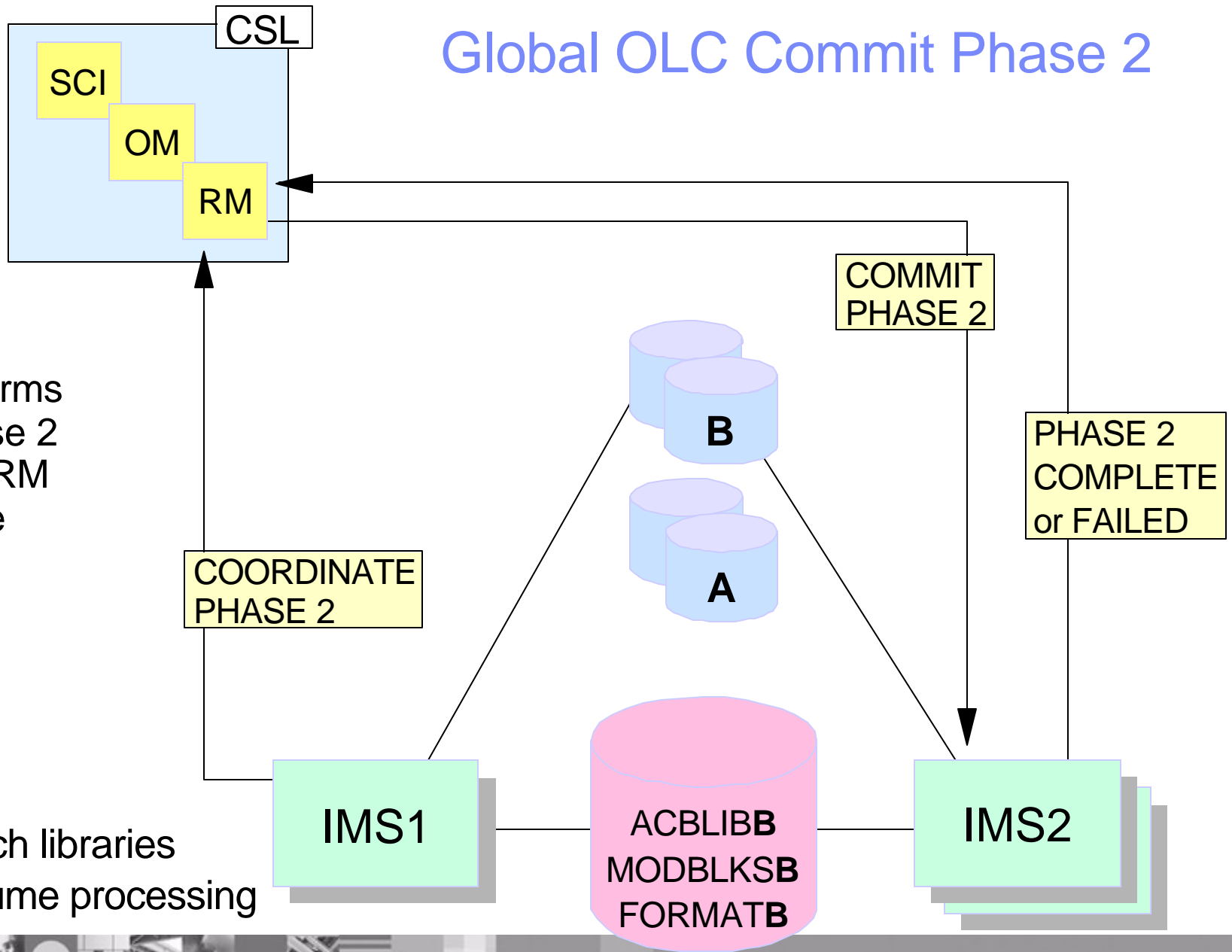
PHASE 1 COMPLETE



- When all IMSs complete phase 1
- ✓ RM informs master
 - ✓ Master updates OLCSTAT dataset
 - ✓ Master signals RM to coordinate phase 2

Global OLC Commit Phase 2

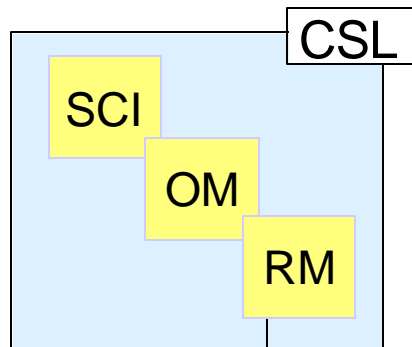
SPOC



Master performs commit phase 2 and signals RM to coordinate process with other IMSs

Switch libraries
Resume processing

Global OLC Commit 2 Complete



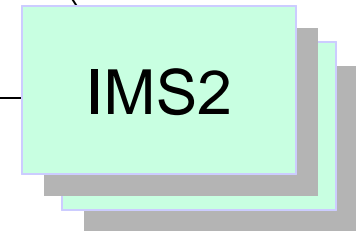
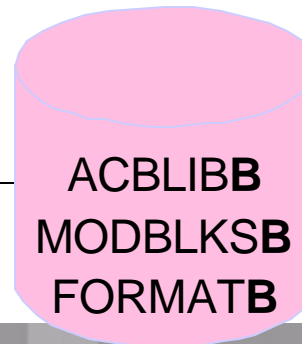
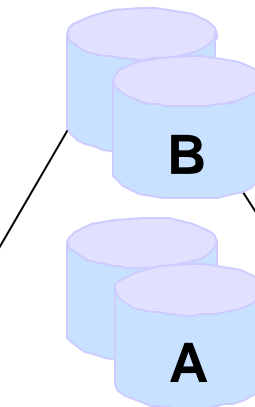
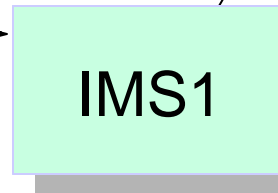
RM signals master that phase 2 is complete

- ✓ Phase 3 initiated to cleanup local storage and OLCSTAT

If any IMS fails phase 2

- ✓ Very rare
- ✓ Retry commit or cancel IMS and warmstart

PHASE 2 COMPLETE



PREPARE response example (route SYS3)

```
File  Display  View  Options  Help
-----
PLEX1                      IMS Single Point of Control
Command ===>

----- Plex . PLEX1  Route . SYS3          Wait . 5:00
Response for: INITIATE OLC PHASE(PREPARE) TYPE(ALL)
MbrName  Member      CC ACBLIB  FMTLIB  MODBLKS   ModId
SYS3     IMS2             0
SYS3     SYS3             0      B      B      B      2

F1=Help      F3=Exit      F4=Showlog   F6=Expand    F9=Retrieve  F12 USRT011
```

PREPARE log example (route SYS3)

```
File Display View Options Help
-----
PLEX1                      IMS Single Point of Control
Command ==>

----- Plex . PLEX1  Route . SYS3          Wait . 5:00
Log for . . : INITIATE OLC PHASE(PREPARE) TYPE(ALL)

IMSplex . . . . . : PLEX1
Routing . . . . . : SYS3
Start time . . . . : 2003.197 14:19:38.97
Stop time . . . . . : 2003.197 14:19:55.96
Return code . . . . : 00000000
Reason code . . . . : 00000000
Command master . . : SYS3

F1=Help      F3=Exit      F4=Showlist  F6=Expand   F9=Retrieve  F12 USRT011
```


COMMIT response example (route SYS3)

```
File  Display  View  Options  Help
-----
PLEX1                      IMS Single Point of Control
Command ===>

----- Plex . PLEX1  Route . SYS3          Wait . 5:00
Response for: INITIATE OLC PHASE(COMMIT)
MbrName  Member      CC ACBLIB  FM LIB  MODBLKS      ModId
SYS3     IMS2             0
SYS3     SYS3             0      A      A      A           3

F1=Help      F3=Exit      F4=Showlog   F6=Expand    F9=Retrieve  F12 USRT011
```

PREPARE response example (route blank)

```

File  Display  View  Options  Help
-----
PLEX1                      IMS Single Point of Control
Command ==>
CSLN023I At least one request was successful.
----- Plex . PLEX1  Route .                Wait . 5:00
Response for: INITIATE OLC PHASE(PREPARE) TYPE(ALL)
MbrName  Member      CC ACBLIB  FMTLIB  MODBLKS      ModId
IMS2     IMS2             0      A      A      A             1
IMS2     SYS3             0

```

F1=Help F3=Exit F4=Showlog F6=Expand F9=Retrieve F12 USRT011

PREPARE log example (route blank)

```

File Display View Options Help
-----
PLEX1                      IMS Single Point of Control
Command ===>

----- Plex . PLEX1 Route .                Wait . 5:00
Log for . . : INITIATE OLC PHASE(PREPARE) TYPE(ALL)

IMSpdex . . . . . : PLEX1
Routing . . . . . :
Start time. . . . : 2003.196 08:12:44.21
Stop time . . . . : 2003.196 08:12:50.15
Return code . . . : 0200000C
Reason code . . . : 00003000
Command master. . : IMS2

      Return      Reason
MbrName Code       Code
-----
SYS3    02000004    00001008

F1=Help      F3=Exit      F4=Showlist  F6=Expand    F9=Retrieve  F12 USRT011

```

COMMIT error log example (route blank)

```

File  Display  View  Options  Help
-----
PLEX1                IMS Single Point of Control
Command ==>
CSLN024I No requests were successful.
----- Plex . PLEX1  Route .           Wait . 5:00
Log for . . : INITIATE OLC PHASE(COMMIT)

IMSpdex . . . . . : PLEX1
Routing . . . . . :
Start time. . . . : 2003.196 08:20:27.15
Stop time . . . . : 2003.196 08:20:28.01
Return code . . . : 0200000C
Reason code . . . : 00003004
Command master. . : IMS2

      Return      Reason
MbrName  Code      Code
-----  -
IMS2     00000010    00004124
SYS3     02000004    00001008

F1=Help      F3=Exit      F4=Showlist  F6=Expand    F9=Retrieve  F12 USRT011

```

Work in progress response example

```

File  Display  View  Options  Help
-----
PLEX1                      IMS Single Point of Control
Command ==>
CSLN024I No requests were successful.
----- Plex . PLEX1  Route .           Wait . 5:00
Response for: INITIATE OLC PHASE(COMMIT)
MbrName  Member      CC ErrorText
-----
IMS2     IMS2       B1 TRAN  OLCTB105QUEUEING
IMS2     SYS3       B1 TRAN  OLCTB105QUEUEING

F1=Help      F3=Exit      F4=Showlog   F6=Expand    F9=Retrieve  F12 USRT011

```

Work in progress log example

```

File  Display  View  Options  Help
-----
PLEX1                IMS Single Point of Control
Command ===>
CSLN024I No requests were successful.
----- Plex . PLEX1  Route .                Wait . 5:00
Log for . . : INITIATE OLC PHASE(COMMIT)

IMSpdex . . . . . : PLEX1
Routing . . . . . :
Start time. . . . : 2003.198 08:22:11.82
Stop time . . . . : 2003.198 08:22:12.05
Return code . . . : 0200000C
Reason code . . . : 00003008
Command master. . : IMS2

      Return      Reason
MbrName  Code      Code
-----  -
IMS2     0000000C    00003004
SYS3     02000004    00001008

F1=Help   F3=Exit   F4=Showlist  F6=Expand  F9=Retrieve  F12 USRT011

```



QUERY MEMBER Command Displays OLC Status

- Online change status
 - ▶ phase (prepare, commit1, commit2, abort)
 - ▶ local or global state (in progress, completed, failed)
- IMS status
- Essential after online change error to help you decide what to do
- Example

TSO SPOC INPUT:

```
QUERY MEMBER TYPE(IMS) SHOW(ALL)
```

TSO SPOC OUTPUT:

MbrName	CC	Type	Status	LclAttr	LclStat	ModId
IMS2	0	IMS		SHAREDQ,GBLOLC	OLCPREPC	0
IMS3	0	IMS		SHAREDQ,GBLOLC	OLCPREPC	0
IMS3	0	IMS	OLCPREPC			
SYS3	0	IMS		SHAREDQ,GBLOLC	OLCPREPC	0

OLC Command Error Handling

QUERY IMSPLEX STATE AFTER ERROR	ACTION
Some IMSs in a prepare complete state	TERMINATE OLC Correct problem before retry
All IMSs in a prepare complete state	INIT OLC PHASE(COMMIT) or TERMINATE OLC
Mix of IMSs in prepare complete & commit phase 1 complete state	Correct problem & try commit again or TERMINATE OLC
All IMSs in commit phase 1 complete state before OLCSTAT dataset updated	Correct problem & try commit again or TERMINATE OLC
All IMSs in commit phase 1 complete state after OLCSTAT dataset updated	Correct problem and try commit again. OLC is committed and cannot be aborted
Mix of IMSs in commit phase 1 & commit phase 2 complete	Correct problem and try commit again
All IMSs in commit phase 2 complete state	Correct problem and try commit again
Mix of IMSs in commit phase 2 & not in online change state	Correct problem and try commit again



QUERY OLC Command Displays OLCSTAT Contents

- Active online change libraries
- OLCSTAT dataset name
- Modify id
- List of IMSs current with online change libraries (may warmstart)
- Example

TSO SPOC INPUT:

```
QUERY OLC LIBRARY(OLCSTAT) SHOW(ACTVLIB,MODID,MBRLIST)
```

TSO SPOC OUTPUT:

MbrName	CC	Library	ACBLIB	FMTLIB	MODBLKS	Modid	MbrList
IMS3	0	OLCSTAT	B	A	B	1	IMS3,SYS3,IMS2

Restart of IMS Down During One Global Online Change

LAST ONLINE CHANGE TYPE	RESTART COMMANDS PERMITTED
ACBLIB	/NRE CHECKPOINT 0 /ERE COLDBASE /ERE COLDSYS
ALL	/NRE CHECKPOINT 0 /ERE COLDSYS
FORMAT	/NRE CHECKPOINT 0 /NRE /ERE /ERE COLDCOMM /ERE COLDBASE /ERE COLDSYS
MODBLKS	/NRE CHECKPOINT 0 /ERE COLDSYS



Online Change migration/fallback

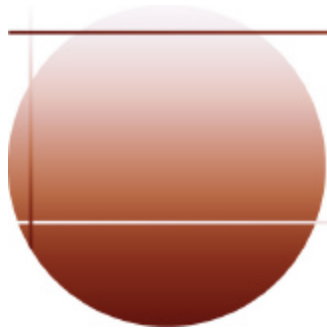
- Migration to global online change can be done one IMS at a time
- Fallback to local online change can be done one IMS at a time
- No online switch between local and global online change
- IMSplex may contain a mix of IMSs enabled with local online change or global online change
 - ▶ only IMSs with global online change enabled participate in global online change

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