Online Change

Online Change Enhancements in IMS V10

- ACBLIB Member Online Change
  - ◆ Capability to add or change individual members of ACBLIB and bring these members online while IMS is running
    - ▪ Quiesces only resources that are affected by the online change

- Online Change COMMIT Processing Enhancement
  - ◆ Enhancement to improve chances of successful online change COMMIT

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IMS Version 10 provides two enhancements for online change processing:

This first is ACBLIB Member Online Change. This is the capability to add or change individual members of ACBLIB without a switch of ACBLIBs. The new or changed members are brought online while IMS is running.

The second is a change in Online Change commit processing. This improves the chances for the success of commit processing by reducing the number of situations where commit will fail.

ACBLIB Member Online Change

ACBLIB Member Online Change

- Capability to add or change one or more members of the ACBLIB
  - Without the need to perform an online change of the entire library
  - Only the resources that are affected by member online change are quiesced
  - Does not support deletion of ACBLIB members

- Coexists with existing full library switch online change capability

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ACBLIB Member Online Change Overview

- Uses existing IMS libraries
  - PSBLIB, DBDLIB, and ACBLIB
- Uses existing IMS control block generation processes
  - PSBGEN, DBDGEN, and ACBGEN
- Uses IMS type-2 commands only
  - INIT OLC PHASE(PREPARE) TYPE(ACBMBR) …
- Uses staging ACBLIB as the source ACBLIB
  - Does not switch active and inactive libraries
- Uses OLCSTAT data set
  - MODSTAT cannot be used, even for a single IMS system
  - IMSplex must be using global online change
    - GOLC needs OLC=GLOBAL in DFSCGxxx or DFSDFxxx

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TYPE(ACBMBR) on the INIT OLC PHASE(PREPARE) command indicates that this is an ACBLIB member online change. Since the INIT OLC command is used, an OLCSTAT data set and a CSL environment are required. OLC=GLOBAL must be specified either in the DFSCGxxx PROCLIB member or the DFSDFxxx PROCLIB member.

ACBLIB Member Online Change Overview

- Selected members of a staging library are copied to the active ACBLIB
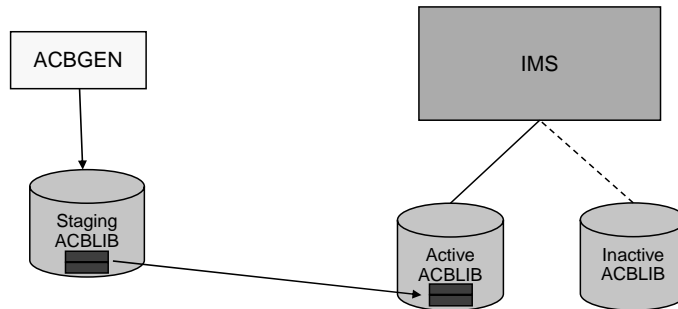
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This is a pictorial overview of the ACBLIB member online change process. First, an ACBGEN is done into a staging library. The online change process copies theselected members from the staging library to the active ACBLIB while the IMS system is running.

Step 1: Build updated member(s)

- Update PSB source and/or DBD source
- Perform PSBGEN/DBDGEN for affected members
- Perform ACBGEN into the staging ACBLIB library for affected members
  - BLDPSB=YES is required on BUILD DBD= statement
    - Rebuilds all PSBs referenced by DBDs in BUILD statement
    - New parameter in IMS Version 10
    - BLDPSB=YES is the default

```
BUILD DBD=(CUSTOMER,ORDER),BLDPSB=YES
```

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The BLDPSB=YES option is new with IMS V10 and ACBLIB member online change. It indicates that ACBGEN rebuilds all PSBs that reference the changed DBD on the BUILD DBD=dbdname statement into the staging ACBLIB. Member online change requires that all PSBs be rebuilt (flag set in PDIR) or it will fail.   For performance reasons, these relationships are found during the execution of ACBGEN in batch versus having to discover these relationships online when ACBLIB member online change is invoked. However, this means there may be additional processing done at ACBGEN time and the ACBGEN utility may run longer.   BLDPSB=YES is the default.

In previous IMS versions, ACBGEN worked as if BLDPSB=NO was specified. BLDPSB=NO indicates that ACBGEN does not rebuild PSBs that reference the changed DBD if the changed DBD does not change the physical structure of the DBD.   The DBD is rebuilt but PSBs are not necessarily rebuilt (ex. exit/randomizer change).   You can still specify BLDPSB=NO if you are not planning to use ACBLIB member online change.   BLDPSB=NO is not the default, so this operates differently than in previous versions.   It must be specified if you want this capability.

The ACBGEN utility does not clear out the staging ACBLIB. The ACBGEN utility only updates the members in the staging ACBLIB that are specified in the BUILD DBD and BUILD PSB statements.

Step 2: (Optional) Create Backup of ACTIVE ACBLIB

- Backup copy recommended
    - ACBLIB member online change updates member(s) in the active ACBLIB data set
    - Backup may be used to restore ACBLIB
        - Backup from before change may be used to restore ACBLIB to its previous state

- Copy active library using the OLC copy utility (DFSUOCU0)
    - New TYPE=ACTVACB to create backup copy of the active ACBLIB
        - Copy may be to the inactive library or another data set

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There is a new option on the OLC copy utility (DFSUOCU0) called TYPE=ACTVACB. This copies the active ACBLIB to another data set. This may be the inactive ACBLIB or another data set. The backup can be used in the event of a problem with ACBLIB member online change. If the copy is made to the inactive ACBLIB, a full library switch can be used to restore the ACBLIB to its previous state.

The ACTIVE ACBLIB is copied to the ACBLIB specified on the IMSACBO DD card in the OLCUTL procedure by specifying OUT=O. The ACTIVE ACBLIB is copied to the INACTIVE ACBLIB by specifying OUT=G.

If you have an IMSplex and you use DFSUOCU0 to copy the active ACBLIB to the inactive, your procedures will depend on your configuration. In an IMSplex where IMS subsystems share the active and inactive ACBLIBs, DFSUOCU0 needs to be executed on only one IMS in the IMSplex. In an IMSplex where IMS subsystems do not share ACBLIBs, DFSUOCU0 needs to be executed on every IMS in the IMSplex

Step 3: OLC INIT commands

- Use INIT … PREPARE command to specify ACBs to be processed

  `INIT OLC PHASE(PREPARE) TYPE(ACBMBR) NAME(xxx,yyy)`
  - ◆ Each member specified is read from the staging ACBLIB
  - ◆ IMS determines related members to copy
    - ▪ For example, NAME(DBDX) will cause PSBs using DBDX to be copied

- Use INITIATE … COMMIT to activate the changes

  `INIT OLC PHASE(COMMIT)`
  - ◆ Only those resources affected by the change are quiesced
  - ◆ Updated members are copied directly into the active ACBLIB
    - ▪ New members go into the first active ACBLIB concatenation
    - ▪ Changed members go into the correct active ACBLIB concatenation
    - ▪ DOPT PSBs are not supported

- Process is similar to existing logic to determine what has changed

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TYPE(ACBMBR) is used to specify an ACBLIB member online change. It cannot be specified with TYPE(ACBLIB,FMTLIB,MODBLKS) in the same INIT OLC PHASE(PREPARE) command. TYPE(ACBLIB,FMTLIB,MODBLKS) and TYPE(ALL) are for full library switch online change and the inactive ACBLIB becomes the active ACBLIB. TYPE(ACBMBR) is for ACBLIB member online change. The active ACBLIB remains the active ACBLIB an the source ACBLIB is the staging ACBLIB.

You need only specify the ACB member(s) with changes in the INIT OLC PHASE(PREPARE) command; IMS will find all the necessary members that are associated with the specified member(s). For example, there is an update to DBDX and an ACBGEN BUILD DBD=DBDX,BLDPSB=Y is done. DBDX is used by members PSBA, PSBB, and PSBC, so these PSBs are rebuilt by ACBGEN. The following command can be entered to bring member DBDX online, along with members PSBA, PSBB, and PSBC:

      INIT OLC PHASE(PREPARE) TYPE (ACBMBR) NAME(DBDX)

Dynamic Option PSBs (DOPT) are not supported by ACBLIB member OLC. Therefore when ACBLIB member OLC processes a changed DBD that references a DOPT PSB, it does not copy the DOPT PSB from the staging ACBLIB to the active ACBLIB, though the changed DBD referenced by this DOPT PSB will be copied to the active ACBLIB. The INITIATE OLC PREPARE command output shows for the DOPT PSB entry a completion code indicating the DOPT PSB will not be copied to the active ACBLIB; COMMIT processing will still be successful if this occurs.

If a GPSB is specified in the INIT OLC PHASE(PREPARE) command, it will be copied to the active ACBLIB and its TTR address will not be refreshed. However, IMS only uses its own GPSB skeletal PSB and will not use the one in the ACBLIB.

If the staging ACBLIB is a subset of the active ACBLIB, the member OLC process reads only the directory entries for those ACB members in the staging ACBLIB. If the staging ACBLIB is a clone of the active ACBLIB, the member OLC process reads all the directory entries in the staging ACBLIB.

Setup for ACBLIB Member Online Change

- The staging ACBLIB must be allocated by the IMS control region
  - DDNAME is IMSACB
    - Either dynamic (DFSMDA) or static (DD statement) allocation may be used
    - All IMS systems in an IMSplex should use the same staging ACBLIB
      - Avoids potential problems with different contents in different ACBLIBs

- Specify whether ACBLIB is shared or dedicated in the IMSplex
  - ACBSHR=<u>Y</u>|N in DFSCGxxx or DFSDFxxx PROCLIB member
    - Y – all of the IMSs use the same active and inactive ACBLIB
    - N – each IMS uses its own dedicated active and inactive ACBLIB
    - Used to determine if each IMS must update its own ACBLIB
    - All IMSs in the IMSplex must specify the same value of ACBSHR=

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Here is a sample DFSMDA member for dynamic allocation of the ACBLIB staging library for ACBLIB member online change.

```
DFSMDA   TYPE=INITIAL
DFSMDA   TYPE=IMSACB,DSNAME=STAGING.LIBRARY
DFSMDA   TYPE=FINAL
```

The staging library was not used in online change in previous IMS versions; therefore, it would not be in the IMS Control Region JCL. This new DFSMDA member of TYPE=IMSACB is created for the staging ACBLIB. With TYPE=IMSACB, users only need to specify the data set name for the staging ACBLIB. A dynamic allocation member with the name of IMSACB will be created for the staging ACBLIB. Because of this, no database MDA members should be created with a DDNAME=IMSACB. IMS dynamically allocates the staging ACBLIB with DISP=SHR.

If dynamic allocation fails, the OLC PREPARE process will fail and return a return/reason code and completion code indicating the error. The user will need to issue a TERMINATE OLC command to abort the online change in progress, and then reissue the INIT OLC PHASE(PREPARE TYPE(ACBMBR) command.

If you don't set up a DFSMDA member for the staging library, you will need to include a DD statement for the staging library in your IMS control region procedure. If the DD statement exists, it will override any DFSMDA member. The following is an example of a DD statement:

```
//IMSACB  DD DSN=STAGING.LIBRARY, DISP=SHR
```

The staging ACBLIB is not updated by member online change. It may be shared or each IMS may have its own copy. If different IMS systems have different staging libraries, they must have the same contents.

The ACBSHR= parameter in the DFSCGxxx or DFSDFxxx PROCLIB member determines if all IMS systems use the same active and inactive ACBLIBs. If they use the same active ACBLIB, the new and changed members are only copied by one IMS during a member online change.

Setup for ACBLIB Member Online Change (cont.)

- Member OLC requires reinitialization of the OLCSTAT data set
  - ◆ Reinitialization with V10 DFSUOLC0 utility adds member OLC information
  - ◆ Do this after IMS V8 and V9 will no longer be used in the IMSplex
    - ▪ IMS V8 and V9 cannot use an IMS V10 level OLCSTAT
    - ▪ IMS V10 can use an IMS V8 or V9 level OLCSTAT
    - ▪ IMS V10 cannot use member online change with V8 or V9 level OLCSTAT
- Reinitialization process
  - ◆ Determine ACBLIB, FMTLIB, and MODBLKS suffixes, modify ID, and IMS systems using OLCSTAT
    - • QUERY OLC LIBRARY(OLCSTAT) may be used to determine current values
  - ◆ Run DFSUOLC0 utility and specify values for suffixes, modify ID, and IMS systems
    - ▪ The utility may be run while IMS systems are up

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The OLCSTAT data set must be reinitialized before ACBLIB member online change may be used. When reinitialized by the IMS V10 DFSUOLC0 utility the data set is expanded to include ACBLIB member online change information. If there are IMS V8 and V9 systems using the OLCSTAT data set they require coexistence maintenance to tolerate a IMS V10 OLCSTAT data sets. This is provided by APARs PK23401 for IMS V8 and PK23402 for IMS V9. ACBLIB member online change cannot be used when IMS V8 or V9 systems are included in the IMSplex. The coexistence maintenance only provides the capability for IMS V8 and V9 systems to use OLCSTAT data sets which have been initialized at the IMS V10 level.

IMS V10 may use a OLCSTAT data set which was initialized for IMS V8 or V9, but it cannot use ACBLIB member online change with an IMS V8 or V9 level OLCSTAT data set.

Reinitialization of the OLCSTAT data set is done with the DFSUOLC0 utility. The IMS V10 will initialize the data set in the IMS V10 format by default. You must specify the correct suffixes for the ACBLIB, FMTLIB, and MODBLKS data sets as well as the correct modify ID. If IMS systems are up you must also specify them to the utility. You may use the QUERY OLC LIBRARY(OLCSTAT) command to determine these values.

There is an option to use the IMS V10 DFSUOLC0 utility to initialize an OLCSTAT data set at the IMS V8 or V9 level. This is done with the VERSION=1 parameter which was added to the utility by APAR PK37127. VERSION=1. VESION=1 for the OLCSTAT is the IMS V8 and V9 version. VERSION=2 is the default for the DFSUOLC0 utility. VERSION=2 for the OLCSTAT is the IMS V10 version.

IMSplex Consideration

- When an IMS system in the IMSplex is not up when a change is made
  - If all IMS systems are sharing the active ACBLIB, this is not a problem
    - When IMS system is restarted it will use the updated ACBLIB
  - If each IMS system has its own ACBLIB, there is a potential problem
    - The system which was down did not get the updates
    - Procedure to handle this situation:
      - Specify INIT OPTION(FRCNRML) parameter for PHASE(PREPARE)
        - Allows a member online change to be processed if any IMS in OLCSTAT is shutdown normally
        - IMS that is down removed from OLCSTAT data set
      - Before IMS restart, copy updated active ACBLIB to ACBLIB which was not updated or update with ACBGEN
      - Message DFS3433W issued at restart

        ```
        DFS3433W ACBLIB MEMBER OLD ID MISMATCH MOLCID=yyyydddhhmmss
        ```

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The FRCNRML (Force Normal) option on the INIT OLC PHASE(PREPARE) command allows the user to do an online change even if one of the IMSs in the OLCSTAT data set is down normally. This does not apply to IMS systems which are down due to an abend.

When using the FRCNRML option and ACBSHR=Y (single, shared ACBLIB), there is no problem if an IMS system is down during the online change. Since there is only one ACBLIB, it will contain all member online changes that were processed while any IMS was down normally. The user does not have any additional ACBLIB processing to do.

When using the FRCNRML option and ACBSHR=N (separate, non-shared ACBLIBs), this member online change will be missing from the active ACBLIB when the terminated IMS is restarted. The user must ensure that the ACBLIB used by the system which was down during the online change is updated with the changed members. There are two possibilities. First, one can execute the ACBGEN utility to put those missing changes into the active ACBLIB before that IMS is restarted. Second, if the ACBLIBs of the IMS systems are clones, one can copy the active ACBLIB of another IMS system to the ACBLIB used by the IMS system which is down.

The FRCABND (Force Abend) option on the INIT OLC PHASE(PREPARE) command is not supported. This means that if an IMS system is down due to an abend, an ACBLIB member online change may not be done before it is emergency restarted.

ACBLIB Member Online Change Phases

- Prepare Phase
  - Build updated members
- Commit Phase 1
  - Update active ACBLIB
- Commit Phase 2
  - Commits all members into the active ACBLIB

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There are three phases to the ACBLIB member online change.   Details are described in the following charts.

Prepare Phase

- Prepare phase is begun by INIT OLC PHASE(PREPARE) … command
- IMS builds a list of changed members
  - DBDs and PSBs in the command plus any PSBs affected by DBD changes
  - All members in the list must be processed successfully or PREPARE fails
- Quiesces only affected resources
- If PREPARE phase fails, the TERMINATE OLC command needs to be issued

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Commit Phase 1

- Commit phase is begun by INIT OLC PHASE(COMMIT) command
- Updated member(s) are written to the active ACBLIB with encrypted name(s)
  - Member name is translated to hex characters and written as new member to the active ACBLIB
  - Existing members are not updated
  - Ensures all new/updated members fit in the active ACBLIB
    - Prevents x37 abends from creating inconsistent members in the active ACBLIB
- If Commit Phase 1 fails, the TERMINATE OLC command needs to be issued

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Commit Phase 2

- Deletes old member(s)
- Renames encrypted member(s) to the actual name(s)
- Refreshes TTRs for changed members
- IMS now processes with new and/or changed members

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ACBLIB member online change adds new and changed log records in IMS. The following table lists the six new log records that are created for ACBLIB Member Online Change and the x'4001' log record which is changed.

Log Record Type	Conditions for writing log record
X'7002'	Begin write Member OLC log record
X'7003'	Write complete Member OLC log record
X'7004'	Commit Member OLC log record
X'7005'	Commit Complete Member OLC log record
X'7006'	Restart Abort Member OLC log record
X'7010'	TERM OLC for Member OLC log record
X'4001'	Checkpoint record is updated to contain an MOLCID

These log records are processed by IMS emergency restart, by the XRF alternate, and by the FDBR tracker at log read time.

The X'4001' Checkpoint record is updated to contain the MOLCID (Member Online Change ID), a 12-byte UTC timestamp. This is used to compare with the MOLCID in the OLCSTAT at IMS warm restart to determine whether a member OLC occurred while an IMS system is down.

Example Commands

- INITIATE OLC PHASE(PREPARE) TYPE(ACBMBR) NAME(mbrname)
- QUERY OLC SHOW(RSCLIST)
- QUERY MEMBER TYPE(IMS)
- INITIATE OLC PHASE(COMMIT)
- TERMINATE OLC

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INIT OLC PHASE(PREPARE) Command Example

- Used to initiate a member online change

```
INIT OLC PHASE(PREPARE) TYPE(ACBMBR) NAME(OLCDB105,OLCDX111)
```

```
Response for: INIT OLC PHASE(PREPARE) TYPE(ACBMBR) NAME(OLCDB105,OLCDX111)
MbrName  Member    CC ACBSHR DBDName  PSBName  Add Chng
-----------------------------------------------------------------------
IMS2     IMS1       0 N
IMS2     IMS1       0        OLCDB105          Y
IMS2     IMS1       0        OLCDX111              Y
IMS2     IMS1       0        OLCDB111              Y
IMS2     IMS1       0        OLCDI111              Y
IMS2     IMS1       0                 OLCPB105 Y
IMS2     IMS1       0                 OLCPB111     Y
IMS2     IMS2       0 N
IMS2     IMS2       0        OLCDB105          Y
IMS2     IMS2       0        OLCDX111              Y
IMS2     IMS2       0        OLCDB111              Y
IMS2     IMS2       0        OLCDI111              Y
IMS2     IMS2       0                 OLCPB105 Y
IMS2     IMS2       0                 OLCPB111     Y
```

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QUERY OLC SHOW(RSCLIST) Command Example

- Issued after INIT … PHASE(PREARE)
  - SHOW(RSCLIST) parameter
    - Returns the ACBLIB members that will be added/copied to or changed

```
QRY OLC SHOW(RSCLIST)
```

```
Response for: QRY OLC SHOW(RSCLIST)
MbrName     CC DBDName  PSBName  Add Chng
----------------------------------------
IMS1         0 OLCDB105           Y
IMS1         0 OLCDX111               Y
IMS1         0 OLCDB111               Y
IMS1         0 OLCDI111               Y
IMS1         0          OLCPB105 Y
IMS1         0          OLCPB111      Y
IMS2         0 OLCDB105           Y
IMS2         0 OLCDX111               Y
IMS2         0 OLCDB111               Y
IMS2         0 OLCDI111               Y
IMS2         0          OLCPB105 Y
IMS2         0          OLCPB111      Y
```

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The QUERY OLC SHOW(RSCLIST) command is valid only when a TYPE(ACBMBR) online change is in progress after an INIT OLC PHASE(PREPARE) command. It lists the DBDs and PSBs to be added or changed by the ACBLIB member online change.

QUERY MEMBER TYPE(IMS) Command Example

- Issued after an INIT … PHASE(PREPARE)
  - OLCMACB indicates that a member online change is in progress
  - Other global online change status will be also be returned

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

```
Response for: QRY MEMBER TYPE(IMS) SHOW(ALL)
MbrName   CC Type  Status           LclAttr LclStat              ModId
---------------------------------------------------------------------------
IMS1       0 IMS   OLCMACB,OLCPREPC
IMS1       0 IMS                     GBLOLC  OLCPREPC,SECCMD,SECMSG       1
IMS2       0 IMS                     GBLOLC  OLCPREPC,SECCMD,SECMSG       1
```

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OLCMACB is a new status indicating a ACBLIB member online change is in progress.

INIT OLC PHASE(COMMIT) Command

- Used to commit a member online change

```
INIT OLC PHASE(COMMIT)
```

```
Response for: INIT OLC PHASE(COMMIT)
MbrName  Member      CC
------------------------------------
IMS2         IMS1            0
IMS2         IMS2            0
```

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TERMINATE OLC Command

- Used to abort a member online change that is in progress
  - Can be issued
    - After an INIT OLC PHASE(PREPARE) TYPE(ACBMBR) error
    - After an INIT OLC PHASE(COMMIT) error

```
TERMINATE OLC

Response for: TERMINATE OLC
MbrName  Member     CC
-------------------------------------
IMS2     IMS1       0
IMS2     IMS2       0
```

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ACBLIB Member Online Change Summary

- Improved availability
  - Quiesces only changed ACBs
- Improved performance
  - More efficient than full library switch global online change
- Complements DRD MODBLKS capability
  - Add new database definition or application definition via DRD
  - Activate associated DBDs/PSBs/ACBs via ACBLIB member online change
    - In any sequence

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ACBLIB member online change requires the use of OLCSTAT, not MODSTAT. It is invoked only with type-2 commands. This means that a CSL environments is required.

All IMSs in the IMSplex must be at IMS V10 to perform an ACBLIB member online change.

ACBLIB member online change supports XRF, FDBR, and DBCTL Warm Standby. It does not support RSR or MSDBs.

Online Change COMMIT Processing Enhancement

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Online Change COMMIT Processing Enhancement

- Commits are not failed by work in progress for indirectly affected transactions
  - ◆ Attribute on TRANSACT macro not changed
    - ▪ But the following may be changed:
      - • PSB in ACBLIB
      - • DBD in ACBLIB
      - • DATABASE in MODBLKS
      - • PROGRAM in MODBLKS
- Commits are failed by work in progress for directly affected transactions
  - ◆ Attribute on TRANSACT macro changed
    - ▪ Change could impact scheduling and processing
- This function has been available with shared queues
  - ◆ IMS 10 extends the function to both shared and non-shared queues

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In previous versions of IMS with a non-shared queues environment, online changes for indirectly affected transactions could cause commit processing to fail. Indirectly affected transactions are those for which the TRANSACT macro is not changed, but a PROGRAM macro or PSB in ACBLIB which the transaction uses is changed or a DATABASE macro or DBD in ACBLIB is changed for a database referenced by the transaction's program. In the previous releases if there were transactions on the queue for indirectly affected transactions the online change would fail commit processing. This changes in IMS V10. Only directly affected transactions will cause commit failures. Directly affected transactions are transactions that have changes to their definitions that could impact the scheduling and processing of queued or subsequently arriving transactions.   Examples on the TRANSACT macro are AOI=, EDIT=, FPATH=, INQ=, and MSGTYPE=.

This applies to both local online change (/MODIFY command) and global online change (INIT OLC command).

This function has been available with shared queues with the following maintenance on previous IMS versions:
- PQ96043 for IMS V9
- PQ96402 for IMS V8

Online Change COMMIT Processing Enhancement

- Change applies to both /MODIFY and INIT OLC online changes
  - Queued transactions will NOT cause the online change COMMIT to fail
    - /MODIFY COMMIT will not fail with:
      ```
      DFS3452 WORK IN PROGRESS FOR RESOURCES TO BE CHANGED
        OR DELETED
      ```
    - INITIATE OLC PHASE(COMMIT) will not fail with:
      - B1 completion code (resource state error) and error text of either `QUEUING` or `SUSPENDED`

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Online Change COMMIT Processing Enhancement Summary

- Improve chances of successful online change commit
- Happens automatically
  - No modifications to online change procedures needed
  - Applies to all online changes including ACBLIB member online change

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