

# IMS Version 10

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# Overview

## Class Agenda

- Day 1
  1. Overview
    - Class contents, prerequisites, and migration/coexistence highlights
  2. System Enhancements
    - System definition and execution parameters
    - Enhanced Display of System Parameters
    - VSCR
    - Sysplex serial program management
    - Log record statistics
    - Large sequential data sets
    - System utilities
    - BPE external trace
    - ABEND search and notification

## Class Agenda

- Day 1
  3. Dynamic Resource Definition (DRD)
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    - IMSplex-wide parameter support
    - Global status support for DBs, PGMs, and TRANS
    - Type-2 commands
    - Secondary master terminal
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## Class Agenda

- Day 2
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## Class Agenda

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## Class Agenda

- Day 3
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    - IMS DLIModel utility
    - IMS XML DB

## Class Agenda

- Day 3
  - 14. DBRC enhancements
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    - API enhancements
    - Parallel RECON Access
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  - 15. Installation and Migration
    - Packaging, Prerequisites, and Coexistence
    - Library Changes
    - IVP enhancements
    - Syntax Checker enhancements
    - KBLA Coexistence
    - Installation and Migration tasks
    - Review of migration considerations previously covered



## Software Prerequisites

- Minimum software level prerequisites
  - ◆ z/OS V1R7 (5694-A01)
    - RACF, or equivalent, if security is used
    - High Level Assembler Toolkit (5696-234)
  - ◆ IRLM 2.2, if IRLM is used
  
- Minimum software levels for optional functions:
  - ◆ IMS V10 Image Copy 2 and Database Recovery fast replication
    - z/OS V1R8
  - ◆ DBRC Parallel RECON Access
    - z/OS DFSMStvs, a separately orderable feature of z/OS

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The minimum level of z/OS for IMS V10 is z/OS V1R7. In addition to z/OS the user must install RACF, or an equivalent security product, in order to use security with IMS V10. As with previous IMS releases, the High Level Assembler Toolkit is required to provide assembler macros that IMS uses. If the IRLM is used, IRLM 2.2 is required. Program Isolation (PI) is also supported with IMS V10. IRLM is required for block level data sharing.

z/OS V1.7 runs on the following IBM System z9 and zSeries servers or equivalents:

- z9-109
- z900
- z990
- z800
- z890

z/OS V1R8 is required if the fast replication function of Image Copy 2 and the Database Recovery utility are used.

DBRC Parallel RECON Access requires z/OS DFSMStvs which is a separately orderable feature of z/OS V1R7 or z/OS V1R8.



## Supported Migrations and Coexistence

- IMS V9
  - ◆ Upgrade RECONs from IMS V9 to V10
  - ◆ Databases are compatible
  - ◆ Application programs are compatible
  
- IMS V8
  - ◆ Upgrade RECONs from IMS V8 to V10
  - ◆ Databases are compatible
  - ◆ Application programs are compatible

# System Enhancements

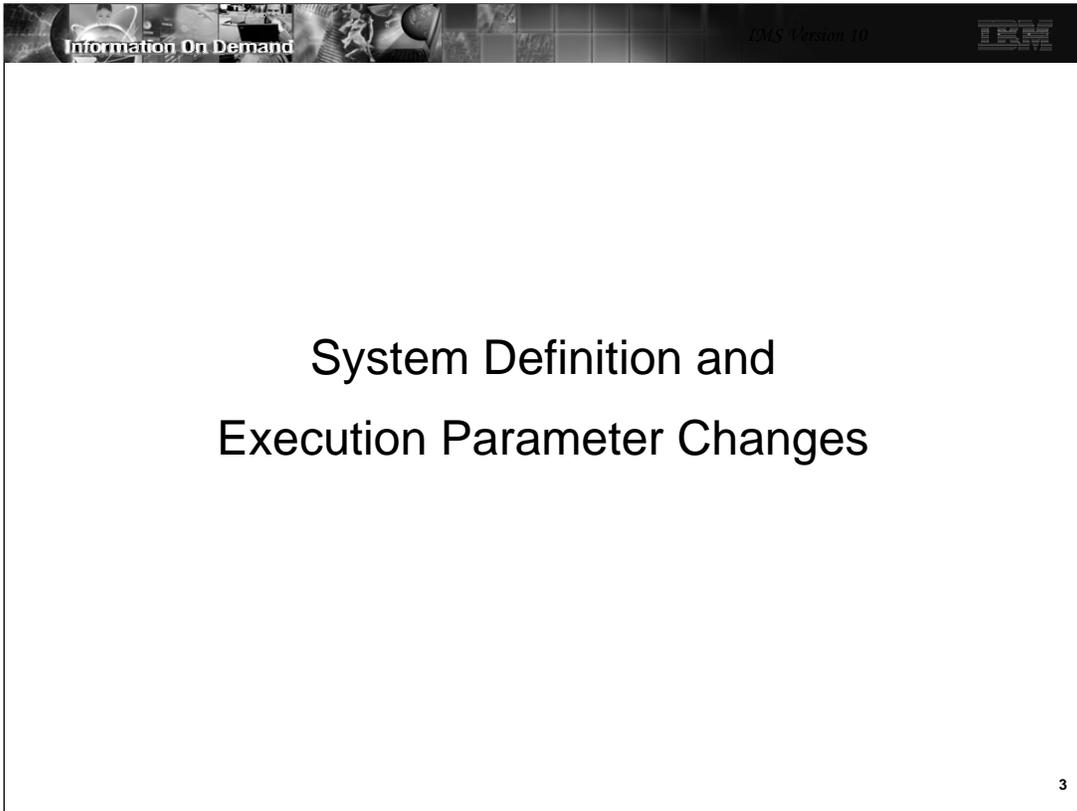
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## System Enhancements

- System Definition and Execution Parameter Changes
- Enhanced Display of System Parameters
- Virtual Storage Constraint Relief
- Sysplex Serial Program Management
- Enhanced Log Record Statistics
- Large Sequential Data Set Support
- System Utilities Enhancements
- BPE External Trace
- Abend Search and Notification



This section covers changes to IMS system definition and execution parameters that affect functions available in previous releases. Definition and execution changes for new functions are discussed where the new functions are explained.

## Transaction Scheduling

- SCHD= parameter on system definition TRANSACT macro is ignored
- Only one scheduling option is used in IMS V10
  - ◆ SCHD=3 option is always used
    - When the transaction defined on the TRANSACT macro cannot be scheduled for "internal reasons", any transaction in the selected class may be scheduled. If no more transactions for this class exist, IMS schedules transaction in next eligible class.
      - "Internal reasons" are database intent or no more space in PSB pool or DMB pool to bring in needed blocks
  - ◆ SCHD=1 was the default in previous releases
    - When the transaction defined on the TRANSACT macro cannot be scheduled for internal reasons, only transaction of equal or higher priority in the selected class may be scheduled. If five intent failures occur within a class, transactions in the next class are attempted

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In previous release of IMS, the SCHD= parameter on the system definition TRANSACT macro specified the scheduling option used when the transaction defined on the TRANSACT macro could not be scheduled for internal reasons (database intent or no more space in PSB pool or DMB pool to bring in needed blocks). IMS V10 always uses the SCHD=3 option. The default in previous releases was SCHD=1.

SCHD=1 specified that only transactions of equal or higher priority in the selected class would be scheduled. Five consecutive intent conflicts are allowed within a class before IMS starts scheduling the next eligible class.

SCHD=3 specified that any transaction in the selected class could be scheduled. IMS starts scheduling the next eligible class after attempting to schedule all the transactions in the current class

Two other options were available in previous releases.

SCHD=2 specified that only higher-priority transactions in the selected class could be scheduled.

SCHD=4 specified that IMS should skip to the next class and attempt to schedule the highest-priority transaction in that class.

Scheduling failures for the "internal reasons" should be rare. Intent conflicts only occur when PROCOPTs with the E (exclusive) option are used. The PSB and DMB pools should always be large enough to hold the currently required PSBs and DMBs.

## FPCTRL System Definition Macro Eliminated

- The system definition FPCTRL macro is ignored
  - ◆ Previous releases:
    - Macro was required to enable Fast Path capability
    - Set defaults for Fast Path parameters
- Execution parameters for IMS and DBC procedures
  - ◆ FP=Y|N used to enable Fast Path
    - Default is FP=N
  - ◆ DBBF=, DBFX=, BSIZ=, and OTHR= used to specify Fast Path parameters
- Benefit
  - ◆ Simplifies implementation of Fast Path
- Migration
  - ◆ Fast Path users must specify FP=Y and values for DBBF=, DBFX=, BSIZ=, and OTHR= for execution

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IMS V10 has simplified the implementation of Fast Path. It does not have to be specified at system definition time. The FPCTRL system definition macro is ignored. In previous releases it was required to enable Fast Path capabilities. It also was used to specify the default values for some Fast Path parameters. Fast Path capabilities are always generated for DB/DC and DBCTL systems. They are enabled by a parameter at execution time.

You must specify FP=Y at execution time for an online system to enable Fast Path capabilities in IMS V10. The default for the parameter is FP=N. Since defaults for Fast Path parameters cannot be specified at system definition time, they should be specified at execution time. These parameters are DBBF=, DBFX=, BSIZ=, and OTHR=. The default values for these parameters are the same as the default values for the FPCTRL macro in previous releases. These are:

DBBF=10, DBFX=4, BSIZ=2048, and OTHR=2

These values are highly unlikely to be appropriate for most Fast Path users.

When an FPCTRL macro is included in the system definition input, the following message is issued:

```
G1010 THE FPCTRL MACRO IS NO LONGER SUPPORTED.  
      THE KEYWORD PARAMETERS WILL BE IGNORED.  
      PLEASE USE THE EQUIVALENT EXECUTION  
      PARAMETER TO SPECIFY VALUES THAT WERE  
      CODED IN THIS MACRO.
```

## DFSDFxxx PROCLIB Member

- DFSDFxxx is new IMS PROCLIB member
  - ◆ Defines IMS parameters for
    - Dynamic resource definition
    - Shared queues
    - CSL
    - Diagnostics and statistics
  - ◆ Eliminates need for DFSSQxxx and DFSCGxxx members
    - They are now optional
    - Values specified in DFSSQxxx and DFSCGxxx override DFSDFxxx values
- IMS execution parameter DFSDF=xxx specifies DFSDFxxx member

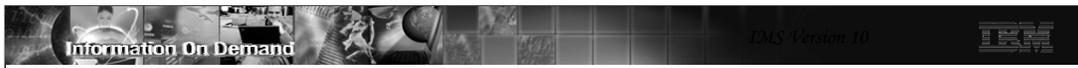
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IMS V10 has a new PROCLIB member which is used to consolidate execution definitions which otherwise might be in several PROCLIB members. The DFSDFxxx member may be used to define parameters for several components of IMS.

DFSDFxxx eliminates the need to use a DFSSQxxx member for shared queues parameters or a DFSCGxxx member for CSL parameters. Instead, these parameters may be specified in the DFSDFxxx member. If a parameter is specified in both members, the values specified in DFSSQxxx and DFSCGxxx override those specified in DFSDFxxx.

DFSDFxxx is required to specify some IMS parameters. These are explained later.

The DFSDFxxx member used by IMS is specified in the DFSDF= execution parameter.



## DFSDFxxx PROCLIB Member

- DFSDFxxx has five sections
  - ◆ Each section begins with a section header
    - <SECTION=DYNAMIC\_RESOURCES>
      - Parameters are shown in Dynamic Resource Definition section of this class
    - <SECTION=SHARED\_QUEUES>
      - Same parameters as are used in DFSSQxxx member
    - <SECTION=COMMON\_SERVICE\_LAYER>
      - Same parameters as are used in DFSCGxxx member
      - Plus DRD parameters which are shown in the Dynamic Resource Definition section of this class
    - <SECTION=DIAGNOSTICS\_STATISTICS>
      - Transaction level statistics, Abend search and notification, BPE external trace, and Message suppression
    - <SECTION=USER\_EXITS>
      - User exits called by IMS restart

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The DFSDFxxx member has up to five sections of definitions. Each section begins with a section identification statement. These statements are shown on the slide.

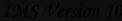
Dynamic resource definition parameters are defined only in DFSDFxxx. They are in the DYNAMIC\_RESOURCES and COMMON-SERVICE\_LAYER sections.

Shared queues parameters may be defined in the SHARED\_QUEUES section.

CSL parameters may be defined in the COMMON\_SERVICE\_LAYER section.

Some diagnostic and statistics parameters are defined in DFSDFxxx. These are defined in the DIAGNOSTICS\_STATISTICS section.

IMS Version 10 includes an IMS restart user exit capability. These exits are specified in the USER\_EXITS section. They are called at the beginning and end of IMS restarts. Restart exits are called during all types of IMS restart. An exit routine is passed a function code and a code that indicates the type of restart that is being done. Multiple routines can be defined. The routines are called in the order that they are listed in the EXITDEF parameter. If an exit is defined multiple times, it is called multiple times. The form of the specification is:  
 EXITDEF=(TYPE=RESTART,EXITS=(*exitname*))


## DFSDFxxx PROCLIB Member

- <SECTION=DIAGNOSTICS\_STATISTICS>
  - ◆ Transaction level statistics, Abend search and notification, and BPE external trace are shown in other sections of this class
  - ◆ Message suppression
    - Suppresses BLDL failed messages for PSBs and DBDs not in ACBLIB
      - MSG0826=ISSUE|SUPPBLDL
        - SUPPBLDL suppresses BLDL failed messages for DBDs; replaced with one message with count of DBDs for which BLDL failed
      - MSG0830=ISSUE|SUPPBLDL
        - SUPPBLDL suppresses BLDL failed messages for PSBs; replaced with one message with count of PSBs for which BLDL failed
- <SECTION=USER\_EXITS>
  - ◆ User exits called by IMS restart
    - Called at beginning and end of restart
      - EXITDEF=(TYPE=RESTART,EXITS=(*exitname1,exitname2,...*))

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The DIAGNOSTICS\_STATISTICS section includes a capability to suppress some DFS826I and DFS830I messages. These messages are issued by IMS restart to indicate that DBDs and PSBs which are defined in the system do not have members in ACBLIB. These messages are suppressed with the following statements:

MSG0826=SUPPBLDL and MSG0830=SUPPBLDL.

If the DBD messages are not suppressed, there is one message for each DBD for which the BLDL failed. Its form is: DFS826I BLDL FAILED FOR FOLLOWING DBD This is followed by a message which includes a count of the number of DBD BLDL failures. Its form is: DFS826I xxx DBD ERRORS SENT TO JOB LOG  
 If the DBD messages are suppressed, the following message is issued: DFS826I xxx DBD ERRORS SUPPRESSED This includes the count of the messages suppressed.

If the PSB messages are not suppressed, there is one message for each PSB for which the BLDL failed. Its form is: DFS830I BLDL FAILED FOR FOLLOWING PSB This is followed by a message which includes a count of the number of DBD BLDL failures. Its form is: DFS830I xxx PSB ERRORS SENT TO JOB LOG  
 If the PSB messages are suppressed, the following message is issued: DFS830I xxx PSB ERRORS SUPPRESSED This includes the count of the messages suppressed.

IMS Version 10 includes an IMS restart user exit capability. These exits are specified in the USER\_EXITS section. They are called at the beginning and end of IMS restarts. Restart exits are called during all types of IMS restart. An exit routine is passed a function code and a code that indicates the type of restart that is being done. Multiple routines can be defined. The routines are called in the order that they are listed in the EXITDEF parameter. If an exit is defined multiple times, it is called multiple times. The form of the specification is:  
 EXITDEF=(TYPE=RESTART,EXITS=(*exitname1.exitname2,...*))

## DFSDFxxx PROCLIB Member

- Example member:

```

<SECTION=DYNAMIC_RESOURCES>
DCLWA=Y                                /* Log write-ahead */
RDDSDSN=(IMS10.RDDSDSN1,IMS10.RDDSDSN2,IMS10.RDDSDSN3,IMS10.RDDSDSN4),
AUTOEXPORT=AUTO,
AUTOIMPORT=AUTO,
IMPORTERR=ABORT,
RDDSEERR=ABORT
<SECTION=DIAGNOSTICS_STATISTICS>
TRANSTAT=Y                             /* Transaction Level Statistics */
IASNPROC=IMSASN                         /* Abend Search & Notification PROC */
<SECTION=SHARED_QUEUES>
CQS=CQSCW1,                             /* CQS name */
CQSSSN=CQS1,                             /* CQS subsystem name */
EMHQ=IMSEMHQ01,                         /* EMHQ structure name */
MSGQ=IMSMGQ01,                          /* MSGQ structure name */
SQGROUP=GRUP1                           /* XCF group name */
<SECTION=COMMON_SERVICE_LAYER>
CMDSEC=N,                                /* No cmd authorization checking */
IMSPLEX=PLEX1,                          /* IMSplex name */
OLC=GLOBAL,                             /* GLOBAL online change */
OLCSTAT=IMSTESTS.IMS01.OLCSTAT          /* OLCSTAT data set name */
MODBLKS=DYN                             /* DRD ENABLED; OLC DISABLED */
PLEXPARAM=( )                           /* GLOBAL resource status */

```

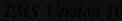
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This is an example of a DFSDFxxx member. It includes parameters for DRD, traces, transaction level statistics, abend search and notification, shared queues, and CSL.

The meanings of the parameters other than those for shared queues and CSL are explained elsewhere in this class. Shared queues and CSL parameters have the same meaning as they had in the DFSSQxxx and DFSCGxxx members for previous releases.



## Enhanced Display of System Parameters


## Enhanced Display of System Parameters

- DFS1929I message is written after reading the log
  - ◆ Displays message twice
    - First message is compatible with prior releases
      - Displays each system parameter specified in system definition, PROCLIB member, or overridden at execution time
        - These are values after initialization, but before restart
    - Second message is written after restart has read the log
      - Displays actual system parameters that are in effect
  - ◆ Message header includes IMS version number and control region type
    - Body of message is compatible with previous releases

```
DFS1929I * IMS SYSTEM PARAMETERS ACTIVE FOR THIS V10.1 DBDC EXECUTION:
DFS1929I *      ALOT                = 1440                      *SYS3
DFS1929I *      AOIP                = 2147483647                 *SYS3
DFS1929I *      AOIS                = N                          *SYS3
...
```

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IMS issues message DFS1929I to list the IMS system parameters. Since the message is issued early in the initialization process, the values displayed reflect those provided during system generation or overridden through startup parameters. Every parameter is shown. If a value has not been provided by the user then the default, if one exists, is displayed. The values shown, however, might not reflect the actual values that are used during online execution. The discrepancy between the actual and requested values may be minor, but in some situations it can be large. IMS V10 continues to issue the DFS1929I message early in initialization, for compatibility, but issues it once again after restart is complete and the log has been read so that the values displayed reflect the actual values in effect for the IMS execution.

The DFS1929I message has been enhanced to include the IMS Control Region type along with the IMS Version number. The remainder of the message is compatible with the format of previous releases. The first form of the message that is printed during IMS initialization contains all the IMS parameters with user-specified or default values.

The second DFS1929I message which is produced after the log has been read has been enhanced to list:

- ▶ Only the parameters that are applicable to the control region type.
- ▶ Only the parameters associated with active components. For example, Fast Path parameters will be shown only if activated. Prior releases always displayed the parameters regardless of whether or not Fast Path was enabled. The new IMS V10 parameter FP=Y | N will always be displayed.
- ▶ Actual values that will be used during execution. For example, the CPLOG value displayed in the first DFS1929I message during initialization might not be valid after a warm or emergency restart because its value was changed by a command. As a result, the value in the first DFS1929I message does not help in diagnosing problems. The problem encompasses other parameters such as APPC, APPCSE, OTMA, OTMASE, etc., which can also be changed by command and are recoverable during an IMS restart. The actual values, therefore, are provided in the second DFS1929I message after restart is complete.

## Enhanced Display of System Parameters

- Migration
  - ◆ DFS1929I message is issued twice
    - Previously issued only once
    - New second message has more accurate information
  - ◆ Header has changed to include version and control region type
  
- Benefits
  - ◆ Assists in determining the actual parameters values for optimal configurations and optimal user response times
  - ◆ Provides an accurate audit list of execution parameters

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When migrating to IMS V10, user-written routines or procedures that look for the DFS1929I message should recognize the header format change to include the IMS version and Control Region type. Additionally, these routines should be modified to recognize that there are two versions of the message.



# Virtual Storage Constraint Relief

## VSCR - Savings

- CSA to ECSA
  - ◆ DFSEPB (module with multiple entry point addresses)
    - Few hundred bytes are automatically moved
  - ◆ About 50K of other modules
- PVT to EPVT for ODBA and CCTL users
  - ◆ AMODE 31 option for DIRCA control blocks
    - Must be requested to take effect
  - ◆ DIRCA contains the application copy of the PCBs
    - Each ODBA or CCTL address space can have multiple threads
      - Each thread has its own DIRCA storage
  - ◆ Savings are dependent on the installation
    - DIRCA size \* number of threads
    - ACBGEN output message DFS689I assists in estimating DIRCA size

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The DFSEPB (Entry Point Block) was introduced in IMS V9 to keep track of entry points of CSECTs of large composite modules that needed to be divided into smaller modules. The movement of this storage from CSA to ECSA saves a few hundred bytes in IMS V10. In addition, a few other modules have been moved from CSA to ECSA. These modules total about 50K bytes.

A more substantial impact is that of potential DIRCA (Dependent Region Interregion Communication Area) storage movement above the line for ODBA and CCTL address spaces. The savings are installation dependent and must be requested for the environment to take advantage of the capability. Each thread from the ODBA/CCTL address space has its own DIRCA and each DIRCA contains the application's copy of the PCBs. This enhancement provides a benefit for those environments, such as CICS, that need to use larger PSBs and more concurrent threads without impacting storage usage below the 16MB line.

## DIRCA

- DIRCA VSCR Implementation
  - ◆ New DFSPRP macro parameter
    - `PCBLOC= 24 | 31`
    - Used when building the DRA startup tables
      - DFSPZPxx for CCTL, DFSxxxx0 for ODBA
  - ◆ Specification of PCBLOC=31 requires
    - Applications to be AMODE=31 and support 31-bit PCB addresses
      - CICS has added support to check for AMODE=31 when using PCBLOC=31
  - ◆ Reassembly of DFSPZPxx
    - Not required if defaulting to 24 bit storage for the DIRCA

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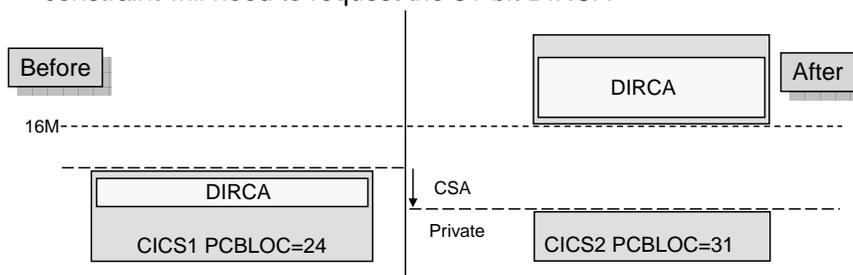
The DFSPRP macro provides the definition for the DRA parameters when building the DRA startup table. A new parameter PCBLOC provides the option of defining whether the DIRCA is to be built using 24-bit or 31-bit storage. Note that a specification of 31 also requires that the applications actually support AMODE 31 and 31-bit PCB addresses.

CICS has added support so that it checks for the use of AMODE=31 by applications when PCBLOC=31 is specified. The application will abend with a new CICS abend code ADCF during schedule of the PSB if it is AMODE=24 and PCBLOC=31 is in effect. This support is added by APARS PK54099 for CICS TS 2.2 and CICS TS 2.3, and PK54100 for CICS TS 3.1 and CICS TS 3.2.

When a CCTL connector starts up, the DRA INIT call can be used to override the PCBLOC specification in the DRA startup table. A new parameter, PPLLPSO, allows specification of 31 or 24. Other values are ignored and the startup defaults to the value specified in the startup table.

## Benefits

- DFSEPB
  - ◆ Moves storage from CSA without user action
- DIRCA
  - ◆ Supports requirement for larger PSBs and greater number of concurrent threads from CCTL/ODBA applications
  - ◆ Opportunity to move the line between CSA and Private for the LPAR
    - Applications (instances of CICS, ODBA, etc.) that are causing the constraint will need to request the 31-bit DIRCA



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The DFSEPB module is automatically moved above the line from CSA to ECSA.

The DIRCA is moved above the 16MB line from private to extended private. This provides two benefits. First, PSBs may be larger. Second, the CICS or ODBA address space private area does not have to be as large, so the line between private and CSA may be lower. This provides more room in CSA.



# Sysplex Serial Program Management (SSPM)





## Sysplex Serial Program Management (SSPM)

- SSPM enforces SCHDTYP=SERIAL on APPLCTN macro across multiple IMS systems in IMSplex
  - ◆ SCHDTYP=SERIAL limits a PSB to one schedule at a time
  - ◆ Previously, only enforced within each IMS system
    - Same PSB could be scheduled in parallel in multiple IMS systems
- SSPM requirements:
  - ◆ Shared Queues
  - ◆ Common Service Layer which includes Resource Manager (RM) and an RM Structure
- Supports MPRs, JMPs, IFPs, message-driven BMPs, non-message driven BMPs, and JBPs
- Does not support CCTL (e.g., CICS) or ODBA application schedules

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IMS Version 10 has enhanced the support for serialization of programs that are defined as SCHDTYP=SERIAL to be across all the members of an IMSplex, rather than just within a single IMS when using Shared Queues. This serialization is only done in systems using shared queues and a Resource Manager with a Resource Manager structure.

IMS V10 will ensure that SCHDTYP=SERIAL programs will be scheduled in only one IMS dependent region (MPR, JMP, IFP, message-driven BMP, non-message driven BMP, JBP) across an entire IMSplex with Shared Queues at a time.

CICS and ODBA are not supported for SSPM. SCHDTYP=SERIAL may be specified for an APPLCTN used by CICS or ODBA. As in previous releases, this will serialize the scheduling of the PSB by CICS, ODBA, and IMS TM within an IMS system. On the other hand, the serialization across multiple IMS systems will only be enforced for IMS TM regions including MPPs, IFPs, JMPs, BMPs, and JBPs.

SCHDTYP=SERIAL is the default if not specified on the APPLCTN macro.

IMS will use the IMS Resource Manager (RM) component of the IMS Common Services Layer (CSL) to provide this serialization.

SCHDTYP=SERIAL is specified on the APPLCTN macro or on the CREATE PGM SCHDTYPE(SERIAL) command when using DRD. This should not be confused with the SERIAL=YES parameter on the TRANSACT macro. SCHDTYP=SERIAL for APPLCTN limits the scheduling of a PSB. SERIAL=YES for TRANSACT limits the scheduling of a transaction. The meaning and enforcement of SERIAL=YES on the TRANSACT macro is not changed in IMS Version 10.

## Implementation via IMS Resource Manager (RM)

- When a program defined as SCHDTYP=SERIAL is chosen for scheduling
  - ◆ IMS scheduler attempts to create a PROGRAM record in the RM structure
    - If PROGRAM does not exist in structure
      - PROGRAM record created
      - Scheduling continues
      - Program record deleted from RM structure when program/PSB is unscheduled
    - If PROGRAM exists in structure
      - Scheduling fails
      - MPRs and JMPs available to schedule the next eligible program
        - Message remains on shared queues, picked up by currently scheduled program
      - BMPs, IFPs, and JBPs abend with U457 as in previous versions

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IMS Version 10 will determine if a SCHDTYP=SERIAL program is already scheduled by interacting with the IMS Resource Manager and its resource structure. IMS uses RM to attempt to create the program resource in the resource structure.

If the program resource does not exist in the resource structure, that means no other copy of this program is scheduled at this time. Therefore, this scheduling can continue. A program record for this program will be created in the resource structure. For MPRs, JMPs, and IFPs, the program resource remains active in the resource structure until the PSB is unscheduled. For BMPs and JBPs, the program resource will be deleted when the batch message processing program terminates.

If the serial program is already scheduled on another IMS, the program resource already exists in RM and the attempt to create the program resource in RM fails. Therefore, this attempt to schedule what would be the second copy of the serial program will fail. For MPRs and JMPs, the dependent region will be available to schedule the next eligible program. The message that got the scheduling failure will remain on the shared queues (was never taken off) and will hopefully be picked up by the currently scheduled program. BMPs, JMPs, and IFPs will get a U457 abend when scheduling finds the program is already scheduled as they would have before in previous versions within a single IMS versus in IMS V10 this abend would be on another IMS in the IMSplex.

## Implementation via IMS Resource Manager (RM) ...

- Releasing the RM program record
  - ◆ Normal termination of Program/PSB
  - ◆ Abnormal termination will be handled by backout
- Notification to retry scheduling
  - ◆ Empty to non-empty queue in shared queues
  - ◆ SCI notification sent to all IMSs when serial program is terminated

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The program record in the RM structure is deleted when the program terminates. If the program ABENDs, backout will delete the program record.

After a scheduling attempt fails due to this serialization, the IMS system will not attempt to schedule the PSB again until it receives a notification. This can occur in two ways. It may occur due to the queue going from an empty to a non-empty state. It may occur due to an SCI notification which is sent when the serial program is terminated.

## Sysplex Serial Program Management Summary

- Benefits
  - ◆ Guarantees that only one copy of an IMS TM program will be scheduled at any point in time across the entire IMSplex with shared queues
    - Enforced for V10 only
  - ◆ Removes requirement for specialized customer procedures to handle serialized programs in an IMSplex with Shared Queues
    - Still needed for V8 and V9
  - ◆ No program changes/definition changes



## Enhanced Log Record Statistics

## Enhanced Log Record Statistics

- New and enhanced log record statistics
  - ◆ Transaction level statistics in optional 56FA log record
    - Written at each commit
      - Written for each input message with MODE=MULT
    - Includes all statistics from 07 log record of previous releases
    - Also includes additional statistics
  - ◆ Additional information in existing 07, 08 and 0A07 log records

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Enhanced statistics are written in several IMS log records. This includes a new 56FA log record which records statistics for individual transactions, not just for executions of programs or schedulings of PSBs. When chosen it is written for each commit for transactions defined as MODE=SNGL and for non-message driven BMPs and JBPs. For transactions defined as MODE=MULT the log record is written for each message. This record includes all of the statistics which were written to the 07 log records in previous releases. This includes CPU time and call counts. In addition, there are also new statistics which are shown on the next page.

Additional information has been added to the application start accounting log record (08), the application termination accounting log record (07), and the CPI-C driven transaction termination log record (0A07).

## Enhanced Log Record Statistics

- Transaction level statistics (x'56FA')
  - ◆ Fields in addition to those in the x'07' log record
    - VSAM I/O reads and writes
    - OSAM I/O reads and writes
    - Total ESAF (DB2) calls
    - CPU time in TOD clock format
    - Elapsed time of database I/Os
    - Elapsed wait time for database locks
    - More...
      - See DFSETPCP macro for mapping of fields
  - ◆ Record is 528 bytes
    - You can easily estimate the logging increase
      - 528 bytes times the transaction rate

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The additional fields in the x'56FA' log record include read counts and write counts for both VSAM and OSAM database data sets. There are counts of External Subsystem Attach Facility calls. There are typically calls to DB2, but they also may be for MQ or another subsystem. The CPU time for the transaction is written in time of day (TOD) format. The statistics include the total elapsed time for database I/Os and the total elapsed time for waits for locks. These two elapsed times were previously available in the x'07' log records for DBCTL threads. It was not available for IMS TM except in IMS Monitor trace records. The x'56FA' log record is mapped by the DFSETPCP macro.

The x'56FA' log record is approximately 528 bytes. It is written for every transaction and for every commit for non-message driven programs for those transactions and programs with the option. If you choose to use this option, you can easily estimate its effect on logging volumes. The increase in logging may be noticeable, but most IMS systems will easily handle this increase.

## Enhanced Log Record Statistics

- Transaction level statistics (x'56FA')
  - ◆ Specified in the diagnostic statistics section of DFSDFxxx PROCLIB member
    - <SECTION=DIAGNOSTIC\_STATISTICS>
    - TRANSTAT=Y|N
    - Applies to all transactions and programs unless overridden by command
  - ◆ Commands for individual transactions or programs
    - PGM applies only to non-msg driven, ODBA, and CCTL (CICS) programs
    - UPDATE TRAN|TRANDESC|PGM|PGMDESC SET(TRANSTAT(Y|N))
      - Example:
 

```
UPD TRAN NAME(ABC) SET(TRANSTAT(Y))
```
    - CREATE TRAN|TRANDESC|PGM|PGMDESC SET(TRANSTAT(Y|N))
      - Example:
 

```
CRE TRAN NAME(ABX) LIKE(RSC(ABC)) SET(TRANSTAT(N))
```

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Transaction level statistics log records are optional. The TRANSTAT specification in the diagnostic statistics section of the DFSDFxxx PROCLIB member determines the default setting for all transactions and non-message driven programs. TRANSTAT=N is the default. TRANSTAT=Y causes the log records to be written. The setting in this member may be overridden for individual transactions and non-message driven programs by using commands.

There are two commands that may be used to set transaction level statistics for transactions and non-message driven programs.

The UPDATE command can be used to change the current setting of transaction level statistics for any of the entities.

The CREATE command includes the SET(TRANSTAT(Y|N)) parameter for setting transaction level statistics on or off when creating a new transaction, transaction descriptor, program, or program descriptor. It defaults to the setting in the descriptor or the transaction or program specified in the LIKE parameter.

There is also a QUERY command that may be used to show the current setting for a transaction (TRAN), transaction descriptor (TRANDESC), program (PGM), or program descriptor (PGMDESC).

## Enhanced Log Record Statistics

- New information in application termination accounting log record (x'07')
  - ◆ Shared queue “false schedule” indicator
  - ◆ Application execution CPU time in TOD clock format
  - ◆ Database I/O time and total lock wait time
  - ◆ VSAM I/O counts, OSAM I/O counts, ESAF calls, FP FLD calls, FP POS calls, and Abend reason code
  - ◆ DLI calls used for Fast Path DBs are included in DLI call accounting area
- New information in application start accounting log record (x'08')
  - ◆ Wait times for intent conflicts and pool space
  - ◆ Elapsed time of scheduling process
  - ◆ Program name and PSB name
- New information in CPI-C driven tran. termination log record (x'0A07')
  - ◆ Total CPU time in TOD clock format

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The application termination accounting log record (x'07') has been enhanced. The DLRFALSE bit in the DLRFLAG2 byte indicates that the scheduling of the transaction was false in a shared queues environment. The DLREXTIM field contains the CPU time for the program in time of day (TOD) format. The DLRTMEIO and DLRTMEPL fields are now populated in all environments. Previously, only DBCTL threads caused these fields to be populated. DLRTMEIO contains the total I/O time for database calls. DLRTMEPL contains the total wait time for database locks. Additional fields have been added. These include counts for VSAM and OSAM database data set reads and writes, ESAF calls, such as those to DB2, and additional Fast Path call counts for FLD calls and POS calls. When an abend occurs the abend reason code is included when available. The DLI call counts for GU, GN, ISRT, etc. now include both full function and Fast Path database calls. The log record is mapped by the DFSLOG07 macro. The offsets to some fields have changed from previous releases.

The application start accounting log record (x'08') is written for each scheduling of a program. The statistics in the log record have been enhanced. Statistics about the scheduling of the program were written for DBCTL threads in previous releases. IMS V10 writes these statistics for all programs, not just DBCTL threads. These statistics show the time that scheduling waited due to intent conflicts as could occur when a PROCOPT includes E, the time that scheduling waited due to a lack of pool space, such as in the PSB pool, and the elapsed time of the scheduling process. Two new fields have been added. They are LINTPGM which contains the program name and LINTPSB which contains the PSB name. The program name and PSB name were previously available in the LINTSY1 and LINTSY2 fields, however, there were complicated rules governing the contents of these two fields. LINTPGM and LINTPSB greatly simplify the discovery of the program name and PSB name. LINTSY1 and LINTSY2 remain in IMS V10 and contain the same contents as in previous releases. The log record is mapped by the DFSLOG08 macro.

The x'0A07' log record is written when a CPI-C driven transaction terminates. It includes accounting data similar to that in the x'07' log records. IMS V10 has added the LOAEXT field to the log record. It contains the CPU time in time of day (TOD) format. Previously, this time was only available in timer units in the LOAETIM field in the log record. The log record is mapped by the DFSLOG0A macro.

## Enhanced Log Record Statistics

- Benefits
  - ◆ Optional
  - ◆ Improved performance data - by transaction or commit
  - ◆ Improved accounting data - by transaction or commit
  - ◆ Provides additional accounting and performance data for IMS TM
    - Some data was only available with DBCTL in previous releases

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IMS V10 provides enhanced performance and accounting information in its log records. This can provide for granular information for accounting and charge out purposes. It also provides more detailed information for understanding the performance of individual transactions and programs. Some of the information in the log records was previously available only when the IMS Monitor trace was on for IMS TM environments. It was then processed by the IMS Monitor report program or the IMS Performance Analysis tool. IMS V10 provides new options for obtaining this data.



# Large Sequential Data Sets

## Large Sequential Data Sets

- z/OS 1.7 DFSMS adds support for large sequential data sets on DASD
  - ◆ More than 65,535 tracks on one volume for a data set
    - More than 4369 cylinders
  - ◆ Theoretical limit is 16,777,215 tracks per volume
  
- IMS V10 adds large sequential data set support
  - ◆ GSAM/BSAM and OSAM data sets
    - Includes
      - Logs
      - Trace data sets
      - Message queue data sets
      - GSAM/BSAM files
      - OSAM database data sets

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z/OS 1.7 added support for large sequential data sets on DASD. These data sets may occupy more than 65,535 tracks on a single volume. Without this support, physical sequential data sets (DSORG=PS) were restricted to 65,535 tracks on any volume. Multi-volume data sets could have up to 65,535 tracks on each volume. The architectural (theoretical) limit with large data set support is 16,777,215 tracks per volume. This is far beyond the maximum number of tracks per volume that storage subsystems support.

IMS Version 10 adds support for large sequential data sets. This applies to GSAM/BSAM and OSAM data sets. These include logs (OLDS and SLDS), trace data sets, message queue data sets, GSAM files, and OSAM database data sets.

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## Large Sequential Data Sets

- Implementation
  - ◆ Allocate the data set with DSNTYPE=LARGE
    - On DD statement, TSO/E ALLOCATE, AMS ALLOCATE statement, dynamic allocation (SVC 99), or SMS data class
- Tracks per volume for 3390s

Volume Type	# tracks per volume	Can exploit DSNTYPE=LARGE	Capacity with 4K, 8K, 12K, or 24K blocks
3390-2	33,390	No	1.53 GB
3390-3	50,085	No	2.29 GB
3390-9	150,255	Yes	6.88 GB
3390-27	491,400	Yes	22.49 GB
3390-54	982,800	Yes	44.99 GB

GB = 1,073,741,824 bytes

- Benefits
  - ◆ May be used to avoid multiple volume data sets
  - ◆ May be used to create larger OLDS

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A data set may use large data set support only if it is allocated with DSNTYPE=LARGE specified. That is, large data set support only applies to data sets that are created with this specification. DSNTYPE=LARGE may be specified on the DD statement, a TSO/E ALLOCATE statement, or an AMS ALLOCATE statement. For dynamic allocation (SVC 99) a DALDSNT text unit may be used to specify LARGE.

The following is an example of the use of a DD statement with DSNTYPE=LARGE specified.

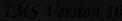
```
//ABCDEF DD DSN=IMS . ABC . XYZ , DSNTYPE=LARGE ,
//          UNIT=SYSDA , SPACE=( CYL , ( 4500 , 100 ) ) ,
//          DISP=( NEW , CATLG ) , VOL=SER=LRGVOL1
```

The table is provided to show which volume types may contain large format data sets. 3390-1, 3390-2, and 3390-3 have less than 65,535 tracks per volume. Large format data sets may be defined on them, however, they cannot take advantage of the larger number of tracks per volume. The table also shows the approximate capacity of a volume for certain block sizes. This applies to 4K, 8K, 12K and 24K. Other block sizes may yield more or less capacity due to the number of blocks which will fit on a track. For example, a 3390-9 will hold a 7.45 GB data set with a block size of 26K.

Large format data sets may be used for any log, trace data set, message queue data set, GSAM/BSAM data set or OSAM database data set. They may be used to avoid the requirement for multiple volumes for very large data sets. Since OLDS data sets must reside on only one volume, large format data sets allow OLDS to be larger than previously possible.

OSAM database data sets are limited to a maximum of 8 gigabytes. The large format data set support does not change this limit.

# System Utilities Enhancements



## Log Transaction Analysis Utility (DFSILTA0)

- Rewritten to improve performance
- Accepts logs from multiple IMS systems
  - ◆ Log Merge utility not required for MSC users
  - ◆ Support for shared queues
- Support for non-recoverable transactions has been added

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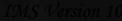
The Log Transaction Analysis utility (DFSILTA0) has several improvements.

In previous releases the utility could produce reports for systems connected by MSC. This required that the user invoke the Log Merge utility to merge the logs from multiple systems and use its output as input to the Log Transaction Analysis utility. The requirement to run Log Merge has been eliminated. Logs from multiple IMS systems may be input to a single execution of the utility. In previous releases the Log Transaction Analysis utility did not support shared queues. This restriction has been eliminated. One execution of the utility can process logs from multiple systems using shared queues.

When logs from multiple systems are input to the utility multiple LOGINxxx DD statements are used. Any valid JCL characters may be used to replace "xxx" in the DD names. The last character in "xxx" is used as the System ID in reports. When multiple log data sets from one IMS system are inputs, they are concatenated under a single DD name.

In previous releases the utility did not report non-recoverable transactions, including APPC messages. Support for reporting non-recoverable transactions has been added in IMS V10.

The Log Transaction Analysis utility has an option to write the output report to an output log data set, to a printer DD, or to both. In previous releases this was controlled by the OUT= parm on the EXEC statement. Both outputs were produced unless the OUT= parameter eliminated them. Possible values were OUT=NOREPORT, OUT=NOLOG, and OUT=(NOREPORT,NOLOG). IMS V10 has eliminated this parm. If you do not want either output just do not include its DD statement. PRINTER is used for the report and LOGOUT is used for the output log data set. The need for the output log data set has been reduced in IMS V10. In previous releases it was used to create a log for input to the Statistical Analysis utility. This is available in IMS V10 but not required.


## Statistical Analysis Utility (DFSISTS0)

- Rewritten to improve performance
  - ◆ Six steps replaced by single step job
    - Internal sorts done in single step
- Accepts logs from multiple IMS systems
  - ◆ Log Merge utility not required for MSC users
  - ◆ Support for shared queues
- Support for non-recoverable transactions has been added
- New message select output order statement
  - ◆ Controls the order of messages in the report

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The Statistical Analysis utility (DFSISTS0) has several improvements.

In previous releases the Statistical Analysis utility reports were created by a six step job which included two sorts. The reports are now produced by a single step. This step invokes internal sorts.

Support for shared queues and MSC is comparable to that in the Log Transaction Analysis utility for IMS V10. This includes the support for multiple LOGINxxx DD statements. When logs from multiple systems are input to the utility multiple LOGINxxx DD statements are used. Any valid JCL characters may be used to replace “xxx” in the DD names. When multiple log data sets from one IMS system are inputs, they are concatenated under a single DD name. The capability to specify multiple input logs eliminates the requirement to use an output log from the Log Transaction Analysis utility when you want a report from multiple IMS systems. In previous releases this was the way that log records from multiple IMS systems were given to the Statistical Analysis utility.

In previous releases the utility did not report non-recoverable transactions, including APPC messages. Support for reporting non-recoverable transactions has been added in IMS V10.

The message select output order statement is a new utility control statement specified in the SYSIN DD data set. The format of the message select output order statement is:

```
ORDER=CREATE | DEST | SOURCE
```

This statement determines the order in which the message select function lists or copies messages. If CREATE is specified, the messages are ordered by the time of the first input message. CREATE is the default. If SOURCE is specified, the messages are ordered by the originating LTERM names. If DEST is specified, the messages are ordered by the original destination. This is the original transaction unless it is a message switch.

## System Utilities Enhancements

- Migration
  - ◆ Old Log Transaction Analysis utility JCL continues to work
    - Specification of `NOLOG` or `NOREPORT` on `EXEC` statement ignored
      - These actions are now controlled by the presence or absence of `DD` statements
  - ◆ Log Merge utility continues to work but is not required
    - Multiple logs may be specified as input to the other utilities
  - ◆ Old Statistical Analysis utility JCL must be modified
    - Move `SYSIN` from step 6 to the first step
    - Delete the `LOGOUT` `DD` statement from first step
    - Delete the last five steps
  - ◆ Logs from previous releases are not valid input to these V10 utilities

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The JCL used in previous releases for the Log Transaction Utility can be used with IMS V10. There is one slight incompatibility. Previously you could specify an `OUT=` parameter on the `EXEC` statement. `OUT=NOLOG` specified that an output report should not be written to the `LOGOUT` `DD` data set. `OUT=NOREPORT` specified that an output report should not be written to the `PRINTER` `DD` data set. In IMS V10 if you do not want either of these data sets do not include the `DD` statement for it. IMS V10 ignores the `OUT=` parameter on the `EXEC` statement.

The Log Merge utility was used in previous releases to merge logs from different systems. The output of Log Merge was used as input to the Log Transaction Analysis or Statistical Analysis utilities. The Log Merge utility can be used with IMS V10, but it is not required. Both analysis utilities can merge multiple logs as part of their processing.

The JCL used for the Statistical Analysis utilities in previous releases must be changed for IMS V10. The actions needed to change the JCL are listed on the slide. The control statements were specified in the `SYSIN` data set of the sixth step. The `SYSIN` data set is now part of the first (and only) step. The `LOGOUT` `DD` in the old first step was used to pass data to the following steps. Since only one step is used in IMS V10, the `LOGOUT` `DD` is no longer used. The last five steps are no longer used, so their JCL should be eliminated.

Logs produced by IMS V8 and IMS V9 are not valid input to the IMS V10 Log Transaction Analysis utility and the IMS V10 Statistical Analysis utility.

## System Utilities Enhancements

- Benefits
  - ◆ Support for shared queues
  - ◆ Support for non-recoverable transactions
  - ◆ Simplified execution
  - ◆ Improved reporting by Statistical Analysis utility
  - ◆ Improved performance

The Log Transaction Analysis utility (DFSILTA0) and the Statistical Analysis utility (DFSISTS0) enhancements provide several benefits. They now provide information for shared queues systems and for non-recoverable transactions in any systems. Their execution has been simplified in two ways. You can now feed logs from multiple systems into both utilities without first merging the logs with the Log Merge utility. The Statistical Analysis utility is now just a single step execution instead of multiple programs and sorts executed in multiple steps. The Statistical Analysis utility has new reporting options that provide you a choice in how the report lines are ordered. The simplification of execution also provides improved performance since entire data sets are not written in each step and passed to following steps.



# BPE External Trace

## Highlights

- BPE Trace facilities enhancements
  - ◆ Ability to write trace tables to external storage as pages of trace entries are filled
  - ◆ Commands to DISPLAY and UPDATE the trace table attributes and settings
  - ◆ IPCS support to format and print the trace entries

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The Base Primitive Environment (BPE) is a critical component of several IMS-related components such as IMS Connect, the Common Queue Server, and several of the address spaces introduced with the Common Service Layer. In prior releases, problem determination using the BPE traces often required an increase in the number of trace pages and a corresponding requirement to recreate the problem and capture an MVS dump at the correct moment. This process increased the chance of multiple repeats, thereby decreasing productivity and increasing the time to find problem resolution.

IMS V10 enhances the BPE Trace facilities to provide a means to write the trace tables to external storage, Tape or DASD, as pages of trace entries are filled thereby increasing the capacity associated with tracing. Additionally, commands are provided to display the trace table attributes and update the trace level settings. To view data, trace formatting is provided through IPCS exits and formatting routines.

## Implementation

- External data sets use Generation Data Groups (GDGs)
  - ◆ GDG name and other trace parameters are specified in the BPE configuration PROCLIB member (e.g., BPECFGxx)
    - New parameter EXTTRACE, and
    - Existing TRCLEV parameter
      - New EXTERNAL sub-parameter
    - Note: as in previous releases, each component can create a separate BPE configuration member or share one
  - ◆ Creating Generation Data Group (GDG) definitions requires:
    - Defining GDG base
    - Defining GDG model

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The BPE external trace data sets are defined as GDGs and must be specified in the BPE configuration member in PROCLIB. The primary tasks include the specification of new values in BPECFGxx as well as creating the GDG definitions.

Both TRCLEV with EXTERNAL=YES and the EXTTRACE statement have to be defined for external trace to start recording data. The existing TRCLEV statement is associated with a particular trace table and has been enhanced with the EXTERNAL=YES/NO parameter which specifies whether that trace table is to be externalized or not. The EXTTRACE statement is for the data set definition options and is needed for the function to be activated. If a user specifies, EXTERNAL=YES on a table and does not specify an EXTTRACE statement, an error message is produced.

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## Setup - BPE Configuration

- BPECFGxx
  - ◆ New EXTTRACE parameter
    - Provides information about the new external data sets

```

▶ EXTTRACE(-GDGDEF(-DSN(data_set_name)
└──UNIT(unit) VOLSER(volser)┘
└──STORCLAS(storclas)┘

▶ SPACE(space)
└──SPACEUNIT( BLK )┘ └──BLKSIZE(blksize)┘ └──DATACLAS(dataclas)┘
└──TRK┘
└──CYL┘
└──AVGREC( U )┘
└──K┘
└──M┘

└──COPYBUFS(copybufs)┘ └──IOBUFS(iobufs)┘ └──COMP(ims_component)┘

```

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The EXTTRACE keyword definition is an enhancement to the BPECFGxx configuration definition set. One EXTTRACE keyword can be specified for each IMS component running with BPE. Alternatively, one EXTTRACE definition can be shared among multiple IMS components. If the COMP specification is omitted, the associated keyword applies to all components.

- GDGDEF(DSN(data\_set\_name),...) This is the name of the GDG data set. It does not include the relative generation number in parentheses. It does not include the absolute generation number. (For definition of absolute and relative generation number, refer z/OS JCL Reference).
- Location: Choices include STORCLAS(class\_name), or, (UNIT(unit\_name) and VOLSER(serial\_number))
- SPACE(space): specify number of units of space to be allocated for a data set
- SPACEUNIT(BLK,TRK,CYL): quantity value of the SPACE operand as the number of blocks, tracks or cylinders.
- AVGREC(U | K | M), in SMS, determines the size of the dataset allocation. The following are the valid values for AVGREC: (U - Use the primary space quantity specified on the SPACE operand; K - Multiply the primary space quantity specified on the SPACE operand by 1024 (1 K); M - Multiply the primary space quantity specified on the SPACE operand by 1,048,576 (1 M)).
- BLKSIZE(blksize): specifies the block size for the data set. The maximum allowable decimal value for block size is 32760.
- DATACLAS(dataclas): specifies the data class for the data set .
- COPYBUFS - are the buffers that will be used to copy data (trace table entries) from BPE tables. Data from these buffers are then copied into IOBUFS. The default value for number of buffers is 15 with max value of 64,000.
- IOBUFS - are the buffers that will copy data into external trace data sets. Number of IOBUFS defined by default is 2 and max value is 99.
- COMP(ims\_component) - Specifies the IMS component to which the EXTTRACE statement applies. Possible values are: (CQS, HWS, OM, RM, SCI).

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## Setup - BPE Configuration ...

- BPECFGxx ...
  - ◆ New EXTTRACE parameter...
    - COMP sub-parameter (see previous visual)
      - Can be coded for each component
      - If not coded, EXTTRACE applies to all component address spaces

Example:   EXTTRACE(GDGDEF(...))  
           EXTTRACE(GDGDEF(...) COMP(CQS))  
 Means:   A CQS address space would use the second definition  
           All others, e.g., IMS Connect (HWS), OM, RM, etc., would use the first

- If EXTTRACE applies to more than one address space
  - DSN name for base GDG must use system symbols for uniqueness

Example: EXTTRACE (GDGDEF(DSN(USRT001.&JOBNAME..GDG)..  
 Results in: jobname = ICONEX, DSN=USRT001.ICONEX.GDG.G0001V00  
               jobname = IMS1OM, DSN=USRT001.IMS1OM.GDG.G0001V00

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If COMP is not coded, then the EXTTRACE statement applies to all component address space types that are using the BPE proclib member, and that do not have an EXTTRACE statement with a specific COMP specified for their component type. For example, for a BPE configuration PROCLIB member with the following statements:

```
EXTTRACE( GDGDEF( ... ) )
EXTTRACE( GDGDEF( ... ) COMP(CQS))
```

If a CQS address space were started, it would use the external trace definitions from the second EXTTRACE statement. If any other type of address space were started, it would use the external trace definition from the first EXTTRACE statement. Note that if you have the EXTTRACE apply to more than one address space, you must use z/OS system symbols in the data set name (DSN) for the GDG base name, to ensure that each data set has a unique name. For example:

```
DSN(USRT001.&JOBNAME..GDG) and jobname=ICONEX then DSN=USRT001.ICONEX.GDG.G0001V00
DSN(USRT001.&JOBNAME..GDG) and jobname=IMS1OM then DSN=USRT001.IMS1OM.GDG.G0001V00
...
```



## Commands

- BPE commands are invoked through the z/OS MODIFY command
  - ◆ TRACETABLE resource type - internal BPE trace tables managed by
    - BPE
    - IMS component using BPE
      - IMS Connect, CQS, OM, RM, or SCI
  
- Two command verbs operate on the TRACETABLE resource type:
  - ◆ DISPLAY - shows the trace level and number of trace table pages of specified trace tables
  - ◆ UPDATE - modifies the trace level attribute of specified trace tables

BPE commands are invoked through the z/OS MODIFY command.

The TRACETABLE resource type refers to the internal BPE-managed trace tables defined either by BPE (for example: DISP, CBS, STG, LATC), or by the IMS component using BPE (for example: IMS Connect, CQS, OM, RM, SCI).

Two command verbs operate on the TRACETABLE resource type: DISPLAY and UPDATE.

## DISPLAY Command

- DISPLAY command
  - ◆ Existing command
    - Output is modified to show a new EXT column
      - Indicates YES or NO to show the external trace is set on or off for a particular trace table
  - ◆ Example

F	CQS1,DIS	TRTAB	NAME(*)	OWNER(CQS)		EXT
BPE0030I	TABLE	OWNER	LEVEL	#PAGES		YES
BPE0000I	CQS	CQS	MEDIUM	4		NO
BPE0000I	ERR	CQS	HIGH	4		NO
BPE0000I	INTF	CQS	LOW	8		YES
BPE0000I	STR	CQS	HIGH	8		YES
BPE0032I	DISPLAY TRACETABLE COMMAND COMPLETED					

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The BPE DISPLAY TRACETABLE command is an existing BPE command that is used to display the current attribute settings for the requested trace tables. IMS V10 modifies the command output by adding a new column to indicate, YES or NO, whether the external trace is set on or off for a particular trace table.

## UPDATE Command

- UPDATE command
  - ◆ Existing command
    - Modified to allow specification of the option EXTERNAL - YES | NO  
F jobname,UPDATE TRACETABLE .... EXTERNAL(YES | NO)
    - Modified to allow changes to trace data set with address space running  
F jobname,UPDATE TRACETABLE .... OPTION(REREAD)
  - OPTION(REREAD) specifies that PROCLIB member should be reread
    - EXTTRACE definition is read
    - External trace data set specification may be changed without terminating and restarting the address space

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The BPE UPDATE TRACETABLE command is used to change the trace level setting for the requested trace tables. The command syntax for UPDATE TRACETABLE has been extended to allow specification of the option EXTERNAL from YES to NO or vice versa.

EXTERNAL is an optional parameter that specifies whether or not the trace entries for the trace tables affected by the command should be written to the external trace data set. If the keyword is not specified on an UPD TRTAB command, then there is no change made to the external trace setting for the affected tables. Note that specification of EXTERNAL(YES) requires that the BPE configuration PROCLIB member contain the parameters to define a trace data set.

The command syntax for UPDATE TRACETABLE also has been extended to allow specification of the option OPTION(REREAD). REREAD is the only valid value for OPTION. REREAD causes the PROCLIB member to be reread for the information in the specified EXTTRACE statement. This allows the external trace data set specification to be changed or added without terminating the address space and restarting it.

## Performance Impacts

- BPE external tracing
  - ◆ Designed for minimal performance impact
    - External trace cost over incore trace
      - Approximately 15 extra instructions per trace point
  - ◆ New TCB in the BPE address space
    - Separate from any existing BPE or IMS component TCB
      - Anticipate processing more likely to be I/O bound than CPU bound
  - ◆ Minimal disruption to system performance if writing of the external trace records experiences problems
    - External trace data will be lost ("skipped") rather than delaying mainline processing

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Performance is always a consideration especially when tracing is activated. The BPE external trace function is designed to minimize the performance overhead incurred at trace points in the mainline code. Running with external tracing enabled results in an approximate cost of 15 extra instructions per trace point compared to running with incore tracing.

The majority of the processing required to externalize BPE trace data occurs under a new TCB in the BPE address space. This TCB is separate from any existing BPE or IMS component TCB. Work under existing TCBS, therefore, is not directly impacted by work performed by the new external trace TCB. The processing under the external trace TCB is more likely to be I/O bound than CPU bound.

If the writing of the external trace records cannot keep up with the rate of the generation of the records, external trace data will be lost ("skipped"), rather than delaying mainline processing. The goal is to make running with BPE external trace enabled minimally disruptive to system performance.



## Benefits

- BPE external trace enhancements that
  - ◆ Provide the ability to trace activities over longer time periods
  - ◆ Provide an IPCS interface to the trace data rather than having to take a console dump in order to look at the BPE traces for problem diagnosis
  
- Result in
  - ◆ More timely access to diagnostic data
  - ◆ Minimizes the need to recreate problem scenarios



## BPE External Trace Appendix

- This appendix for BPE External Trace includes:
  - ◆ GDG set up instructions
  - ◆ External trace formatting and printing documentation
    - IPCS examples
  - ◆ New messages

## Setup - GDG Base



Use method appropriate to your environment

- GDG base must be set up by one of the following methods:
  - ◆ IDCAMS batch job

```
/* STEP1 - Define the GDG Base
//STEP1 EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
  DEFINE GENERATIONDATAGROUP -
  (NAME('USRT001.GDG') -
  NOEMPTY -
  SCRATCH -
  LIMIT(5)
/*
```

- ◆ TSO command invoked in foreground mode

```
DEFINE GENERATIONDATAGROUP (name(usrt001.gdg01) scratch noempty limit(255))
```

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Users must define the GDG base prior to using BPE external trace functionality. This definition can be performed in any of the following ways:

- 1) IDCAMS batch job
- 2) TSO command invoked in the foreground
- 3) TSO command invoked in a batch job

## Setup - GDG Base ...



Use method appropriate to your environment

- ◆ TSO command invoked in batch job

```
//DEFGDG JOB ...  
//Step1 EXEC PGM=IKJEFT01  
//SYSTSPRT DD SYSOUT=*  
//SYSTSIN DD *  
DEFINE GENERATIONDATAGROUP (name(usrt001.gdg01) scratch noempty limit(255))
```

- GDG Parameter definition

- NAME - specifies the high-level qualifier to be used when allocating the GDG data sets
  - value must match the DSN specified on the GDGDEF keyword in the IMS BPE configuration member.
- NOEMPTY - specifies that only the oldest generation data set is to be uncatalogued when the maximum is reached.

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Regardless of which method is chosen, the GDG parameter definition must specify a value for NAME which is the high level qualifier that will be used when allocating the DGD data sets. This value must match the value in the DSN parameter of the EXTTRACE keyword definition in the BPE configuration member.

The specification of NOEMPTY provides for the uncataloguing of the oldest GDG data set when the maximum number is reached.

## Setup - GDG Base ...

- GDG Parameter definition ...
  - SCRATCH - specifies that the generation data set's DSCB is to be deleted from the volume's VTOC when the generation data set is uncatalogued
    - Direct access device space management (DADSM) removes the data set's DSCB from the VTOC, erases the data set's space on the volume, and makes the space available to other system users
    - For SMS-managed GDGs, SCRATCH also specifies that the NVR is to be removed from the VVDS when the data set is uncatalogued.
  - LIMIT - (required parameter) specifies the maximum number of GDGs in the group



Use method appropriate to your environment

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SCRATCH specifies that the generation data set's DSCB is to be deleted from the volume's VTOC when the generation data set is uncatalogued. Direct access device space management (DADSM) removes the data set's DSCB from the VTOC, erases the data set's space on the volume, and makes the space available to other system users. The generation data set ceases to exist. For SMS-managed GDGs, SCRATCH also specifies that the NVR is to be removed from the VVDS when the data set is uncatalogued.

LIMIT is a required parameter and specifies the maximum number of GDGs in the group. In the example on the previous visuals, this value is 255.

## Setup - GDG Model



Use method appropriate to your environment

- A set of DCB specifications for use when allocating GDG entries must be provided using one of the following methods
  - ◆ PROCLIB member definition
    - DCB-related information can be passed as described in the EXTTRACE definition
  - ◆ GDG model data set
    - Allocated using IEFBR14
    - DCB information in PROCLIB member not needed

```

/* STEP1 - Define the GDG Base
//STEP2 EXEC PGM=IEFBR14
//BLDDSCB DD DSN=USRT001.GDG, <-- Note model name is same as GDG Base
//      DISP=(NEW,KEEP),      <-- Note disp is KEEP, not CATLG
//      UNIT=SYSALLDA,
//      VOL=SER=PAGE01,      <-- This volume contains the catalog entry for index
//      SPACE=(TRK,(0)),
//      DCB=(DSORG=PS,LRECL=4000,RECFM=VB,BLKSIZE=32760) <-- DCB each GDG DS
//*                               will acquire

```

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As with all GDGs, DCB information must be provided for use when the GDG entries are created. The DCB can be provided via one of the following methods:

- PROCLIB member definition - the DCB-related information can be passed in the EXTTRACE definition
- GDG model data set - a GDG model data set can be allocated using IEFBR14 and put on the same volume as the user catalog and GDG data sets. With a GDG model, providing the DCB information in EXTTRACE is not required. The visual gives an example of the IEFBR14 JCL.

## GDG Data Set Allocation/Deallocation Flow

- BPE external trace data sets are allocated and opened:
  - ◆ When the first trace table is specified with external option
    - Either at BPE initialization
      - EXTERNAL=YES is coded on the TRCLEV statement
    - Or, when the first table is updated with EXTERNAL(YES) on the UPD TRTAB command
  
- Data sets are closed and deallocated:
  - ◆ When the last trace table is stopped
    - E.g., UPD TRTAB EXTERNAL(NO) command.
  - ◆ Or, when they are filled and the next data set in the generation is subsequently opened for write access

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BPE external trace data sets are allocated and opened in one of two situations: during BPE initialization if the TRCLEV statement specifies EXTERNAL=YES, or as a result of the UPD TRTAB command and a specification of EXTERNAL(YES).

The trace data sets are closed and deallocated when the last trace table is stopped by a specification of EXTERNAL(NO) in the UPD TRTAB EXTERNAL command, or when the data sets are filled and the next data set in the generation is subsequently opened for write access.

## Data Formatting and Printing

- BPE external trace data formatting options
  - ◆ Offline, through IPCS exits and formatting routines
  - ◆ Batch processing

There are two modes available to format and print the external trace data. The first is through IPCS routines. The second is through batch processing.

## Data Formatting and Printing - IPCS

- IPCS
  - ◆ From the IPCS main menu, select option 0 to specify the GDG used
  - ◆ The selection brings up the IPCS Default Values panel, hit enter

```
-----IPCS Default Values -----  
Command ==>>  
  
You may change any of the defaults listed below. The defaults shown before  
any changes are LOCAL. Change scope to GLOBAL to display global defaults.  
  
Scope ==> LOCAL (LOCAL, GLOBAL, or BOTH)  
  
If you change the Source default, IPCS will display the current default  
Address Space for the new source and will ignore any data entered in  
the Address Space field.  
  
Source ==> DSNAME('TSouserid.ICFUCAT1.GDG01.G0001V00')  
Address Space ==> ASID(X'029B')  
Message Routing ==> NOPRINT TERMINAL  
Message Control ==> NOCONFIRM VERIFY FLAG(TERMINATING)  
Display Content ==> NOMACHINE REMARK REQUEST STORAGE NOSYMBOL
```

This and the next several visuals give an example of using IPCS to format and print the external data set trace records.

## Data Formatting and Printing - IPCS ...

- The IPCS MVS Dump Component Data Analysis panel shows the available options for analysis
- Select DFSAAMPR - IMS Interactive Dump Formatter

```
----- IPCS MVS DUMP COMPONENT DATA ANALYSIS -----  
  
To display information, specify "S option name" or enter S to the left  
of the option desired. Enter ? to the left of an option to display  
help regarding the component support.  
  
Name      Abstract  
ALCWAIT   Allocation wait summary  
AOMDATA   AOM analysis  
APPCDATA  APPC/MVS Data Analysis  
ASCHDATA  APPC/MVS Scheduler Data Analysis  
ASMCHECK  Auxiliary storage paging activity  
ASMDATA   ASM control block analysis  
AVMDATA   AVM control block analysis  
CICS330   CICS Version 3 Release 3 analysis  
COMCHECK  Operator communications data  
COUPLE    XCF Coupling analysis  
CTRACE    Component trace summary  
DAEDATA   DAE header data  
DB2DATA   DB2 analysis  
S DFSAAMPR IMS Interactive Dump Formatter  
DIVDATA   Data in virtual storage  
DLFDATA   Data Lookaside Facility data
```

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The IMS Interactive Dump Formatter is named DFSAAMPR.

## Data Formatting and Printing - IPCS ...

- Select Option 6

```
----- IMS DUMP FORMATTING PRIMARY MENU -----  
OPTION ==>>  
  
0 INIT      - IMS formatting initialization and content summary  
1 BROWSE   - Browse Dump dataset          *****  
2 HI-LEVEL - IMS Component level formatting *USERID - IBMUSER  
3 LOW-LEVEL - IMS ITASK level formatting   *DATE   - 05/04/22  
4 ANALYSIS - IMS dump analysis            *JULIAN - 05.112  
5 USER     - IMS user formatting routines *TIME   - 14:21  
6 OTHER COMP - Other IMS components (BPE, CQS...) *PREFIX - IBMUSER  
7 OTHER PROD - Other IMS-related products *TERMINAL- 3278  
E EDA      - IMS Enhanced Dump Analysis  *PF KEYS -  
T TUTORIAL - IMS dump formatting tutorial *****  
X EXIT     - Exit IMS dump formatting  
  
Enter END or RETURN command to terminate IMS component formatting.  
-----
```

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The IMS Dump Formatting Primary Menu shows the available IMS dump formatting options. Select Option 6 - 'OTHER COMP'.

## Data Formatting and Printing - IPCS ...

- Select Option B (BPE)

```
----- IMS COMPONENT SELECTION DUMP FORMATTING MENU -----
OPTION  ==>

  1 BROWSE      - Browse dump dataset                *****
  2 CQS         - Common Queue Server                *USERID - IBMUSER
  3 OM          - Operations Manager                 *DATE   - 05/04/22
  4 RM          - Resource Manager                   *JULIAN - 05.112
  5 SCI         - Structured Call Interface          *TIME   - 14:32
  6 IMS Connect - IMS Connect (9.1 and above only) *PREFIX - IBMUSER
                                           *TERMINAL- 3278
  B BPE         - IMS BPE formatting (for any of the
                 above component address spaces)    *PF KEYS - 12
                                           *****
  X EXIT        - Exit IMS component menu

Enter END or RETURN command to terminate IMS component formatting.
-----
```

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The next panel identifies IMS BPE Formatting. Select B to access this formatter. Alternatively, each of the components can be chosen separately.

## Data Formatting and Printing - IPCS ...

- Select Option 4 for the BPE external trace formatting

```
----- IMS BPE SUBSYSTEM DUMP FORMATTING MENU -----  
OPTION ==>  
0  INIT      - Show BPE status and initialize dump  
1  BROWSE    - Browse dump dataset (IPCS norm)      *****  
2  HI-LEVEL  - BPE component level formatting      *USERID - IBMUSER  
3  LOW-LEVEL - BPE detail level formatting          *DATE   - 05/03/09  
4  EXT TRACE - BPE external trace formatting        *JULIAN - 05.068  
X  EXIT      - Exit BPE dump formatting menu        *TIME   - 15:34  
                                           *PREFIX - IBMUSER  
                                           *TERMINAL- 3278  
                                           *PF KEYS - 24  
                                           *****  
Enter END or RETURN command to terminate IMS component formatting.  
-----
```

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Option 4 provides the access to the new BPE External Trace formatting capability.

## Data Formatting and Printing - IPCS ...

- Select the traces to view

```

== BPE External Trace Formatting ==
OPTION ==>

Format all trace types . . . . . (Y/N)
Specify any component trace type . . . . . (Trace name, or * for all)
Specify any BPE external trace type. . . . . (BPE trace name, or * for all)

Specify a BPE external trace table to format:
Asynchronous work element (AWE) . . . . . (Y/N)
Control block storage/services (CBS) . . . . . (Y/N)
Commands trace (CMD) . . . . . (Y/N)
Dispatcher trace (DISP) . . . . . (Y/N)
Error trace table (ERR) . . . . . (Y/N)
Hash table services (HASH) . . . . . (Y/N)
Latch management and serialization (LATC) . . . . . (Y/N)
System service calls (SSRV) . . . . . (Y/N)
Storage service requests (STG) . . . . . (Y/N)
Activity related to exit routines (USRX) . . . . . (Y/N)

Optional parameters:
Start Date/Time (UTC) . . . . . (Example 2002190 133500)
Stop Date/Time (UTC) . . . . . (Example 2002190 133500)

or,

Number of records to skip . . . . . (Mutually exclusive with start parameters)
Number of records to process . . . . . (Mutually exclusive with stop parameters)

```

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The BPE External Trace Formatting panel provides the options to select how the trace is to be produced.



## Data Formatting and Printing - IPCS ...

- Each of the components can also be chosen separately
  - ◆ For example, Option 6 will request IMS Connect formatting

```
----- IMS COMPONENT SELECTION DUMP FORMATTING MENU -----  
OPTION  ===>  
  
1 BROWSE      - Browse dump dataset          *****  
2 CQS         - Common Queue Server          *USERID - IBMUSER  
3 OM          - Operations Manager           *DATE   - 05/04/22  
4 RM          - Resource Manager             *JULIAN - 05.112  
5 SCI         - Structured Call Interface    *TIME   - 14:32  
6 IMS Connect - IMS Connect (9.1 and above only) *PREFIX - IBMUSER  
                                     *TERMINAL- 3278  
B BPE        - IMS BPE formatting (for any of the *PF KEYS - 12  
               above component address spaces) *****  
  
X EXIT       - Exit IMS component menu  
  
Enter END or RETURN command to terminate IMS component formatting.  
-----
```

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IPCS also supports accessing each component separately. This next example will show the panels associated with IMS Connect.

## Data Formatting and Printing - IPCS ...

- Select Option 4 for External Trace formatting

```
----- IMS CONNECT DUMP FORMATTING MENU -----  
OPTION ==>  
  
0 INIT      - Show BPE status and initialize dump *****  
1 BROWSE   - Browse dump dataset (IPCS norm) *USERID - IBMUSER  
2 HI-LEVEL - IMS Connect component level formatting *DATE  - 05/03/24  
3 LOW-LEVEL - IMS Connect thread level formatting *JULIAN - 05.083  
4 EXT TRACE - ICON BPE external trace formatting *TIME  - 14:11  
           *PREFIX - IBMUSER  
           *TERMINAL- 3278  
B BPE      - IMS Connect BPE formatting *PF KEYS - 24  
           *****  
  
X EXIT     - Exit IMS Connect dump formatting menu  
  
Enter END or RETURN command to terminate IMS Connect formatting.
```

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The IMS Connect Dump Formatting panel provides several options. Option 4 is new and shows how to access the BPE external trace formatting for IMS Connect.

## Data Formatting and Printing - IPCS ...

- New panel

```

== IMS Connect BPE EXTERNAL TRACE FORMATTING ==
OPTION ==>
Specify any IMS Connect external trace table to format:
Command Activity Trace (CMDT) . . . . . (Y/N)
Interface Trace (ENVT) . . . . . (Y/N)
ICON to OTMA Driver Trace (HWSI) . . . . . (Y/N)
ICON to Local Option Driver Trace (HWSN) . . . . . (Y/N)
IMSPlex Driver Trace (HWSO) . . . . . (Y/N)
ICON to TCP/IP Driver Trace (HWSW) . . . . . (Y/N)
Communication Protocol Activity Trace (OMDR) . . . . . (Y/N)
OTMA Communication Driver Trace (OTMA) . . . . . (Y/N)
Local Option Driver Trace (PCDR) . . . . . (Y/N)
TCP/IP Communication Driver Trace (TCPI) . . . . . (Y/N)

Specify any external trace type: . . . _____ (BPE trace name, or * for all)

Optional parameters:
Start Date/Time (UTC) . . . . . _____ (Example 2002190 133500)
Stop Date/Time (UTC) . . . . . _____ (Example 2002190 133500)
or,
Number of records to skip . . . _____ (Mutually exclusive with start parameters)
Number of records to process . . _____ (Mutually exclusive with stop parameters)
-----
    
```

The visual shows the new panel for IMS Connect. Note that the other components, e.g., CQS, RM, OM and SCI also have panels that relate specifically to each of those functions.

## Data Formatting and Printing - Batch mode

- An alternative to IPCS is Batch mode
  - ◆ BPE external trace records can be formatted in batch mode by using JCL similar to the following:

```
//USER001 JOB (USER001,A421,090,M31),'USER001',  
//          CLASS=B,TIME=(,15),USER=USER001,  
//          MSGLEVEL=(1,1),MSGCLASS=H  
//JOBLIB      DD DSN=IMSBLD.I10ATS17.CRESLIB,DISP=SHR  
//          DD DSN=SYS1.MIGLIB,DISP=SHR  
//IPCSDDMP EXEC PGM=IKJEFT01,REGION=4096K  
//SYSPRT DD SYSOUT=*  
//IPCSDDMP DD SYSOUT=*  
//OUTFILE DD SYSOUT=*  
//INDEX DD SYSOUT=*  
//SYSABEND DD SYSOUT=*  
//SYSTSIN DD *  
IPCSDDIR 'USER001.DUMP.DIR.DD'  
ALLOC FILE(IPCSDDIR) +  
DA('USER001.DUMP.DIR.DD') +  
REUSE SHR  
ALLOC FILE(INFILE) +  
DA('N900380.BPETRACE.ALL') +  
REUSE SHR  
IPCS NOPARM  
VERBX BPETRFM0 'COMP(ALL) TRACE(TYPE(ALL))'  
END
```

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Batch invocation is an alternative to IPCS. This visual gives an example of how to run a batch job for data formatting and printing.

## Data Formatting and Printing - Batch mode ...

- VERBX - keyword definition that defines the formatting request

<b>COMP()</b>	- (required) specify the component type to format {ALL,HWS,CQS,RM,OM,SCI }
<b>TRACE()</b>	- (required, may repeat) specify the trace type to format. Example: TRACE(TYPE(AWE)) TRACE(TYPE(ERR)) ...
<b>SDATE(), STIME(), EDATE(), ETIME()</b>	- (optional) specify filtering for start and end date, time format: YYYYDDD and HHMMSS
<b>UL()</b>	- whether the filtering time is UTC or Local; value = { U, L }
<b>CSTCK()</b>	- determines whether to print the STCK at the end of each entry in the original HEX or formatted value = { Y, N }

- Example:

- |   |
|---|
| <ul style="list-style-type: none"> <li>▪ <b>VERBX BPETRFM0 'COMP(ALL) TRACE(TYPE(ALL)) SDATE(2006001) STIME(120000) EDATE(2006100) ETIME(120000) UL(U) CSTCK(N)'</b> <ul style="list-style-type: none"> <li>- Format trace records for all component and for all trace type between 1st day of 2006, 12pm and 100-th day of 2006, 12pm'</li> </ul> </li> <li>▪ <b>VERBX BPETRFM0 'COMP(CQS) TRACE(TYPE(ERR)) TRACE(TYPE(INTF))'</b> <ul style="list-style-type: none"> <li>- Format trace records for only CQS component with trace type ERR or INTF</li> </ul> </li> </ul> |
|---|

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The VERBX keyword provides the definitions that request the type of formatting to be done along with filtering requirements.

## Formatted Data - Example

```

--- BPE STG Trace Table ---
-----
ETHD: 00000000
+0000 LL..... 1090 ZZ..... 0000 TYPE.... 01 SUBTYPE.. 01 RESERVED. 0000 RVERS... 00000001
+000C NAME.... STG LENGTH... 00000080 UDATALEN. 00000000 TDATALEN. 00001000 NUMPGS... 0008 ENTLEN... 0020
+0020 ENTSKPD. 00000000 BVERS... 010600 RESERVED. 00 UTYPE.... RM UVERS.... 010300 RESERVED. 00
+0030 USYSNAME. RMIRM UTRMOD... 00000000 00000000 FLG1..... 40 FLG2.... 00 LEVEL.... 04
+0043 IDX..... C2 CYCLECT.. 00000000 OFFSET... 00000000 BYTELOST. 00000000 LDTO.... FFFF94B6 2E000000
+0058 LSO..... 00000000 00000000 RESERVED. 00000000 RESERVED. 00000000 RESERVED. 00000000 RESERVED. 00000000
+0070 RESERVED. 00000000 RESERVED. 00000000 ID..... ETHD END
Flag analysis for ethd_flg1:
ethd_fl_system (40x) - Trace table is a BPE system table
ETSF: 00000000
+0000 STCK.... BE0F6EEB 873FD4A0 SEQNUM... 00000000 00000001
Trace table data (oldest entry dumped first):
Code Subcode Trace Entry Trace Data
-----
STG : BPEDELETE C2050000 006D4C48 8C206CC0 C2D7C5E3 D9C9F0F0 00000000 BE0F6EE9 B0571E40 BPETRI00
STG : BPELOADC C2140000 006D4C48 8C203E80 C2D7C5C3 C2C9F0F0 0C20F268 BE0F6EE9 B0572E20 BPECB100
STG : BPELOAD C2030000 006D4C48 8C206C48 C2D7C5C3 C2C9F0F0 8C21A6C0 BE0F6EE9 B3568300 BPECB100
STG : BPELOAD C2030000 006D4C48 8C21A89A C2D7C5C3 C2E3F0F0 8C261958 BE0F6EE9 B61834E0 BPECBT00
STG : BPELOAD C2030000 006D4C48 8C21A970 C3E2D3D9 C2C3C2F0 8C261548 BE0F6EE9 B912EBA0 CSLRBCB0
STG : BPELOAD C2030000 006D4C48 8C21AA54 C2D7C5C3 C2C7E2F0 8C216098 BE0F6EE9 BBC29F40 BPECBGS0
STG : BPELOAD C2030000 006D4C48 8C21AA96 C2D7C5C3 C2D9E2F0 8C21A1F0 BE0F6EE9 BE419160 BPECBRS0
STG : BPELOAD C2030000 006D4C48 8C21AAD4 C2D7C5C3 C2C1D3F0 8C214030 BE0F6EE9 C0CE1D00 BPECBAL0
STG : BPELOAD C2034000 006D4C48 8C21AB16 C2D7C5C3 C2C3F0F0 8C217040 BE0F6EE9 C386A6A0 BPECB000
STG : BPELOAD C2034000 006D4C48 8C21AB16 C2D7C5C3 C2C7F0F0 8C262910 BE0F6EE9 C69409C0 BPECBG00
STG : BPELOAD C2034000 006D4C48 8C21AB16 C2D7C5C3 C2D9F0F0 8C21B1F0 BE0F6EE9 C9189340 BPECBR00
STG : BPELOAD C2034000 006D4C48 8C21AB16 C2D7C5C3 C2D7F0F0 8C262658 BE0F6EE9 CB80A880 BPECBP00

```

The formatted data is printed in a format similar to what is shown on this visual.

## New Messages

- Several new message are added for BPE processing:
  - ◆ BPE0043E ERROR DURING EXTERNAL TRACE PROCESSING IN MODULE module
  - ◆ BPE0044I BPE EXTERNAL TRACE FUNCTION NOT ACTIVE
  - ◆ BPE0046I EXTERNAL TRACE DATA SET dsn OPENED ON VOL vol
  - ◆ BPE0046I EXTERNAL TRACE DATA SET dsn CLOSED ON VOL vol
  - ◆ BPE0047I ERROR OCCURRED DURING UPDATE TRACETABLE OPTION PROCESSING

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If the BPE external trace function is enabled, an installation's Operations Procedures documentation should be updated to reflect the possibility of several new error messages associated with external tracing. This visual documents the new messages.

If an error occurs during UPDATE TRACETABLE processing, the text of the message produces one of the following:

- UNABLE TO GET NECESSARY STORAGE
- ERROR READING BPE CONFIGURATION PROCLIB MEMBER member address space
- ERROR PARSING BPE CONFIGURATION PROCLIB MEMBER member processing
- UNKNOWN ERROR rc FROM PARSING MODULE BPEPCF10
- LOAD FAILED FOR BPEPCF10, BPELOADC RC=rc
- BPE CONFIGURATION PROCLIB MEMBER NAME WAS NOT CODED ON STARTUP PARMS
- PREVIOUS UPDATE COMMAND REREAD PROCESSING IN PROGRESS
- NO MATCHING EXTTRACE STATEMENT FOUND FOR ADDRESS SPACE



# Abend Search and Notification

## Highlights

- IMS Abend Search and Notification (IMS ASN)
  - ◆ Notification mechanism for IMS failures
    - E-mails to user-specified recipients
    - Text messages to user-specified cellular devices, ...
  
- Provides direct and real time access to the ABEND information and description
  - ◆ Automatic creation of hyperlinks (URLs) to IBM-supplied Internet resources for analyzing and resolving problems
  - ◆ Security
    - E-mails are sent internally from the IMS system task to pre-defined e-mail addresses
    - No sensitive information, such as customer data, is sent

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The IMS Abend Search and Notification (IMS ASN) function in IMS V10 provides a mechanism for 'real-time' automatic notification of IMS problems, such as abnormal terminations, to designated personnel who may not have immediate or direct access to the operator consoles.

When the abend occurs (or when the system fails), IMS ASN gathers information about the abend, the return code, the module affected, and, when possible, the APAR level.

Note that security is not an issue because all associated e-mails are sent internally from the IMS system task to the list of pre-defined e-mail addresses. No sensitive information, such as customer data, is ever sent.



## Functionality

- E-mail or text messages (SMS) are sent after a system failure to a specified list of recipients
  - ◆ “Event driven” – automatic and immediate e-mail message for IMS Control Region Abends
  - ◆ “On demand” – e-mail creation through ISPF panels
- System driven and Knowledge-based e-mail text construction provides:
  - ◆ Direct hyperlinks to the ABEND problem description and analysis
  - ◆ Direct hyperlinks to hits resulting from the search of the failure using:
    - Known problems Database (APARs)
    - User errors Database
  - ◆ Direct hyperlink to the latest PSP for the current version
  - ◆ Direct link to internet-based PTF ordering facility

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The goal of IMS ASN is to notify one or more pre-defined recipients, via mechanisms such as e-mail or a text message to a cellular device, that an abend just occurred in a given subsystem. There are two ways to initiate an IMS ASN e-mail. The first is “event driven” which occurs based upon an event such as an IMS system abend. The second is “on demand” by initiating a request that is sent from the ISPF panels that are a part of the IMS ASN support.

IMS ASN also attempts to construct a message that provides more information on the specific nature of the problem along with potential solutions. The function automatically attempts to create hyperlinks to:

- An abend explanation in the IMS Messages and Codes manual
- Pertinent INTERNET database search engines (in practical terms, the hyperlink will be a URL with a pre-built search argument). The following are examples of links but note that, since they are links, then they are subject to change:

Technotes: <http://www-1.ibm.com/support/search.wss?rs=81&tc=SSEPH2&dc=DB520+D800+D900+DA900+DA800&dtm>

PSP bucket: <https://techsupport.services.ibm.com/server/390.psp390>

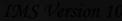
Messages: <http://publibfp.boulder.ibm.com/cgi-bin/bookmgr/BOOKS/dfsmc1g1/CCONTENTS>

PMR: [https://www-925.ibm.com/software/support/esr/esr\\_home.do](https://www-925.ibm.com/software/support/esr/esr_home.do)

List of possible related APARs (fix), or APARs in error (PE APAR).

Note: this hyperlink will be present only if the APAR information is available to IMS ASN components at time of error.

The APAR hyperlink is <http://www-1.ibm.com/support/search.wss?rs=81&tc=SSEPH2&dc=DB550+D100&dtm>


## Functionality ...

- IMS Control region abends
  - ◆ Only the first abend triggers a notification
    - Abends will not be grouped nor multiple e-mails sent for the same abend on different tasks
      - Targets a single IMS cycle
        - A new notification is sent if IMS is restarted and then abends again
- IMS Dependent region abends
  - ◆ NO “event driven” notification for application abends
    - Notification is triggered only when an abend involves IMS system processing
  - ◆ The IMS ASN “on demand” interface
    - Available to anyone with a TSO id
    - Can be used to search for abend/message/apar/etc. related information

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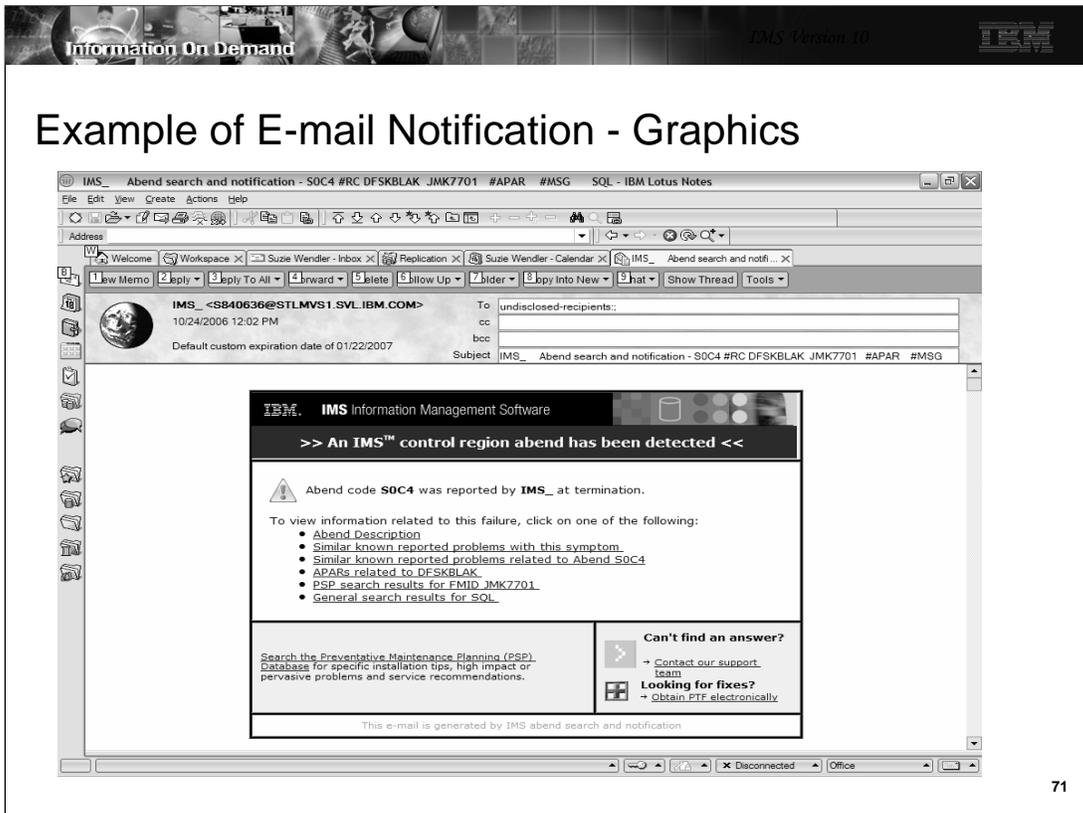
Abend notification is triggered when an abend occurs that causes the IMS Control Region to abnormally terminate. Only the first abend triggers a notification. Additionally, IMS ASN does not group abends, nor does it send multiple e-mails for the same abend that might occur in different TCBS. The notification is intended for a single IMS cycle so if IMS is restarted and then abends again, IMS ASN sends a new notification.

Before creating the notification, IMS ASN logic checks a new dump suppression table in the dump module DFSFDMP0 to determine if an abend requires notification. If it does, then IMS ASN gathers information about the abend, the return code, the module affected, and, when possible, the APAR level. On the other hand, there are abends that may have notification interest, but for which no search is meaningful or necessary. The following list shows abends for which either no notification, or notification without hyperlinks is generated:

- U0020 - notification only, no hyperlinks with search arguments provided
- U0150 - no notification necessary. CTL region abend already generated a notification
- U0604 - no notification necessary. /SWITCH SYSTEM FORCE/ACTIVE entered (XRF)
- U4095 - no notification necessary. CTL region abend already generated a notification
- SFFF - non-IBM program termination. No notification necessary
- SFFE - non-IBM program termination. No notification necessary

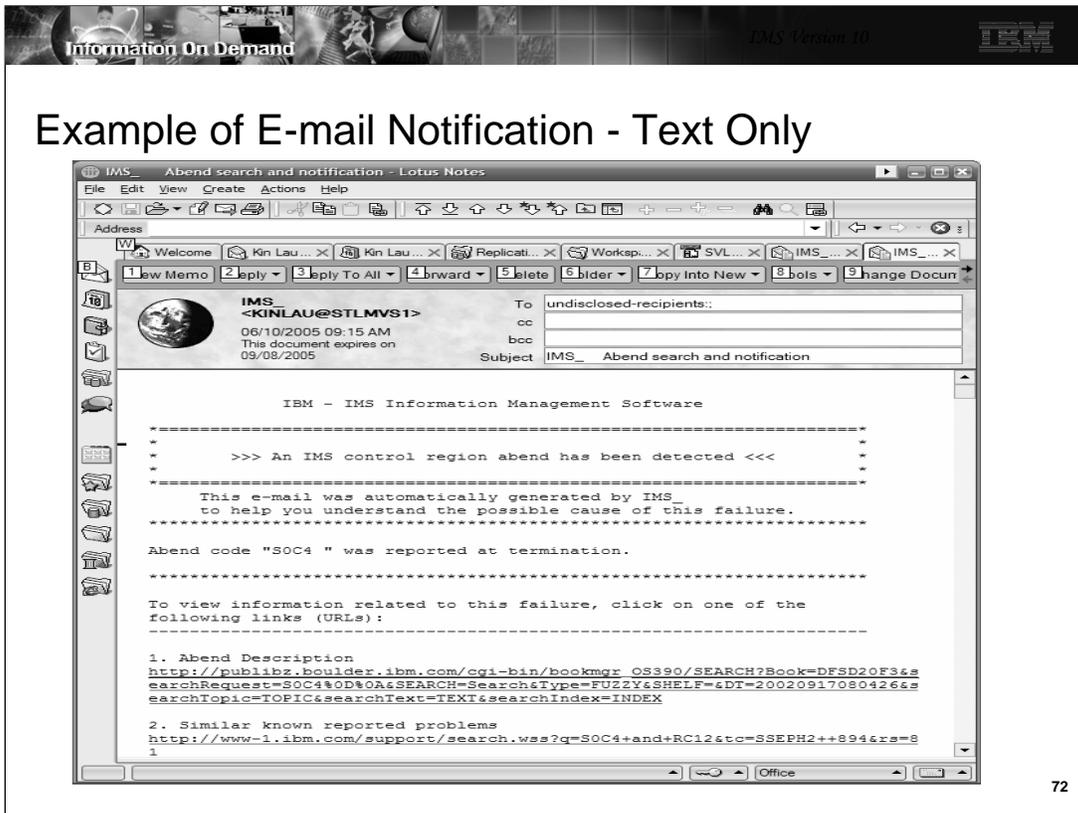
Note that dependent regions abends (MPP or BMP) trigger the notification and search “event driven” function only if the abend involves IMS system processing. Application abends are not recognized by the “event driven” capability.

Dependent Region abend searches, however, can be accomplished using the IMS ASN functionality. The IMS ASN “on demand interface”, available to anyone with a TSO id, can be used to search for abend/message/apar/etc. related information.



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This visual gives an actual example of an e-mail notification in an environment that supports full graphics.



For environments with limited graphics capabilities, text-only notification is available. This visual provides an example of the text-only e-mail format.

## Setup

- Setup overview
  - ◆ Allocate two data sets
    - Runtime data set and skeletal data set
  - ◆ Invoke "IMS ASN System Setup"
    - Specifies data sets
    - Specifies message recipients
    - Specifies SMTP server
  - ◆ Copy procedure produced by IMS ASN System setup to z/OS Proclib
  - ◆ Specify procedure name in DFSDFxxx member

```
/* Diagnostic_STATISTICS Section */
/*****
<SECTION=DIAGNOSTICS_STATISTICS>
IASNPROC=procname /* IMS abend search and notification PROCLIB member */
```

- Detailed information is in the *System Definition Guide*

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IMS ASN has a set of ISPF panels that are used to set up the environment. The application can be invoked either by keying in an exec command in the TSO ISPF Option 6 panel or selecting option 9 in the IMS Application Menu program.



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## On Demand Interface ...

- Specifications for “on demand” processing

```

      IMS abend search and notification - on demand interface
COMMAND ==>>

*Product Name . . . . . _____ REQUIRED (example: IMS)

Provide one or more of the following web search arguments
PSP for FMID . . . . . _____ (example: JMK7701)
Abend Code . . . . . _____ (example: S0C4)
Return Code (RC) . . . . . _____ (example: 44)
Module Name. . . . . _____ (example: DFSSAMP0)
APAR Number (PE or other). . . _____ (example: PQ99999)
Message ID . . . . . _____ (example: EFS555i)
Generic Search Argument. . . . _____ (example: SQL OVERFLOW)

Recipient Information
Recipient E-mail Address. . . _____
                                     example: name@company.com)
Specify Additional Addresses? _ (Y-Yes/N-No)
JOB JCL Statement. . . . . _ (E-Edit/Y-Yes/N-No)

```

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The panel for the “on demand” interface is used to activate IMS ASN dynamically from a TSO session. It also provides the ability to specify search criteria, or to replicate the search criteria which was initiated by an abend-driven invocation of IMS ASN.

The program driving this panel parses and assembles the search criteria into a JCL stream. The user can then submit the job generated by IMS ASN.

If ‘Y’ is specified in the ‘Specify Additional Addresses?’ field above, the user will be prompted in edit mode on a member of a PDS where an unlimited number of e-mail recipients can be entered.

If ‘E’ is specified in the “JOB JCL Statement” field, a JOB statement is presented for the user to customize. It is retained for future use. If ‘Y’ is specified, the previously customized job statement is used.

‘Product Name’ is a required field and at least one search argument must be provided on the panel.



## Prerequisites

- IMS ASN e-mail notification uses a set of commands that are part of the Simple Mail Transfer Protocol (SMTP)
  - ◆ SMTP is an MVS function provided with TCP/IP
    - MVS TCP V3.1 or later
    - Both local and user-specified external SMTP servers are supported
  
- Receiving e-mail system
  - ◆ For graphic formats, MIME1.0 or higher is needed
    - Lotus Notes clients need patch, MJUK42GR8K, in addition to MIME 1.0 support
  - ◆ Otherwise a text-only email is displayed

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Since the e-mail is sent using SMTP, the IMS system must reside on a z/OS system that has enabled MVS TCP/IP. SMTP is a standard application that is delivered with the TCP/IP stack. For optimal results, the e-mail manager should support graphics and images. With consideration for the small screen size of cellular devices, the sample text message does not include the creation of URLs. The purpose of the text message is to notify users of the occurrence of the abend.



## Benefits

- The IMS Abend Search and Notification function
  - ◆ Provides
    - Timely and automatic notification of IMS system problems
    - Quick access to explanation of the error and possible causes
    - Quick and direct access to IBM-supplied diagnostics
  
  - ◆ Facilitates problem determination
    - Inclusion of links that are of interest to the problem
  
  - ◆ Reduces problem resolution time



## System Enhancements

- System Definition and Execution Parameter Changes
- Selective Display of System Parameters
- Virtual Storage Constraint Relief
- Sysplex Serial Program Management
- Enhanced Log Record Statistics
- Large Sequential Data Set Support
- System Utilities Enhancements
- BPE External Trace
- Abend Search and Notification

# Dynamic Resource Definition (DRD)



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## Dynamic Resource Definition (DRD) Overview

- DRD provides type-2 commands to create, delete or update database, program, transaction and routing code definitions in an online IMS system
  - ◆ CREATE
    - Add the IMS control block representing the resource to the online IMS environment
  - ◆ DELETE
    - Remove the IMS control block from the IMS environment
  - ◆ UPDATE
    - Change the attributes of the resource
- Definitions are "permanent"
  - ◆ They are written to the IMS log and restored on warm and emergency restarts
  - ◆ They may be exported and imported from a Resource Definition Data Set (RDDS)
    - EXPORT – at IMS system checkpoint time
    - IMPORT - during IMS cold start
- QUERY commands may be used to show definitions

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DRD is implemented with new and enhanced type-2 commands. The CREATE command is used to add (create) a new resource control block in a running IMS environment. The DELETE command is used to delete existing control blocks. The UPDATE command is used to update resource attributes.

The definitions added by DRD are typically permanent. They are always permanent across warm and emergency restarts. All definitions are written to the IMS log. This includes those created by the system definition (sysgen) process and those created by DRD. When an IMS system is warm started or emergency restarted, these definitions are read from the log. Definitions added by DRD may be permanent across cold starts. They may be exported for use by subsequent cold starts. Exports are done as part of system checkpoints. They are written to Resource Definition Data Sets (RDDS). When a cold start is done, IMS optionally reads the definitions from an RDDS. We will see later that the use of RDDSs is optional. If they are not used, cold starts will not restore definitions added by DRD.

Finally, QUERY commands may be used to show all resources including those created or updated by DRD.



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## Environment for DRD

- Required
  - ◆ IMS PROCLIB members with DRD enablement parameters
    - DFSDFXxx (new in IMS V10)
  - ◆ Common Service Layer with SCI and Operations Manager (OM)
    - Resource Manager (RM) is not required
  - ◆ OM client for entering DRD commands
    - SPOC, IMS Control Center, or other OM interface
- Optional, but recommended
  - ◆ Data sets to hold resource definitions
    - Resource Definition Data Sets (RDDSs)
- Alternative to Online Change for MODBLKS
  - ◆ If DRD is enabled, online change cannot be used for MODBLKS

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You must define DRD to IMS by including DRD parameters the new DFSDFXxx PROCLIB member.

Since type-2 commands are used, you must have a Common Service Layer (CSL) including SCI and OM. RM is not required. You also must have an OM client through which you may enter the commands. This can be the IMS TSO SPOC, the IMS Control Center, or any other OM client.

RDDS data sets are recommended. They are used for exporting and importing definitions across IMS cold starts. They also may be used by the extract utility to move the definitions to another system.

DRD is supported in all IMS environments, including DB/DC, DBCTL, and DCCTL. It is also supported in a data sharing environment and a shared queues environment. Care must be taken in a multi-IMS environment to define resources consistently across all IMSs

When DRD is implemented, online change cannot be used for MODBLKS. Online change remains available for ACBLIB and FORMAT.

When DRD is fully implemented, there is no longer a need for a MODBLKS system definition. MODBLKS system definitions may be used when DRD is implemented, but you may choose to eliminate it and define all MODBLKS resources (programs, transactions, routing codes, and databases) using DRD commands. The MODBLKS libraries associated with the system definition and online change processes may be deleted when only DRD is used to define these resources.



## Defining Resources with DRD

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## Resources

- IMS resources defined by DRD

RESOURCE TYPE	SYSGEN MACRO	CONTROL BLOCK
Database	<b>DATABASE</b> (DB/TM, DBCTL)	<b>DDIR</b> (Database Directory)
Application Program (PSB)	<b>APPLCTN</b> (DB/TM, DBCTL, DCCTL)	<b>PDIR</b> (Program Directory)
Transaction	<b>TRANSACT</b> (DB/TM, DCCTL)	<b>SMB</b> (Scheduler Message Block)
Routing Code	<b>RTCODE</b> (DB/TM, DCCTL)	<b>RCTE</b> (Routing Code Table Entry)

- ◆ The control blocks created with DRD are the same as those created by system definition macros
- Terminology
  - ◆ *Runtime resource definitions* - internal control blocks that IMS maintains and uses
  - ◆ *Stored resource definitions* - information stored offline such as in an RDDS or MODBLKS

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The resources that may be defined by DRD are shown here. The control blocks are the same as those that are created by the system definition process.

IMS publications use two new terms to describe the difference between definitions that IMS uses while running versus those that are stored outside of a running IMS system.

- Runtime resource definitions - these are the internal control blocks that IMS maintains and uses
- Stored resource definitions - this is resource information stored offline such as in an RDDS or MODBLKS

These are new terms, however, they describe a difference that has always existed in IMS. For example, the MODBLKS data set contains stored resource definitions that IMS uses to create runtime resource definitions when it is executed. The new terms are not limited to use with DRD.

## Commands Used in DRD

- Type-2 commands entered through OM interface to
  - ◆ CREATE, UPDATE, DELETE, and QUERY resources and descriptors

Command	Short Form	Purpose
CREATE	CRE	Creates definitions
DELETE	DEL	Deletes definitions
UPDATE	UPD	Updates definitions
QUERY	QRY	Queries definitions

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There are four commands used with DRD.

- CREATE – This command is used to create definitions
- DELETE – This command is used to delete definitions
- UPDATE – This command is used to update definitions
- QUERY – This command is used to show definitions

The commands may have other uses. For example, the UPDATE command may be used to change a status and the QUERY command may be used to show a status. Statuses are discussed later.

## Resource Attributes and Statuses

- Attributes are defined for a resource
  - ◆ Example macro from System Definition

```
DATABASE DBD=ACCTMSTR,RESIDENT,ACCESS=UP
```
  - ◆ Example command with DRD

```
CREATE DB NAME(ACCTMSTR)SET(RESIDENT(Y),ACCTYPE(UPD))
```
  - ◆ RESIDENT and UPDATE access are attributes of the ACCTMSTR database
  
- Statuses are set or changed during execution of the system
  - ◆ Examples of commands

```
/STOP TRAN ABC
/DBR DB ACCTMSTR
```
  - ◆ Example of IMS changing a status
    - IMS stops a transaction if the application abends

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Resources have attributes and statuses.

Attributes are defined for a resource. They are specified either on a system definition macro or on a DRD command.

Statuses are not part of definitions. They indicate the current availability of a resource. For example, a transaction or database may be stopped or started. The /STA DB, /STOP DB, /DBD DB and /DBR commands are examples of commands that change the status of a database. IMS may change the status of a resource without a command. For example, when an application program abends IMS may stop the transaction.

## CREATE Command

- Creates resource definitions or descriptors
  - ◆ Programs, transactions, routing codes, and databases
    - Appropriate attributes for each resource type may be set or defaulted
    - SET used to specify attribute values
- Examples:

```
CREATE PGM NAME(PGM1) SET(RESIDENT(Y))  
  
CREATE TRAN NAME(TRN1) SET(PGM(PGM1) CLASS(4))  
  
CRE      DB NAME(DB001) SET(RESIDENT(Y))
```

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The CREATE command is used to create program, transaction, routing code and database definitions. It is also used to create descriptors for these resources, Descriptors are explained on the next page. The NAME parameter is used to specify the name of the resource or descriptor. You use the SET parameter to set the attribute values. Of course, default values may be used for any or all of the attributes. CREATE may be abbreviated to CRE.

## Descriptors

- A model for creating a resource or another descriptor
  - ◆ May be referenced in CREATE command with the LIKE parameter
  - ◆ Establishes defaults for attributes not SET in CREATE command
- IMS-defined descriptors
  - ◆ Provided with the IMS product
- User-defined descriptors
  - ◆ Defined by the user with CREATE commands
- Current system default descriptor
  - ◆ Each resource type will have one current default descriptor
    - IMS-defined or user-defined

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A descriptor is a model or template (you will probably see both terms being used) that can be used by the user to define default attributes for resources being created. You can even use a descriptor as a model in creating another descriptor.

IMS provides four descriptors with the product – one for each resource type. Unless the user creates a descriptor with the DEFAULT(Y) attributes, these IMS descriptors are the “current system default descriptors.” The user may create a descriptor which can be specified in the CREATE command or can be set as the current default descriptor, replacing the IMS-defined descriptor. Whichever one is the default is used when the CREATE command does not SET all attributes.

## CREATE Command with LIKE Parameter

- LIKE parameter uses default attributes from another resource or descriptor
  - ◆ Examples:

```
CRE PGM NAME(PGM1) SET(RESIDENT(Y))
CRE PGM NAME(PGM2,PGM3) LIKE(RSC(PGM1))

CRE TRAN NAME(TRN1) SET(PGM(PGM1) MAXRGN(5)
    PARLIM(6) CLASS(4))
CRE TRAN NAME(TRN2,TRN3) LIKE(RSC(TRN1)
    SET(PGM(PGM23)))

CRE TRANDESC NAME(TRNCONV) SET(PGM(PGM1)
    CLASS(1) PARLIM(3) CONV(Y) SPASZ(2000))
CRE TRAN NAME(TRN5) LIKE(DESC(TRNCONV)
    SET(PGM(PGMC1) CLASS(5)))
```

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The LIKE parameter may be used to specify a model for the resource or descriptor being created. LIKE refers either to another resource of the same type or to a descriptor for the type. When LIKE is used the new attributes for the new resource or descriptor have the same values as the referenced resource or descriptor unless they specified with the SET parameter. The LIKE parameter allows you to use defaults other than those in the default descriptor.

The first two pairs of commands shown on this page show how the LIKE parameter may refer to another resource. The last pair of commands show how the LIKE parameter may refer to a descriptor.

## IMS-defined Descriptor

- IMS-defined descriptors
  - ◆ Provided with the IMS product – one for each resource type
    - Database descriptor           DFSDSDB1
    - Program descriptor           DFSDSPG1
    - Transaction descriptor       DFSDSTR1
    - Routing Code descriptor      DBFDSRT1
  - ◆ Define default attributes for resource types
    - When not specifically SET in CREATE command
    - When user-defined descriptor not set as default descriptor
- IMS-defined descriptors cannot be deleted or updated

*IMS-defined descriptor attribute values are shown in the appendix to this section.*

These are the four IMS-defined descriptors. They have similar names with two letters identifying the resource type to which the descriptor applies. These are DFSDSxx1, where xx is DB, PG, TR, or RT. These IMS descriptors cannot be updated or deleted except to make it the default if you have previously made a user-defined descriptor the default and want to go back to the IMS descriptor.

## User-defined Descriptor

- Descriptors created by users
  - ◆ Every descriptor has a value for every attribute
    - If not SET in CREATE command, attribute value defaults to value in current default descriptor

```
CREATE TRANDESC NAME(TRND001)
SET(PGM(PGM1) CLASS(1))
```

- ◆ A descriptor may become the default descriptor
  - DEFAULT(Y) parameter on CREATE or UPDATE command

```
CREATE TRANDESC NAME(TRND001)
SET(PGM(PGM1) CLASS(1)) DEFAULT(Y)
```

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You can have as many user-defined descriptors as you like. User descriptors are created, updated, and deleted just like resources. They have the same attributes as resources. If, when creating a user descriptor, you do not SET the value of the attribute, then it will default to whatever that value is in the current default descriptor for that resource type.

When a user descriptor is created, you may make it the default descriptor by including the parameter DEFAULT(Y). Or, you may later make it the default using an UPDATE command.

The keyword for creating, updating, deleting, or querying descriptors are DBDESC, PGMDESC, TRANDESC, and RTCDESC. In the first example on this slide, the user has created a transaction descriptor named TRND001 with an attribute of CLASS(1). The program PGM1 will be invoked for transactions created with this descriptor unless this is overridden when they are created. The other attributes for TRND001 will be taken from whatever the current default transaction descriptor is, perhaps DFSDSTR1.

In the second example, the same descriptor is created, but it has been made the default transaction descriptor.

## UPDATE Command

- Updates existing resource definitions or descriptors
  - ◆ Resource may have been defined by system definition macro
- Examples:

```
UPDATE PGM NAME(PGM1) SET(RESIDENT(N))  
  
UPD     TRAN NAME(TRN1,TRN2) SET(PARLIM(4) MAXRGN(2))  
  
UPD     TRANDESC NAME(TRANCONV) SET(SPASZ(3000))  
  
UPD     TRANDESC NAME(TRND002) DEFAULT(Y)
```

- Cannot update attribute and status in the same command
  - ◆ The following command is not allowed:

```
UPD TRAN NAME(UJW001) START(SCHD) SET(MAXRGN(3))
```

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The UPDATE command is used to update resources and descriptors. The parameters used with the CREATE command are also used with the UPDATE command. In the first example, the resident attribute for program PGM1 is set off. In the second example, the PARLIM and MAXRGN values for transactions TRN1 and TRN2 are changed. In the third example the SPASZ value of the TRANCONV transaction descriptor is changed. In the last example, the TRND002 transaction descriptor is made the default transaction descriptor.

An UPDATE command cannot update both an attribute and a status. The UPD TRAN command for transaction UJW001 attempts to change the status of to "start scheduling" and to the MAXRGN attribute to 3. This is invalid. The command will be rejected.

## DELETE Command

- Deletes existing resource definitions or descriptors
  - Cannot delete resources which are in use
- Examples:

```
DELETE PGM NAME(PGM1 )  
  
DELETE TRAN NAME( TRN1 , TRN2 )  
  
DEL      TRANDESC NAME( TRANCONV )
```

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The DELETE command is used to delete existing resource definitions and descriptors.

To delete a database definition, it must not be in use. It cannot be allocated to the system. In addition, it cannot be referenced by the PSB for any program (PDIR) that is defined in the system.

To delete a program definition, it must not be in use. It cannot be currently scheduled. There cannot be any transactions defined that invoke this program. For FP(E) programs, there cannot be any routing codes that are associated with the program.

To delete a transaction definition, there must not be any instances on the local queue. You should stop queuing, release suspended transactions, and drain the queues. When the queues are empty, stop scheduling and exit all conversations. With shared queues, you may delete a transaction for which there are instances on the shared queues. Obviously, you should be careful about deleting such a transaction for all of the systems in the IMSplex.

To delete a routing code, it must not be active in any IFP region. You do not have to delete routing codes created by IMS for an FPE transaction. Deleting the transaction will also delete the routing code.

The first example deletes program PGM1. The second example deletes transactions TRN1 and TRN2. The third example deletes the TRANCONV transactions descriptor.

## Quiescing for UPDATE and DELETE Commands

- IMS will not delete a resource which is in use
  - ◆ If work is in progress for resource, command will fail
- IMS will not update certain attributes of a resource which is in use
  - ◆ For example, CONV parameter cannot be changed for a transaction
    - If work is in progress for the transaction, command will fail
  - ◆ On the other hand, PARLIM can be changed while a transaction is in use
    - If work is in progress for the transaction, command will succeed
- You may want to stop the resource before you attempt to update or delete it
  - *Command Reference* publications have complete instructions under "Usage notes" for each command

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IMS will not allow you to delete a resource which is in use. If you attempt to do so, the command will fail.

When a resource is in use, some attributes can be updated and some cannot. For example, you can change the following with an UPDATE TRAN command without stopping the transaction: CLASS, CPRI, LCT, LPRI, MAXRGN, NPRI, PARLIM, PLCT, SEGNO, and SEGSZ. On the other hand you cannot change AOCMD, CMTMODE, CONV, DCLWA, DIRROUTE, EDITRTN, EDITUC, EMHBSZ, FP, INQ, MSGTYPE, MSNAME, PLCTTIME, PGM, RECOVER, REMOTE, RESP, SERIAL, SIDL, SIDR, SPASZ, SPATRUNC, TRANSTAT, or WFI while the transaction is in use. The Command References publications contain complete instructions for the use of these commands and when resources must be stopped under the heading "Usage notes" for each command.

When updating or deleting a resource, IMS quiesces the resource (set a quiesce flag) to prevent other commands from coming in and changing the resource at the same time.

## QUERY Command to Show Attributes

- Queries resource definitions or descriptor definitions
  - ◆ Including attributes defined with SET(...) parameter on CRE or UPD command
- Examples:

```
QUERY PGM NAME(PGM1) SHOW(BMPTYPE,RESIDENT)
QRY   TRAN NAME(TRN1,TRN2) SHOW(ALL)
QRY   TRANDESC NAME(TRANCONV) SHOW(ALL)
```

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QUERY commands may be used to show attributes of resources and descriptors. The SHOW parameter may specify attributes to be shown or SHOW(ALL) may be used to show all of the attributes.

In the first example, only the BMPTYPE and RESIDENT attributes will be returned in the response.

In the second example, all attributes of transactions TRN1 and TRN2 will be returned.

In the third example, all attributes of the TRANCONV transaction descriptor will be returned.



# IMS Restarts

## Restoring Definitions on Restarts

- IMS logs all definitions
  - ◆ All resource and descriptor definitions are written during system checkpoints
  - ◆ CREATE, UPDATE, and DELETE commands are logged
- Definitions are restored during warm and emergency restarts
  - ◆ IMS reads all resource and descriptor definitions from the log
    - Built from system checkpoint and command log records
- Definitions may be restored during cold starts
  - ◆ Resource and descriptor definitions may be exported and imported
    - Export writes definitions to a Resource Definition Data Set (RDDS)
    - Import reads definitions from RDDS for cold starts
- Definitions are lost across cold starts if export and import are not used

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IMS logs all resource and descriptor definitions during system checkpoints. If any changes are made by commands the commands are logged.

When a warm start is done, the definitions are restored from the shutdown checkpoint. When an emergency restart is done, the definitions are restored from the last system checkpoint and updated from the log records for any commands.

Resource Definition Data Sets are optional. When they are used, all definitions are written to one of them during the restart of the IMS system. If any changes are made to the definitions, all definitions are written to another RDDS during the next system checkpoint. During an IMS cold start, when DRD is enabled, you can import resource and descriptor definitions from an RDDS or from the active MODBLKS library. Or, you can choose not to import any definitions. In this case, you would have to define all your resources dynamically using the CREATE command.

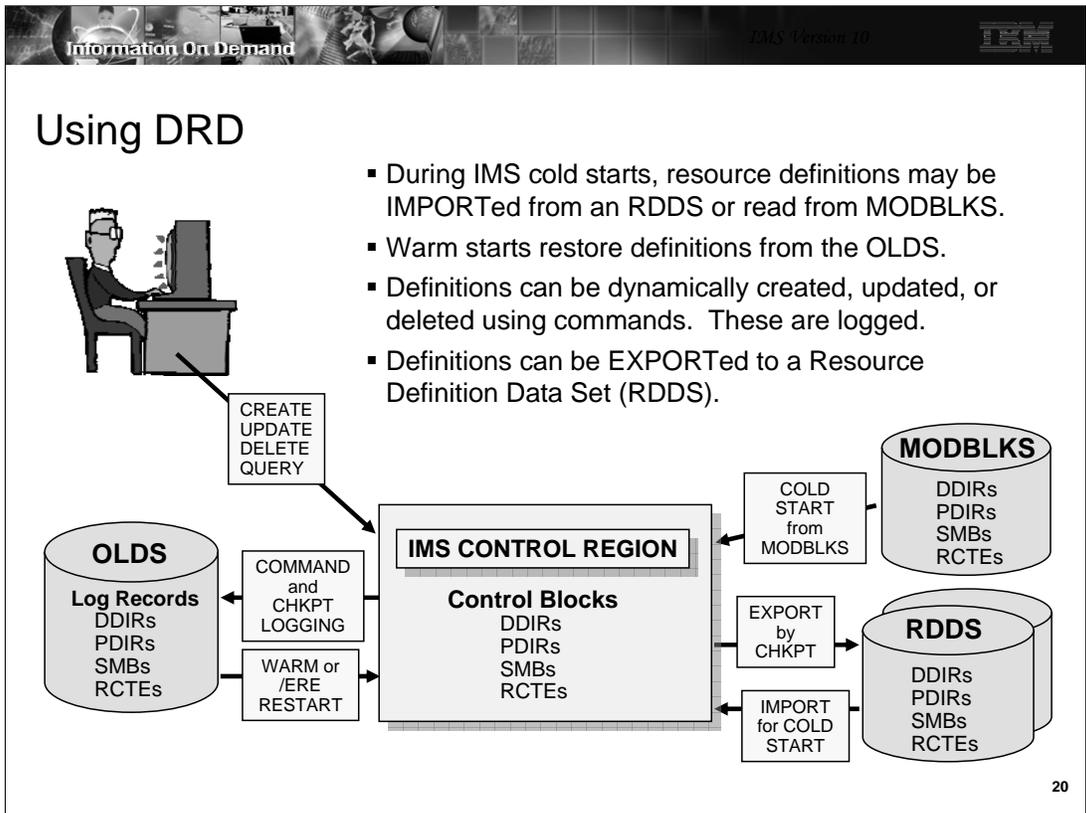
## Resource Definition Data Sets

- Set of BSAM data sets containing definitions of resources and descriptors
  - ◆ Used in a “round-robin” fashion
- Each IMS has its own set of RDDSs
  - ◆ Cannot be shared across IMSplex
- Target for “exporting” definitions during system checkpoint
  - ◆ All definitions are exported during initialization checkpoint
  - ◆ If any definitions have changed between later system checkpoints, all definitions are exported
- Source for “importing” definitions
  - ◆ Load resource and descriptor definitions

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The Resource Definition Data Sets are a set of BSAM data sets used by IMS to export resource and descriptor definitions and import these definitions. A minimum of two is required, but more may be defined. They are used in a round-robin fashion with the most recent one never being the target of an EXPORT. IMS does not write over the last good set of definitions because a write error could destroy the last good copy of the definitions.

Each IMS has its own set of RDDSs. They are not shared by multiple IMSs. Each RDDS has a header record which identifies the IMS which initialized it. We will discuss the RDDSs in more detail later.

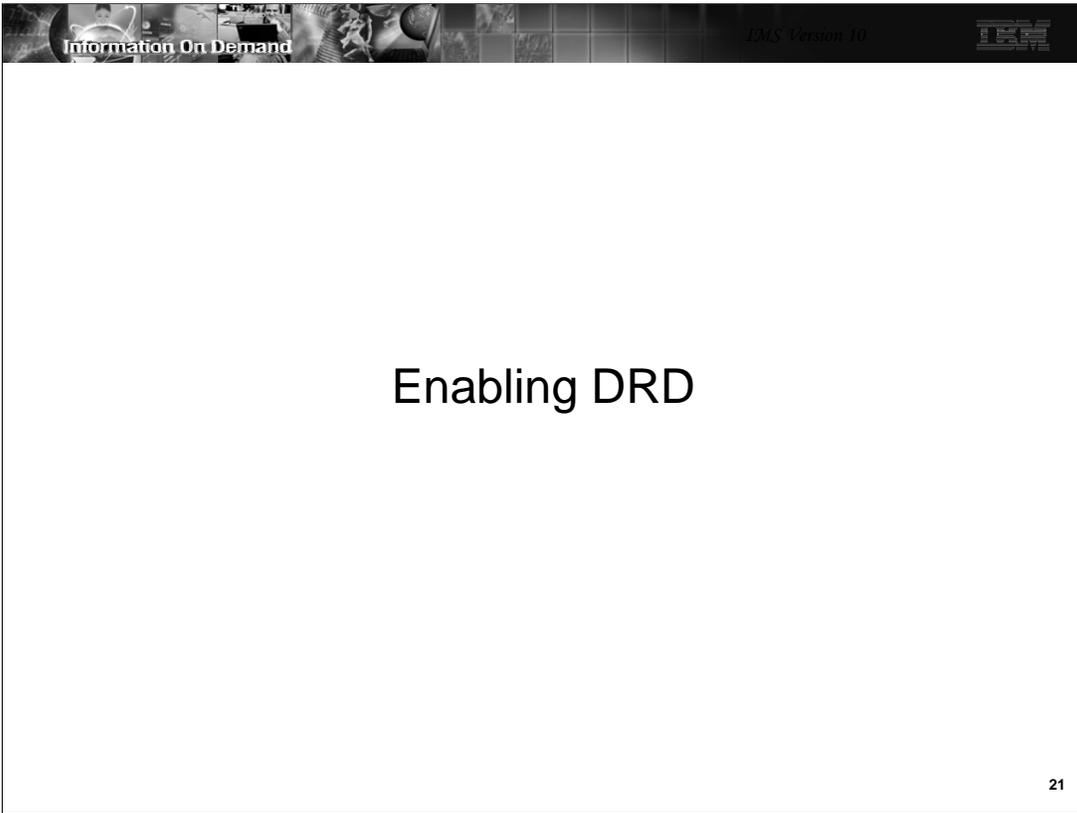


During an IMS cold start, IMS imports (loads) all of its resource definitions. In a non-DRD environment, these are always from the active MODBLKS library as determined by MODSTAT or OLCSTAT. In a DRD environment, IMS may “import” resource definitions from MODBLKS, or both resource and descriptor definitions from a new type of data set called the Resource Definition Data Set (RDDS). The process is called AUTOIMPORT and where the definitions are loaded from is determined by an execution time option in DFSDFxxx. MODBLKS, of course, does not contain any descriptors.

During an IMS warm start, definitions are rebuilt from the restart checkpoint on the OLDS. During an IMS emergency restart, definitions are rebuilt from the checkpoint log records plus additional log records created when the attributes or status of those definitions are changed. This is true for both DRD and non-DRD systems.

After restart is complete, in a DRD system, all definitions are “exported” to an RDDS (enabling them to be imported again at the next cold start). This process is called AUTOEXPORT and occurs at every system checkpoint, including the initialization and shut down checkpoints. Definitions are also logged during system checkpoint for restart purposes.

During execution, an operator using the OM interface may enter commands to create, update, or delete resource and descriptor definitions and status. CREATE and DELETE are available only in a DRD environment. UPDATE is available in either environment, although it is not as complete in terms of what can be updated. These updates are also logged for use during restart.



This section describes how to enable DRD.

## PROCLIB Members

- DFSPBxxx
  - ◆ **CSLG=xxx**
    - Suffix to DFSCGxxx – CSL proclib member
  - ◆ **DFSDF=xxx**
    - Suffix to DFSDFxxx – IMS Definition proclib member – new in V10
- DFSCGxxx
  - ◆ This proclib member can be replaced with CSL section of DFSDFxxx
  - ◆ CSL proclib member
    - DRD requires a CSL environment with SCI and OM; RM not required

◆ **MODBLKS=DYN**

- Enables DRD

MODBLKS= parameter may be specified in DFSCGxxx or DFSDFxxx member

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The CSLG=xxx parameter in DFSPBxxx points to the CSL global proclib member (DFSCGxxx) and the DFSDF=xxx parameter points to the IMS System Definition proclib member which is new in IMS Version 10.

The entire contents of the CSL member can be moved to the CSL section of DFSDFxxx. If both DFSCGxxx and a CSL Section in DFSDFxxx exist, the DFSCGxxx member takes precedence. It is therefore necessary to remove the CSLG parameter from DFSDFxxx if you are coding a CSL section in DFSDFxxx.

DFSCGxxx contains the new parameter MODBLKS=DYN which enables DRD. MODBLKS defaults to MODBLKS=OLC. When MODBLKS=DYN is specified, online change cannot be used for the resources stored in MODBLKS (programs, transactions, routing codes, and databases). Online change for ACBLIB and FORMAT may be used with either MODBLKS=OLC or MODBLKS=OLC.

## PROCLIB Members

- DFSDFxxx
  - ◆ New “IMS Definition” PROCLIB member
    - **DFSDF=xxx** in DFSPBxxx
  - ◆ Divided into Sections
    - <**SECTION=COMMON\_SERVICE\_LAYER**>
      - May define **MODBLKS=** and CSL parameters as alternative to DFSCGxxx
        - If both exist, DFSCGxxx parameters override DFSDFxxx parameters
      - MODBLKS=DYN**
        - Enables DRD
    - <**SECTION=DYNAMIC\_RESOURCES**>
      - Defines DRD parameters

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DFSDFxxx is a new proclib member in IMS Version 10. It is required for DRD but can also be used in place of DFSCGxxx and DFSSQxxx. The user may define four sections in this member.

DRD is enabled by specifying MODBLKS=DYN in the COMMON-SERVICE\_LAYER section.

If MODBLKS=DYN is coded in the CSL section, the Dynamic Resources section defines all the DRD parameters .

## DRD Section of DFSDFxxx

- Parameters in DFSDFxxx determine the automatic import and export functions of DRD

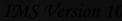
```
<SECTION=DYNAMIC_RESOURCES>
  RDDSDSN=( dsn1 , dsn2 , . . . )
  AUTOEXPORT=AUTO | RDDS | NO
  AUTOIMPORT=AUTO | RDDS | MODBLKS | NO
  IMPORTERR=ABORT | CONTINUE
  RDDSERR=ABORT | NOIMPORT
```

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The DFSDFxxx member has multiple sections. The DYNAMIC\_RESOURCES section is used to define DRD export and import parameters.

- RDDSDSN defines the RDDS data set names. These must be defined to import from an RDDS (obviously) or to export. If defined, there must be at least two but may be more.
- AUTOEXPORT defines the option for exporting definitions at system checkpoint.
- AUTOIMPORT defines the option for importing definitions at IMS cold start
- IMPORTERR determines what action to take if IMPORT fails for other than an allocation or read error
- RDDSERR determines what action to take if there is an allocation or read error

The meanings of these parameters will be discussed in the next several slides.


## Resource Definition Data Sets (RDDS)

**RDDSDSN=( dsn1 , dsn2 , . . . )**

- Defines the RDDSs to IMS
  - ◆ A set of BSAM data sets that contain MODBLKS resource and descriptor definitions for one IMS
    - None or a minimum of 2 RDDSs must be defined
      - IMS abends during initialization with U0071 if only 1 defined
    - Each IMS has its own set of RDDSs
      - Header record contains IMSID and last update timestamp
    - Dynamically allocated by IMS when needed
      - Must be predefined and cataloged
        - Variable blocked with block size up to 32760
        - **DCB=( RECFM=VB , BLKSIZE=32760 , LRECL=32756 )**
    - Size requirements are about 1.5 times the size of MODBLKS data set

RDDSDSN defines the RDDS data set names to IMS. For example, they might be defined as:

```
RDDSDSN=( IMS10.RDDS1 , IMS10.RDDS2 , IMS10.RDDS3 , IMS10.RDDS4 )
```

Technically they do not have to be defined to a DRD system, however, if they are not, then IMS cannot import or export definitions. IMS can import from MODBLKS but cannot export, meaning everything that changes cannot be restored during a cold start. If you do define RDDSDSN, then you must define at least two. IBM recommends at least three so that you have a spare in case of an RDDS error. If you define only one, IMS initialization will abend with a U0071.

Each RDDS is pre-allocated as a BSAM data set. When IMS initialization opens these data sets for the first time, it will create a header record with its own IMSID (the RDDSs are not shared by multiple IMSs). As EXPORT writes to these data sets, the export time (last update time) is also written in the header record.

IMS dynamically allocates these data sets using the data set names in this parameter. Therefore they must also be cataloged. The block size of the RDDS may be up to 32760. It is a variable blocked sequential data set. Sample DCB parameters are shown for the maximum block size. The size of each RDDS should be about 1.5 times the size of one of your MODBLKS data sets. Larger would be wise if you intend to add many new definitions.



## Exporting Resource and Descriptor Definitions

**AUTOEXPORT=**AUTO | RDDS | NO

### **AUTO** (default)

- Export all resource and descriptor definitions to oldest RDDS
- When export completes, a message is issued identifying the RDDS used
  - DFS3371I SUCCESSFUL AUTOMATIC EXPORT TO RDDSDSN=dsn
- No export if no RDDSs are defined
  - DFS3374I AUTOMATIC EXPORT DISABLED

### **RDDS**

- Same meaning as AUTO

### **NO**

- Definitions not exported to RDDS

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AUTOEXPORT defines what IMS is to do at all IMS checkpoints.

AUTO and RDDS have the same meaning. Definitions will be exported to the oldest RDDS (the one with the oldest time stamp in the header record).

During system checkpoint, definitions are exported only if at least one of them has changed (created, deleted, updated) since the last export. The exceptions to this are that export always occurs during the initialization checkpoint. When export does run, ALL definitions are exported, even those that didn't change.

If export fails trying to write to one, it will try another but will NOT try writing to the most recent. This would be overwriting the latest definitions and failure there could pose significant problems. If only one is available (that is, it can't write to another RDDS), then IMS will issue a DFS3372E AUTOMATIC EXPORT FAILED, RC=8 message.

If you specify AUTOEXPORT=AUTO or RDDS, and no RDDSs have been defined, IMS initialization will abend with a U0071.

## Export Errors

- If an RRDS error occurs during export processing
  - ◆ IMS issues a DFS3368E message with appropriate reason code
    - DFS3368E ERROR PROCESSING RDDS, RC=rc, RDDSDSN=dsn
  - ◆ Continues with next available RDDS
  
- If RDDSs are defined but none are available
  - ◆ IMS issues a DFS3370E message
    - DFS3370E NO SYSTEM RESOURCE DEFINITION DATA SETS ARE AVAILABLE FOR AUTOMATIC EXPORT
      - Message highlighted on console – deleted when successful export
    - Redefine and allocate bad RDDSs
  - ◆ Export processing suspended until next checkpoint
  - ◆ Try again at next checkpoint

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If an error occurs during export processing, IMS will attempt exporting to the next available RDDS. Message DFS3368E identifying the bad RDDS and a reason code is issued.

If there are no RDDSs available for export (remember, the latest one will not be used), IMS will abort export processing and issue message DFS3370E.

In either case, the user should delete and reallocate the bad RDDS

## Importing Definitions for Cold Start

**AUTOIMPORT=**AUTO | RDDS | MODBLKS | NO

### **AUTO** (default)

- ◆ Import resource and descriptor definitions from most recent RDDS if
  - Two or more system RDDSs are defined
  - And - all the defined RDDSs can be allocated and read
  - And - at least one of the RDDSs contains valid definitions
- ◆ Import resource definitions from active MODBLKS data set in JCL if
  - No system RDDSs are defined in DFSDFxxx
  - Or - all of the defined system RDDSs are empty
  - MODBLKS suffix is determined by OLCSTAT or MODSTAT
- ◆ Automatic import is not performed if
  - Two or more system RDDSs are defined, but IMS cannot allocate and read all of them
    - IMS action depends on RDDSERR parameter
  - Or - no RDDSs are defined and no MODBLKS data set is defined

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AUTOIMPORT defines what IMS is to do during cold start. AUTOIMPORT is invoked only during IMS cold start. Warm and emergency restart load control blocks from the logs. Options are to import (load) definitions from MODBLKS, from the most recent RDDS, or to not load them at all. If they are loaded from MODBLKS, then MODSTAT or OLCSTAT is used to determine which library (A or B) to use. Care must be taken to ensure the correct version of MODBLKS is being used.

AUTO is the default for AUTOIMPORT and is recommended. AUTO lets IMS decide from where to import the definitions. When AUTO is used IMS will import from the most recent RDDS if it can be determined and it contains definitions. If all of the RDDSs cannot be read, the most recent RDDS cannot be determined. If there are no RDDSs or they are all empty, definitions will be read from MODBLKS. The MODBLKS suffix is determined the same way it is without DRD. If there are RDDS data sets, but one or more cannot be read definitions are not loaded from either an RDDS or MODBLKS. What IMS does depends on the IMPORTERR parameter. If there are no RDDS or MODBLKS data sets defined, definitions are not loaded.

If any transaction definitions include Transaction Edit Routines, they are also loaded at this time.

## Importing Definitions for Cold Start

**AUTOIMPORT=**AUTO | RDDS | MODBLKS | NO

### RDDS

- ◆ Import resource and descriptor definitions from most recent RDDS
  - Same conditions as AUTO except will not import from MODBLKS if all defined RDDSs are empty

### MODBLKS

- ◆ Import resource definitions from MODBLKS data set in JCL
  - MODBLKS suffix is determined by MODSTAT or OLCSTAT

### NO

- ◆ Do not import definitions from either RDDS or MODBLKS
  - All resources have to be created dynamically

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If AUTOIMPORT equals RDDS or MODBLKS, IMS will import from whichever is specified but the same conditions apply as for AUTO.

If AUTOIMPORT=NO, then IMS will come up without any MODBLKS resources defined. If this happens, then all definitions would have to be dynamically created. This might be OK for a test system, but probably not for production.

## Import Errors

### **RDDSERR=ABORT | NOIMPORT**

- ◆ Specifies action to take if IMS cannot allocate and read all defined RDDSs
  - I/O error, allocation error, etc.

#### **ABORT**

- IMS cold start terminates with U3368 abend
- Message indicates reason

#### **NOIMPORT**

- Cold start completes but no resources defined

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RDDSERR determines the action IMS will take in the event of an error trying to allocate or read the RDDSs – for example, if there is a read error. It does NOT apply if the RDDS is successfully read but there are errors in the definitions.

One option is to ABORT with a U3368 abend. Messages will indicate the cause of the failure. The other option is to continue without importing. This is similar to the AUTOIMPORT=NO option.

## Import Errors

### **IMPORTERR=ABORT | CONTINUE**

- ◆ Specifies action to take due to invalid resource or descriptor definition or failure to load Transaction Input Edit Routine
  - This is a “should not happen” error

#### **ABORT**

- IMS cold start terminates with U3397 abend
- Message identifies resource(s) with bad definitions

#### **CONTINUE**

- Resource in error marked bad and given NOTINIT status
- Must manually correct error after restart completes (CREATE or UPDATE)

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IMPORTERR says what to do if some definitions are imported but later determined to be invalid (a “should not happen” condition) or if a transaction definition specifies a Transaction Input Edit routine and that edit routine cannot be loaded. Again, there are two options:

-ABORT causes IMS to abend with a U3397. DFS3398E identifies the “bad” definitions.

-CONTINUE lets IMS continue without the bad definitions. They acquire a status of NOTINIT and must be corrected later with UPDATE or DELETE/CREATE.

## A Procedure to Enable DRD

- Update IMS proclib members
  - ◆ DFSCGxxx (set MODBLKS=DYN)
  - ◆ DFSDFxxx (define RDDSDSNs, set other DRD parameters – AUTOIMPORT=AUTO)
- Define and catalog RDDSDSNs
  - ◆ DSNs defined in DFSDFxxx
- Cold start IMS
  - ◆ Load definitions from active MODBLKS
    - RDDSDSNs will be empty
  - ◆ Exports definitions to RDDSDSNs at first system checkpoint
- Warm start and emergency restart
  - ◆ Rebuild definitions from IMS checkpoint records
- Next cold start
  - ◆ Import definitions from most recent RDDSDSN (AUTOIMPORT=AUTO)
    - RDDSDSNs no longer empty

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DRD is “enabled” simply by coding MODBLKS=DYN (meaning MODBLKS changes are dynamic – not by online change) in either DFSCGxxx or the CSL Section of DFSDFxxx. Technically it is not necessary to code any other parameters, however, if RDDSDSNs are not defined, export and importing from an RDDSDSN cannot be done. Import could only be done from MODBLKS and OLC would be disabled. Creates, updates, and deletes could be done but they couldn’t be exported.

Assuming this is not what you want, you must create a DFSDFxxx proclib member with a DRD section containing the desired RDDSDSN, AUTOIMPORT, AUTOEXPORT, and DCLWA parameters and the parameters for handling errors. Since all of these parameter except RDDSDSN have reasonable defaults, it may not be necessary to code anything except RDDSDSN.

You can then cold start IMS. Assuming AUTOIMPORT=AUTO, IMS will detect that the RDDSDSNs are empty and import the definitions from the active MODBLKS. At the completion of cold start, AUTOEXPORT=AUTO or RDDSDSN will cause IMS to export these MODBLKS definitions to an RDDSDSN.

After cold starting IMS the first time successfully, and before the next cold start, you can remove the MODBLKS DD statements from the control region JCL. This is not, however, necessary and you may want to leave them in until you are certain you will never want to import from them again.

At the next IMS cold start, the latest version of the definition in RDDSDSN will be imported. At the next warm or emergency restart, the definitions will be rebuilt from the logs.

## Processing Flow with DRD Enabled

- During IMS initialization
  - ◆ All RDDSs are dynamically allocated, opened, and read
  - ◆ Empty RDDS
    - Initialized with header record containing IMSID
  - ◆ Non-empty RDDS
    - Header records with timestamps are read and put into an array
- During IMS cold start
  - ◆ Definitions are imported from
    - MODBLKS
    - Or - RDDS with most recent export timestamp
- During IMS warm restart
  - ◆ Definitions are rebuilt from checkpoint log records
- During IMS emergency restart
  - ◆ Definitions are rebuilt from restart checkpoint plus x'22' log records

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This slide shows the general flow when DRD is enabled.

During IMS initialization:

- All RDDSs defined in DFSDFxxx are dynamically allocated and read
- If they are empty, IMS initializes them with a header record containing the IMSID
- If they are not empty, IMS builds an array in storage of the available (i.e., successfully allocated and read) RDDSs. These RDDSs will be used in round-robin fashion by export

During IMS cold start:

- Definitions are imported from the most recent RDDS or from MODBLKS

During warm start:

- Definitions are rebuilt from the checkpoint log records

During emergency restart:

- Definitions are rebuilt from restart checkpoint log records plus and updates made since that checkpoint (x'22' log records)

## Processing Flow with DRD Enabled

- After all restart types
  - ◆ All definitions are exported to RDDS (unless AUTOEXPORT=NO)
- During normal operations
  - ◆ Creates, updates, and deletes are logged (x'22')
  - ◆ User may scratch and reallocate "bad" RDDSs
- During system checkpoint (including shutdown checkpoint)
  - ◆ Resource and descriptor definitions are logged
  - ◆ If any definitions have changed since last checkpoint
    - All definitions are exported to the RDDS with the oldest (or no) export time
  - ◆ RDDS is closed and deallocated

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After any type of restart completes. AUTOEXPORT will export definitions to the oldest RDDS. These (or later exports) then become available at the next IMS cold start.

During normal operations, all creates, updates, and deletes are logged in x'22' log records. If an RDDS cannot be read, an error message is issued. You may scratch and reallocate this RDDS. This will add it back to the RDDSs that are used by IMS. You cannot add new RDDS data sets while IMS is executing. Only those defined in the DFSDFxxx member at start up will be used.

At initialization time, IMS reads the RDDSDSN parameter in the DFSDFxxx member. It opens the specified data sets and reads their headers.

At system checkpoint times, if any definitions have change since the last checkpoint, all definitions are exported to the next RDDS. The RDDS is closed and deallocated after the definitions are written to it.



# RDDS Extraction Utility

## RDDS Extraction Utility

- RDDS Extraction Utility
  - ◆ Creates Stage 1 macros or CREATE commands from definitions in RDDS
    - May be used to copy definitions to another system
    - May be used to fall back to non-DRD use
    - May be used to create documentation of system definitions
  - ◆ Stage 1 macros
    - DATABASE, APPLCTN, TRANSACT, and RTCODE macros are written
    - Does not write descriptor information
    - Does not write other stage 1 macros (IMSCTRL, IMSCTF, etc.)
  - ◆ CREATE commands
    - CREATE commands for DB, DBDESC, PGM, PGMDESC, TRAN, TRANDESC, RTC, and RTCDESC are written

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The RDDS Extraction Utility (DFSURDD0) is a batch utility which can be used to convert the resource definitions in an RDDS into either stage 1 macro statements or type-2 CREATE commands.

This provides a convenient way to take the definitions for one system and copy them to another system. It also may be used fall back from the use of DRD to the use of MODBLKS. Finally, the creation of stage 1 macros may be used as documentation of the current definitions.

If stage 1 macros are produced, descriptor information in the RDDS is not created. Of course, it only produces stage 1 macros for MODBLKS resources (DATABASE, APPLCTN, TRANSACT, and RTCODE macros).

If CREATE commands are produced, commands for creating descriptors are included.

## RDDS Extraction Utility

- Sample JCL

```
//MYJOB JOB CLASS=J,MSGCLASS=A,MSGLEVEL=(1,1)
//JOB LIB DD DSN=IMS10.SDFSRESL,DISP=SHR
//S1 EXEC PGM=DFSURDD0,MEMLIMIT=4G
//DFSRDDS DD DSN=IMS10.RDDS01,DISP=SHR
//SYSOUT DD DSN=MY.RDDS.OUTPUT,DISP=(,CATLG,DELETE),
// UNIT=SYSDA,VOL=SER=ABC001,
// SPACE=(CYL,(1,1),RLSE),
// DCB=(LRECL=80,RECFM=FB,BLKSIZE=800)
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
OUTPUT=MAC
/*
//
```

- ◆ SYSIN control statement:

- **OUTPUT=MAC** creates stage 1 macros
- **OUTPUT=CMD** creates CREATE commands
  - May be used as input to the Batch SPOC utility

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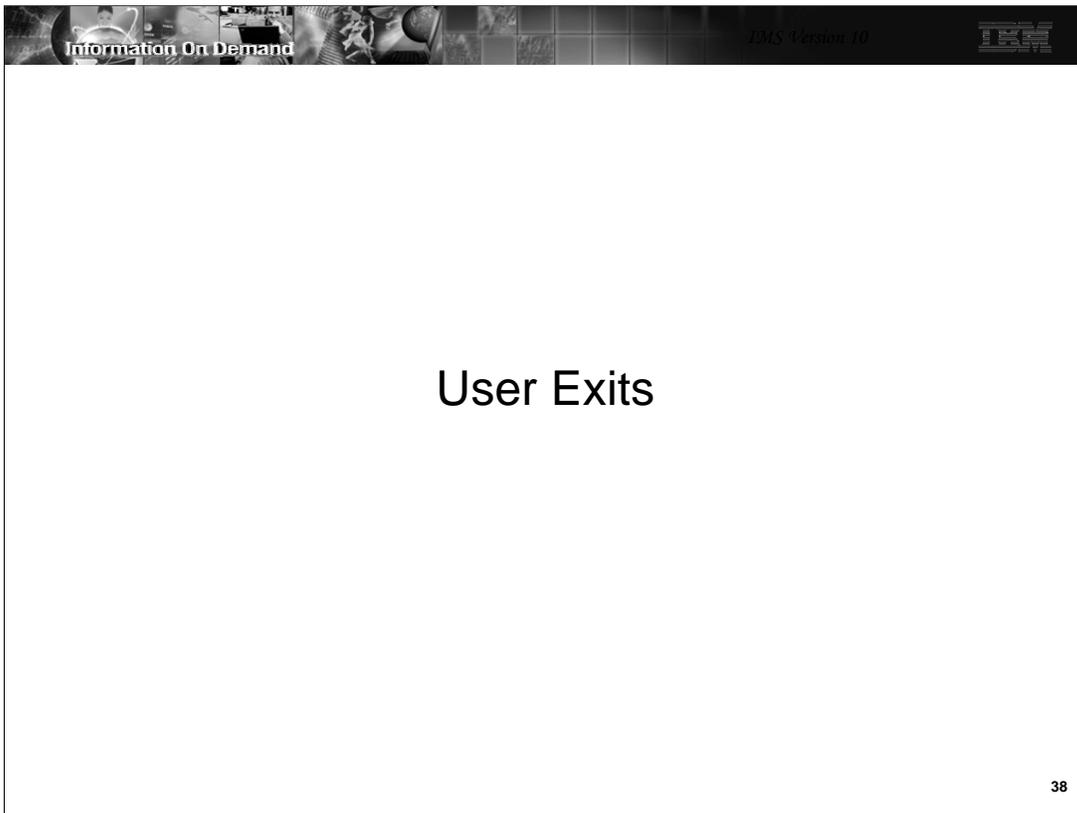
This shows sample JCL for the execution of the RDDS Extraction Utility (DFSURDD0). The utility obtains 64-bit storage. The MEMLIMIT parameter on the EXEC statement should be used to ensure that adequate storage above the bar is available for the utility. MEMLIMIT should be set to 4G or higher.

The DFSRDDS is used to specify the RDDS input data set. You are responsible for choosing the correct RDDS. Typically, this will be the one most recently written.

The output is written to the SYSOUT data set.

The SYSIN data set is used for the control statement. Either OUTPUT=MAC or OUTPUT=CMD must be specified. There is not a default.

The output with OUTPUT=CMD may be used as input to the Batch SPOC utility. This utility is new in IMS 10. It is discussed in the Operations Enhancements section.



There are some user exits affected by DRD.



## Transaction Input Edit Routines

- Defined on CREATE TRAN or UPD TRAN
  - ◆ SET(EDITRTN(name))
- If found in nucleus
  - ◆ If other transactions reference it
    - Use nucleus copy
  - ◆ If no other transactions reference it
    - Dynamically load it from STEPLIB concatenation
    - Do not use nucleus copy
  - ◆ If dynamic load fails
    - Use nucleus copy
- If not found in nucleus
  - ◆ Dynamically load it from STEPLIB concatenation
    - If load fails, CREATE or UPDATE command fails

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Transaction edit routines are defined during create or update by the SET(EDITRTN(rtn-name)). Since the name of these edit routines is not known at IMS initialization, the rules for loading it following a create or update are:

- if the edit routing is found in the nucleus and other transactions use it, use the nucleus copy
- if no other transactions reference it, load it from the STEPLIB concatenation – do not use the nucleus copy
- if it is not found in STEPLIB, then use the nucleus copy

If the edit routing is not found in the nucleus

- load it from STEPLIB
- if it fails, then the create or update command fails

## Destination Creation Exit (DFSINSX0)

- Originally called “Output Creation Exit”
  - ◆ Was ETO-only exit; then ETO and Shared Queues
  - ◆ Now called in any environment when destination is unknown
- IMS V10
  - ◆ Exit enhanced and name changed
  - ◆ When message with unknown destination arrives, exit is invoked
    - Can create transaction destination in any environment (DRD or non-DRD)
    - Can create program to process transaction (DRD only)
    - Can create LTERM destination (ETO only)
    - Can reject message
  - ◆ May also be invoked with QUEUE command
  - ◆ To enable exit, include in STEPLIB concatenation

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DFSINSX0 was originally called the Output Creation Exit and was implemented for ETO to dynamically create an LTERM destination. When shared queues came along, it was enhanced to allow the exit to also create a transaction destination. However, IMS could use this only for purposes of queuing a message to the shared queue. It could not schedule that transaction locally.

With IMS 10 the name of the exit has change to Destination Creation Exit. And it has been enhanced in terms of what it can create and for what purpose (i.e., for queuing and/or scheduling). It can create both transactions and the programs to schedule those transactions. It can also create LTERMs but only in an ETO environment.

The exit is invoked when a message with an unknown destination arrives in IMS, and also when the new QUEUE command references a TRAN or LTERM which is not defined. The exit is only invoked for messages. It will not be invoked when you attempt to execute a BMP which is not defined.

The exit can create both transactions and programs. It can create them on the IMS where the exit is invoked, on one other IMS, or on all IMSs. SCI is used to send the create requests to other IMS systems.

To enable DFSINXS0, all you have to do (besides coding it) is to include it in STEPLIB. Details for writing this exit can be found in the Exit Routine Reference.

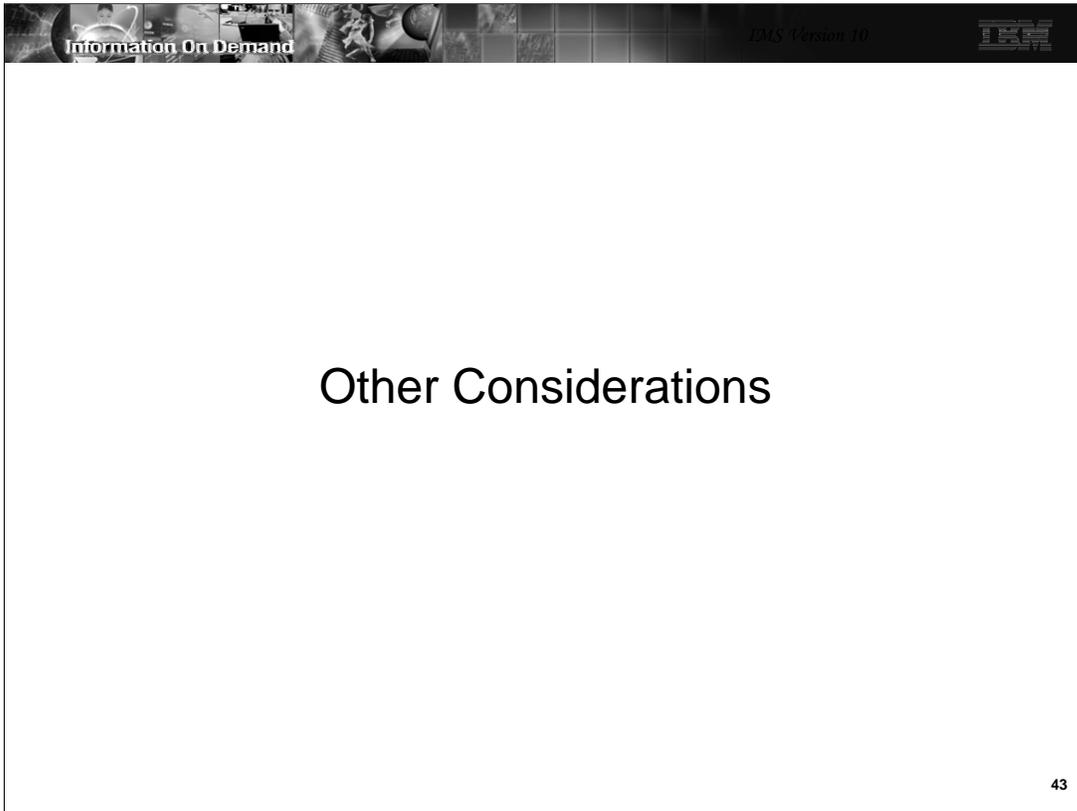
# Security

## Security Considerations

- All DRD commands are type-2 and can only be entered through the Operations Manager interface
- Command security for type-2 commands can only be performed by the Operations Manager
  - ◆ In OM Initialization proclib member (CSLOIxxx)
    - `CMDSEC=N|R|E|A`
      - N do not perform command authorization in OM (default)
      - R call RACF for authorization
      - E call user security exit for authorization
      - A call both RACF (first) and the user security exit

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All DRD commands are type-2 commands. That means they are only submitted through the OM interface. Therefore, only OM can perform authorization processing for these commands. In the OM initialization proclib member (DFSOLxxx), the CMDSEC parameter determines what type of security checking should be done for commands submitted through OM. There is not change in the regard for the DRD commands. This slide is just a quick review of what is already available.



There are some other considerations when enabling DRD.

## IMS System Generation Considerations

- DRD can eliminate the following macros from the system definition
  - ◆ DATABASE
  - ◆ APPLCTN
  - ◆ TRANSACT
  - ◆ RTCODE
    - These system definition macros may be used with DRD, but are not required
  
- IMSCTRL
  - ◆ MSVID= only applicable when using MODBLKS (not DRD)
  - ◆ Can still use /MSVERIFY command to verify MSC resource definitions

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There are a few sysgen considerations when implementing DRD, although nothing is required.

-You can eliminate the DATABASE, APPLCTN, TRANSACT, and RTCODE macros. If you do not eliminate them, their definitions will reside in the MODBLKS data set, but IMS execution will not read them from MODBLKS

-The MSC Verification ID (MSVID) is not applicable when DRD is enabled. You can, however, continue to use /MSV to verify your MSC definitions.



## Elimination of MODBLKS

- MODBLKS
  - ◆ Can eliminate //MODBLKSx DD statements and libraries
    - Resources can be dynamically created
    - Resources can be imported from Resource Definition Data Set (RDDS)

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After successfully importing from MODBLKS the first time, and exporting to an RDDS, the MODBLKS data sets can be eliminated from the control region JCL.



## Operational Considerations

- Each resource or descriptor is created, updated, or deleted individually
  - ◆ Some may be successful and some may fail
  - ◆ If successful
    - Response will have CC=0 for that resource
  - ◆ If not successful
    - Response will have CC>0 for that resource and indicate reason for failure

```
CREATE PGM NAME ( PGM1 , PGM2 )
```

PgmName	MbrName	CC	CCText
PGM1	IMS1	11	RESOURCE ALREADY EXISTS
PGM2	IMS1	0	

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Each resource or descriptor is created, updated, or deleted individually. If some fail, a non-zero return code and condition code indicate the reason for the failure of each resource. In this example, CREATE for PGM1 failed because PGM1 already existed. However, CREATE for PGM2 as successful.

## Operational Considerations

- Type-1 commands affected by DRD
  - ◆ /DIS MODIFY
    - Indicates whether DRD is enabled
  - ◆ /MOD PREPARE
    - Cannot specify MODBLKS if DRD enabled
    - “ALL” is OK – MODBLKS omitted by IMS if DRD enabled

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/DIS MODIFY indicates whether DRD is enabled or not.

/MOD PREPARE MODBLKS will fail if DRD is enabled. /MOD PREPARE ALL can be issued – the MODBLKS library be ignored.

## Operational Considerations

- Type-2 commands affected when DRD enabled
  - ◆ INIT OLC
    - TYPE(MODBLKS) returns CC=1 (not applicable)
      - TYPE(ALL) OK
  - ◆ QRY OLC
    - Does not display MODBLKS information
  - ◆ QRY MEMBER
    - Indicates whether DRD is enabled or not
      - LclAttr = DYNMODBLKS
  - ◆ QRY DB and QRY TRAN
    - Displays additional attributes
  - ◆ UPD DB and UPD TRAN
    - Can SET additional attributes

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Some type-2 commands are affected when DRD is enabled.

INIT OLC TYPE(MODBLKS) will return a completion code of 1 which indicates that it is not applicable. If the command is processed by multiple IMSs and only some have DRD enabled, the command will be processed by those IMSs without DRD and ignored by those with DRD.

QRY OLC does not display MODBLKS information if processed by a DRD system.

QRY member indicates whether DRD is enabled for the IMS processing the command. It will have a Local Attribute of DYN or MODBLKS.

QRY DB and QRY TRAN can SHOW additional attributes.

UPD DB and UPD TRAN can SET additional attributes.



## Operational Considerations

- Commands that don't work if DRD not enabled
  - ◆ CREATE DB|PGM|TRAN|RTC
  - ◆ DELETE DB|PGM|TRAN|RTC
  - ◆ UPDATE DB with SET(...)
    - Except SET(ACCTYPE(...)) and SET(LOCK(...))
  - ◆ UPDATE PGM with SET(...)
    - Except SET(LOCK(...))
  - ◆ UPDATE TRAN with SET(...)
    - Except those attributes allowed to be SET in V9 and TRANSTAT
  - ◆ All commands that reference descriptors

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These commands are disabled if DRD is enabled.

For UPD DB, you can SET ACCTYPE and SET LOCK but you cannot set RESIDENT.

For UPD PGM, you can only SET LOCK – no other attributes

For UPD TRAN, you can only SET those attributes supported by V9

And of course, and commands that reference descriptors and those that import or export definitions.

## Shared Queues Considerations

- Transactions can be updated and deleted even when message exists on the shared queue
  - ◆ Must be careful to create or update transaction to be consistent with messages on shared queue
    - For example
      - SPASZ, RESP, FP, EMHBSZ, MSGTYPE, SEGNO, SEGSZ, SERIAL, EDITRTN
  
- Programs can be created and updated when there are associated transactions on the shared queue
  - ◆ Must be careful to define program to be consistent with messages on shared queue for that program
    - FP, BMPTYPE, CONV, SERIAL

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There are some considerations when using shared queues. Most have already been discussed.

-Transactions can be created, updated, or deleted even if there are messages queued for that transaction on the shared queue. You must be careful when updating or creating a transaction in a SQ environment to set the attributes consistently across all IMSs in the SQ group.

-Programs can be created, updated, or deleted even if there are messages queued for that program on the shared queue. You must be careful when updating or creating a program in a SQ environment to set the attributes consistently across all IMSs in the SQ group.

The slide indicates some of the attributes that can cause problems if not defined consistently.

## IMSplex Considerations

- CREATE, DELETE, and UPDATE are not mirrored across IMSplex
  - ◆ Can be successful on some IMSs and fail on others
    - Response indicates success or failure for each IMS
  - ◆ User responsibility to verify success everywhere
  
- When RM and Resource Structure available
  - ◆ CREATE TRAN creates entry in RM structure to enforce resource name consistency for Transactions, LTERMs, and MSNAMEs
    - DELETE TRAN does NOT delete transaction entry from structure
      - Can only delete by deleting structure
      - QUERY TRAN after delete still displays the transaction, but with all blank attributes since the transaction is not defined locally
  - ◆ DFSINSX0 creates entry in RM structure when transaction is created

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Creates, deletes, and updates are not automatically mirrored across an IMSplex. When routing the command to all IMSs, it may be successful on some and fail on others. It is a user responsibility to verify success everywhere, or to take corrective action.

CREATE TRAN and DFSINSX0 creates an entry in the Resource Structure but DELETE TRAN does not delete it.

## XRF Considerations

- “Created” and “Updated” resources picked up by XRF alternate in the log stream and created or updated on the alternate
- XRF active and alternate use different RDDSs

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The XRF alternate reads the active log and processes the x'22' log records.

When using Resource Definition Data Sets the XRF alternate and active systems do not share these data sets. You must define different sets for the two systems.



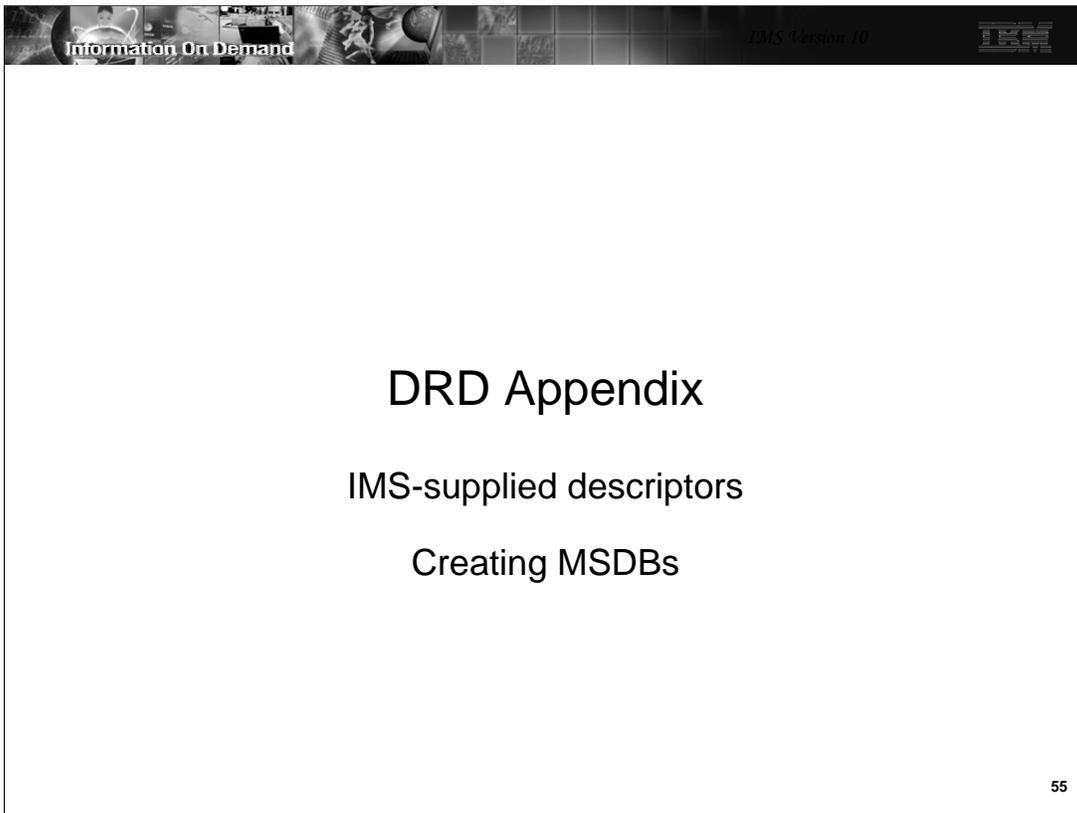
## Summary

- DRD is an alternative to online change for MODBLKS
- DRD is supported in all IMS environments
  - ◆ DB/DC, DB/CTL, DC/CTL
  - ◆ Data sharing, shared queues
- Definitions can be dynamically created, deleted, and updated
  - ◆ CREATE, DELETE, UPDATE commands
  - ◆ DB, DBDESC, PGM, PGMDESC, TRAN, TRANDESC, RTC, RTCDESC
- Resources and descriptors can be modeled after existing resource or descriptor
  - ◆ CRE .... LIKE(DESC(desc-name)) < or > LIKE(RSC(rsc-name))
  - ◆ Determines defaults for attributes not explicitly SET in CREATE command



## Summary

- Migration to DRD requires a cold start
- Definitions persist across warm and emergency restarts
- Export and import may be used to carry definitions across a cold start
- Extract may be used to copy definitions to another system



This section shows the descriptors that are supplied with IMS. They are the default descriptors unless you change the defaults. It also has a procedure for creating MSDBs with DRD.

## DFSDSDB1 – IMS-defined Database Descriptor

DATABASE macro keyword with default	CREATE DB attribute name with default
DBD=(name)	NAME(name1,name2,...)
(not) RESIDENT	RESIDENT( <u>N</u>  Y)
ACCESS=EX	ACCTYPE( <u>UPD</u> ,EXCL,READ,BRWS)
	DEFAULT( <u>N</u>  Y) – for descriptors only

- DRD and system definition have different defaults for access type
  - ◆ DRD ACCTYPE default is UPD
  - ◆ System definition ACCESS default is EX
- To keep exclusive as the default
  - ◆ Create a user descriptor with ACCTYPE=EXCL and DEFAULT(Y)

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This table shows the default attributes in DFSDSDB1. You cannot update these attributes. To change them, you would need to define a new DB descriptor with the different attributes.

The left column of the table shows the attribute and its default in the DATABASE macro. The right column shows it as it appears in the CREATE command. There are some differences in the keyword (spelling), the parameters, and the defaults.

-There are no defaults for NAME. It must be specified in the CREATE command.

-The Non-resident attribute is implied by the absence of the RESIDENT keyword in the DATABASE macro. It is specifically coded in the CREATE command although it defaults to the same value, NO.

-ACCTYPE replaces ACCESS. Note that the default is UPD, which is different from the default for the DATABASE ACCESS parameter, which is EX. To return to EXclusive, you would have to define a DB descriptor with ACCTYPE=EXC and then use that descriptor either with LIKE or set it as the default.

-DEFAULT(N|Y) applies only to descriptors. If DEFAULT(Y) is specified, this descriptor will replace DFSDSDB1 (or another DB descriptor) as the current system default descriptor for databases.

**DFSDSPG1 – IMS Program Descriptor**

APPLCTN macro keyword w/ default	CREATE PGM attribute name with default
PSB=name < or > GPSB=name	NAME(name1,name2,...) < and > GPSB=( <u>N</u>  Y) – if Y, uses NAME specified above
(not) RESIDENT	RESIDENT( <u>N</u>  Y)
(not) DOPT	DOPT( <u>N</u>  Y)
FPATH= <u>NO</u> FPATH=(YES,size)	FP( <u>N</u>  E) “size” not supported for PGM – EMH buffer size defined in CREATE TRAN command
LANG= <u>ASSEM</u>	LANG( <u>ASSEM</u>  COBOL JAVA PL/I PASCAL)
PGMTYPE=( <u>TP</u>   BATCH, OVLY, 1 class)	BMPTYPE=( <u>N</u> ,Y) OVLY no longer supported by IMS “class” not supported for PGMs – class defined in CREATE TRAN command
SCHDTYP= <u>SERIAL</u>	SCHDTYPE( <u>PARALLEL</u>  SERIAL)
SYSID=(remote,local)	Not supported for PGM – defined in CREATE TRAN command
	DEFAULT(Y) – for descriptors only

❖ BMPTYPE(N) includes MSG, JMP, IFP, CICS DRA, ODBA

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This table shows the default attributes in DFSDSPG1. You cannot update these attributes. To change them, you would need to define a new PGM descriptor with the different attributes.

The left column of the table shows the attribute and its default in the APPLCTN macro. The right column shows it as it appears in the CREATE command. There are some differences in the keyword (spelling), the parameters, and the defaults.

- There are no defaults for the NAME or GPSB name. They must be specified in the CREATE command.
- FP(N|E) identifies this program as an IFP or a full function. If FP(E) is coded, this is equivalent to coding FPATH(YES) on the APPLCTN macro. Note that the “size” parameter, which sets the size of the EMH Buffer, is not code on the CREATE PGM command. It will be set instead on the CREATE TRAN command.
- BMPTYPE replaces PGMTYPE. BMPTYPE(Y) indicates this program is either a BMP (message or non-message driven) or a JBP. BMPTYPE(N) defines everything else (MSG, JMP, IFP, CICS DRA, ODBA). OVLY (overlay) is no longer supported by IMS. Class, which can be specified on the APPLCTN macro and defaults to “1” if not coded, is not set at all on the CREATE PGM command. Instead, the class is set by the CREATE TRAN command.
- The SCHDTYPE default has changed from SERIAL to PARALLEL. To return to SERIAL as the default, create a new PGMDESC with SCHDTYPE(SERIAL) and set DEFAULT(Y).
- SYSID, which on the APPLCTN macro applies to all transactions defined following this macro, is not coded on the CREATE PGM command. Local and remote SYSIDs are coded on the CREATE TRAN command.

**DFSDSTR1 – IMS Transaction Descriptor**

<b>TRANSACT macro keyword with default</b>	<b>CREATE TRAN attribute name with default</b>
Previous APPLCTN macro	PGM(name)
CODE=name	NAME(name1,name2,...)
AOI=N	AOCMD( <u>N</u>  CMD TRAN Y)
DCLWA=YES	DCLWA(Y N) – if not specified, defaults to value in DFSDFxxx; if not in DFSDFxxx, default is DCLWA(Y)
EDIT=(UC,name) – no default for edit routine	EDITUC( <u>Y</u>  N) EDITRTN(name)
FPATH=NO FPATH=(Y,size)	FP( <u>N</u> ) FP(E P) – FP exclusive or FP potential EMHBSZ(12-30720) – default is EMHL size or 12
INQUIRY=(NO,RECOVER)	INQ( <u>N</u>  Y) RECOVER( <u>Y</u>  N)
MAXRGN=0	MAXRGN( <u>0</u> ,1-999)

- ❖ FP(E) – fast path exclusive transaction; PGM(name) must be FP(E)
- ❖ FP(P) – fast path potential transaction; PGM(name) must be FP(N)

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This table shows the default attributes in DFSDSTR1. You cannot update these attributes. To change them, you would need to define a new transaction descriptor with the different attributes.

The left column of the table shows the attribute and its default in the TRANSACT macro. The right column shows it as it appears in the CREATE command. There are some differences in the keyword (spelling), the parameters, and the defaults.

-There are no defaults for PGM or NAME. They must be specified on the CREATE command. On the CREATE command, PGM identifies the program with which this transaction is associated.

-PGM - In sysgen, the transaction is associated with the previous APPLCTN macro in the stage 1 input. With DRD, the name of the program is defined by the PGM keyword parameter. The exception is for remote transactions where PGM is not defined.

-DCLWA determines whether DC Log Write Ahead is set for this transaction. On the TRANSACT macro, this defaults to YES. For DRD, if DCLWA is not specified on the CREATE command, it defaults to the value in the default descriptor. The value in the default descriptor, however, has its own default. In DFSDSTR1, and in user-defined descriptors where it is not SET, it will default to the value of DCLWA in the DRD section of DFSDFxxx. If no value is set in DFSDFxxx, and none is set when defining the default descriptor, the descriptor assumes a default of Y(es).

-There are two parameters to replace the EDIT parameter on the TRANSACT macro. EDITUC(Y|N) determines upper case translation (default is “yes” in both cases), and EDITRTN identifies a Transaction Input Edit Routine (no default).

-Full function transactions are defined as FP(N).

-Fast path exclusive transactions are defined as FP(E) and the PGM parameter must refer to a program defined as FP(E).

-Fast path potential transactions are defined as FP(P) and the PGM parameter must refer to a program defined as FP(N).

-For both types of FP transactions, the EMH buffer size is defined by the EMHBSZ parameter (remember, this was not specified on the CREATE PGM command).

## DFSDSTR1 – IMS Transaction Descriptor

TRANSACT macro keyword with default	CREATE TRAN attribute name with default
MODE=MULT	CMTMODE( <b>SNGL</b>  MULT)
MSGTYPE=(MULTSEG,NONRESPONSE,1)	MSGTYPE( <b>MULTSEG</b>  SNGLSEG) RESP( <b>N</b>  Y) CLASS( <b>1</b>  1-999)
PARLIM=65535	PARLIM( <b>65535</b>  0-65535)
PROCLIM=(65535,65535)	PLCT( <b>65535</b>  number) PLCTTIME( <b>6553500</b>  hundredths of a second)
PRTY=(1,1,65535)	NPRI( <b>1</b>  0-14) LPRI( <b>1</b>  0-14) LCT( <b>65535</b>  smaller number)
ROUTING=NO	DIRROUTE( <b>N</b>  Y)
SCHD=1	None - All scheduling is SCHD=3 in V10
SEGNO=0	SEGNO( <b>0</b> ,number)
SEGSIZE=0	SEGSZ( <b>0</b> ,number)

- ❖ Note: PLCTTIME is in hundredths of a second rather than seconds. This applies to both the CREATE and UPDATE commands.

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-CMTMODE replaces MODE and the default changes to single (SNGL)

-MSGTYPE is replaced by three keywords but the defaults remain the same. Remember that “class” could not be specified on the CREATE PGM command, so it must be set here or default to “1”.

-PROCLIM is replaced by two keywords – PLCT for processing limit count – and PLCTTIME for processing limit count time. The defaults are the same but note that the “time” specification has changed from “seconds” to “hundredths of a second.” The meaning has not changed – it has just become more granular.

-PRTY has been replaced by three keywords – NPRI, LPRI, and LCT for normal and limit priority and for limit count. The defaults and the meanings have not changed.

-The SCHD parameter on the TRANSACT macro is no longer supported in IMS. All transactions are now scheduled as though they were coded with SCHD=3

Information On Demand IMS Version 10

## DFSDSTR1 – IMS Transaction Descriptor

TRANSACT macro keyword with default	CREATE TRAN attribute name with default
SERIAL=NO	SERIAL( <b>N</b>  Y)
SPA=(size,STRUNC)	CONV( <b>N</b>  Y) SPASZ(size) SPATRUNC(R S) – if not specified, defaults to value specified in DFSDCxxx; if not in DFSDCxxx, default is SPATRUNC(S)
SYSID=(remote sysid,local sysid) – default is not remote	REMOTE( <b>N</b>  Y) SIDR(1-2036) – no default SIDL(1-2036) – no default <b>MSNAME(logical link path name) – can use this instead of SIDR and SIDL</b>
(not) WFI	WFI( <b>N</b> ,Y)
	TRANSTAT( <b>N</b>  Y)
	DEFAULT(Y) – for descriptors only

❖ MSNAME – if this parameter is coded instead of SIDR and SIDL, the remote and local sysids take on the values of the logical link identified by the MSNAME

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-SPA has been replaced by three keywords. CONV(Y) defines this transaction as conversational. If conversational, SPASZ sets the spa size, and SPATRUNC sets the SPA truncation rules.

-SYSID has been replaced by three keywords. REMOTE(Y) defines this transaction as remote (MSC). If remote, the SIDR defines the remote SYSID and DISL defines the local SYSID.

-MSNAME is a new parameter that can be used instead of SIDR and SIDL. IF MSNAME is coded, the remote and local SYSIDs are taken from those values in the MSNAME macro. Note that MSC definitions cannot be dynamically created at this time – they must still be defined in the sysgen. However, they can be UPDATED. This is discussed in the Systems Management Enhancements presentation.

-WFI transactions defaulted to not WFI in the sysgen by absence of the WFI keyword. With DRD, WFI(Y|N) determines whether or not a transaction wait-for-input. The default remains not-WFI.

-TRANSTAT – this is a new parameter for transactions in V10. It determines whether statistics are to be kept for individual transaction executions. Prior to V10, or with TRANSTAT(N) – the default – statistics are kept only by PSB schedule (x'08'to x'07'). With TRANSTAT(Y) they are kept for each sync internal. TRANSTAT is discussed in more detail in the System Enhancements section of the class.



## DBFDSRT1 – IMS Routing Code Descriptor

RTCODE macro keyword with default	CREATE RTC attribute name with default
Previous APPLCTN macro	PGM(name)
CODE=name	NAME(name1,name2,...)
INQUIRY=NO	INQ( <u>N</u> ,Y)
	DEFAULT(Y) – for descriptors only

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This table shows the default attributes in DBFDSRT1. You cannot update these attributes. To change them, you would need to define a new transaction descriptor with the different attributes.

The left column of the table shows the attribute and its default in the RTCODE macro. The right column shows it as it appears in the CREATE command. There are some differences in the keyword (spelling), the parameters, and the defaults.

-There are no defaults for PGM or NAME. They must be specified on the CREATE command. On the CREATE command, PGM identifies the FPE program with which this routing code is associated.

## Creating MSDBs

- The following procedure can be used to add an MSDB
  - ◆ Do a DBDGEN and ACBGEN for the MSDB
    - Copy staging library to inactive library
  - ◆ Execute full ACBLIB online change
    - Member level OLC (new in V10) does not support MSDBs
  - ◆ Insert segments into the MSDBINIT data set
    - Use MSDB Maintenance Utility (DBFDBMA0)
  - ◆ Issue CREATE DB for the MSDB
    - MSDB cannot be used yet because it has not been loaded
  - ◆ Shut down IMS
  - ◆ Warm start IMS with MSDBLOAD keyword
    - /NRE MSDBLOAD

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When creating an MSDB, special procedures are required.

-As for all DB types, a DBDGEN and an ACBGEN must be done followed by an online change to make the BHDR (MSDB version of the DBCB) available to IMS. Add the BHDR to ACBLIB by doing a full ACBLIB OLC. Note that you cannot use V10's Member Online Change to add an MSDB BHDR to ACBLIB. It requires a full OLC.

-Insert the MSDB segments into the MSDBINIT data set using the MSDB Maintenance Utility (DBFDBMA0). MSDBs do not support ISRT and so cannot be loaded online.

-Issue the CREATE DB NAME(msdb-name) command to create the DDIR. Since the BHDR will be in ACBLIB, IMS will know that this is an MSDB. However, unlike FF and DEDBs, the database cannot be used yet. IMS loads MSDBs into ECSA only during a restart.

-If it is necessary to use the MSDB immediately, you must shut down IMS normally and warm start it with the MSDBLOAD keyword. IMS will then load the MSDB from the MSDBINIT data set.

# System Management

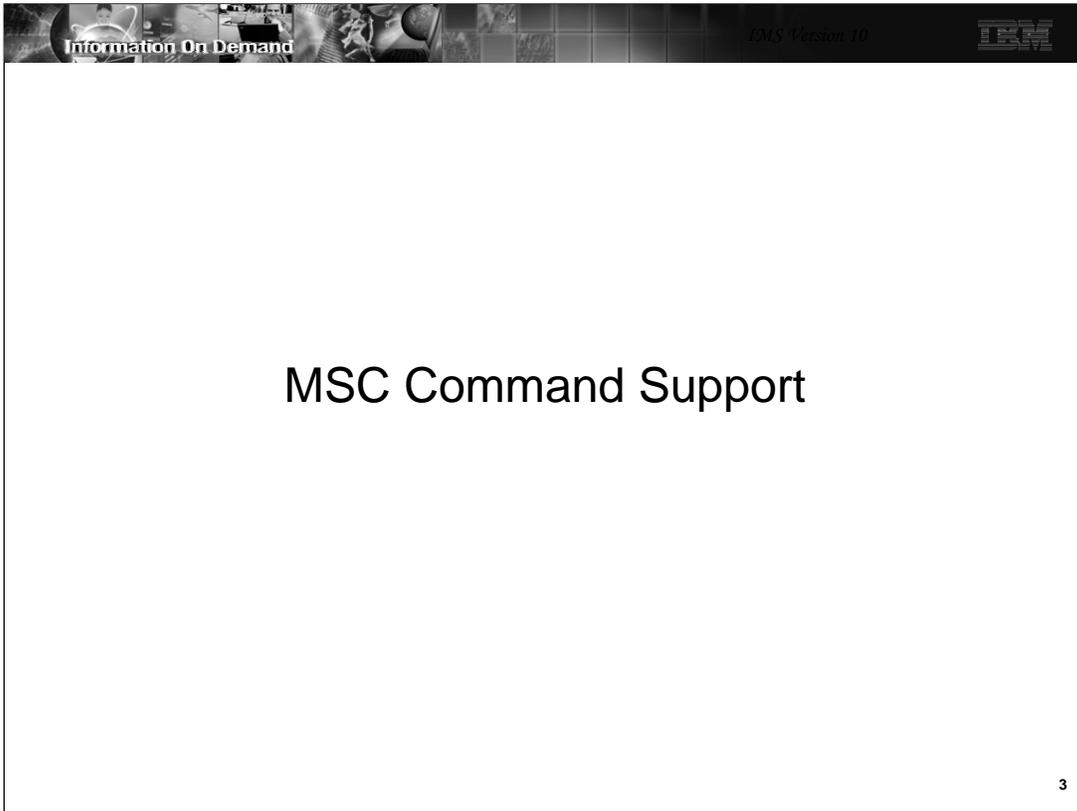
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## Systems Management Enhancements

- MSC dynamic definition updates
- IMS command enhancements
  - ◆ QUERY command
  - ◆ UPDATE command
  - ◆ QUEUE command
- Enhanced messages
- Enhanced secondary master terminal support
- Global status support for DBs, AREAs, and TRANS



Although the DRD CREATE and DELETE process does not support MSC resources, there is some enhanced support for MSC in V10.

## New MSC Commands

- UPDATE
  - ◆ Type-2 command to modify MSC resource definitions and statuses
    - UPDATE MSPLINK – physical link
    - UPDATE MSLINK – logical link
    - UPDATE MSNAME – logical link path
  - ◆ UPDATE commands may be used to create MSC connections
    - Requires that dummy definitions be available for updating
- QUERY
  - ◆ Type-2 command to display MSC resource definitions and statuses
    - QUERY MSPLINK – physical link
    - QUERY MSLINK – logical link
    - QUERY MSNAME – logical link path

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IMS V10 adds support for MSC resources with the type-2 UPDATE and QUERY commands.

There is a new performance parameter for MSC logical links called BANDWIDTH. You will see this reference in the following slides but a discussion of what this means is in Transaction Manager Enhancements section of the class.

## UPDATE MSPLINK

```
UPD  MSPLINK NAME(name1,name2,...)
      SET(attr1(val1),attr2(val2),...) } or
      START(LOGON)
      STOP(LOGON)
```

- Updates one or more physical links
  - ◆ SET, START, and STOP are mutually exclusive
  - ◆ SET(attributes) requires the physical link and all assigned logical links to be stopped
- NAME(*name1,name2,...*) – specifies one or more MSPLINKs to update
  - ◆ Required, there is no default
  - ◆ Generic names supported

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This slide shows the format of the UPDATE MSPLINK command.

## UPDATE MSPLINK (cont.)

```
UPD  MSPLINK NAME(name1,name2,...)
      SET(attr1(val1),attr2(val2),...) } or
      START(LOGON)
      STOP(LOGON)
```

- SET(*attribute1,attribute2,...*) – specifies the update to perform
  - ◆ ASR(*ON/OFF*) – sets Automatic Session Restart for each assigned VTAM logical link
  - ◆ MODETABL(*new\_modetable\_name*) – changes VTAM mode table name for each assigned logical link
  - ◆ MSPLINK(*new\_msplinkname*) – changes the physical link name
  - ◆ NODE(*new\_nodename*) – changes the VTAM node name for this link
- START(*LOGON*) – Enables logons to the physical link
- STOP(*LOGON*) - Disables logons to the physical link

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The UPDATE MSPLINK command can be used to change any of the four attributes identified on the slide. Except for changing the MSPLINK name, they apply only to VTAM links. Before the attributes can be changed, the physical link and all assigned logical links must be stopped.

START and STOP LOGON enables or stops logons to the physical link. STOP does not affect existing sessions.

## UPDATE MSLINK

```
UPD  MSLINK NAME(name1,name2,...)
      SET(attr1(val1),attr2(val2),...)
      START(COMM,TRACE,TKOTRC)
      STOP(COMM,TRACE,TKOTRC) OPTION(FORCE) } or
```

- Updates one or more physical links
- NAME(name1,name2,...) – specifies one or more logical links to update
  - ◆ Required, there is no default
  - ◆ Generic names supported
  - ◆ MSLINK macro now supports a label which is the name of the logical link
    - e.g., LINKA1 MSLINK xxxx
    - If no label is coded, the default name is DFSLnnnn where nnnn is the link number with leading zeros
      - e.g., DFSL0005
- SET, START, and STOP are mutually exclusive

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This slide shows the format of the UPDATE MSLINK command. As with the other UPD commands, you cannot change attributes and the status in the same command. The NAME of the MSLINK is either the label on the MSLINK macro or, if no label exists, a default name of DFSLnnnn where nnnn is the MSLink number with leading zeros. The command does not support MSLink numbers. You must specify a NAME.

## UPDATE MSLINK (cont.)

```

UPD  MSLINK NAME(name1,name2,...)
      SET(attr1(val1),attr2(val2),...)
      START(COMM,TRACE,TKOTRC)
      STOP(COMM,TRACE,TKOTRC) OPTION(FORCE)
  
```

} or

- SET(*attribute1,attribute2,...*) – specifies the update to perform
  - SET requires the logical link to be stopped
  - ◆ ASR(*ON/OFF*) – sets Automatic Session Restart for VTAM links
  - ◆ BANDWIDTH(*ON/OFF*) – sets bandwidth mode
  - ◆ BUFSIZE(*new\_buffer\_size*) – changes send and receive buffer sizes
  - ◆ MODETBL(*new\_modetable\_name*) – changes VTAM mode table name
  - ◆ MSLINK(*new\_mslinkname*) – changes the logical link name
  - ◆ MSPLINK(*new\_msplinkname*) – reassigns the link to a different physical link
  - ◆ PARTNER(*new\_partner\_id*) – changes the partner id
  - ◆ SYNCOPT(*FORCSESS/SYNCSESS/COLDSESS*) – sets resynchronization options

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Any of the attributes can be changed using this command. The link must be stopped before changing the attributes.

## UPDATE MSLINK (cont.)

```
UPD  MSLINK NAME(name1,name2,...)
      SET(attr1(val1),attr2(val2),...)
      START(COMM,TRACE,TKOTRC)
      STOP(COMM,TRACE,TKOTRC) OPTION(FORCE) } or
```

- **START**(*status1,status2,...*)
  - ◆ **COMM** – Start the link and start sending and receiving messages
  - ◆ **TRACE** – Starts internal tracing
  - ◆ **TKOTRC** – Starts tracing during XRF takeover
- **STOP**(*status1,status2,...*)
  - ◆ **COMM** – Stops the link and stops sending and receiving messages
  - ◆ **TRACE** – Stops internal tracing
  - ◆ **TKOTRC** – Stops tracing during XRF takeover
- **OPTION**(*option1*)
  - ◆ **FORCE** -- Force termination of the link if **STOP(COMM)** fails
    - **OPTION(FORCE)** is valid only with **STOP(COMM)**

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The **START** and **STOP** keywords can be entered on the same command, but you cannot start and stop the same status. **OPTION(FORCE)** is valid only for VTAM and CTC sessions, and only when used in conjunction with **STOP(COMM)**.

## UPDATE MSNAME

```
UPD  MSNAME NAME(name1,name2,...)
      SET(attr1(val1),attr2(val2),...) } or
      START(Q,SEND)
      STOP(Q,SEND)
```

- Updates one or more logical link paths (msnames)
- NAME(*name1,name2,...*) – specifies one or more msnames to update
  - ◆ Required, there is no default
  - ◆ Generic names supported
- SET and START or STOP are mutually exclusive
  - ◆ Exception: START and STOP can be entered on same command but can't specify same parameter e.g., START(SEND) STOP(Q) is OK
- START(Q,SEND) and STOP(Q,SEND)
  - ◆ Q – Start or stop input queuing to the logical link path
  - ◆ SEND – Start or stop sending messages to the logical link path

10

The slide shows the format of the UPDATE MSNAME command. As with the others, you cannot issue a command with SET and with START or STOP.

UPD MSNAME can be used to start or stop queuing and sending messages across that logical link path. You can use START and STOP in the same command, but not with the same status.

## UPDATE MSNAME Attributes

```

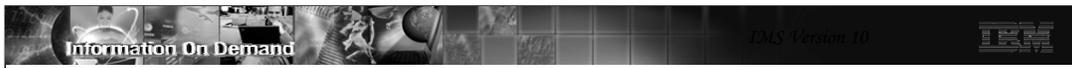
UPD MSNAME NAME(name1,name2,...)
SET(attr1(val1),attr2(val2),...) } or
START(Q,SEND)
STOP(Q,SEND)
  
```

- **SET(attribute1,attribute2,...)** – specifies the update to perform
  - ◆ **MSLINK(new\_linkname)** – reassigns the MSNAME to a new logical link
  - ◆ **SIDR(new\_remote\_sysid)** – changes the remote sysid for the MSNAME
    - The changes also apply to remote LTERMs associated with this MSNAME
    - Cannot change SID if currently assigned to existing transaction
  - ◆ **SIDL(new\_local\_sysid)** – changes the local sysid for the MSNAME
    - The changes also apply to remote LTERMs and transactions associated with this MSNAME

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To change the logical link (MSLINK) with which this logical link path (MSNAME) is associated, the logical link must be stopped. To change the remote and local sysids, both the logical link and the logical link path must be stopped.

If the SYSIDs are currently assigned to an existing transaction, you must first use the UPDATE TRAN SET(SIDL(),SIDR()) command to reassign that transaction to another valid SYSID. Then you can update SIDR and SIDL. Then you can UPDATE TRAN again to reassign the remote and local sysids for the transaction back to the new sysids.



## QUERY MSPLINK

```

QRY MSPLINK NAME(name1,name2,...)
STATUS(NOTOPEN,STOLGN)
TYPE(VTAM,MTM,CTC)
SHOW(ALL|ADDR,NODE,STATUS,TYPE) } or
SHOW(MSLINK,MSNAME)

```

- NAME(*name1,name2,...*) – specifies one or more physical links to display
  - ◆ Optional, default is NAME(\*)
  - ◆ Generic names supported
- STATUS(*status1,status2,...*) – displays only those links with specified status
  - ◆ NOTOPEN, STOLGN
- TYPE(*CTC,MTM,VTAM*) – displays only those links that are the specified type
- SHOW(*attr1,attr2,...*)
  - ◆ ALL shows CTC address, VTAM node name, physical link type, link status
  - ◆ MSLINK shows MSLINK name and number, maximum session count
  - ◆ MSNAME shows MSNAME, SIDR, and SIDL

12

This slide shows the format of the QRY MSPLINK command.

NAME is the name of the physical link. You can specify one or more names, and wild cards are allowed (\* = multi-character substitution and % = single character substitution). The default is \* which is to display all physical links.

STATUS is a filter to limit the responses to those MSPLINKs with the specified status. Multiple statuses are ORed. For example, if STATUS(STOLGN) is specified, only those physical links with the STOP LOGON status will be displayed. The only other valid status is NOTOPEN.

TYPE is a filter for the link type – VTAM, Memory-to-memory, or Channel-to-channel.

SHOW determines what information is returned by IMS and what the TSO SPOC will show on the screen. SHOW(ALL) includes CRC address. VTAM node name of the remote IMS, the physical link type, and the link status. Each individual attribute may be selected - e.g., SHOW(NODE,STATUS). You can also select SHOW(MSLINK and/or MSNAME). You cannot specify the first and second type of SHOW together on the same command - e.g. SHOW(NODE,STATUS,MSNAME,MSLINK) is not allowed. MSNAME displays the maximum session count defined on the MSPLINK macro as well as the link name, link number.

Note: V10 permits a label on the MSLINK macro. This label is the MSLINK name. If not specified, the default name is DFSLnnnn, where nnnn is the link number.

## Example – QRY MSPLINK SHOW(ALL)

Command

```
QUERY MSPLINK NAME(PLNK12C*,PLNK12MA,PLNK12VU,PLNK51*) SHOW(ALL)
```

Response

MSPLink	MbrName	CC	Type	NodeName	CTCaddr	LclStat
PLNK12C	SYS1	0	CTC			NOTOPEN
PLNK12CB	SYS1	0	CTC			NOTOPEN
PLNK12CU	SYS1	0	CTC			NOTOPEN
PLNK12MA	SYS1	0	MTM			
PLNK12VU	SYS1	0	VTAM	PZ606099		

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This is an example of a QRY MSPLINK NAME(xxx) SHOW(ALL) command. All QRY MSPLINK commands show the MSPLINK name, the member name responding, the condition code, and, if CC is not zero, the CC text explaining why the command failed.

## Example - QUERY MSPLINK

Command

```
QUERY MSPLINK NAME(IMSAB) SHOW(MSLINK,MSNAME)
```

Response

MSPLINK	MbrName	CC	MSLink	MSLink#	MaxSess	MSName	SIDR	SIDL
IMSAB	IMSA	0			2			
IMSAB	IMSA	0	IMSAB1	1		LINKA1	30	20
IMSAB	IMSA	0	IMSAB2	2		LINKB1	31	21

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This slide shows an example of QRY MSPLINK showing MSLINK and MSNAME. For MSLINK, the MSLink name and number and the MSPLINK maximum sessions are shown. For MSNAME, the MSName and remote and local sysids are shown.

## QUERY MSLINK

```

QRY MSLINK NAME(names)
    STATUS(logical link status)
    BANDWIDTH(ON|OFF)
    SHOW(ALL|attributes) } or
    SHOW(MSNAME)
  
```

- NAME(*name1,name2,...*) – specifies one or more logical links to display
  - ◆ Generic names supported
  - ◆ Specific names require names on the MSLINK macro in sysgen
- STATUS(*status1,status2,...*) – displays only those links with specified status
  - ◆ ACTIVE, IDLE, STOCOMM, etc. (refer to Command Reference for valid values)
- BANDWIDTH(ON|OFF) – displays only links that have bandwidth mode on or off
- SHOW(*attr1,attr2,...*) – specifies what output to display
  - ◆ Always displays link name and link number
  - ◆ Attributes: Bandwidth status, Buffer size, VTAM CID, Send/Receive counts, VTAM mode table names, assigned MSNAMEs, Assigned MSPLINK names, MSC partner ID, link status, and Statistics (Statistics discussed in TM Enhancements section of class)

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This is the format of the QRY MSLINK command.

NAME is like other query commands. The name of the MSLINK is either the label on the macro (new in V10), or the default name DFSLnnnn, where nnnn is the MSLINK number with leading zeros. The command does not support MSLink numbers. You must specify a NAME.

STATUS is a filter to limit the responses to those MSLINKs with the specified status. Multiple statuses are ORed. These statuses may be found in the Command Reference publication.

BANDWIDTH is a filter for whether the new bandwidth performance option is turned OFF or ON.

SHOW always shows the MSNAME name (the label) and the link number to which this MSNAME is assigned.

SHOW(ALL) shows all the definitional attributes and the status of the logical link. The attributes that may be specified can be found in the Command Reference publication. You can request that just some of them be shown. Statistics may be requested. This is discussed in the TM Enhancements section of this class. SHOW(ALL) does not return statistics. They must be explicitly requested.

SHOW(MSNAME) cannot be specified with SHOW(ALL) or any of the attributes.

## Example – QRY MSLINK

Command

```
QRY MSLINK NAME(LINK12V*) SHOW(ALL)
```

Response

MSLink	MSLink#	MbrName	CC	MSPLink	CID	PID	RecdCnt	SentCnt	DefMdtbl	ActMdtbl
LNK12V01	1	SYS1	0	PLNK12V	00000000	AB	0	0		
LNK12V02	10	SYS1	0	PLNK12V	8E000004	AK	12	12		DEFRESP
LNK12V03	11	SYS1	0	PLNK12V	00000000	AL	0	0		
LNK12V04	13	SYS1	0	PLNKSON1	00000000	SA	0	0	MTMSCVAA	
LNK12V05	14	SYS1	0	PLNKSON2	00000000	SB	0	0	MTMSCVAB	
LNK12V06	15	SYS1	0	PLNKSON3	00000000	SC	0	0	MTMSCVAB	
LNK12V07	20	SYS1	0	PLNK12VB	00000000	BY	0	0		

(continued scroll to the right)

MSLink	MSLink#	MbrName	BufSize	Bandwidth	LclStat
LNK12V01	1	SYS1	1024	OFF	STOCOMM, IDLE, COLDSESS, SYNCSESS
LNK12V02	10	SYS1	1024	OFF	IDLE, ACTIVE, PRI, FORCSESS
LNK12V03	11	SYS1	1024	OFF	STOCOMM, IDLE, COLDSESS, SYNCSESS
LNK12V04	13	SYS1	1024	OFF	STOCOMM, IDLE, COLDSESS, FORCSESS
LNK12V05	14	SYS1	1024	OFF	ASR, STOCOMM, IDLE, COLDSESS, FORCSESS
LNK12V06	15	SYS1	1024	OFF	ASR, STOCOMM, IDLE, COLDSESS, FORCSESS
LNK12V07	20	SYS1	65536	OFF	STOCOMM, IDLE, COLDSESS, SYNCSESS

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This slide shows an example of the QRY MSLINK xxx SHOW(ALL) command. The output is too wide for a single screen, so the TSO SPOC will let you scroll right and left, or up and down. The lower part of this screen assumes the user as scrolled right.

## QUERY MSNAME

```

QRY MSNAME NAME(names)
  STATUS(logical link path status)
  QCNT(condition, nbr) SHOW(QCNT) } or
  SHOW(ALL|attributes)

```

- NAME(*name1,name2,...*) – specifies one or more logical link paths to display
  - ◆ Generic names supported
- STATUS(*status*) – displays only those links with specified status
  - ◆ DYN, QERR, STOQ, STOSEND
- QCNT - condition is a relational operator
  - ◆ LE, LT, GT, GE, EQ, NE
- SHOW(*attr1,attr2,...*) – specifies what output to display
  - ◆ Attributes: MSLINK, MSPLINK, QCNT, STATUS, SYSID
- Warning: QUERY MSNAME with QCNT() specified with shared queues
  - ◆ Wildcard names result in all logical link path queues in the coupling facility being read, which could delay completion of the command

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The logical link path status may be:

- DYN - dynamically created in a shared queues environment
- QERR - queue error
- STOQ - stopped queuing
- STOSEND - stopped sending

The "condition" value in the QCNT parameter is a relational operator. It can be:

- LE – less than or equal
- LT – less than
- GE – greater than or equal
- GT – greater than
- EQ – equal
- NE – not equal

QRY MSNAME NAME(\*) QCNT(NE,0) SHOW(QCNT) would show all MSNAMEs with a queue count that is not zero.

Be careful when issuing the QUERY MSNAME ... QCNT command in a shared queues environment. The use of wildcard names will result in reading every remote queue "list" to determine whether it satisfies the wildcard name (XES list services does not support wildcards).

## Example – QRY MSNAME

Command

```
QUERY MSNAME NAME(LINK12V*,LINK12C1) SHOW(ALL)
```

Response

MSName	MbrName	CC	MSPLink	MSLink	MSLink#	SIDR	SIDL	LQCnt	LclStat
LINK12C1	SYS1	0	PLNK12C	LNK12C01	2	23	13	0	
LINK12V	SYS1	0	PLNK12V	LNK12V02	10	256	1012	0	
LINK12V1	SYS1	0	PLNK12V	LNK12V02	10	20	10	0	STOQ,STOSEND
LINK12V2	SYS1	0	PLNK12V	LNK12V03	11	40	9	0	
LINK12V3	SYS1	0	PLNK12VB	LNK12V07	20	93	73	0	

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This is an example of a QRY MSNAME ... SHOW(ALL) command. In a shared queues environment, there would be two lines for each MSName, with the first line showing the global QCNT and the second line showing the local attributes, queue count, and status as you see in the slide.

## Example of Using UPDATE Commands for MSC

- IMSA and IMSB use cloned system definitions
  - ◆ Dummy MSC definitions are created for future use
    - MSPLINK, MSLINK, and MSNAME macros
- UPDATE commands are used to change definitions
  - ◆ Assign more meaningful names
  - ◆ Associate logical links with physical links
  - ◆ Provide SYSIDs for logical link paths (MSNAMEs)
- QUERY commands are used to verify the definitions

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Although CREATE does not support the addition of new MSC links, with careful planning, you can define dummy physical links, logical links, and logical link paths in each IMS between which you might want to create links. Then when they are needed, you can use the UPDATE MSPLINK, MSLINK, and MSNAME commands to activate those links.

The following shows an example of this technique. First dummy MSC definitions are included in the system definitions for IMSA and IMSB. The two systems have cloned definitions for future use by UPDATE commands. Second, QUERY commands are used to show these definitions. Third, UPDATE commands are used to assign more meaningful names to the physical links and logical links, to associate logical links with specific physical links, and to provide appropriate SYSIDs for the logical link paths. Finally, QUERY commands are used to show the changed definitions.

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## System Definition and Queries Before Updates

System definitions for IMSA and IMSB

DUMMY1	MSPLINK	TYPE=VTAM,NAME=DUMY1,SESSION=2,BUFSIZE=4096
DUMMYA	MSLINK	PARTNER=XA
LINKA1	MSNAME	SYSID=(101,100)
DUMMYB	MSLINK	PARTNER=XB
LINKB1	MSNAME	SYSID=(102,100)

Definitions are the same for IMSA and IMSB.  
 MSLINK statements do not include MSPLINK= parameter.

QUERY MSPLINK NAME(DUMMY1) SHOW(MSLINK,MSNAME)

MSPLink	MbrName	CC	MSLink	MSLink#	MaxSess	MSName	SIDR	SIDL
DUMMY1	IMSA	0			2			
DUMMY1	IMSA	0			2			
DUMMY1	IMSB	0						
DUMMY1	IMSB	0						

Logical links not assigned to physical link.

QUERY MSLINK NAME(DUMMY\*) SHOW(PARTNER,MSPLINK)

MSLink	MSLink#	MbrName	CC	MSPLink	PID
DUMMYA	1	IMSA	0		XA
DUMMYB	2	IMSA	0		XB
DUMMYA	1	IMSB	0		XA
DUMMYB	2	IMSB	0		XB

Logical link paths (MSNAMEs) assigned to logical links.

QUERY MSNAME NAME(LINKA1,LINKB1) SHOW(MSLINK,MSPLINK,SYSID)

MSName	MbrName	CC	MSPLink	MSLink	MSLink#	SIDR	SIDL
LINKA1	IMSA	0		DUMMYA	1	101	100
LINKB1	IMSA	0		DUMMYB	2	102	100
LINKA1	IMSB	0		DUMMYA	1	101	100
LINKB1	IMSB	0		DUMMYB	2	102	100

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This shows the beginning of a scenario for defining dummy links and then activating them. Here we have defined in the System Definition with one MSPLINK, two MSLINKs, and two MSNAMEs.

The MSPLINK statement uses dummy names for the label and for the node name (NAME=).

The MSLINK statements use dummy names for the label and partner. They do not have a MSPLINK= parameter, so they are not assigned to a physical link.

The MSNAME statements use dummy numbers for the SYSIDs.

The QRY commands show the definitions before any changes are made. The MSNAMEs are assigned to MSLINKs, but since the MSLINKs are not defined to a MSPLINK, neither are the MSNAMEs.

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## Commands to Activate the Dummy Links

**Commands issued to IMSA:**  
 Change name of dummy MSPLINK and set VTAM node name to partner IMS:

```
UPD MSPLINK NAME(DUMMY1) SET(MSPLINK(IMSAB),NODE(IMSAB))
```

Change name of dummy MSLINKs and assign them to the MSLINKs:

```
UPD MSLINK NAME(DUMMYA) SET(MSLINK(IMSAB1),MSPLINK(IMSAB))
UPD MSLINK NAME(DUMMYB) SET(MSLINK(IMSAB2),MSPLINK(IMSAB))
```

Change the MSNAME SYSIDs for the local and remote systems:

```
UPD MSNAME NAME(LINKA1) SET(SIDR(30),SIDL(20))
UPD MSNAME NAME(LINKB1) SET(SIDR(31),SIDL(21))
```

**Commands issued to IMSB:**  
 Change name of dummy MSPLINK and set VTAM node name to partner IMS:

```
UPD MSPLINK NAME(DUMMY1) SET(MSPLINK(IMSAB),NODE(IMSAB))
```

Change name of dummy MSLINKs and assign them to the MSLINKs:

```
UPD MSLINK NAME(DUMMYA) SET(MSLINK(IMSAB1),MSPLINK(IMSAB))
UPD MSLINK NAME(DUMMYB) SET(MSLINK(IMSAB2),MSPLINK(IMSAB))
```

Change the MSNAME SYSIDs for the local and remote systems:

```
UPD MSNAME NAME(LINKA1) SET(SIDR(20),SIDL(30))
UPD MSNAME NAME(LINKB1) SET(SIDR(21),SIDL(31))
```

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On this slide, we show how to “create” the MSC links between IMSA and IMSB. Similar commands are issued on both IMS systems. The responses to these commands are not shown.

For both systems the MSPLINK is updated to give it a name that is more descriptive and to identify the remote VTAM node. The command in IMSA specifies IMSB as the NODE name. The command in IMSB specifies IMSA as the NODE name.

The MSLINKs are updated to assign them to the renamed MSPLINK. The commands are the same for IMSA and IMSB.

MSNAMEs are updated to specify remote and local sysids. Of course, the remote sysids in IMSA are local sysids in IMSB.

After this we can CREATE remote transactions in IMSA and IMSB with the corresponding sysids.

## Queries After Updates

QUERY  
Commands  
and  
Responses

```

QUERY MSPLINK NAME(IMSAB) SHOW(MSLINK,MSNAME)
MSPLink MbrName CC MSLink MSLink# MaxSess MSName SIDR SIDL
IMSAB IMSA 0 0 2
IMSAB IMSA 0 IMSAB1 1 LINKA1 30 20
IMSAB IMSA 0 IMSAB2 2 LINKB1 31 21
IMSAB IMSB 0 0 2
IMSAB IMSB 0 IMSAB1 1 LINKA1 20 30
IMSAB IMSB 0 IMSAB2 2 LINKB1 21 31
    
```

Logical links now assigned to physical links.

```

QUERY MSLINK NAME(IMSAB*) SHOW(PARTNER,MSPLINK)
MSLink MSLink# MbrName CC MSPLink PID
IMSAB1 1 IMSA 0 IMSAB XA
IMSAB2 2 IMSA 0 IMSAB XB
IMSAB1 1 IMSB 0 IMSAB XA
IMSAB2 2 IMSB 0 IMSAB XB
    
```

Logical link paths (MSNAMEs) assigned to logical links with new names.

```

QUERY MSNAME NAME(LINKA1,LINKB1) SHOW(MSLINK,MSPLINK,SYSID)
MSName MbrName CC MSPLink MSLink MSLink# SIDR SIDL
LINKA1 IMSA 0 IMSAB IMSAB1 1 30 20
LINKB1 IMSA 0 IMSAB IMSAB2 2 31 21
LINKA1 IMSB 0 IMSAB IMSAB1 1 20 30
LINKB1 IMSB 0 IMSAB IMSAB2 2 21 31
    
```

The QUERY commands show the results of the updates.

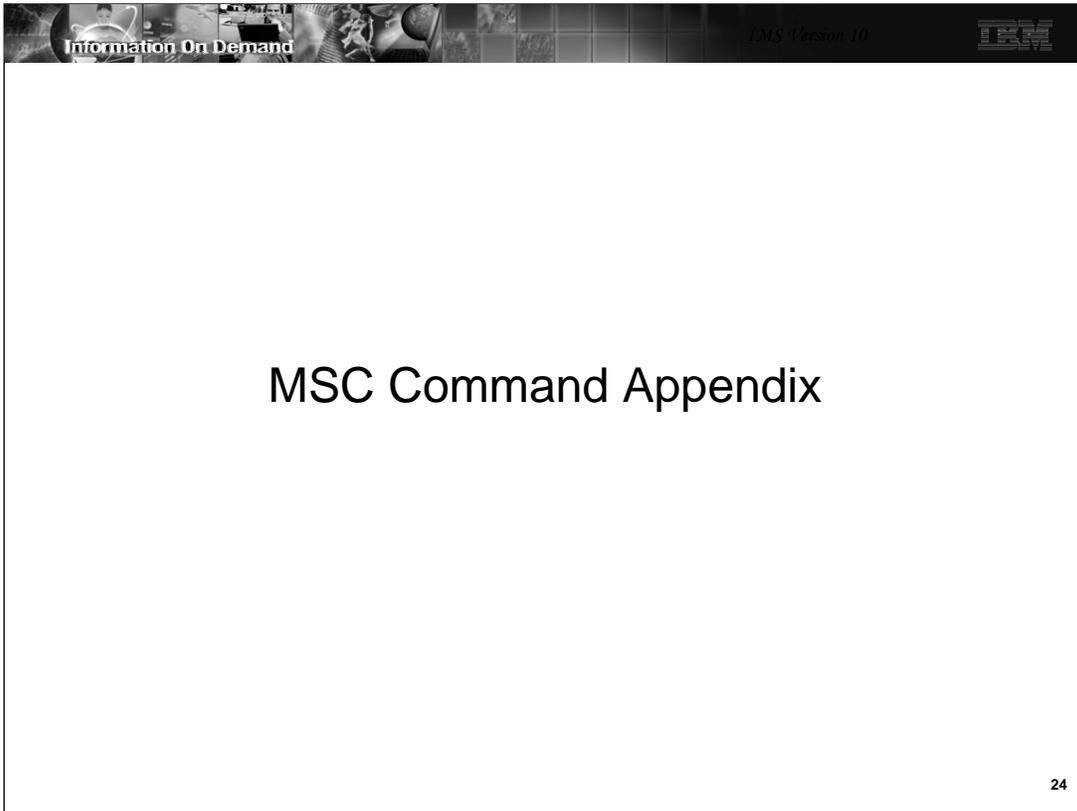
## MSC Commands Summary

- Updates provide capability to dynamically add and modify MSC links
  - ◆ Addition of links requires available dummy definitions
  - ◆ Restrictions:
    - Cannot change link type: CTC, VTAM, or MTM
    - Cannot modify CTC DDNAME or address
    - Cannot change number of sessions for VTAM link
  
- Queries show current definitions

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UPDATE commands for MSPLINK, MSLINK, and MSNAME may be used to dynamically add and modify MSC links. The addition of links requires available dummy definitions. This capability is most easily used with VTAM links. Dummy definitions must be of the correct link type. That is, CTC, VTAM, and MTM definitions cannot be changed to another type. For example, you cannot change a CTC MSPLINK definition to a VTAM MSPLINK. The UPDATE command cannot be used to change the DDNAME or address associated with a CTC MSPLINK definition. The SESSION= parameter on the MSPLINK system definition macro for VTAM physical links cannot be modified with the UPDATE command.

QUERY commands may be used to show the current definitions.



This section compares the capabilities of the QUERY and UPDATE commands for MSC resources with the capabilities of type-1 commands.

## UPDATE MSPLINK – Command Comparison

Action	Type-2 keywords	Type-1 Command
Enable logons to this physical link	START(LOGON)	/RSTART MSPLINK <i>name</i>
Disable logons to this physical link	STOP(LOGON)	/PSTOP MSPLINK <i>name</i>
Set or reset ASR for all assigned logical links	SET(ASR(ON OFF))	N/A
Change default modetable name for all assigned logical links	SET(MODETBL( <i>name</i> ))	N/A
Change physical link name	SET(MSPLINK( <i>name</i> ))	N/A
Change VTAM node name	SET(NODE( <i>name</i> ))	N/A

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This table shows the UPD command and the comparable type-1 command. There are no type-1 commands to change the attributes.

## UPDATE MSLINK – Command Comparison

Action	Type-2 keywords	Type-1 Command
Set or Reset ASR	SET(ASR(ON OFF))	/CHANGE LINK <i>link</i> ASR ON OFF
Change default modetable name	SET(MODETBL( <i>name</i> ))	/CHANGE LINK <i>link</i> MODE <i>name</i>
Assign to new physical link	SET(MSPLINK( <i>name</i> ))	/MSASSIGN LINK <i>link</i> MSPLINK <i>name</i>
Change session resynchronization option	SET(SYNCOPT( <i>FORCSESS</i>   <i>SYNCSESS</i>   <i>COLSDESS</i> ))	/CHANGE LINK <i>link</i> <i>FORCSESS</i>   <i>SYNCSESS</i>   <i>COLDSESS</i>
Start link, send/receive	START(COMM)	/RSTART LINK <i>link</i>
Start link, send/receive, use modetable for this session only	START(COMM) SET(MODETBL( <i>name</i> ))	/RSTART LINK <i>link</i> MODE <i>name</i>
Start/stop internal trace	START(TRACE) or STOP(TRACE)	/TRACE SET ON OFF LINK <i>link</i>
Start/stop XRF takeover trace	START(TKOTRC) or STOP(TKOTRC)	/TRACE SET ON OFF LINK <i>link</i> TAKEOVER
Stop link, send/receive	STOP(COMM)	/PSTOP LINK <i>link</i>
Force stop link	STOP(COMM) OPTION(FORCE)	/PSTOP LINK <i>link</i> PURGE FORCE
Start/Stop bandwidth mode	SET(BANDWIDTH(ON OFF))	N/A
Change send/receive buffer size	SET(BUFSIZE( <i>size</i> ))	N/A
Change logical link name	SET(MSLINK( <i>name</i> ))	N/A
Change partner id	SET(PARTNER( <i>id</i> ))	N/A

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This table shows the type-1 and type-2 commands that will produce the Action shown in Column 1. There are no type-1 commands to change BANDWIDTH, BUFSIZE, MSLINK, or PARTNER.

## UPDATE MSNAME - Command Comparison

Action	Type-2 keywords	Type-1 Command
Assign to new logical link	SET(MSLINK( <i>name</i> ))	/MSASSIGN MSNAME <i>name</i> LINK <i>link</i>
Start MSNAME, queuing/sending	START(Q,SEND)	/START MSNAME <i>name</i>
Stop MSNAME, queuing/sending	STOP(Q,SEND)	/STOP MSNAME <i>name</i>
Stop input for MSNAME	STOP(Q) START(SEND)	/PURGE MSNAME <i>name</i>
Change remote system identification SIDs	SET(SIDR( <i>id</i> ))	N/A
Change local system identification SIDs	SET(SIDL( <i>id</i> ))	N/A
Stop output for MSNAME	START(Q) STOP(SEND)	N/A

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This table shows the type-1 and type-2 commands necessary to make the changes identified in column 1. Note that you cannot change the attributes with a type-1 command other than assigning it to a different logical link.

## QUERY MSPLINK – Command Comparison

To Display	Type-2 Keywords	Type-1 Command
Status	SHOW(STATUS)	/DISPLAY ASMT MSPLINK <i>name</i>
Assigned MSLINKs	SHOW(MSLINK)	/DISPLAY ASMT MSPLINK <i>name</i>
Physical link type	SHOW(TYPE)	/DISPLAY ASMT MSPLINK <i>name</i>
CTC address	SHOW(ADDR)	/DISPLAY ASMT MSPLINK <i>name</i>
Maximum session count	SHOW(MSLINK)	/DISPLAY ASMT MSPLINK <i>name</i>
VTAM node name	SHOW(NODE)	/DISPLAY ASMT MSPLINK <i>name</i>
Assigned MSNAMEs	SHOW(MSNAME)	N/A
MSPLINKs with specified status	STATUS( <i>status</i> )	N/A
MSPLINKs of a specified type	TYPE( <i>type</i> )	N/A

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This table shows you how to display attributes of the MSPLINK using either the type-1 /DISPLAY command or the type-2 QUERY command. For example, to display the VTAM node name of the remote IMS, submit either /DISPLAY ASMT MSPLINK *name* or QUERY MSPLINK NAME(*xxx*) SHOW(NODE). Note that the display command shows all of those attributes but QRY shows only what you ask for. There are some attributes that don't show up on the /DISPLAY command, e.g., the assigned MSNAMEs. Also you can't specify filters on the type-1 command.

## QUERY MSLINK – Command Comparison

To Display	Type-2 Keywords	Type-1 Command
Status	SHOW(STATUS)	/DISPLAY LINK <i>link</i> /DISPLAY STATUS LINK
Send/receive counts	SHOW(COUNT)	/DISPLAY LINK <i>link</i>
Local queue counts	N/A	/DISPLAY LINK <i>link</i>
Global queue counts	N/A	/DISPLAY LINK <i>link</i> QCNT
Modetable name	SHOW(MODETBL)	/DISPLAY LINK <i>link</i> MODE
Partner id	SHOW(PARTNER)	/DISPLAY LINK <i>link</i> MODE
Assigned MSPLINKs	SHOW(MSPLINK)	/DISPLAY ASMT LINK <i>link</i>
Assigned MSNAMEs	SHOW(MSNAME)	/DISPLAY ASMT LINK <i>link</i>
Bandwidth mode	SHOW(BANDWIDTH)	N/A
Buffer size	SHOW(BUFSIZE)	N/A
VTAM CID	SHOW(CID)	N/A
Link statistics	SHOW(STATISTICS)	N/A
Links with specified status	STATUS( <i>status</i> )	N/A
Links with bandwidth mode	BANDWIDTH(ON OFF)	N/A

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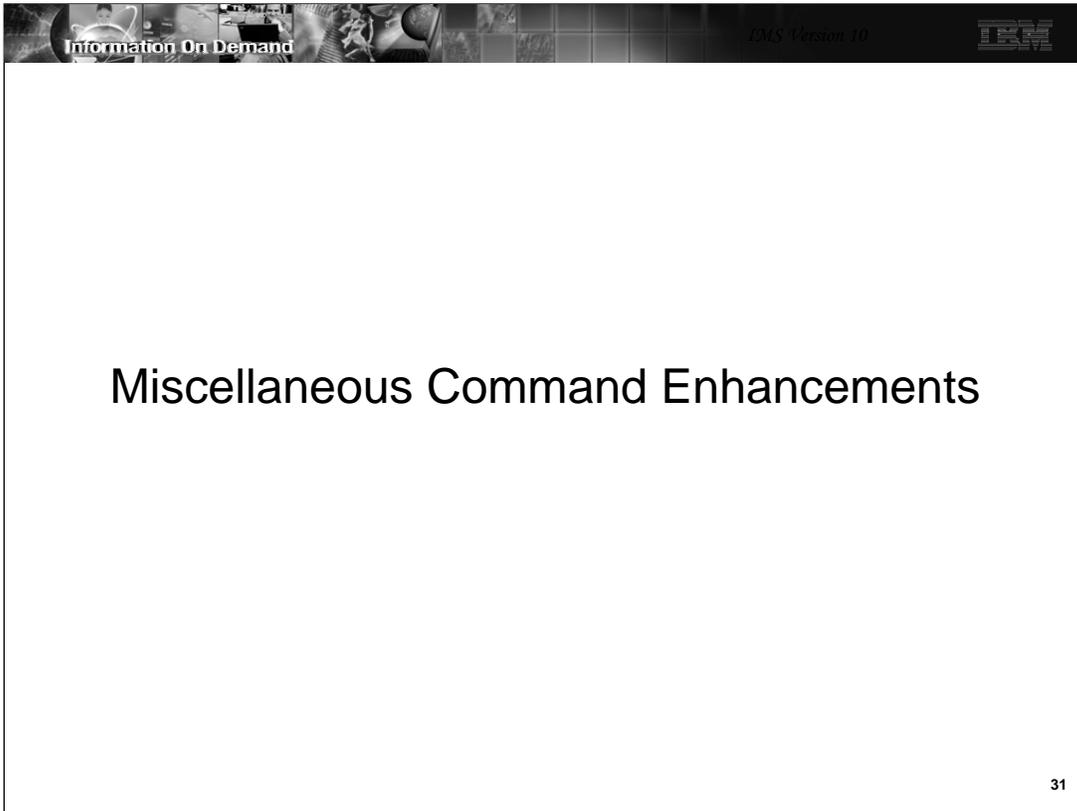
This table shows you how to display attributes of the MSLINK using either the type-1 /DISPLAY command or the type-2 QUERY command. Note that the display link command shows the local and global queue counts whereas the QRY command does not. This is because the queue counts are shown on the QRY MSNAME command. There are several attributes that cannot be displayed using the type-1 command, for example BANDWIDTH, BUFSIZE, and the new link statistics. SHOW(STATISTICS) and SHOW(BANDWIDTH) are explained in detail in the MSC topic of TM Enhancements.

## QUERY MSNAME – Command Comparison

To Display	Type-2 Keywords	Type-1 Command
Status	SHOW(STATUS)	/DISPLAY MSNAME <i>msname</i> /DISPLAY STATUS MSNAME
Local queue counts	SHOW(QCNT)	/DISPLAY MSNAME <i>msname</i>
Global queue counts	SHOW(QCNT)	/DISPLAY MSNAME <i>msname</i> QCNT
Assigned MSPLINK	SHOW(MSPLINK)	/DISPLAY ASMT MSNAME <i>msname</i>
Assigned MSLINK	SHOW(MSLINK)	/DISPLAY ASMT MSNAME <i>msname</i>
Local and remote sysids	SHOW(SYSID)	/DISPLAY ASMT MSNAME <i>msname</i>
Links with specified status	STATUS( <i>status</i> )	N/A
Links with specified queue counts	QCNT( <i>condition,count</i> )	N/A

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This table shows you how to display attributes of the MSNAME using either the type-1 /DISPLAY command or the type-2 QUERY command.



## Miscellaneous Command Enhancements

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This next section discusses additional command enhancements.

Information On Demand IMS Version 10 

## Completion Code (CC) and Error Text Enhancements

- Explanation of non-zero CCs included in output of all Type-2 commands
  - ◆ If all CCs are zero, TSO SPOC does not display CCText column
  - ◆ Error text for some completion codes (see notes)

UPD DB NAME(ACCTMSTR) STOP(ACCESS)			
DBName	MbrName	CC	CCText
ACCTMSTR	IMS1	AA	DB IN USE-BMP
ACCTMSTR	IMS2	0	
ACCTMSTR	DBC3	AB	DB IN USE-DBCTL LONG THREAD

QRY DB NAME(ACCTHIST,CUSTHST) SHOW(ACCTYPE,LOCAL)				
DBName	MbrName	CC	CCText	ACCTYPE
ACCTHIST	IMS1	0		UPD
CUSTHST	IMS1	10	NO RESOURCES FOUND	

- Complete list of CC and CCText documented in *Command Reference Guide*

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The chart shows an example of the SPOC displaying non-zero completion codes and the CCText returned by IMS with that CC for Type-2 commands. . If all CCs are equal to zero, the CCText column is omitted from the output display. The Command Reference manuals show all of the condition codes and the text for any command.

Some UPDATE and DELETE commands may also include 'Error Text'. For example, a DELETE DB command may include error text which identifies a program which prevented the command from being processed because the program was using the database. 'Error Text' is an additional column. The following is an example of a command response with 'Error Text'.

**DELETE DB NAME(ACCTMSTR)**

DBName	MbrName	CC	CCText	ErrorText
ACCTMSTR	IMS1	11	REFERENCED BY PROGRAM	ACCTUPDT

## UPD DB - PFA and READONLY DBRC flags

- STOP or START with PFA option and SCOPE(ALL)
  - ◆ Sets or resets PFA and/or READONLY flags in RECONS
    - When used with STOP(ACCESS | SCHD)
      - Sets PFA flag ON – (prevents further authorization)
    - When used with STOP(UPDATES)
      - Sets READONLY flag ON (prevents further authorization for update)
    - When used with START(ACCESS)
      - Sets PFA flag and READONLY flag OFF – (allows authorization)
  - ◆ All IMSs process START or STOP command
    - Command Master processes PFA option
      - PFA not updated if command fails on Command Master

```
UPD DB NAME(DBX) STOP(ACCESS | SCHD | UPDATES)
OPTION(PFA) SCOPE(ALL)
```

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Some new options have been added to the UPD DB command. The new options set the PFA (Prevent Further Authorization) or READONLY flag in the RECONS. This is what the /DBR, /DBD, /STA, and /STO commands for databases or areas with the GLOBAL parameter do. For these type-1 commands, the flags are set when GLOBAL is specified unless the NOPFA parameter is also specified. For the UPD command, the PFA parameter must be specified along with SCOPE(ALL) for the flags to be affected.

The UPD command OPTION(PFA) sets or resets the PFA or READONLY flag in DBRC. Specifying the PFA option with a STOP(ACCESS) or STOP(SCHD) command sets the PFA (prohibit further authorization) flag in the RECONS. Specifying the PFA option with a STOP(UPDATES) command sets the READONLY flag in the RECONS. The READONLY prohibits update and exclusive authorizations. Both flags are set off with START(ACCESS) command when the PFA option is used.



# QUERY Command Enhancements

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This section addresses enhancements to the QRY command.

## QUERY (QRY) Command Enhancements

- The QRY command has been enhanced
  - ◆ New resources supported:
    - Programs QRY PGM
    - Routing codes QRY RTC
    - Descriptors QRY xxxDESC (requires DRD)
    - IMS QRY IMS
      - Shown with Global Status in this section of class
    - MSNAME, MSLINK, and MSPLINK
      - Shown with MSC Command Support in this section of class
  - ◆ Enhanced queries for:
    - Databases QRY DB
    - Areas QRY AREA
    - Transactions QRY TRAN
    - IMSplex QRY IMSPLEX
      - Shown in DBRC section of class
    - Members QRY MEMBER
      - Shown with Enhanced Secondary Master Terminal support in this section of class

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The QUERY (or QRY) command has been enhanced to support new resources and extend the command for resources supported in previous releases.

The QRY command for descriptors is rejected if DRD is not active. The other QRY commands may be used with or without DRD.

The only change in the QUERY TRAN command is the way of filtering requests for conversational, fast path, remote, and response mode. Previously, these were done with STATUS(xxxxxxx) where xxxxxxxx was CONV, FPE, FPN, RMT, or RESP. There are new alternatives in IMS V10. The new alternatives are CONV(Y|N), FP(N|E|P), REMOTE(Y|N)m and RESP(Y|N).

Some of the QRY command enhancements are discussed in other sections of the class.

## QRY PGM and QRY RTC Commands

```
QRY PGM NAME(names)
      STATUS(DB-NOTAVL,IOPREV,LOCK,NOTINIT,STOSCHD,TRACE)
      SHOW(XXX,YYY,...)
```

```
QRY RTC NAME(names)
      STATUS(ACTIVE,NOTINIT,NOTSCHD,STOQ)
      SHOW(XXX,YYY,...)
```

- Status filters are optional

- ◆ Example:

```
QRY PGM NAME(AB*) STATUS(STOSCHD) SHOW(ALL)
```

- Shows programs whose names begin with "AB" and which are stopped

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QRY PGM and QRY RTC are new in IMS V10.

The following statuses may be specified for QRY PGM:

<b>DB-NOTAVL</b>	At least one database is not available
<b>IOPREV</b>	BMP with GSAM can't complete due to IO Prevention
<b>LOCK</b>	Program is LOCKED
<b>NOTINIT</b>	Program is not initialized – PSB or DMB not in ACBLIB
<b>STOSCHD</b>	Program scheduling has been stopped - UPD PGM xxx STOP(SCHD)
<b>TRACE</b>	Program trace is on - UPD PGM xxx START(TRACE)

The following statuses may be specified for QRY RTC:

<b>ACTIVE</b>	RTC is active
<b>NOTINIT</b>	RTC is not initialized and can't be used
<b>NOTSCHD</b>	RTC is not scheduled
<b>STOQ</b>	Routing code is stopped

## QRY Resource or Descriptor – Definition Attributes

- QRY commands can return definition attributes
  - ◆ DB, TRAN, PGM, RTC, DBDESC, TRANDESC, PGMDESC, and RTCDESC
- Examples:

```
QRY TRAN NAME(ZG*) SHOW(SPATRUNC,SPASZ)
```

Trancode	MbrName	CC	SPATrunc	SPASz
ZG0700RG	IMS1	0	S	200
ZG2314WL	IMS1	0	R	500

```
QRY PGMDESC NAME(PD100A) SHOW(SCHDTYPE)
```

DescName	MbrName	CC	SchdType
PD100A	IMS1	0	PARALLEL

QUERY commands may be used to show definition attributes for databases, programs, transactions, routing codes and their descriptors. These attributes may have been defined through system definition or through the use of DRD.

## QRY Resource – Definition Type and Model

- QRY with SHOW(DEFNTYPE) shows how resource or descriptor was defined:
  - ◆ MODBLKS - Loaded from MODBLKS data set and not UPDATED
  - ◆ UPDATE - Loaded from MODBLKS but then later updated using UPDATE command
  - ◆ CREATE - Defined using the CREATE command
  - ◆ IMPORT - AUTOIMPORTed from RDDs
  - ◆ DFSINSX0 - Created by Destination Creation Exit (PGMs and TRANS only)
  - ◆ CPIC - Created by IMS as CPI-C transaction
  - ◆ IMS - An IMS default descriptor (DFSDSxx1)
- QRY with SHOW(MODEL) shows the name of the model used by CREATE
  - ◆ Model may be the resource name or descriptor name specified in the CREATE command
  - ◆ Model may be the default descriptor used by the command
  - ◆ Model is blank if the resource or descriptor was created with all attributes defined

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For all resources and descriptors, there are several new attributes that can be shown.

The first is definition type which shows how that resource or descriptor was created. The slide shows the possibilities. CREATE and IMPORT may be returned for both resources and descriptors. MODBLKS, UPDATE, DFSINSX0, and CPIC may be returned only for resources. IMS may be returned only for descriptors.

The second is the name of the model, if any, used by the CREATE command which created the definition.

## QRY Resource – Timestamps

- QRY with SHOW(TIMESTAMP)
  - ◆ Four timestamps are displayed in format: YYYY.JJJ HH:MM:SS.TH
    - TIMECREATE – time resource or descriptor was created
      - Includes import time for resources defined by system definition
    - TIMEUPDATE – time resource or descriptor definition was last updated
    - TIMEACCESS – time resource or descriptor was last accessed or used as a model
      - For example, last DL/I call for a database
    - TIMEIMPORT – time resource was imported from RDDS
      - Create, update, and access times are remembered across warm restarts, emergency restarts, and EXPORT/IMPORT
      - Import times are remembered across warm restarts and emergency restarts

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Four timestamps can be displayed. These are the time the resource was created, the time it was last updated, the time it was last accessed, and the time it was imported from an RDDS.

TIMECREATE is the time of the CREATE command, the time the definition was IMPORTed from RDDS, the time the definition was loaded from MODBLKS, or the time a transaction or program definition was created by DFSINSX0.

TIMEUPDATE is the time that an UPDATE command that updated a definitional attribute, not a status.

TIMEACCESS may be used to understand the last time a resource or descriptor was accessed. For resources and descriptors the meaning of TIMEACCESS is:

DB	time DB was last accessed by an application program (DL/I call)
PGM	time program (PSB) was last scheduled
TRAN	time message was last enqueued or dequeued by a program
RTC	time message was last enqueued to BALG using this routing code
DESC	time descriptor last used as a model in CREATE command

The create, update and access times are remembered across warm start, emergency restart, EXPORT and IMPORT. Import times are remembered across warm and emergency restarts.

The updating of the last access time is not logged between system checkpoints. After a restart, the last access time reflects the time recorded in the restart checkpoint log records. For warm starts this is the time recorded in the shutdown checkpoint. For emergency restarts, any access between the last system checkpoint and the failure of the IMS system will not be reflected in the information available to the restarted IMS system. For cold starts that import definitions from the RDDS, the times will be those in the RDDS. This will be the last access times at the time of the last export.

## QRY Resource Example

- Example:

Command

```
QRY TRAN NAME(INVTRA*) SHOW(TIMESTAMP,MODEL,DEFNTYPE)
```

Response

Trancode	MbrName	CC	TimeCreate	TimeUpdate
INVTRAR	IMS1	0	2006.185 12:33:15.16	2006.186 09:15:26.17
INVTRA7	IMS1	0		

TimeAccess	TimeImport	ModelName	DefnType
2006.195 17:30:04.56		INVDESC	CREATE
2006.195 17:30:05.22	2006.183 07:11:43.44		IMPORT

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Timestamps, model, and definition type have been added to the QRY command SHOW parameters. The example above is what would be shown by the TSO SPOC. The second part of the example above would be displayed by scrolling to the right.

## QRY Resource - SHOW Related Definitions

- For query resource commands show related definitions

```
QRY DB NAME(names) SHOW(PGM)
QRY PGM NAME(names) SHOW(DB|RTC|TRAN)
QRY TRAN NAME(names) SHOW(PGM)
QRY RTC NAME(names) SHOW(REGION)
```

Rsc-type	SHOW(xxx)
DB	PGM - Names of programs that reference database in PSB
PGM	DB - Databases referenced in PSB RTC - Routing codes associated with this program TRAN - Transactions associated with this program
TRAN	PGM - Name of program associated with this transaction
RTC	REGION - Regions where routing code is active

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For resource types, you can show the related resources. These are shown here. Queries for databases accessed by programs and programs which access databases access ACBLIB for this information.

## QRY with SHOW Related Definitions Examples

- Examples of QRY with SHOW for related definitions

Command

```
QRY DB NAME(ACCTMSTR) SHOW(PGM)
```

Response

DBName	MbrName	CC	PgmName
ACCTMSTR	IMS1	0	UPDACCT
ACCTMSTR	IMS1	0	DELACCT

Command

```
QRY PGM NAME(ADDACCT) SHOW(TRAN)
```

Response

PgmName	MbrName	CC	RgnType	Tran
ADDACCT	IMS1	0	MPP	NEWACCT

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These are examples of QUERY commands for the programs which access database ACCTMSTR and for the transactions which invoke program ADDACCT.

## QRY Resource - SHOW Work in Progress

- For query resource commands show work in progress

```
QRY DB NAME(names) SHOW(WORK)
QRY PGM NAME(names) SHOW(WORK)
QRY TRAN NAME(names) SHOW(WORK)
QRY RTC NAME(names) SHOW(WORK)
```

### ◆ SHOW(WORK)

- Indicates reasons that would prevent online change or some DRD commands from completing successfully
  - Online Change MODBLKS
  - Online Change ACBLIB
  - CREATE resource
  - DELETE resource
  - UPDATE resource

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For all resource types, you can show the WORK status. This is typically a status that would keep OLC or DRD from completing successfully.

## QRY Resource - SHOW(WORK)

- SHOW(WORK) conditions

Rsc-type	Some common conditions
	<ul style="list-style-type: none"><li>• See Command Ref. Vol. 2 for additional conditions</li></ul>
<b>DB</b>	<ul style="list-style-type: none"><li>• DB defined to a scheduled program</li><li>• DEDB has at least one open Area</li></ul>
<b>TRAN</b>	<ul style="list-style-type: none"><li>• Transaction is in conversation</li><li>• Transaction is in use - queuing is in progress</li><li>• Transaction has messages queued (non-shared queues)</li><li>• Transaction is scheduled</li><li>• Transaction has messages on the suspend queue</li></ul>
<b>PGM</b>	<ul style="list-style-type: none"><li>• Program scheduled in at least one region</li></ul>
<b>RTC</b>	<ul style="list-style-type: none"><li>• Routing code is active (not stopped)</li></ul>

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This table shows some common conditions that would be shown in the response to a QRY command with SHOW(WORK). All of the possible responses for this field are shown in the Command Reference Volume 2 manual.

## QRY with SHOW(WORK) Example

- Example of QRY TRAN with SHOW(WORK)

```
QRY TRAN NAME(*) SHOW(WORK)
```

Trancode	MbrName	CC	Work
ADDACCT	IMS1	0	IN CONVERSATION
ADDCUST	IMS1	0	IN USE
DELACCT	IMS1	0	QUEUING
UPDACCT	IMS1	0	SCHEDULED
UPDCUST	IMS1	0	SUSPENDED
UPDINV	IMS1	0	ANOTHER CMD IN PROGRESS

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The QRY TRAN command can be used to display the work status of a transaction. It will show those conditions which would prevent a transaction from being deleted.

## QRY Resource – NOTINIT Status

- For all query resource commands

```
QRY rsc-type NAME(names) SHOW(STATUS)
QRY rsc-type NAME(names) STATUS(NOTINIT) SHOW(STATUS)
```

- ◆ When status is NOTINIT
  - Reason for NOTINIT is provided
    - NOTINIT-rc-text
  - Examples

```
QRY TRAN NAME(RLSW0012) SHOW(STATUS)
```

```
Trancode MbrName CC LclStat
RLSW0012 IMS1    0  NOTINIT-01-NOPGM
```

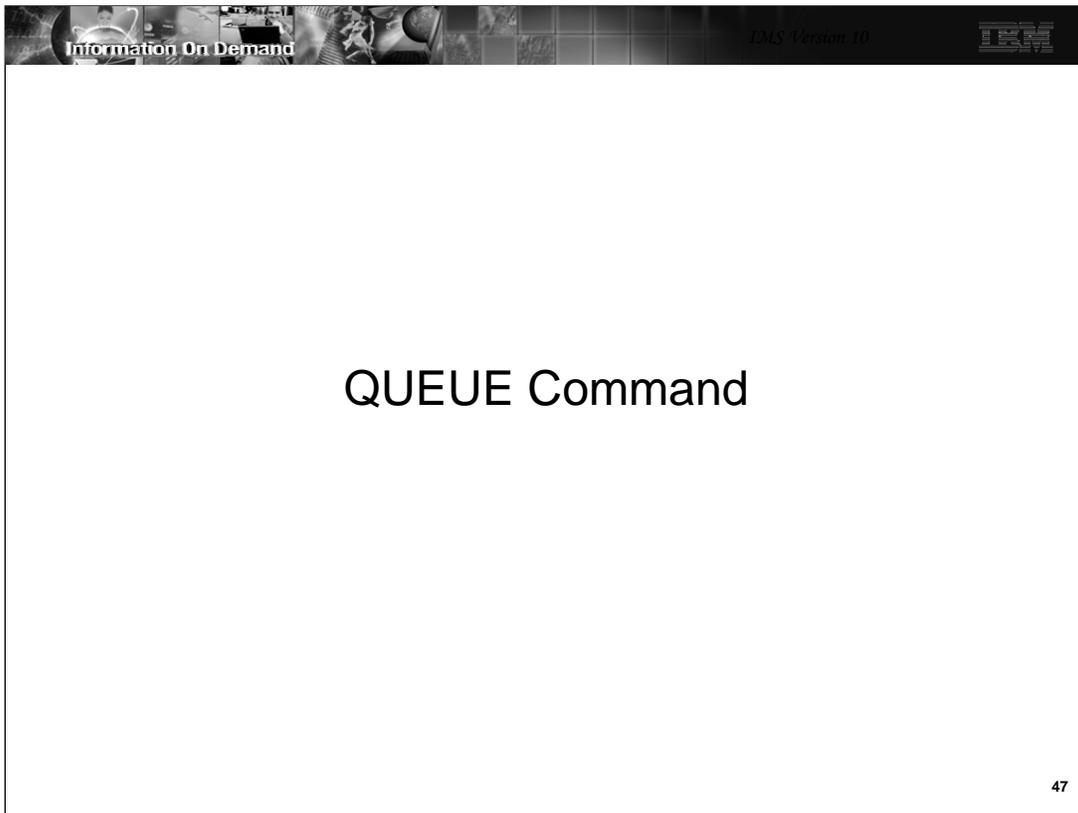
```
QRY DB STATUS(NOTINIT) SHOW(STATUS)
```

```
DBName   MbrName CC LclStat
RZSM098P IMS1    0  NOTINIT-01-NODMB
```

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When a resource has a status of NOTINIT, IMS also keeps the reason it was not initialized. The QUERY command may be used to show this. The response includes NOTINIT followed by the reason code and a description of what that reason code means. For example, a program just created or loaded from MODBLKS or an RDDS may have a status on NOTINIT because there is no PSB in ACBLIB. The Command Reference Vol 2 manual identifies all of the reasons for a resource having a NOTINIT status.

The second form of the command shown above lets you query for resources that have any NOTINIT status and the output will tell you the reason.



The QUEUE command is new in IMS V10.

Security for the QUEUE command is provided by OM with an exit, RACF, or both. The commands must be placed in the OPERCMDS resource class with a prefix of the CSL plex name. The short form of the command must be registered and may be followed by either TRAN or LTERM. For example, if IMSPLEX=PLEX1, then to provide security for the QUEUE TRAN command, you would RDEFINE CSLPLEX1.QUE.TRAN in the OPERCMDS class. Then PERMIT authorized users UPDATE access.

## QUEUE (QUE) TRAN - ENQ

```
QUEUE TRAN NAME(xxx) OPTION(ENQ) DATA(message-data)
```

- Enqueues message to a transaction queue
- NAME(xxx) name of a single transaction code; wildcard (\*) not supported
- OPTION(ENQ) option to enqueue message on transaction queue (default)
- DATA() message data following trancode
  - ◆ If COMM ... OPTION=NOBLANK, DATA is optional
  - ◆ If COMM ... OPTION=BLKREQD, need DATA with at least a leading blank
    - e.g., DATA( )
  - ◆ Single segment message
  - ◆ Maximum length = LGMSG buffer size – 12 bytes (for LLZZ+TRANCODE)

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This shows the syntax when using the QUE command to enqueue a transaction to the transaction queue.

-NAME(xxx) identifies the transaction code – there can be only a single name in this command

-OPTION(ENQ) indicates that the trancode and DATA should be enqueued to the transaction queue (local or global); ENQ is the default

-DATA(xxx) is optional; if supplied, the trancode is followed by the data within the parentheses. Note that whatever is in DATA is moved character for character following the trancode. If OPTION=BLANK is specified on the COMM macro, then DATA must have a leading blank. All messages are single segment, and the maximum size of the DATA can be the size of the LGMSG buffer minus 12 bytes for LLZZ and the trancode.

## QUEUE TRAN - ENQ

```
QUEUE TRAN NAME(xxx) OPTION(ENQ) DATA(message-data)
```

- Shared queues: Command processed only by command master
- Local queues: Command processed by all IMSs to which it is sent
- Command rejected if
  - ◆ Transaction is response mode, fast path, or conversational
  - ◆ Transaction is REMOTE(Y) and MSNAME is stopped
- LTERM name for message is DFSOMAPI
- Userid for message is the userid of the command client

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The command is processed only by the command master in the shared queues environment. It is processed by all the IMSs to which it is sent in a local queues environment.

The message data does not include the LLZZ fields for the segment. IMS adds these fields.

Response mode, fast path, and conversational transactions are rejected if entered. Remote transactions are rejected if the logical link is stopped.

If there is not an RM structure and therefore, there is no global status, the command is rejected if the local status of the transaction on the command master is STOPPED.

If there is an RM structure and if the global status in a shared queues environment is STOQ, the command will be rejected even if the local status is not stopped. If there is an RM structure and if the global status in a shared queues environment is STAQ, the command will be accepted even if the local status is stopped. In other words, if there is an RM structure with shared queues, the global status controls whether the command is accepted or rejected.

The LTERM name used for messages enqueued with this command is DFSOMAPI. The userid associated with the message is the userid of the command client, such as TSO SPOC.

## QUEUE TRAN - ENQ

```
QUEUE TRAN NAME(xxx) OPTION(ENQ) DATA(message-data)
```

- Response (if any) returned by IMS to OM as unsolicited output message
  - ◆ XML Format:

```
<msg>trancode(8) imsid(8) output-message</msg>
```

    - trancode and imsid are 8 bytes followed by a blank
- If transaction code doesn't exist
  - ◆ DFSINSX0 called
    - Has same capability as if message entered from IMS terminal

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Any response from this transaction is returned by IMS to OM in XML format as an unsolicited message. The XML tags are shown on the slide. The new OM2 Unsolicited Output Message support will place this message in the audit trail if enabled, and the SPOC (or a REXX program) can be used to display the contents of the message.

In the above XML format, 8 bytes is reserved for the trancode, followed by a blank, then 8 bytes for the IMSID, followed by a blank, then the message text.

If an IMS V8 or V9 system processes the message and inserts to the IO-PCB, the program will get an AD status code. This requires APARS PK30188 for IMS V8 and PK30189 for IMS V9.

If the transaction name is unknown, DFSINSX0 is invoked. The exit has the same capabilities as if a message from the network arrived with an unknown destination.

## QUEUE (QUE) TRAN - DEQ

```
QUEUE TRAN NAME(xxx) OPTION(DEQ1 | DEQALL)
```

- Dequeues one or all messages on a transaction queue
- NAME(xxx) name of a single transaction code; wild card not supported
- OPTION
  - ◆ (DEQ1) dequeues a single message from transaction queue
  - ◆ OPTION(DEQALL) dequeues all messages on the transaction queue
- Share queues: Command processed only by command master
- Local queues: Command processed by all IMSs to which it is sent
- Transaction must be stopped for scheduling locally and globally

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Transactions can be dequeued from either the local or shared message queue by specifying OPTION(DEQ|DEQALL). DEQ deletes one message. DEQALL deletes all the messages on the queue. In a shared queues environment, the transactions are deleted by the command master. In a local queue environment, each IMS to which the command is routed deletes transactions from its local queue.

The transaction must be stopped for queuing and scheduling on the IMS processing the command.

The QUEUE TRAN ... OPTION(DEQ1|DEQALL) command is not supported for Fast Path exclusive transactions.

If the transaction is unknown, DFSINSX0 can create the transaction for purposes of dequeuing it. This is useful only in a SQ environment since, if it is unknown in a local queues environment, there won't be any messages on the queue.

## QUEUE LTERM - ENQ

```
QUEUE LTERM NAME(xxx) OPTION(ENQ) DATA(message-data)
```

- Enqueues message to an LTERM queue
- NAME() name of a single logical terminal; wildcard (\*) not supported
- OPTION(ENQ) option to enqueue message on LTERM queue
- DATA message data
  - ◆ Single segment message
  - ◆ Maximum length = LGMSG buffer size – 4 bytes (for LLZZ)
  - ◆ If EDIT=UC, message translated to upper case
- Share queues: Command processed only by command master
- Local queues: Command processed by all IMSs to which it is sent
- Command rejected if
  - ◆ LTERM is stopped on processing IMS
  - ◆ LTERM is remote and MSNAME is stopped

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This chart shows the syntax of the QUEUE LTERM command. There can be only one name specified in the command. This is similar to the QUEUE TRAN command, except that the data can be 8 bytes longer since there is no truncode. Messages must be single segment.

In a SQ environment, only the command master queues the message. In a local queues environment, each IMS queues the message. The command is rejected by any IMS where the LTERM is stopped or if it is a remote LTERM and the MSNAME is stopped.

## QUE LTERM - DEQ

```
QUEUE LTERM NAME( xxx ) OPTION( DEQ1 | DEQALL )
```

- Dequeues one or all messages on an LTERM queue
- NAME() name of a single transaction code; wild card not supported
- OPTION
  - ◆ (DEQ1) dequeues a single message from LTERM queue
  - ◆ OPTION(DEQALL) dequeues all messages on the LTERM queue
- LTERM and associated NODE or USER must be stopped
- Local queues: Command processed by all IMSs to which it is sent
- Share queues: Command processed by command master
  - ◆ Exception: If Sysplex Terminal Management is used and node or user is owned, then command processed by the owner

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Messages can be dequeued from the local or shared LTERM queues. For this command to be accepted, the LTERM and associated NODE or USER must be stopped on the IMS processing the command.

This command is a little different when Sysplex Terminal Management is active (which means that SQ is also active). If STM is not enabled, the command is processed only by the command master. If STM is enabled, the command is processed by either the NODE or USER owner or by the command master if the node or user is not owned.

## QUEUE (QUE) TRAN Command

- If transaction not defined locally
  - ◆ DFSINSX0 (Destination Creation Exit) called to resolve
    - Capabilities depend on environment (DRD, SQ)
  - ◆ Options for queuing and scheduling
    - Scheduling implies queuing

DRD	SQ	SCI	Create Transaction Options
NO	YES	YES	✦ Create for queuing only
YES	NO	YES	✦ Create for scheduling – not for queuing only
YES	YES	YES	✦ Create for queuing on local IMS only ✦ Create for scheduling on local IMS only ✦ Create for scheduling on local IMS plus one other IMS and for queuing on all other IMSs ✦ Create for scheduling on all IMSs
YES	YES	Failed	✦ Create for queuing or for scheduling on local IMS only

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If QUE TRAN is entered and the transaction is not defined to IMS, then IMS will invoke the Destination Determination Exit (DFSINSX0) to make a decision about how to process the command. The options are the same as for a message with an unknown destination arriving from the network. The table shows the options depending on the environment – DRD, SQ, and SCI. SCI should always be there, since CSL is required for Type-2 commands, but the last row of the table identifies the options if, for some reason, SCI has failed.



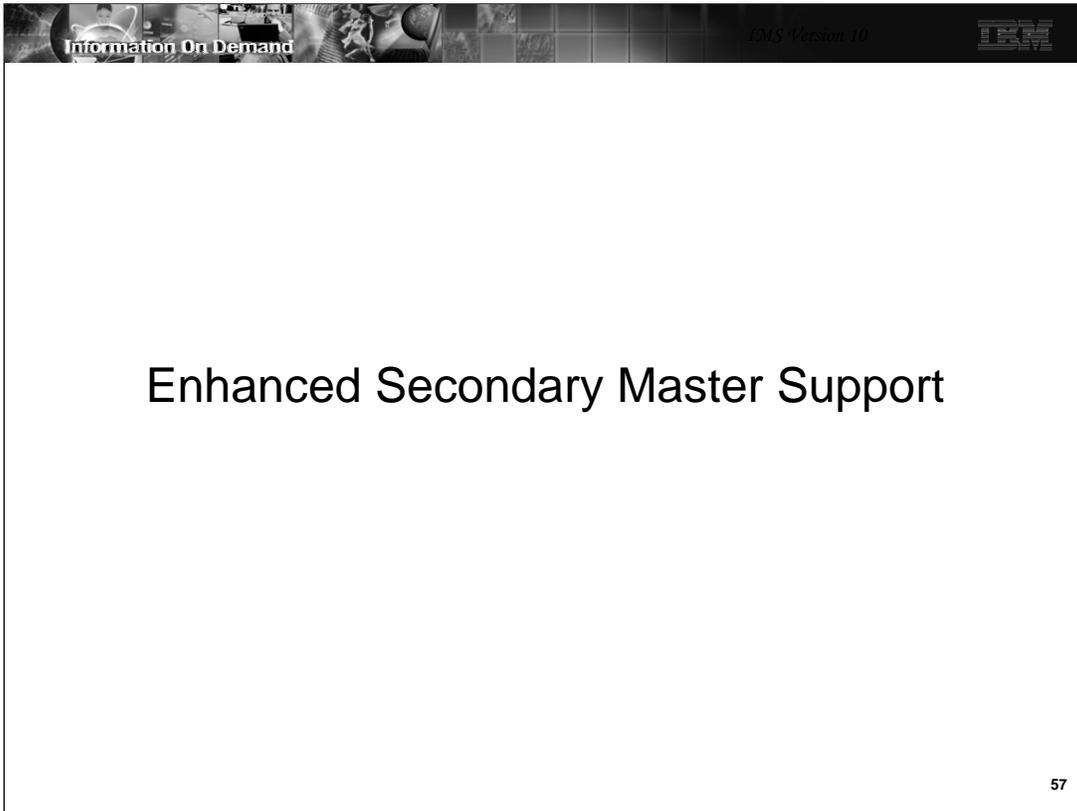
# Enhanced Messages

## DFS064I and DFS065 Messages

- DFS064I and DFS065 messages include transaction or LTERM name
  - ◆ IMS V9 messages:
    - DFS064 DESTINATION CANNOT BE FOUND OR CREATED
    - DFS065I TRAN/LTERM STOPPED
  - ◆ IMS V10 messages:
    - DFS064 DESTINATION CANNOT BE FOUND OR CREATED, DEST=TRANX
    - DFS065I TRAN/LTERM STOPPED, T/L=TRANX
- Benefit
  - ◆ Simpler and faster resolution of problems

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The text in the DFS064 and DFS065I messages has been enhanced to include the name of the transaction or LTERM for which the message is issued. This is especially useful in situations where the user of the application is not aware of the transaction code being used since it is hidden either in the program producing the input message or in the MFS definitions being used.



Although the DRD CREATE and DELETE process does not support MSC resources, there is some enhanced support for MSC in V10.

Information On Demand IMS Version 10 

## Secondary Master Support

- New MSG keyword on /SMCOPY command
 

**/SMC MSG ON | OFF**

  - ON           IMS should send system messages to secondary master
  - OFF          IMS should NOT send system messages to secondary master
  
- QUERY MEMBER TYPE(IMS) shows current setting
 

Command

**QRY MEMBER TYPE(IMS) SHOW(STATUS)**

Response

MbrName	TYPE	Status LclStat
IMS1	IMS	SECCMD, SECCMDT, SECMSG
IMS2	IMS	SECMSG

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You can turn off the logging of system messages to the secondary master in V10 by entering the command: /SMC MSG OFF.

In previous releases the /SMCOPY command was used to control the copying of commands and command responses to the secondary master. It did not affect the copying of system messages to the secondary master. /SMC MASTER ON|OFF controlled the sending of commands from the master terminal and their responses the secondary master. /SMC TERMINAL ON|OFF controlled the sending of commands from non-master terminals and their responses the secondary master. IMS V10 adds the control of whether or not systems messages are sent to the secondary master. In previous releases all system messages were sent to the secondary master.

A status of SECMSG indicates this status in response to a QRY MEMBER TYPE(IMS) SHOW(STATUS) command indicates that system messages are sent to the secondary master. SECCMD indicates that commands from the master are sent to the secondary master. SECCMDT indicates that commands from the other terminals are sent to the secondary master.

## Secondary Master Support

- Type-2 AOI Exit (DFSABOE00) enhanced
  - ◆ Secondary master messages
    - Can control logging of secondary master messages on a per message basis
      - Prior to this enhancement, exit called only for messages sent to primary
    - Exit called during IMS initialization
      - May indicate if it should be called for secondary master messages
    - Exit called for first segment of secondary master message
  - ◆ Additional information about command origins when the exit is invoked
    - Indicators for system console or master terminal origin of command
      - Previously, these were included in "other" category

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The Type-2 AOI Exit (DFSABOE00) has been enhanced in two ways.

First, it can now control the logging of system messages to the secondary master on a message-by-message basis. The exit decides during IMS initialization if it wants to be called for secondary master messages. In prior versions, it was called only for messages to the primary master. If it is called for secondary master messages, it can reply to IMS to process the message normally or cancel the message to the secondary master. If the message is also going to the primary, it is called a second time.

Second, when the exit routine is invoked for a command, the function-specific parameter list also includes whether the command originated with the system console or the MTO. In earlier versions of IMS these origins were included in the "other" category.

A more complete description of the use of this exit for secondary master logging is described in the Exit Routine Reference manual.



This section discusses the concept of “global status” which is enabled by defining a Global PLEXPARM parameter.

## Global Status

- User may elect to maintain global status of following resources
  - ◆ Databases including HALDB partitions
  - ◆ Areas
  - ◆ Transactions
- Statuses include started, stopped, locked, etc.
- Enablement requires
  - ◆ CSL layer with RM and RM Structure
  - ◆ Global PlexParm parameter in DFSCGxxx or DFSDfxxx
- Global status set by command
  - ◆ Type-1 command with GLOBAL keyword
  - ◆ Type-2 command with SCOPE(ALL)
- Benefits
  - ◆ If global status for a resource is changed while an IMS system is down, the system assumes the global status when it restarts

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The user can elect to maintain global status for databases, areas, and transactions in a Resource Structure. Global status is enabled initially by coding the GSTSxxx parameters in the DFSCGxxx or DFSDfxxx PROCLIB member, and may be updated (or added) later by the UPD IMS command. Global status for a resource is set with a global command. Global commands are type-1 commands with the GLOBAL keyword or type-2 commands with SCOPE(ALL) specified.

The benefit of global status is that it allows users to more easily manage sysplex environments where some IMS systems are not always up. The user may change the status of a resource, such as starting it or stopping it, while some IMS systems are not up. When these systems are started, the resources in them assume the statuses that were changed while they were not running.

## Global Status and Global PLEXPARM

- Requires Resource Manager (RM) and Resource (RM) Structure
  - ◆ Global PLEXPARM Entry created in RM Structure
  - ◆ Resource Entries created in RM Structure
  
- Enabled by
  - ◆ Including PLEXPARM parameters in DFSCGxxx or DFSDFXxx
  - ◆ Entering an UPDATE IMS command
  
- Global status is maintained for the following resources in the Resource Entries and in local control blocks
  - ◆ Databases >>> DDIR, including HALDB Partition DDIRs
  - ◆ DEDB Areas >>> DMAC
  - ◆ Transactions >>> SMB

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Maintaining global status on databases, DEDB areas, and transactions requires the CSL environment with a Resource Manager and Resource Structure. Resource entries are created in the structure and hold the global status. Enabling parameters are coded in DFSCGxxx, or the CSL section of DFSDFXxx. They may also be enabled after IMS is up and running using the UPDATE command.

Resources for which global status is kept are databases (all kinds except MSDBs), HALDB partitions, DEDB areas, and transactions. The global status is kept in both the resource entry and the local control block.

## What Is Global Status?

- Global status is a resource status which has been set by a “global” command
  - ◆ Requires global status be enabled
  - ◆ Commands that set global status
    - Type-1 commands with GLOBAL keyword
    - Type-2 UPDATE command with SCOPE(ALL)
      - SCOPE(ALL) is the default for the UPDATE command
      - SCOPE(ACTIVE) does not set global status
  - ◆ Global status exists ONLY if set by one of these commands
  - ◆ Global status is never set by events in IMS
- Global status is maintained in a Resource Entry in the RM Structure
- A restarting IMS may change its local resource status to the global status of that resource
  - ◆ Cold start
  - ◆ Warm start
  - ◆ Emergency restart

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Global status is status which has been set by a “global command” or more accurately, a command with global scope.

Both type-1 and type-2 command may be global in scope. For type-1 commands, this means including the keyword GLOBAL on the command - for example /DBR DATABASE XXX GLOBAL. For type-2 commands, this means including SCOPE(ALL) on the command - for example, UPD DB NAME(XXX) STOP(Access) SCOPE(ALL). Global status is only set by one of these commands. It is never set by events in IMS.

When IMS is restarted, it may change its local status for a resource to the global status found in the structure. This is always true for cold starts, and sometimes true for warm or emergency restart. The conditions under which global status will override local status will be discussed a little later.

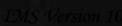
## Global Status vs Local Status

- A resource control block contains both local and global status
  - ◆ Local status is current status of resource *in that IMS*
    - Maintained in local control blocks
  - ◆ Global status is status contained in Resource Entry *in RM structure*
    - Global status and timestamp of when global status was established also maintained in local resource control blocks
    - Global status is only used to set status when an IMS system is (re)started
  - ◆ *Local status does not always equal to global status*
    - e.g., Can stop database globally, then start it locally

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Resource controls blocks (DDIRs, DMACs, and SMBs) contain BOTH the local status and the last known global status. Global status is also contained in the resource entry of the structure. Both the control block and the structure also have the timestamp of when that status was set.

Local status does not always equal global status. For example, a database can be stopped globally, but then later started locally on one IMS. We will talk more later about this concept of local vs global status.


## What Is the Global PLEXPARM?

- The Global PLEXPARM parameter enables or disables the keeping of global status for each resource type
  - ◆ A new parameter in
    - CSL proclib member DFSCGxxx < or >
    - CSL section of the DFSDFXxx proclib member
  - ◆ Specifies whether global status is to be kept for each resource type

**PLEXPARM=( GSTSDB=Y | N, GSTSAREA=Y | N, GSTSTRAN=Y | N)**

- ◆ A Global PLEXPARM Entry is created in the RM Structure by the first IMS V10 system to join the IMSplex
  - Subsequent IMSs (V10 only) use values in Global PLEXPARM Entry
  - Values can be changed using “UPDATE IMS” command

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Whether or not global status is maintained is determined by the “global plexparm” parameters in CSL (either DFSCGxxx or the CSL section of DFSDFXxx). The PLEXPARM parameter has values for databases, DEDB areas, and transactions. In each case, the default is N (no), meaning that global status is not to be maintained for that resource type.

When any IMS V10 in the IMSplex joins the IMSplex, it looks for this parameter in the RM structure. If it does not find it, it creates a global plexparm entry with values for GSTSDB, GSTSAREA, and GSTSTRAN.

The user can change these parameters later using the UPDATE IMS command. The UPDATE IMS command is new in V10.

When an IMS system starts, it uses the values from the PLEXPARM entry in the RM structure if they exist. If they do not exist, it sets them from its parameters (those specified in DFSCGxxx or DFSDFXxx). If the values in the structure entry and those from the IMS system differ, message DFS3425I is issued. The message is:

```
DFS3425I PLEXPARM INIT VALUE rrrrrrr=xxxx OVERRIDDEN WITH GLOBAL PLEXPARM VALUE rrrrrrr=y
```

where rrrrrrr is GSTSDB, GSTSAREA, or GSTSTRAN, x is Y, N, or NULL and y is Y or N.

DBCTL systems do not have transaction resources. DCCTL systems do not have database or area resources. The PLEXPARM value for the resource type they do not support is NULL within these systems. Nevertheless, they can set values for all three parameters in their PROCLIB member or with the UPDATE IMS command.

## Global PLEXPARM Command Support

- Global PLEXPARM entry may be updated using UPD command

```
UPDATE IMS  
SET ( PLEXPARM ( GSTSDB ( Y | N ) , GSTSAREA ( Y | N ) , GSTSTRAN ( Y | N ) )
```

- ◆ The command master processes this command, updating the global plexparm entry in the structure
  - ◆ IMS system will change its local plexparm values accordingly
  - ◆ This command is the only way to change PLEXPARM values once they have been set
- PLEXPARM values may be shown with QRY command

```
QRY IMS
```

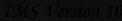
- ◆ Shows the current values for PLEXPARM

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The global PLEXPARM parameters set in the CSL PROCLIB member are only effective for the first IMS to join the IMSplex. Afterward, they may be changed only by using the UPDATE IMS command as shown in this slide. When this command is entered, the values of the global PLEXPARM parameters in the entry of the structure are updated by the command master. Each IMS to which the command is routed will also change its local PLEXPARM values.

Restarting an IMS with a different set of PLEXPARM values does NOT change the global values in the structure entry.

The QUERY IMS command may be used to display the current settings of the PLEXPARM parameters.


## Creating Global Status

- A global status for a database, area, or transaction if both of the following conditions are true
  - ◆ Global status for resource type is requested in PlexParm
    - GSTSDB(Y)
    - GSTSAREA(Y)
    - GSTSTRAN(Y)
  - < AND >**
  - ◆ Global status command is issued
    - Type-1 DB or AREA command with GLOBAL keyword
    - Type-2 DB or AREA command with SCOPE(ALL)
    - Type-2 TRAN command with SCOPE(ALL)

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Database and area entries are added to the structure if:

- they are not already there (obviously)
- global status is enabled (GSTSxxx = Y)
- and global status exists

This means that IMS does not automatically add an entry to the structure just because it has a database or someone stopped or started it locally. It only adds an entry if someone enters a global command, giving the DB or area global status. Once it has global status, then it stays in the structure until it no longer has global status. This would occur only if someone changes GSTSxxx to N. If that happens, the database or area entries are deleted from the structure.

In the sense used here a "global command" is a type-1 DB or AREA command with the GLOBAL keyword specified or a type-2 command with SCOPE(ALL) specified. These commands set global status for the resource.

On the other hand, there is a significant difference between the type-1 commands with the GLOBAL keyword and type-2 commands with SCOPE(ALL). Type-1 commands with the GLOBAL keyword are sent to all of the data sharing partners via an IRLM notify. If you issue a type-1 command with the GLOBAL keyword it will be processed by all the data sharing systems. SCOPE(ALL) on a type-2 command does NOT cause the command to be processed by other systems. It only affects the global status in the RM structure and the local status to be set in the systems to which the command is routed. Type-2 commands are only processed by the systems to which they are directly sent. IRLM notifies are not used to send type-2 commands to other systems.

## Examples of Setting or Changing Global Status

```
/DBR DB ABC GLOBAL  
  
UPD DB NAME(ABC) STOP(ACCESS) SCOPE(ALL)  
  
UPD DB NAME(ABC) STOP(ACCESS)  
  
UPD TRAN NAME(XYZ) STOP(SCHD) SCOPE(ALL)  
  
UPD TRAN NAME(XYZ) STOP(SCHD)
```

- ◆ GLOBAL changes global status for type-1 commands
- ◆ SCOPE(ALL) changes global status for type-2 commands
  - SCOPE(ALL) is the default for the UPD command

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You should note that even though the first three commands on this page set the global status of database ABC to STOACC, they are not equivalent commands.

The GLOBAL parameter on type-1 /DBR, /DBD, /STA, and /STO commands for databases and areas causes the command to be sent to the data sharing partner IMS systems. This is done via IRLM notifies. Since the other systems receive the command they change the local status of the resource.

On the other hand, the SCOPE(ALL) parameter on type-2 commands does not cause the command to be sent to any other IMS systems. If you route the command to only one system, only that system is affected by the command. The local status on other systems is not changed. If you want to change the local status on all systems, you should route the command to all systems.

## Global Database Status

- Possible database (and HALDB partition) global status values
  - ◆ STA                database is to be started
  - ◆ LOCK             database is to be locked
  - ◆ STOSCHD         database is to be stopped
  - ◆ STOACC          database is to be stopped for access and offline
  - ◆ STOUPDS        database is to be stopped for updates
  - ◆ OPEN            database is to be opened
  - ◆ ALLOC           database is to be allocated
  - ◆ NONE            database has no global status  
(database entry doesn't exist)
- Databases may have multiple statuses
  - ◆ STA, ALLOC
  - ◆ STA, ALLOC, OPEN

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This chart shows the possible global statuses that an database or HALDB partition can have. It may also have no status (NONE) in which case there would be no database entry. It is also possible to have multiple global statuses, such as started, allocated, and open. You will note that the notation for these global statuses is sometimes different than the same local status. For example, you can have a global status of STOACC and a local status of STOPPED which mean the same thing. Another example is that you could have a global status of STOUPDS and a local status of READONLY which mean the same thing.

## Global Area Status

- Possible area global status values
  - ◆ STA            area is to be started
  - ◆ STOPPED    area is to be stopped but ADS may be allocated
  - ◆ STOACC     area is to be stopped and ADS is not to be allocated
  - ◆ NONE        area has no global status (area entry doesn't exist)

This chart shows the possible global statuses for DEDB areas.

## Global Transaction Status

- Possible transaction global status values
  - ◆ STAQ            transaction is to be started for queuing
  - ◆ STASCHD       transaction is to be started for scheduling
  - ◆ STOQ           transaction is to be stopped for queuing
  - ◆ STOSCHD       transaction is to be stopped for scheduling
  - ◆ NONE           transaction has no global status (null)
  
- A transaction can have multiple statuses
  - ◆ STAQ, STASCHD
  - ◆ STAQ, STOSCHD
  - ◆ STOQ, STASCHD
  - ◆ STOQ, STOSCHD

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This chart shows the possible global statuses for transactions. Like databases, a transaction can have multiple global statuses.

## Global DB Access Type (ACCTYPE)

- Database access type can be updated globally

```
UPD DB NAME(XXX) SET(ACCTYPE(YYY)) SCOPE(ALL)
```

- ◆ Global ACCTYPE is maintained in Resource Entry
  - BRWS | READ | EXCL | UPD
- ◆ Type-1 command cannot be used to set global access type
  - /START DB xxx ACCESS=yy GLOBAL is invalid

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ACCTYPE is the only DB “attribute” that is maintained globally. If an UPDATE DB NAME(XXX) SET(ACCTYPE(yyy)) SCOPE(ALL) is issued, the access type of yyy is set in the DB entry. One is created if it doesn’t already exist. IMSs being started will set their ACCTYPE to yyy if they have not been active since the global setting was changed.

It is invalid to include both the ACCESS= and GLOBAL keywords in a type-1 command.

## QUERY Command Support

- QRY commands can show local and global status and access type  
**QRY DB|AREA|TRAN NAME(names) SHOW(ACCTYPE,STATUS)**
- Example – IMS1 is Command Master

Command

```
QRY DB NAME(ACCT*) SHOW(ACCTYPE,STATUS)
```

Response

DBName	MbrName	Global		Local	
		Acc	Status	LAcc	LclStat
ACCTHIST	IMS1	UPD	STOACC		
	IMS1			UPD	ALLOCS,OPEN
	IMS2			UPD	STOACC,NOTOPEN
ACCTMSTR	IMS1	UPD	STA		
	IMS1			UPD	ALLOCS,OPEN
	IMS2			BRWS	ALLOCS,OPEN

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This is an example of a command showing local and global DB status and local and global DB access type. Because neither LOCAL nor GLOBAL was specified, both are shown in the response.

The response could have been created by the following actions.

A /DBR DB ACCTHIST GLOBAL or a UPD DB NAME(ACCTHIST) STOP(ACCESS) SCOPE(ALL) command was issued. If the UPD DB command was used, it was routed to both IMS systems. This set the global status for the database to STOACC. It also caused the database to be closed on both IMS1 and IMS2. Later a /START DB ACCTHIST or an UPD DB NAME(ACCTHIST) START(ACCESS) SCOPE(ACTIVE) command was issued only on IMS1. This started the database locally on IMS1. The database was then allocated and opened. The QRY command shows the results for ACCTHIST.

Database ACCTMSTR was started on both systems with a global status of STA and a global access type UPD. A /DBD DB ACCTMSTR or a UPD DB NAME(ACCTMSTR) SET(ACCTYPE(BRWS)) was sent only to IMS2. This caused IMS2 to change its local access type to BRWS which is read-only. It also closed and reopened the database data sets for read. The QRY command shows the results for ACCTMSTR.

## Batch Jobs and Utilities

- Global status affects only online systems running in CSL environment
  - ◆ Batch jobs and utilities do not have access to RM
  - ◆ Some online IMS subsystems may not be running with CSL
- Batch jobs and utilities are not affected by global status
  - ◆ PFA flags are only way to prevent batch jobs from getting DB authorizations
- DBRC PFA flags may be used to control batch authorizations
  - ◆ Prevent further authorization set by
    - /DBR ... GLOBAL or /STO ... GLOBAL
    - UPD DB ... STOP(ACCESS|SCHD)(PFA)
  - ◆ Only read authorizations set by
    - Set by /DBD ... GLOBAL
    - UPD DB ... STOP(UPD)(PFA)

New in V10

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The PFA (prohibit further authorization) flag in DBRC prevents further authorization of a database to another IMS subsystem, including batch jobs. Because non-online IMS systems do not run with CSL and do not have access to the global status of a database, a global command such as UPD DB NAME(XYZ) STOP(ACCESS) SCOPE(ALL) would not prevent a batch job from getting authorization to that database. Only the PFA flag can do that. It also prevents online IMS systems that are not running with CSL and global status support from being able to authorize the DB. The point is global status is effective only within an IMSplex running with CSL and global status enabled.

DEDB areas also have a PFA flag, but cannot be accessed by batch jobs so it is seldom as much of an issue.

As we will see in the commands section of the class, the type-2 UPD DB class has been enhanced in V10 to set PFA flags.

## IMS Initialization

- During IMS V10 initialization in IMSplex
  - ◆ IMS queries RM for Global PLEXPARM Entry in RM Structure
- If no entry found and PLEXPARM parameter specified for IMS
  - ◆ Entry is created with PLEXPARM values
- If no entry and no PLEXPARM parameter specified for IMS
  - ◆ Entry is created with "N" values
- If entry is found, it is used
  - ◆ It overrides PLEXPARM values in the IMS system being initialized
  - ◆ If global status is being maintained for resource type (GSTSxxx=Y)
    - IMS obtains global resource statuses and timestamps from Resource Entries
      - Saved for IMS restart processing – Not applied locally yet

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During initialization, IMS queries RM for the global PLEXPARM entry and takes action depending on whether or not the entry exists.

If the entry does not exist, IMS will create one according to the type of IMS it is and according to the PLEXPARM parameter in DFSCGxxx of DFSDFXxx. Note that the default for each of the parameters is N (no global status to be maintained).

-DB/DC will add an entry with values from PLEXPARM for all three resource types.

-DBCTL will add an entry with values from PLEXPARM for databases and areas, but will leave the transaction parameter NULL

-DCCTL will add an entry with values for transactions but leave databases and areas NULL

If there is no PLEXPARM parameter in DFSCGxxx of DFSDFXxx, IMS will set the GSTSxxx values to N or NULL, depending on subsystem type.

## IMS Restart

- When IMS is restarted
  - ◆ Global statuses from RM structure have already been obtained during initialization
- Cold starts apply global statuses to local statuses
  - ◆ Cold started systems assume the global status for each resource
- Warm and emergency restarts only apply global statuses to local statuses if global statuses were set while IMS was down
  - ◆ Warm started systems assume the global status only if it was changed while IMS was down

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When IMS is restarted, it has already obtained the global values from the structure. It is during restart that IMS decides whether or not to apply this global status to the local control blocks.

-For cold starts IMS always sets the local status to the global status.

-For warm and emergency restart, the local status from the log records used for restart are first applied. (1) If the global status read from the structure was set at a time when IMS was down, the global status is applied to the control block. This occurs because someone changed the status globally while IMS was down. If IMS had been up, it would have changed its status at the time. (2) If the global status was set before IMS went down, then the local status is retained. The status on this IMS must have been changed after the global status was set.

-For an /ERE COLDBASE restart, the database and area statuses are set according to the rules for cold start. Transaction statuses are set according to the rules for emergency restart.

-For an /ERE COLDCOMM restart, the transaction statuses are set according to the rules of cold start. Database and area statuses are set according to the rules of emergency restart.

## Global PLEXPARM – Structure Failure

- If Resource Structure fails
  - ◆ RM notifies active IMSs to repopulate structure from their control blocks
    - Each IMS maintains current global status in its control blocks
  - ◆ If a resource is defined to only one IMS and that IMS is down at repopulate time
    - Structure is not repopulated with that resource and status
    - Only a global command will create a global status for the resource
    - If "down" system is restarted without a global status in the structure, the restarted system will assume its last local status for the resource

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If the resource structure fails, RM notifies each IMSplex member to repopulate the structure from their control blocks. Remember, the control blocks have both the local and global status. Whichever IMS gets to the entry first sets the global status.

If a resource is defined to just one IMS, and that IMS is down at repopulate time (or all IMSs to which the resource is defined are down), then it cannot be repopulated. If a DB or AREA resource is later dynamically added to another IMS, there is no global status. If a transaction is dynamically entered by another IMS, a transaction entry is created with NULL status. If the DB or AREA resource then acquires global status, a DB or AREA entry is created with the appropriate global status. A transaction entry is updated with the global status. When the down IMS is restarted, it takes its global status from the structure.

## Global Status Summary

- Global Status Support
  - ◆ Allows new systems to assume global statuses for database, area, and transaction resources
  - ◆ Allows restarted systems to assume global statuses that were changed while they were down
  
- Benefit
  - ◆ Simplifies operations in a Parallel Sysplex environment
  - ◆ Resources may be managed globally
    - Support for new systems
    - Support for systems which are down

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The user can elect to maintain global statuses for databases, areas, and transactions in a Resource Structure. Global status is enabled initially by coding the GSTSxxx parms in the DFSCGxxx or DFSDfxxx PROCLIB member. It may be updated or added later by the UPD IMS command. Both type-1 and type-2 commands can set global statuses for databases and areas, Only type-2 commands can set global statuses for transactions. The benefit is that it allows the user to set a global status while some IMSs are down and then have an IMS accept that status when it is restarted.

## Systems Management Enhancements

- Type-2 command support for MSC
  - ◆ Dynamically change MSC definitions
- IMS Command Enhancements
  - ◆ QUERY command
  - ◆ UPDATE command
  - ◆ QUEUE command
- Enhanced messages
  - ◆ Destination added to DFS064 and DFS065I messages
- Enhanced secondary master terminal support
  - ◆ Control of messages and commands
- Global status support for DBs, AREAs, and TRANS
  - ◆ Statuses maintained across a sysplex



There is a new SPOC-like ISPF program to help manage IMS resources using the DRD commands

## Manage Resources Highlights

- This enhancement to the IMS Application portfolio extends its capabilities with direct support for Dynamic Resource Definition
  - ◆ Invoked from IMS Application Menu
  
- It includes a series of panels to let the user perform DRD functions against IMS MODBLKS resources and descriptors
  - ◆ Actions
    - Create, delete, update, query
  - ◆ Resource types supported are those supported by DRD
    - Databases, programs, transactions, routing codes
  - ◆ Primary technique is “fill in the blanks”
  - ◆ Panels and navigation similar to TSO SPOC panels
  
- Supports various skill levels
  - ◆ Graduated levels of help available
  - ◆ Fewer screens required for higher skill levels

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Manage Resources is invoked from the Application Menu. This is the menu that includes several other programs, including SPOC, KBLA, and the HALDB Partition Definition Utility.

Manage Resources presents a series of panels to simplify the task of creating, deleting, updating and querying the definitions used with DRD. The primary technique for creating a resource or descriptor is to present the user with a screen with a field for every attribute which the user can then fill in or let default. The defaults will be shown to the right of the field.

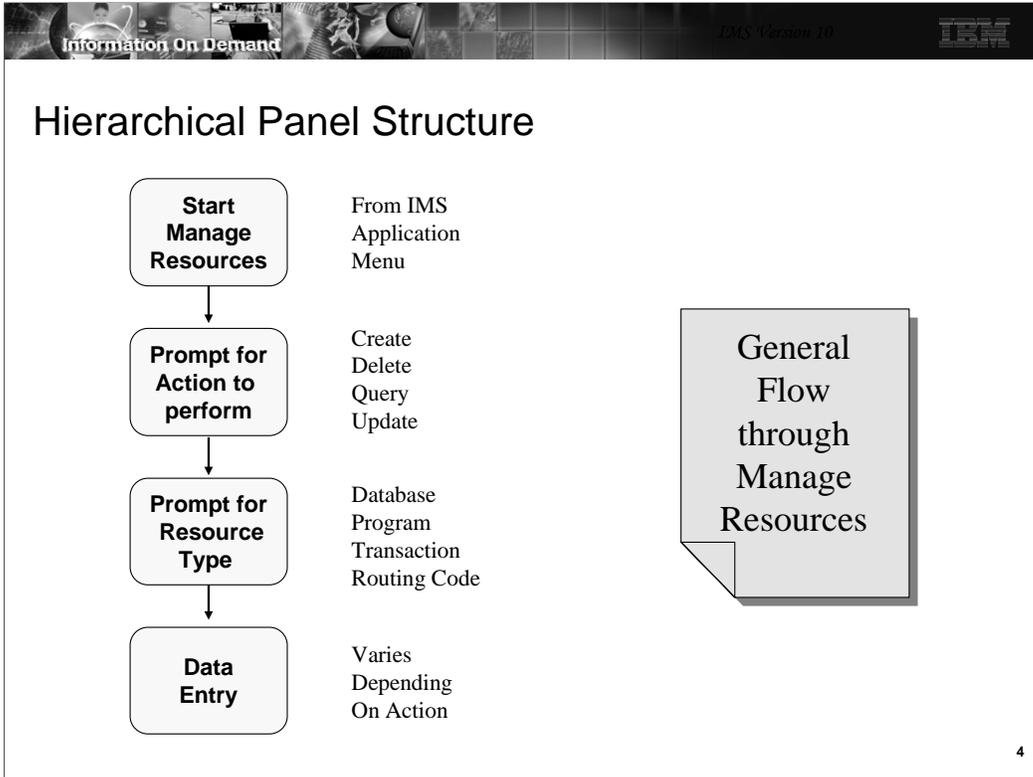
More skilled users can choose a different format that requires them to know the meaning and valid values for every field. This streamlines the process by presenting everything in a single screen.

## Manage Resources Highlights

- Manage Resources panels prompt for input
  - ◆ Select from menu
    - Action
    - Resource Type
  - ◆ Data entry
    - Default values shown where appropriate
    - List View or Command Syntax View
  
- User Preference panel enhanced to include ...
  - ◆ Select view
    - List view – fields listed with descriptive text – requires more screens
    - Command syntax view – looks like command – no descriptive text
  - ◆ Select confirmation option before submitting command – Yes or No

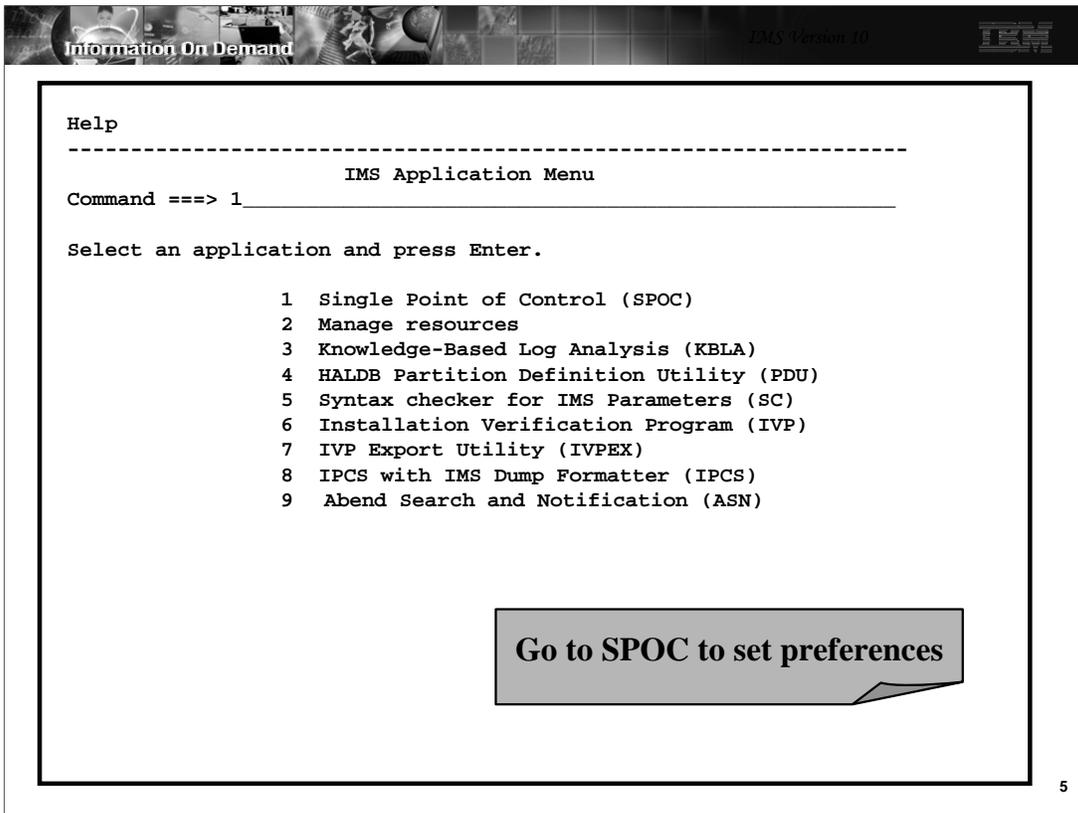
3

Manage Resources will always prompt the user for the next input. It will, for example, ask you what action you want to perform against what resource or descriptor. The SPOC Preference screen lets you select a default for the view. You may select either List View which is designed for the less skilled user and the Command System View which is intended for the more skilled user. You can tell the program that you do not want to confirm every entry that would update a resource or descriptor.



The basic flow is:

- Start Manage Resources from the IMS Application Menu
- Select the action you want to perform (e.g., create a definition)
- Select the resource type (e.g., create a DATABASE)
- Enter the data (e.g., enter the database name and attributes)



Start the IMS Application Menu and select Option 1 – SPOC. You should go to SPOC first to set your preferences for Manage Resources.



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Help

---

IMS Application Menu

Command ==> 2

Select the desired Sub-Options and press Enter.

- 1 Single Point of Control (SPOC)
- 2 Manage resources
- 3 Knowledge-Based Log Analysis (KBLA)
- 4 HALDB Partition Definition Utility (PDU)
- 5 Syntax checker for IMS Parameters (SC)
- 6 Installation Verification Program (IVP)
- 7 IVP Export Utility (IVPEX)
- 8 IPCS with IMS Dump Formatter (IPCS)
- 9 Abend Search and Notification (ASN)

Go to  
Manage  
Resources

7

Go back to Application Menu and select Manage Resources

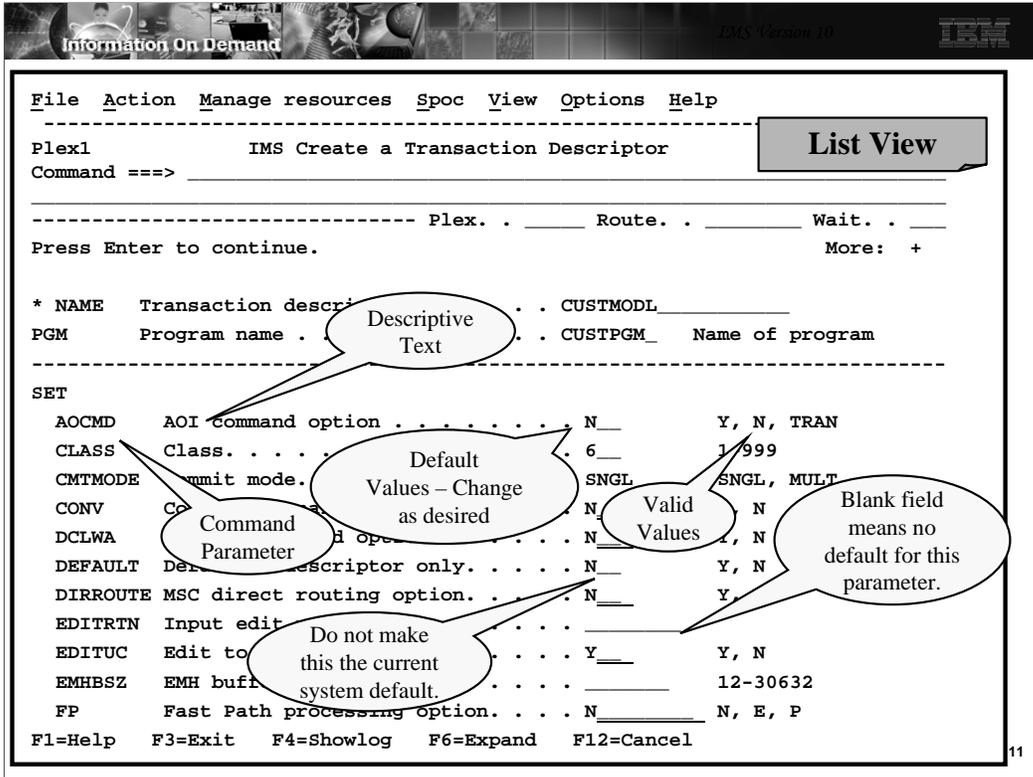


## Create Resources

- The following screens show an example of creating a transaction descriptor and two transactions
  - ◆ Multiple resources of the same type can be created with a single command
  - ◆ Separate resource names by commas
- The first set of screens uses the “List View”
  - ◆ Each parameter on a separate line with a short description
- The second set of screens shows the same CREATE action using the “Command Syntax View”
  - ◆ Fewer screens
  - ◆ Requires higher skill level

The next few screens are an example of creating a transaction descriptor then using that descriptor to create two transactions. Both the List View and Command Syntax View are shown.





Manage Resources sends us screens (List View – that was our preference) with all the possible attributes for transaction descriptors. There will be multiple screens since there are more attributes than will fit on one screen in List View.

At the top of the screen, enter the name or names of the descriptors you want to create and the name of the program.

Since we opted to use the system default transaction descriptor, the third column will have these defaults already filled in. If the field is blank, there is no default. You can change those you want to change and leave the rest as they are. The far right column shows the valid values for the field.

Press F8 to scroll forward and F7 to scroll backward through all the screens.

After entering all the data, pressing Enter will either send a CREATE TRANDESC command to IMS or will ask you to confirm.

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---

```

File Action Manage resources Spoc View Options Help
-----
Plex1                      IMS Create New Resource
Command ===> _____
----- Plex. . _____ Route. . _____ Wait. . _____

Select a resource type. To base the resource on a template, specify
template information. Press Enter to continue.

* Resource. . . . . 4 1. Database
                   2. Program
                   3. Routing Code
                   4. Transaction

Resource name . . . . . CUSTADD,CUSTUPD
Resource type . . . . . 1 1. Resource
                   2. Descriptor

Definition template . . . . . 2 1. System default
                   2. Existing resource

Existing resource
  Definition template name . . . CUSTMODL
  Definition template type . . . 2 1. Resource
                                   2. Descriptor

F1=Help  F3=Exit  F4=Showlog  F6=Expand  F12=Cancel

```

Create two transactions with same attributes

Use CUSTMODL descriptor as model.

After the transaction descriptor has been created you can create transactions using this descriptor as a template.

On this screen, we are creating two transactions, CUSTADD and CUSTUPD, using the descriptor we just created, CUSTMODL, as a template.

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---

File Action Manage resources Spec View Options Help

---

Plex1 **List View**  
 Command ==>> \_\_\_\_\_

---

----- Flex. . . . . Route. . . . . Wait. . . . .  
 Press Enter to continue. More: +

Based on definition template . . . : CUSTMODL

\* NAME Transaction name . . . . . CUSTADD,CUSTUPD \_\_\_\_\_  
 PGM Program name . . . . . CUSTPGM\_ Name of program

---

SET

AOCMD	AOI comm	. . . N__	Y, N, TRAN
CLASS	Class. . .	. . . 12_	1-999
CMTMODE	Commit mode. . . . .	. . . SNGL	SNGL, MULT
CONV	Conversational . . . . .	. . . N__	Y, N
DCLWA	Log write-ab	. . . N__	Y, N
DEFAULT	Default	. . . N__	Y, N
DIRROUTE	MSC di	. . . N__	Y, N
EDITRTN	Input edi	. . . _____	
EDITUC	Edit to uppercase . . . . .	. . . Y__	Y, N
EMHBSZ	EMH buffer size. . . . .	. . . _____	12-30632
FP	Fast Path processing option. . . . .	. . . N_____	N, E, P

F1=Help F3=Exit F4=Showlog F6=Expand F12=Cancel

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Change any attributes that should be different from the descriptor. In this example, we are changing the class from 6 to 12.

## Create Resource

- Scroll through the screens using ISPF function key assignments
  - ◆ PF8 – scroll forward
  - ◆ PF7 – scroll back
  
- Make changes to defaults on the screen and press Enter to submit
  
- A confirmation screen will be presented if elected in Preferences
  
- Press enter again and Manage Resources will submit command to IMS(s)
  - ◆ Manage Resources will edit input for valid field values
    - Does not cross check multiple fields
  - ◆ IMS edits input and returns success or failure

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If your preference is to confirm all updates, a confirmation screen will be displayed. Check the definitions and press Enter again. Manage Resources will submit a CREATE TRAN command for you.

Note that Manage Resources will edit fields for valid values but will not cross-check to be sure definitions are consistent. For example, Manage Resources will not verify that a RTC is assigned to an FPE program, or that a FP transaction is not conversational. This is done only by IMS.

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---

File Action Manage resources Spec View Options Help

---

Plex1 IMS Create a Transaction

Command ==> \_\_\_\_\_

---

----- Plex. . \_\_\_\_\_ Route. . \_\_\_\_\_ Wait. . \_\_\_\_\_

You are about to create the following transaction on your system.  
 Press Enter to continue or Cancel to go back.

Based on definition template . . . : CUSTMODL

NAME Transaction name . . . . . : CUSTADD, CUSTUPD

PGM Program name . . . . . : CUSTPGM

---

SET

AOCMD	AOI command option . . . . .	: N
CLASS	Class . . . . .	: 12
CMTMODE	Commit mode . . . . .	: SNGL
CONV	Conversational . . . . .	: N
DCLWA	Log write-ahead option . . . . .	: N
DEFAULT	Default - descriptor only . . . . .	: N
DIRROUTE	MSC direct routing option . . . . .	: N
EDITRTN	Input edit routine . . . . .	:



---

F1=Help F3=Exit F4=Showlog F6=Expand F12=Cancel

15

If you asked to confirm, you will be presented with a confirmation screen. Check it out and press enter again.

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---

File Action Manage resources Spec View Options Help

---

It's done.

Plex1 IMS Create a Transaction

Command ==> \_\_\_\_\_

---

Plex. . \_\_\_\_\_ Route. . \_\_\_\_\_ Wait. . \_\_\_\_\_

CSLM0xxI Transaction CUSTADD and CUSTUPD created successfully.

Press Enter to continue. More: +

Based on definition template . . . CUSTMODL

NAME Transaction name . . . . . CUSTADD,CUSTUPD

PGM Program name . . . . . CUSTPGM\_ Name of program

---

SET

AOCMD	AOI command option . . . . .	N__	Y, N, TRAN
CLASS	Class. . . . .	12_	1-999
CMTMODE	Commit mode. . . . .	SNGL	SNGL, MULT
CONV	Conversational . . . . .	N__	Y, N
DCLWA	Log write-ahead option . . . . .	N__	Y, N
DEFAULT	Default - descriptor only . . . . .	N__	Y, N
DIRROUTE	MSC direct routing option. . . . .	N__	Y, N
EDITRTN	Input edit routine . . . . .	_____	
EDITUC	Edit to uppercase . . . . .	Y__	Y, N

---

F1=Help F3=Exit F4=Showlog F6=Expand F12=Cancel

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If everything went well, you will get a message indicating success. If the command failed, you will get an error message.

With this command we are creating two transactions with exactly the same attributes.



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---

File Action Manage resources Spec View Options Help

---

Plex1 IMS Create a Transaction

Command ==> \_\_\_\_\_

---

----- Plex. . \_\_\_\_\_ Route. . \_\_\_\_\_

Press Enter to continue.

```

CREATE TRAN NAME(CUSTADD,CUSTUPD) LIKE(DESC(CUSTMODL))
SET( AOCMD(N) CLASS(12) CMTMODE(SNGL) CONV(N) DCLWA(N)
DIRROUTE(N) EDITRTN(_____) EDITUC(Y) EMHBSZ(____) FP(E)
INQ(N) LCT(65535) LPRI(1) MAXRGN(0) MSGTYPE(SNGLSEG)
MSNAME(_____) NPRI(1) PARLIM(65535) PGM(APOLWEB )
PLCT(65535) PLCTIME(6553500) RECOVER(Y) REMOTE(N) RESP(Y) SEGNO(0)
SEGSZ(0) SERIAL(N) SIDL(____) SIDR(____) SPASZ(____) SPATRUNC(____)
TRANSTAT(N) WFI(N) )

```

LIKE included only if a template was specified.

**Command Syntax View**

- ❖ Fits on one screen
- ❖ Requires more skill

F1=Help F3=Exit F4=Showlog F6=Expand F12=Cancel

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This is the same input as the previous CREATE TRAN but this shows the exact syntax of the command without all the help (field descriptions and valid values).

## Querying Resources

- Support for the QUERY command has been enhanced
  - ◆ Short cut to displaying ALL attributes of a resource
    - QRY xxxx SHOW(ALL)
  - ◆ Short cut to displaying resources with “exceptional” status
    - QRY xxxx <user-default filters>
  - ◆ Build customized queries
    - QRY xxxx <customized filters>
  - ◆ Field level help on all displayed fields
    - Put cursor on column heading and press F1

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Manage Resources also supports a QRY capability. This capability has a shortcut for displaying all attributes of a resource. You can choose to display only resources with exceptional status. You decide what is exceptional. You can also build custom queries which show only a subset of the attributes.

The QRY results screen has a column where you can enter line commands.

Help is available for individual fields on each screen.



## Manage Resources Summary

- An ISPF program
  - ◆ Screens have same look and feel as TSO SPOC
- Greatly reduces users need to
  - ◆ Format of CREATE, DELETE, UPDATE, and QUERY commands
  - ◆ Need to know names and valid values for attribute
- Provides two views
  - ◆ List view for less skilled operators
    - Requires more screens (in most cases)
  - ◆ Command syntax view for more skilled operators
    - Generally requires a single screen
- Manage Resources is especially valuable for test systems

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Manage Resources greatly reduces the need for the user to know the names of all the attributes and their valid values. It also eliminates the need to know the exact format of the commands. For those that do know the names and values for the attributes, a Command Syntax View is available to reduce the number of screens required for some commands – especially those related to transactions which have lots of attributes.

Some installations will find Manage Resources to be especially valuable for test systems. With production systems they may prefer the use of standard commands for DRD. This may be more easily audited. For test systems Manage Resources provides a convenient and flexible interface for quickly changing resource definitions.

# Operations

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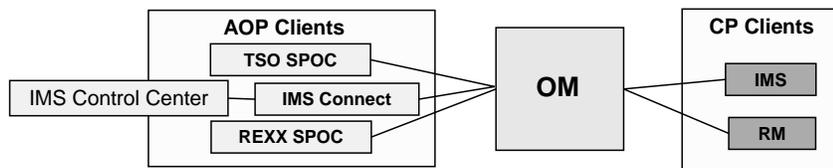
## Operations Enhancements

- OM Audit Trail and Unsolicited Messages
- SPOC and REXX support
- Batch SPOC Utility
- REXX XML Parser

# OM Audit Trail and Unsolicited Messages

## OM Terminology Review

- A command processing (CP) client
  - ◆ An IMSplex member that accepts and processes commands entered by another member through the OM API
    - Examples are the IMS control region and RM
- An automated operator program (AOP) client
  - ◆ An IMSplex member that submits commands through the OM API to a CP client
    - Most common example is TSO SPOC
    - Other examples are REXX programs using the REXX SPOC API, IMS Connect (for IMS Control Center), vendor or user-written SPOC



4

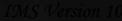
As a review, OM has command processing clients and automated operator program clients.

## Operations Manager Enhancements

- Operations Manager provides two enhanced functions in IMS V10
  - ◆ Create an audit trail of IMS commands entered through the OM interface by all AOP clients (e.g., TSO SPOC)
    - Audit trail
      - Input commands from AOP clients
      - Responses by CP clients to input commands
      - Unsolicited messages
    - Consists of log records written to z/OS System Logger log stream
  - ◆ Handle unsolicited messages from an IMSplex member (e.g., IMS)
    - Messages generated by IMSplex members can be sent to OM and delivered by OM to an OM “AOP Client”
      - AOP client must subscribe to OM for unsolicited messages
    - Shares log stream with audit trail

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In IMS V10, OM provides two new functions: (1) an audit trail of commands and (2) support for unsolicited messages.


## OM Audit Trail

- OM audit trail uses the z/OS System Logger
  - ◆ Specified in CSLOIxxx OM initialization proclib member
    - IMSPLEX(NAME=plexname,AUDITLOG=log stream name)
  - ◆ Can be CF structure log stream (multiple OMs) or DASD-only log stream (single OM)
  - ◆ Contains all OM log records from all OMs that are connected to this log stream within the IMSplex
    - Recommendation: no more than two OMs should share a log stream due to duplicate copies of unsolicited messages
- Command input logged before OM calls the OM input user exit
  - ◆ Logged again if text modified by OM input user exit
- Output logged before OM calls the OM output user exit
  - ◆ Logged again if text modified by OM output user exit

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The OM Audit Trail is implemented with an MVS logger log stream. It is specified via the AUDITLOG=log stream name in CSLOIxxx. The log stream can be either in a CF (for multiple IMSs) or DASD-only (for a single IMS). OM does not require that the same MVS log stream be used within an IMSplex. You may have multiple OMs use the same log stream or they may each have their own log stream. When multiple OMs use the same log stream a CF is required. The audit trail will be maintained in chronological sequence.

Each OM will receive a copy of unsolicited messages. If multiple OMs share a log stream, it will contain multiple copies of unsolicited messages. For this reason, IBM recommends that no more two OMs share a log stream to avoid many duplicate messages. On the other hand, the advantage of a shared log stream is that all messages are in one stream.

The OM input user exit is an optional exit that allows a user to view and manipulate command input from an automation client. This exit is called before OM processes the command, which allows the command to be modified or rejected.

The OM output user exit is an optional exit that allows a user to view and manipulate output from OM. This exit is called when a command has been processed and is ready to be delivered to the originator of the command; the exit can modify the response text before it is delivered, or when an unsolicited message is received from a client using the CSLOMOUT API.

Based on whether or not the optional OM input and OM output exits modify the text, each input command or output response will have one or two entries in the audit trail.

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## OM Audit Trail

- Recommended CFRM and LOGR policy definition values:
  - ◆ CFRM policy
    - SIZE ( 8192 )
  - ◆ LOGR policy
    - STRUCTURE
      - LOGSNUM ( 1 )
      - AVGBUFZSIZE ( 4000 )
      - MAXBUFSIZE ( 32760 )
    - LOGSTREAM
      - LOWOFFLOAD ( 20 )
      - HIGHOFFLOAD ( 50 )

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The recommended CFRM and LOGR policy definition values are shown.

The recommended structure size definition in the CFRM policy is SIZE(8192). This is specified in Kbytes, so it creates an 8M structure.

The DEFINE STRUCTURE statement in the LOGR policy should include:

```
LOGSNUM ( 1 )  
AVGBUFZSIZE ( 4000 )  
MAXBUFSIZE ( 32760 )
```

The DEFINE LOGSTREAM statement in the LOGR policy should include:

```
LOWOFFLOAD ( 20 )  
HIGHOFFLOAD ( 50 )
```



## Printing the new OM Audit Trail

- Use the IMS File Select and Formatting Print Utility (DFSERA10) with exit routine CSLULALE (formatted) or CSLOERA3 (dump format)
- Sample JCL

```

//CSLERA10    JOB      MSGLEVEL=1,MSGCLASS=A,CLASS=K
//STEP1      EXEC     PGM=DFSERA10
//STEPLIB    DD       DISP=SHR,DSN=IMS.SDFSRESL
//SYSPRINT   DD       SYSOUT=A
//SYSUT1     DD       DSN=SYSLOG.OM.AUDIT.TRAIL.LOG,
//           SUBSYS=(LOGR,IXGSEXIT),
//           DCB=(BLKSIZE=32760)
//SYSIN      DD       *
CONTROL CNTL H=EOF
OPTION       PRINT    EXITR=CSLULALE|CSLOERA3
END
//
  
```

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This is an example of how to use DFSERA10, the IMS File Select and Formatting Print Utility, to print the OM Audit Trail. The JCL requirements are:

- STEPLIB - DSN points to IMS.SDFSRESL, which contains DFSERA10
- SYSUT1 - DSN= points to the log stream name that was specified in the CSLOlxxx PROCLIB member on the AUDITLOG parameter
- H= - specifies the number of log records to print (H=EOF to print all records)
- EXITR=CSLxxxxx – specifies the log record routine that is called to format each log record

OM log record formats are available by assembling mapping macro CSLOLGRC.

Each OM log record contains a log record prefix, followed by data that is unique to the record. Macro CSLZLGPF maps the log record prefix.

The audit trail log records are:

#### Log Record

Type	Subtype	Mapping Macro	Conditions for writing log record
X'06'	X'01'	CSLOLGCM	Command input, prior to calling the OM Input user exit
X'06'	X'02'	CSLOLGCM	Command input, after being modified by the OM Input user exit
X'08'	X'01'	CSLOLGCR	Command response output, prior to calling the OM Output user exit
X'08'	X'02'	CSLOLGCR	Command response output after being modified by the OM Output user exit
X'09'	X'01'	CSLOLGOU	Unsolicited output message to an AOP client before calling OM Output user exit
X'09'	X'02'	CSLOLGOU	Unsolicited output message to an AOP client after calling OM Output user exit and OM output user exit modified the unsolicited output message

The documentation for printing the OM audit trail using CSLULALE with DFSERA10 for formatted output is in the IMS 10 System Utilities Reference; the documentation for printing the OM audit trail using CSLOERA3 with DFSERA10 for dump output is in the IMS 10 Diagnosis Guide.

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## Sample Listing of OM Audit Trail using CSLULALE

IMSplex member

Date and time of log record

Formatted message text

```

OM1OM 2006.299 19:21:52.47 CSL0020I OM READY OM1OM
RM1RM 2006.299 19:22:43.91 CSL0020I RM READY RM1RM
IMS1 2006.299 19:23:20.43 DFS0578I - READ SUCCESSFUL FOR DDNAME PROCLIB MEM
IMS1 2006.299 19:23:20.86 DFS0578I - READ SUCCESSFUL FOR DDNAME PROCLIB MEM
IMS1 2006.299 19:23:20.86 DFS0578I - READ SUCCESSFUL FOR DDNAME PROCLIB MEM
IMS1 2006.299 19:23:23.45 DFS3613I - LUM TCB INITIALIZATION COMPLETE IMS1
IMS1 2006.299 19:23:23.61 DFS3613I - RLM TCB INITIALIZATION COMPLETE IMS1
IMS1 2006.299 19:23:23.61 DFS3613I - XCF TCB INITIALIZATION COMPLETE IMS1
IMS1 2006.299 19:23:23.61 DFS3613I - RLM TCB INITIALIZATION COMPLETE IMS1
IMS1 2006.299 19:23:23.62 DFS3613I - ALC TCB INITIALIZATION COMPLETE IMS1
IMS1 2006.299 19:23:23.62 DFS3613I - ALM TCB INITIALIZATION COMPLETE IMS1
IMS1 2006.299 19:23:23.62 DFS2088I APPC/OTMA SMQ Enablement inactive. Reason
IMS1 2006.299 19:23:23.62 DFS2088I APPC/OTMA SMQ Enablement inactive. Reason
IMS1 2006.299 19:23:23.65 DFS3613I - RRS TCB INITIALIZATION COMPLETE IMS1
IMS1 2006.299 19:23:23.66 DFS0578I - READ SUCCESSFUL FOR DDNAME PROCLIB MEM
IMS1 2006.299 19:23:23.66 DFS0578I - READ SUCCESSFUL FOR DDNAME PROCLIB MEM

```

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This shows the listing created by DFSERA10 with exit routine CSLULALE (formatted output) for messages in the OM audit trail.

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## Sample Listing of OM Audit Trail using CSLOERA3 (command input/output)

```

0601 RECORD - 2006-09-15 22:34:01.721325 UTC - CSLOMCM UNMODIFIED BY OM INPUT EXIT
000000 00000000 00000000 BF695E7B 429ED597 .... *...g.....;#..NpCSLPLEX10130....*
000020 0B9153 4E78001 0A9A5288 BF695E7B .... *.j..67.....h..;#....USRT011 ....*
000040 00084040 40404040 40404040 00000000 .... *.
000060 00000000 00000000 00000000 00000000 .... *USRT011 .....USRT011 *
000080 00000000 00000000 00000000 00000000 .... *.....*
LINES 0000A0 TO 0000C0 SAME AS ABOVE
0000C0 00000000 00000000 7FFFF000 7FFFF000 .... *...q....".0.".0.....;#*
0000E0 429ED597 40404040 40404040 00000000 .... *.Np.....*
000100 00000000 00000000 00000000 00000027 .... *.....QRY TRAN NAME(AP*
000120 D6D35C5D 40E2C8D6 E64DC3D3 C1E2E26B .... *OL*) SHOW(CLASS,STATUS).....*
000140 00000000 00000000 00000000 00000000 .... *.....*
LINES 000160 TO 00017F SAME AS ABOVE
000180 00000000 00000000 00000000 .... *.....*

0801 RECORD - 2006-09-15 22:34:01.721325 UTC - CSLOMRSP UNMODIFIED BY OM OUTPUT EXIT
000000 00000000 00000000 BF695E7B 429ED597 .... *.....;#..NpCSLPLEX10130....*
000020 0B9153 4E78001 0A9A5288 BF695DF3 .... *.j..67.....)3....USRT011 ....*
000040 00084040 40404040 40404040 00000000 .... *.
000060 E4E2D9E3 F0F1F1 F0F1F5 F3F4F0F1 .... *USRT011 10153401..)3|...OMIOM *
000080 00000000 00000000 00000000 00000000 .... *.....*
LINES 0000A0 TO 0000C0 SAME AS ABOVE
0000C0 00000000 00000000 00000000 00000000 .... *.....;#..Np*
0000E0 40404040 40404040 00000000 00000000 .... *.....*
000100 00000000 00000000 00000990 4C6FA794 .... *.....<?xml version="1.0"?*
000120 6E4C5AC4 D6C3E3E8 D7C54089 94A296A4 .... *><!DOCTYPE imsout SYSTEM "imsout*
000140 4B84A384 7F6E4C89 94A296A4 A36E4C83 .... *.dtd"><imsout><ctl><omname>OMIOM*
000160 40404040 61969495 8194856E 4C9694A5 .... * </omname><omvsn>1.3.0</omvsn>*
000180 4CA79493 A5A2956E F2F04040 4C61A794 .... *<xmlvsn>20 </xmlvsn><statime>20*
0001A0 F0F64BF2 F5F840F2 F27AF3F4 7AF0F14B .... *06.258 22:34:01.721325</statime>*
0001C0 4CA2A396 A3899485 6EF2F0F0 F64BF2F5 .... *<stotime>2006.258 22:34:01.72226*

```

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This shows the listing created by DFSERA10 with exit routine CSLOERA3 (dump format) for a QRY TRAN command where the OM input and OM output exits did not modify the messages. Since this is in XML format, it is very large and only the beginning of the output record is shown here.

## Unsolicited Message Support

- An unsolicited message is a message that is issued by a CP client such as IMS but is not associated with a specific command input
- OM support for unsolicited messages
  - ◆ Logs unsolicited messages to “audit trail log stream” defined in CSLOIxxx
  - ◆ If requested, will send these messages to a user-provided AOP client
- AOP client must use new OM requests to Subscribe and Unsubscribe to unsolicited messages
  - ◆ Implemented by REXX SPOC API
  - ◆ Not yet implemented by IMS Control Center

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A command processing client will use the CSLMOUT API to send an unsolicited message.

The IMS-provided TSO SPOC does not use Subscribe/Unsubscribe support.

Command responses are sent as unsolicited messages to any AOP clients that have asked for them (subscribed), in addition to sending the command response back to the client that issued the command.

## Unsolicited Message Support

- Two new OM requests for assembler language AOP clients
  - ◆ CSLOMSUB (subscribe)
    - Issued by an AOP client to subscribe to unsolicited messages
    - OM will send unsolicited messages only to subscribed clients
      - AOP client must have an SCI Input Exit to receive the unsolicited output message
      - Messages go to OM Output User Exit (if present) first which can edit the message or indicate not to send the unsolicited output
  - ◆ CSLOMUSB (unsubscribe)
    - Issued by an AOP client to unsubscribe from unsolicited messages
    - OM no longer sends unsolicited messages to this AOP

**Format and parameters for above macros  
shown in System Programming API Reference**

OM provides two new requests for unsolicited message support for assembler language programs: CSLOMSUB and CSLOMUSB.

REXX support is shown in the next section.





## Unsolicited Message Support - Tailoring

- DFSDFxxx or DFSCGxxx PROCLIB member UOM= parameter
  - ◆ Controls which IMS unsolicited output messages are sent to OM
    - UOM=MTO - only unsolicited messages destined for MTO or console are sent
    - UOM=ALL - all unsolicited messages are sent
    - UOM=NONE - no unsolicited messages are sent
- Optional user modifiable tables
  - ◆ Indicates whether or not to send a message to OM as unsolicited output
    - Default is to send all messages
  - ◆ CSLZUMTU – CSL Unsolicited Output Messages
  - ◆ CQSUOMTU – CQS Unsolicited Output Messages
  - ◆ DFSUOMTU – IMS Unsolicited Output Messages
- Benefits
  - ◆ May not need messages for automation
  - ◆ May not need messages for auditing

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There are two ways to limit the unsolicited messages sent to OM.

IMS messages may be limited by using the UOM= parameter in the DFSDFxxx or DFSCGxxx PROCLIB member. UOM=MTO is the default. It specifies that the only unsolicited messages sent to OM from IMS are those that IMS sends to the MTO or system console. UOM=ALL specifies that all unsolicited messages from IMS are sent to OM. UOM=NONE specifies that no unsolicited messages are sent to OM from IMS.

There are optional user modifiable tables for IMS, CSL, and CQS which may be used to send or not send messages based on their message number. You may specify whether messages whose numbers are specified should be sent or not sent. You may also specify whether messages whose numbers are not specified in the table should be sent or not sent.

Of course, if messages are not sent to OM they will not appear in the audit trail.

You may want to limit the unsolicited output messages sent to OM for several reasons. You may only need some messages from to AOP processing. You may only need some for auditing purposes. You may not need any messages.

## OM Audit Trail Migration Considerations

- OM audit trail
  - ◆ Enabled by specifying new **AUDITLOG=log-stream-name** parameter in the CSLOIxxx (OM Initialization) PROCLIB member
  - ◆ Must define log stream in LOGR policy
  - ◆ Must define logger structure in CFRM policy (if using CF)
  - ◆ For OMs using the same AUDITLOG parameter (same log stream)
    - Log records are merged in chronological sequence
    - Warning: log stream will contain duplicate copies of unsolicited output messages
  - ◆ Consider user modifiable tables and UOM= parameter to limit output sent to OM
  
- Processing the audit trail
  - ◆ All types of messages can be retrieved by TSO SPOC or REXX SPOC
  - ◆ Should consider procedures to handle archiving z/OS log stream output if you need to retain its information



This section addresses enhancements to the SPOC ISPF application and enhancements to REXX support for the OM interface.

## TSO SPOC Support for OM Enhancements

- TSO SPOC enhanced to display audit trail log stream
  - ◆ “SPOC” function on Action Bar
    - Replaces “Display” function of previous releases
    - New option (6) added to display messages in “Audit Trail” log stream
      - Reads directly from log stream
        - Does not use OM services for this function
        - Requires local IXGLOGR address space
      - Commands entered through OM and their responses
        - Includes “non-deliverable” command responses received late by OM (WAIT time expired)
      - Unsolicited messages received by OM
- TSO SPOC Preferences
  - ◆ New Audit Trail Preferences allow user to set defaults for IMSplex member name or IMSplex member type

More information and examples are in the TSO SPOC Appendix

16

The TSO SPOC program has been enhanced to support the new OM “audit trail” of command input/response through the OM and unsolicited messages sent by IMSplex members to OM. Note that the function of SPOC reads directly from the Audit Trail logstream. It does NOT retrieve any of these messages directly from OM. This allows the user to scroll back and forth through the entire logstream, going as far back in time as those log records still in the logstream. This does require that the SPOC be on an LPAR which has an ISGLOGR address space to which it can connect and request log records.

## REXX Support for Audit Trail

- Users can write REXX programs to retrieve messages from the “Audit Trail” log stream
  - ◆ Commands and responses using OM interface
  - ◆ Unsolicited messages sent to OM by IMSplex members
  
- User programs must
  - Subscribe to OM for messages
  - Retrieve and process messages
  - Unsubscribe from OM
  
- Only messages received by OM after subscription are sent
  - ◆ Unlike SPOC which can look at messages in the past

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You can also write a REXX program to

-join the IMSplex

-subscribe to OM for unsolicited messages (actually, for any logstream message that arrives after you subscribe, including command input and response)

-retrieve the messages into a REXX stem variable

-unsubscribe from OM when you want to exit

Unlike the TSO SPOC application, this feature receives its messages from OM directly – not from the system logger. OM will only send messages received AFTER the program subscribes.

## REXX Functions

- Three new REXX functions are provided
  - ◆ CSLULSUB
    - Subscribe to OM for messages
  - ◆ CSLULGUM
    - Get one or more messages from OM (since last CSLULGUM)
    - Repeat as needed
  - ◆ CSLULUSB
    - Unsubscribe from OM

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There are three new REXX functions provided by IMS to help you with these functions.

-CSLULSUB is a function used to subscribe to OM

-CSLULGUM retrieves messages from OM and puts them into a REXX stem variable

-CSLULUSB is used to unsubscribe to OM

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## Sample REXX Code

```

/* rexx */
interval = 5
Call syscalls 'ON'
Address LINK 'CSLULXSB'
If rc = 0 Then
  Do
    subrc = CSLULSUB('PLEX1','IMS2')
    If subrc = 0 then
      Do a = 1 To 25
        Address syscall "sleep" interval
        results = CSLULGUM('PLEX1','xml.')
        say 'Message = ('results')'
        If xml.0 /= '' Then
          Do
            say 'xml.'0' = ('xml.0')'
            Do idx = 1 To xml.0
              say 'xml.'idx'=('xml.idx')'
            End
          End
        End
      End
    usbrc = CSLULUSB('PLEX1', 'IMS2')
  "END"
End
Exit

```

**This program gets a message from OM every five seconds. After 25 messages, it terminates.**

**Only messages received by OM after subscription are sent to the program.**

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This is a sample of a REXX program which sets up the REXX SPOC environment, subscribes to OM for audit trail messages from IMS2 which is a member of CSLPLEX1.

You invoke the subscription service by coding **subrc = CSLULSUB** and its parameters. subrc will be set to the return code from this function. subrc=0 means it worked.

You retrieve the messages into the stem variable by coding - **results=CSLULGUM(plexname,stem-variable)**. The stem variable in the example is xml. but you can use anything you like.

The results are returned in a stem variable named "xml."

- xml.0 is the number of rows (lines) returned
- xml.1 is the first row
- xml.2 is the second row
- etc

It is up to the programmer to parse the responses and take action (if necessary).

Full details on coding these REXX functions is in the Systems Programming API Reference manual.

# Batch SPOC Utility



## Batch SPOC Utility (CSLUSPOC)

- Provides a capability to submit IMS commands from a batch job
  - ◆ Uses the Operations Manager (OM) interface
  - ◆ Supports both Type-1 and Type-2 commands
- IMSplex environment defined in execution parameters
  - ◆ IMSplex name
  - ◆ Command routing
  - ◆ Wait time
- Commands defined in SYSIN file
  - ◆ Multiple commands allowed
  - ◆ Commands executed serially
- Output to SYSPRINT
  - ◆ Responses formatted to look like SPOC screen format

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You can now invoke a batch SPOC application and submit IMS commands from a batch job using the OM interface. Like the online SPOC, both Type-1 and Type-2 commands are supported. Execution parameters include the IMSPLEX name, the routing (default routing is all IMSs), and how long you want OM to wait for IMS to respond before returning a negative response to the SPOC. Commands are coded in a SYSIN file with each command executed serially – that is, OM submits the first command and waits for a response before submitting the second command. The output goes to SYSPRINT and looks like a formatted SPOC screen.

## CSLUSPOC Parameters

- IMSPLEX= (required)
  - ◆ 5 character IMSplex name suffix
- ROUTE= (optional)
  - ◆ Defines routing for all commands in SYSIN file
  - ◆ Examples
    - ROUTE=IMS1
    - ROUTE=(IMS2,IMS4)
  - ◆ Default is all IMSs registered to OM
- WAIT= (optional)
  - ◆ Time OM waits for IMS to respond
  - ◆ Minutes and seconds (mmm:ss) or seconds (sssss)
  - ◆ WAIT=0
    - Submit next command immediately – don't wait for response
  - ◆ Default is WAIT=5:00

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-IMSPLEX name is required. (Note: you must have a SCI address space on the image you are running on, but IMS can be on any image in the sysplex.

-ROUTE defines the routing for the command. It is optional. If not coded, the default routing will be all IMSs.

-WAIT is also optional with a default of 5 minutes (probably way too long). Specifying WAIT=0 will cause the SPOC to submit commands immediately without waiting for a response to the previous command from OM. When you specify WAIT=0, OM will wait up to 5 minutes for an IMS to respond.




## Sample Batch SPOC Utility JCL

```

//SPOCJOB      JOB      ...
//STEP1 EXEC PGM=CSLUSPOC,PARM=( ` IMSPLEX=PLEX1 ,ROUTE=IMS2,WAIT=30' )
//STEPLIB      DD      DSN=IMSV10.SDFSRESL,DISP=SHR
//SYSPRINT     DD      SYSOUT=*
//SYSIN DD      *
  QRY IMSPLEX SHOW(MEMBER,TYPE,STATUS)
  QRY TRAN NAME(ACCT*) SHOW(ALL)
  /DIS DB ACCTMSTR
/*EOF

```

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This is the JCL for the batch SPOC. The program name is CSLUSPOC. The input parameters are the IMSPLEX name, where you want the commands routed to, and how long you want OM to wait for a response from IMS before returning to the SPOC. The SPOC will then submit the next command in the SYSIN file.

The example shows the SYSIN to be inline, however, you could put the commands into a data set and identify the data set in the SYSIN DD statement. This would allow you to just update the contents of the file and resubmit the job rather than change the job input stream

If the continuation character is a plus (+) sign, then the next line is concatenated to this one without any blanks. This would be required when you are (for example) coding the SHOW parameters and they don't all fit on one line. A minus (-) sign will insert a blank before whatever is coded on the next line. For example, the next keyword should be separated by a blank from the previous one.



## //SYSIN File

- Commands are read from a SYSIN file
  - ◆ Utility supports all commands supported by OM
  - ◆ Commands are executed serially
    - When OM responds to one command, the next is submitted
    - Exception: if WAIT=0, commands are submitted without waiting for response from OM

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The utility supports all commands supported by OM. They are executed serially, waiting for the response to one before submitting the next. If WAIT=0 is coded, commands are submitted without waiting for the response.

Command continuation characters allow commands to span multiple lines. A plus (+) sign means no blank between this line and the continuation line. A minus (-) sign means to insert a blank between lines.

## //SYSPRINT Output

- Contains the formatted command response from OM
  - ◆ Formatted to look like the response on a TSO SPOC display

```
Log for. . . : QRY IMSPLEX SHOW(MEMBER,TYPE,STATUS)

IMSpIex . . . . . : PLEX1
Routing . . . . . : IMS1,IMS3
Start time. . . . : 2005.132 15:36:28.11
Stop time . . . . : 2005.132 15:36:29.17
Return code . . . : 00000000
Reason code . . . : 00000000
Command master. . : IMS1

IMSpIex  MbrName      CC Member   Type   Status
CSLPLEX1 OM1          0 IMS1      DBDC   ACTIVE
CSLPLEX1 OM1          0 IMS3      DBDC   ACTIVE
```

The output goes to SYSPRINT. If you print it, it will look almost like the output to the same command submitted from the TSO SPOC (with a few things omitted, like function keys).

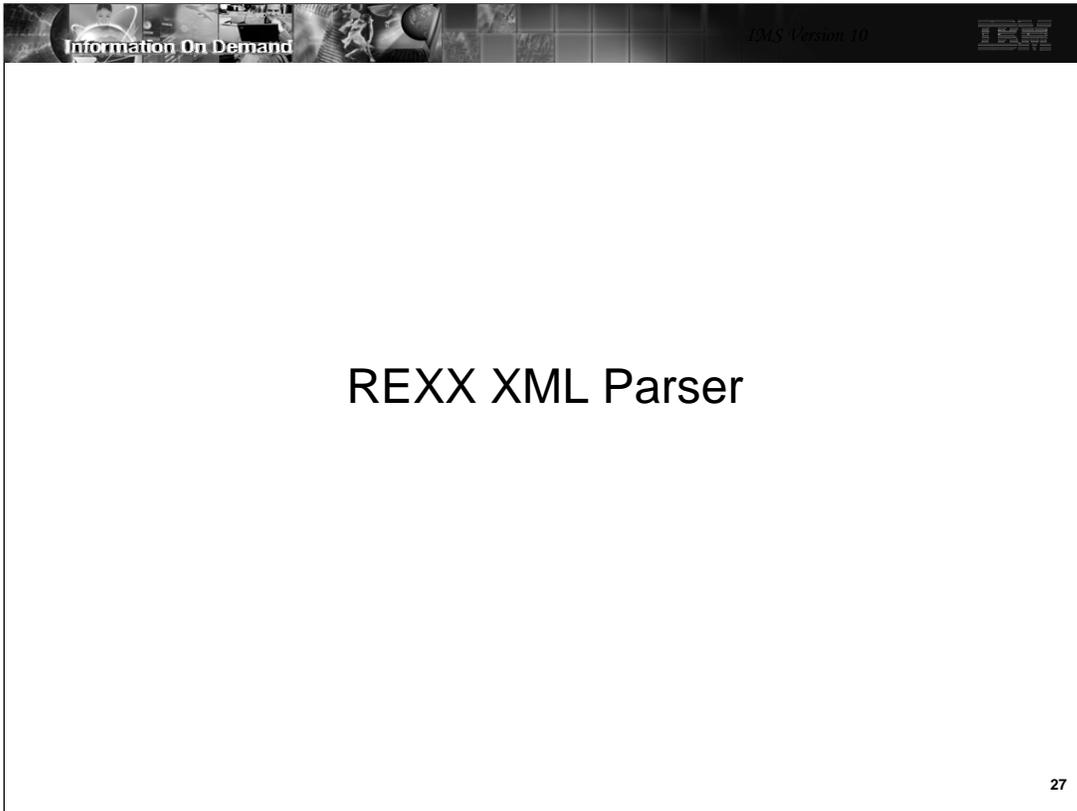
## //SYSPRINT Output

- If OM does not respond before WAIT interval, or if WAIT=0
  - ◆ Response is not written to SYSPRINT
  - ◆ Short summary information written

```
LOG FOR... : QRY IMSPLEX SHOW(MEMBER,TYPE,STATUS)
```

```
IMSpIex .....: PLEX1  
Routing .....: IMS1,IMS3  
Start time ...: 2006.185 15:36:22.11
```

If OM does not respond within the wait interval time, but responds later, then that response does not go to sysprint. Instead, a short summary page is printed as shown. This is also true if you code WAIT=0.



This section addresses an XML parser that can be used with REXX programs to process command responses from IMS.

## Prior to V10

- Responses to OM-submitted commands always encapsulated in XML
  - ◆ Commercial REXX XML parser does not exist
  - ◆ Makes interpreting command responses more difficult
    - Programs must look for XML tags
- Example of QRY TRAN command using the original function

```
...  
"QRY TRAN NAME(CUS*)  
results = CSLULGTS('qryinfo.',cartid,'1:30')"  
...
```

- ◆ REXX stem variable is "qryinfo."
  - qryinfo.0 = number of rows returned
  - qryinfo.1 = 1<sup>st</sup> row
  - qryinfo.2 = 2<sup>nd</sup> row
  - etc.

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IMS has provided support for REXX programs to join an IMSplex and submit commands to IMS using the OM interface. However, IMS always responds to these commands by encapsulating the response in XML. This made it difficult for the programmer to analyze and take any appropriate action.

The example shows a REXX function (CSLULGTS) used to retrieve the IMS response and put the "output lines" into a REXX stem variable. For example "qryinfo.1" would be the first line, "qryinfo.2" the second line, etc. "qryinfo.0" is the number of lines (or rows) returned.

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## Sample XML Output

```

<imsout>
<ctl>
<omname>OM10M </omname>
...
</ctl>
<cmd>
...
<verb>QRY </verb>
<kwd>TRAN </kwd>
<input>QRY TRAN NAME(CUS*)SHOW(PGM,QCNT) </input>
</cmd>
<cmdrsphdr>
<hdr s1bl="TRAN" l1bl="Trancode" ... />
<hdr s1bl="MBR" l1bl="MbrName" ... />
<hdr s1bl="CC" l1bl="CC" ... />
...
</cmdrsphdr>
<cmdrspdata>
<rsp>TRAN(CUSA ) MBR(IMS1) CC(0) CUSTADD 4 </rsp>
<rsp>TRAN(CUSQ ) MBR(IMS1) CC(0) CUSTQRY 0 </rsp>
</cmdrspdata>
</imsout>

```

Your REXX code must parse XML response to find fields of interest.

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This slide shows a sample response to a QRY TRAN command with the XML tags. It is difficult for the average programmer to write code to analyze this response.

-qryinfo.1 = <imsout>

-qryinfo.2 = <ctl>

Somewhere down the line (line n) is the actual response that you are interested in:

- qryinfo.n = <rsp>TRAN\*CUSA ) MBR(IMS1) CC(0) CUSTADD 4 </rsp>

## Using REXX Parser Function

- New REXX XML parser function
  - ◆ CSLULGTP
    - Use instead of CSLULGTS
  - ◆ Parses XML output directly into a “stem variable” and “suffix”
  - ◆ Makes interpreting command responses easier for REXX programmer
- Same command using the new function

```
...  
"QRY TRAN NAME(CUS*)"  
results = CSLULGTP('qryinfo.',cartid,'1:30')  
...
```

- ◆ Stem variable is “qryinfo.”
- ◆ Stem variable suffix is “xmltag1.xmltag2”

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IMS now provides a REXX parser function that makes it much easier. The new function is CSLULGTP and has the same format as CSLULGTS. The first parameter is the stem variable (qryinfo). What is new is that the function assign values to stem variable suffixes which the programmer can use to find the pertinent information in the response. The suffix is always the xmltag1.xmltag2 where xmltag1 is a high level tag and xmltag2 is an imbedded tag within xmltag1. This will easier to understand with an example.

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## Sample XML Output with REXX Stem Variables

```

<imsout>
<ctl>
<omname>OM10M </omname>
...
</ctl>
<cmd>
...
<verb>QRY </verb>
<kwd>TRAN </kwd>
<input>QRY TRAN NAME(CUS*) SHOW(PGM,QCNT) </input>
</cmd>
<cmdrsphdr>
<hdr slbl="TRAN" llbl="Trancode" ... />
<hdr slbl="MBR" llbl="MbrName" ... />
<hdr slbl="CC" llbl="CC" ... />
<hdr slbl="PSB" llbl="..." />
<hdr slbl="LQ" llbl="..." />
</cmdrsphdr>
<cmdrspdata>
<rsp>TRAN(CUSA ) MBR(IMS1) CC(0) PSB(CUSTADD) LQ(4) </rsp>
<rsp>TRAN(CUSQ ) MBR(IMS1) CC(0) PSB(CUSTQRY) LQ(0) </rsp>
</cmdrspdata>
</imsout>

```

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Here is that same XML output again. Note that there are xmltags imbedded within xmltags. For example, with the <cmd> ... </cmd> tags are several other tags - <verb>...</verb>, <kwd>...</kwd>, etc. The suffixes assigned by CSLULGTS are, for example:

- qryinfo.cmd.verb
- qryinfo.cmd.kwd
- qryinfo.cmd.input

Likewise

-qryinfo.ctl.omname is the name of the OM that forwarded the response from IMS

qryinfo is just an example of a stem variable name. You can choose anything you like as the name.

## Using REXX Parser Function

- Using previous example
  - ◆ qryinfoctl.omname = OM10M
  - ◆ qryinfo.cmd.verb = QRY
  - ◆ qryinfo.cmd.kwd = TRAN
  - ◆ qryinfo.cmd.input = QRY TRAN NAME(CUS\*)
  
- For repeating tags (e.g., the <rsp> tag represents 1 “row” from IMS)
  - ◆ qryinfo.rsp.0 = number of rows = 2
  - ◆ qryinfo.rsp.1 = 1st row = TRAN(CUSA ) MBR(IMS1) CC(0) CUSTADD 4
  - ◆ qryinfo.rsp.2 = 2nd row = TRAN(CUSQ) MBR(IMS1) CC(0) CUSTQRY 0
  
- Within each row
  - ◆ qryinfo.rsp.1.0 = number of columns = 5
  - ◆ qryinfo.rsp.1.1 = 1st column = TRAN(CUSA )
  - ◆ qryinfo.rsp.1.5 = 5th column = 4

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Things get a little trickier when there are repeating tags. For example, the query in the previous example resulted in IMS returning several lines of response, each of which is imbedded within the <rsp> ... </rsp> tags. In this case:

-qryinfo.rsp.0 would be the number of rows

-qryinfo.rsp.1 would be the entire 1<sup>st</sup> row

If you want to parse each “column” in a “row”, then:

-qryinfo.rsp.1.0 is the number of columns in that row

-qryinfo.rsp.2.3 would be the 3<sup>rd</sup> column in row 2



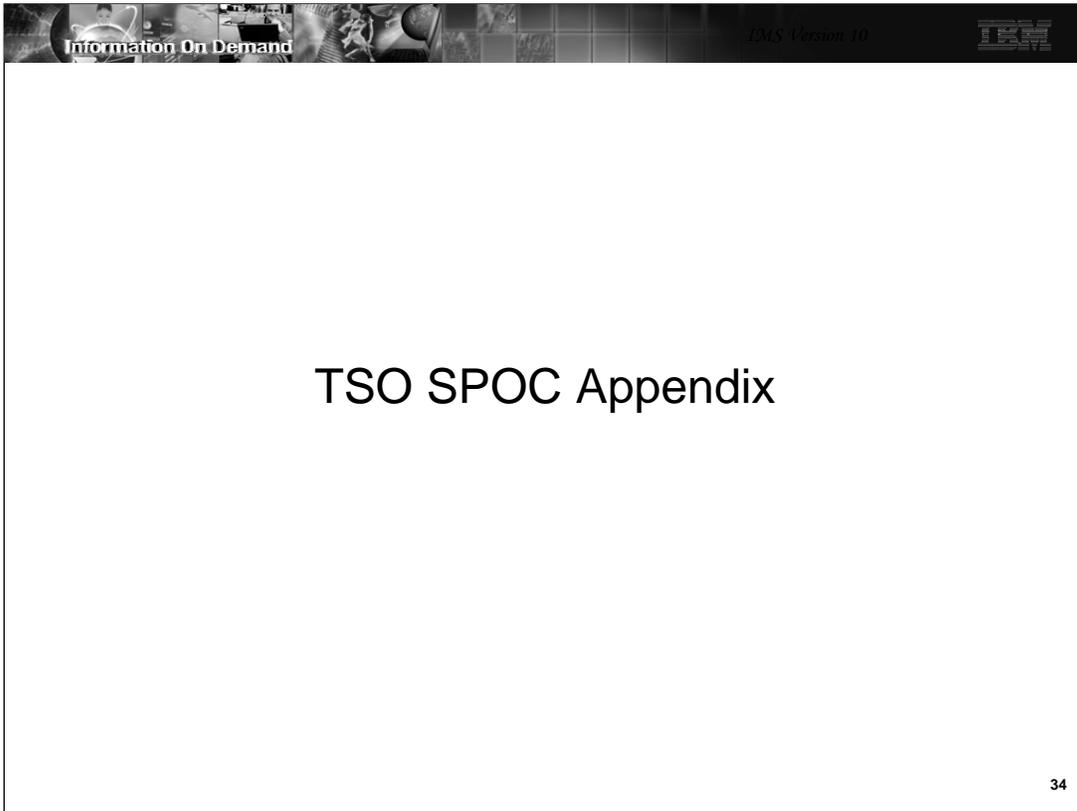
## Summary

- OM Audit Trail and Unsolicited Messages
  - ◆ OM auditing capability for commands, responses and unsolicited messages
- SPOC and REXX support
  - ◆ For audit trail and unsolicited messages
- Batch SPOC Utility
  - ◆ Batch utility for submitting commands
- REXX XML Parser
  - ◆ Makes writing REXX programs and execs to interface with OM much easier

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Enhancements in SPOC make the use of CSL and OM much more attractive to even the single IMS user.

Enhancements in IMS support for REXX makes writing your own AO programs much more feasible.



This section addresses an XML parser that can be used with REXX programs to process command responses from IMS.

## Action Bar Enhancements

- Options
  - ◆ New preferences
    - Command confirmation for commands that create, update, or delete resources
      - Confirm changes before submitting
      - Don't confirm changes before submitting
    - Exit confirmation
      - Do you want to exit
      - Do you want to keep or erase command responses
    - Storage management
      - Maximum number of commands in status list
      - Delete command after "n" minutes
    - Command view
      - List view
      - Syntax view
    - Query exceptions
      - Allows user to identify "exceptions (unusual status)" when submitting QRY exceptions command

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There are new "Preferences" that can be chosen. Command Confirmation, Exit Confirmation, Storage Management, Command View, and Query Exceptions. The impact of each of these will be shown in later slides.

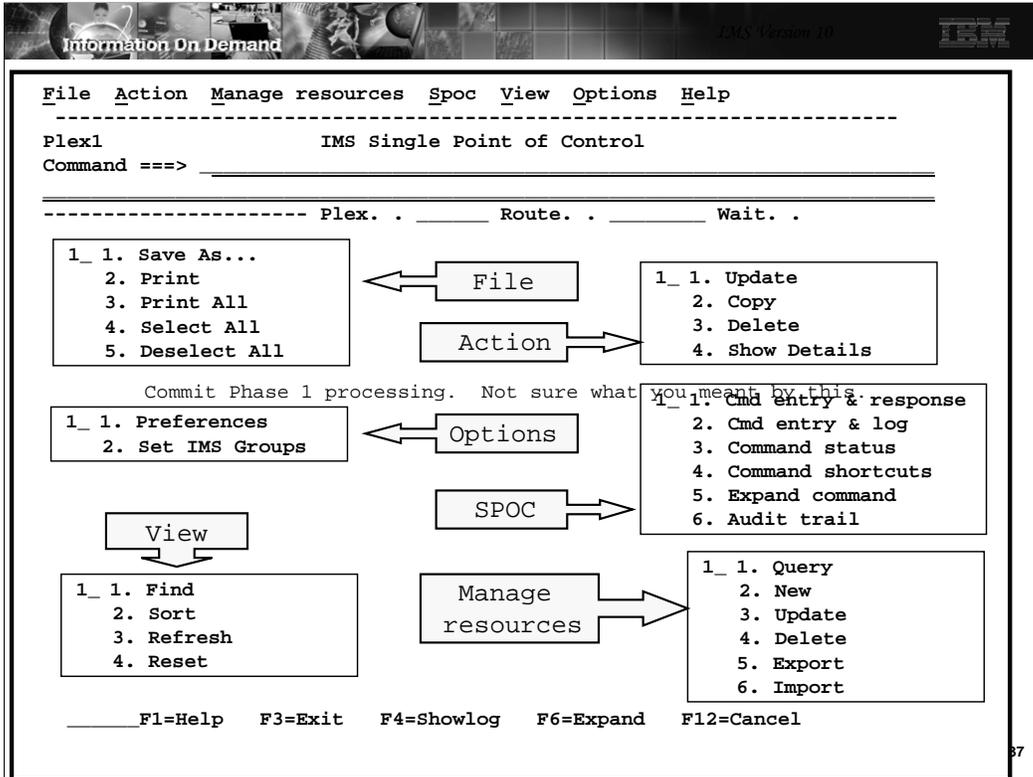
## Action Bar Enhancements

- SPOC (renamed from Display)
  - ◆ Audit trail (new)
    - Displays messages sent to OM as command responses or unsolicited messages
  
- Manage resources (new)
  - ◆ Allows user to go to Manage Resource application directly from SPOC
  
- View
  - ◆ Refresh (new)
    - Resubmits previous command

-SPOC is renamed from DISPLAY of earlier releases of SPOC. There is one new option to display the Audit Trail created by OM for command input and responses and unsolicited messages.

-Manage resources is new. It invokes an ISPF application similar to SPOC which can be used to manage resources using DRD. This will also be discussed in detail later.

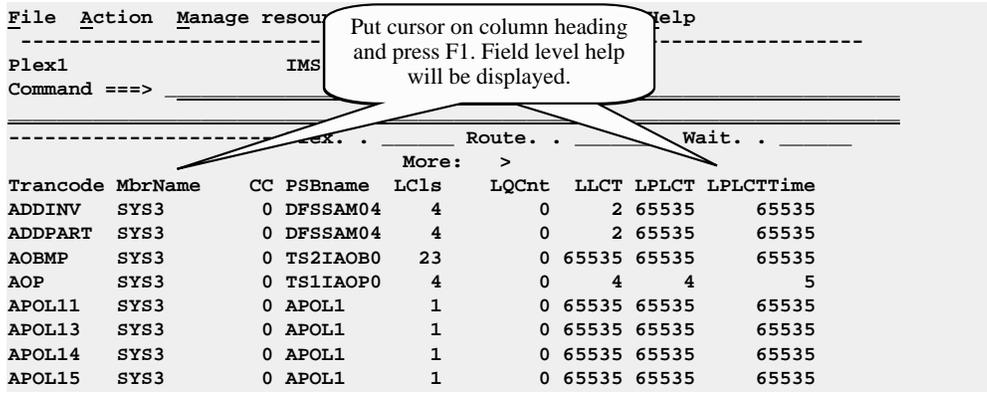
-View has a new option. "Refresh" resubmits the previous command.



This screen shot shows what each of these pull down menus from the Action Bar would look like.

## Improved Help

- Field level help added to QRY display screen
  - ◆ Put cursor on column heading and press F1



Trancode	MbrName	CC	PSBname	LClS	LQCnt	LLCT	LPLCT	LPLCTTime
ADDINV	SYS3	0	DFSSAM04	4	0	2	65535	65535
ADDPART	SYS3	0	DFSSAM04	4	0	2	65535	65535
AOBMP	SYS3	0	TS2IAOB0	23	0	65535	65535	65535
AOP	SYS3	0	TS1IAOP0	4	0	4	4	5
APOL11	SYS3	0	APOL1	1	0	65535	65535	65535
APOL13	SYS3	0	APOL1	1	0	65535	65535	65535
APOL14	SYS3	0	APOL1	1	0	65535	65535	65535
APOL15	SYS3	0	APOL1	1	0	65535	65535	65535

Field level help is now available for columns on the QRY result screen. Place the cursor on the column heading and press F1. A description of the meaning of that field will be displayed.

## Support for OM Audit Trail

- Operations Manager provides support in V10 for an “audit trail” of
  - ◆ Commands and responses entered through OM interface
  - ◆ Unsolicited messages from IMSplex members
  
- SPOC provides support for displaying this audit trail
  - ◆ Preference screen
    - IMSplex member names or types
  - ◆ Display
    - Message written to “audit trail log stream” by OM
    - Read directly from log stream
  - ◆ Details earlier in this section of class

Choosing Option 6 in the SPOC pull down menu invokes the SPOC Audit Trail display function.

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---

File Action Manage resources Spec View Options Help

---

Plex1 IMSplex Audit Trail

Command ==> \_\_\_\_\_

---

----- Members. . IMS1,IMS2,IMS3\_\_ Type. . \_\_\_\_\_

MbrName	Time	Message
IMS1	2006.227 14:00:01.00	DFSxxxxW message text
IMS1	2006.227 14:00:02.05	DFSxxxxI message text
IMS2	2006.227 14:00:02.16	DFSxxxxI message text
IMS1	2006.227 14:01:02.92	DFSxxxxW message text
IMS3	2006.227 14:03:01.37	DFSxxxxI message text
SPOCUSR1	2006.227 14:04:15.22	Response for QRY IMSPLEX
IMS2	2006.227 14:04:47.00	DFSxxxxW message text

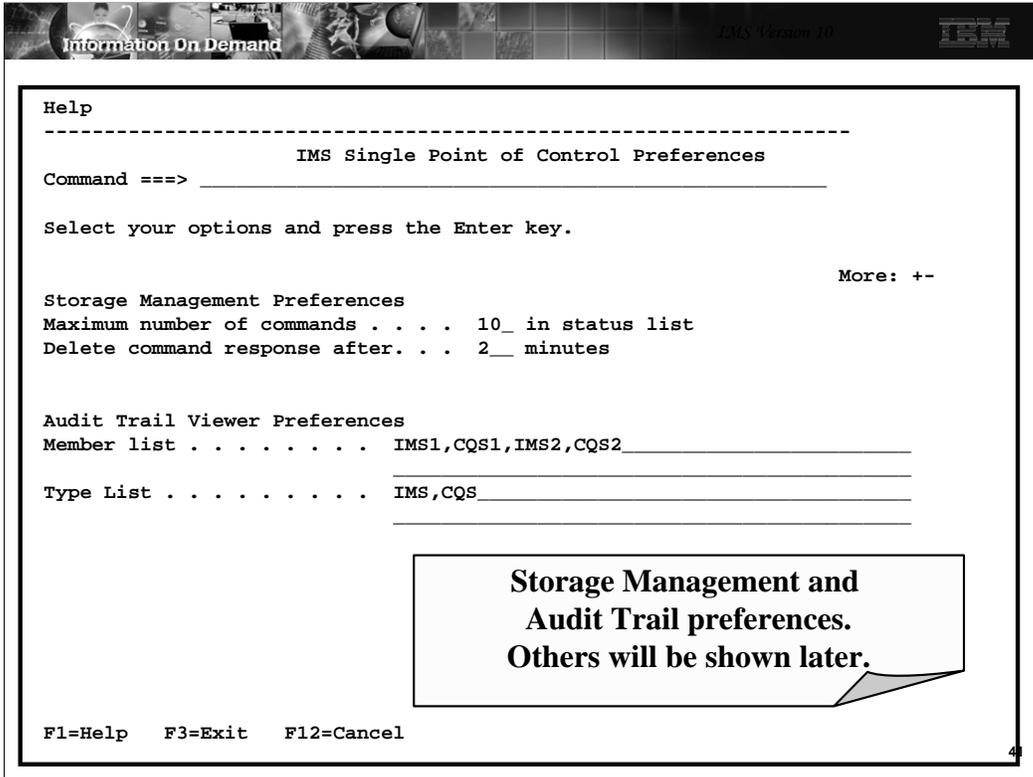
**Use F7 and F8 to scroll up and down.**

**Press Enter to refresh screen with new messages.**

To display responses for Type-2 commands, put cursor on line and press Enter

F1=Help      F7=Up      F8=Down      F12=Cancel 40

This is an example of a screen shot of an Audit Trail display. Note that Type-2 command responses may be seen by placing the cursor on the line and pressing Enter.



This screen shows the Storage Management Preferences

- What is the maximum number of commands and their responses to keep in the status list
- How long should a command/response stay in the status list before being deleted

Audit Trail Preferences

- Member list of messages to display
  - Type list of messages to display
- If both have values, the member list takes precedence

# Online Change

**ON DEMAND BUSINESS**

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## 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

## ACBLIB Member Online Change Overview

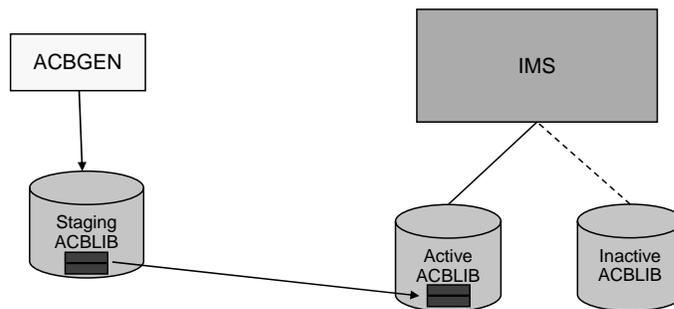
- Uses existing IMS libraries
  - ◆ PSBLIB, DBDLIB, and ACBLIB
- Uses existing IMS control block generation processes
  - ◆ PSBGEN, DBDGEN, and ACBGEN
- Uses IMS type-2 commands only
  - ◆ INIT OLC PHASE(PREPARE) TYPE(ACBMBR) ...
- Uses staging ACBLIB as the source ACBLIB
  - ◆ Does not switch active 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

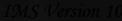
- Backup copy recommended
  - ◆ ACBLIB member online change updates member(s) in the active ACBLIB data set
  - ◆ Backup may be used to restore ACBLIB
    - Backup from before change may be used to restore ACBLIB to its previous state
- Copy active library using the OLC copy utility (DFSUOCU0)
  - ◆ 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.

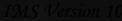
You need only specify the ACB member(s) with changes in the INIT OLC PHASE(PREPARE) command; IMS will find all the necessary members that are associated with the specified member(s). For example, there is an update to DBDX and an ACBGEN BUILD DBD=DBDX,BLDPSB=Y is done. DBDX is used by members PSBA, PSBB, 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=Y|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.

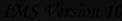
If dynamic allocation fails, the OLC PREPARE process will fail and return a return/reason code and completion code indicating the error. The user will need to issue a TERMINATE OLC command to abort the online change in progress, and then reissue the INIT OLC PHASE(PREPARE TYPE(ACBMBR) command.

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

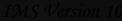
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The OLCSTAT data set must be reinitialized before ACBLIB member online change may be used. When reinitialized by the IMS V10 DFSUOLC0 utility the data set is expanded to include ACBLIB member online change information. If there are IMS V8 and V9 systems 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=yyyydddhhmms
```

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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

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



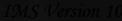
## Prepare Phase

- 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



## 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


## 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.

<b>Log Record Type</b>	<b>Conditions for writing log record</b>
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

## 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

## 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)
```

MrName	Member	CC
-----		
IMS2	IMS1	0
IMS2	IMS2	0

## 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
```

## 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

## 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



## 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

# Security

**ON DEMAND BUSINESS**

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## Highlights

- Support for mixed-case passwords
  - ◆ New PSWDC parameter
  
- Security auditing improvements
  - ◆ Consistency for SMF logging requests
  - ◆ New AUTHLOG parameter that affects CHNG|AUTH call processing
    - Controls SMF logging and auditing
    - Supports suppression of the ICH408I message
  
- Enhanced security for IMS conversations
  
- **SMU support is removed**

IMS V10 provides several enhancements in the security area:

- Support for mixed-case passwords through a new parameter, PSWDC.
- Greater consistency in how IMS requests SMF logging.
- A new AUTHLOG parameter that enhances auditing requests during DL/I CHNG|AUTH call requests even when DFSC TSE0 (Security Reverification Exit) exists.
- Enhanced security for IMS conversations when the terminal has been disconnected with an active conversation in progress.

Most importantly, IMS V10 removes SMU security and all the components associated with SMU. Migration from SMU to SAF/RACF (or equivalent product) is easiest if accomplished before the IMS V10 migration, otherwise the migration from SMU to SAF will need to coincide with the migration to IMS V10.



## Support for Mixed-case Passwords

- New startup parameter
  - ◆ PSWDC = M | U
    - M requests mixed-case support
    - U converts to upper-case and is compatible with previous releases
  
- Mixed-case support in IMS relies on mixed-case enablement in the security environment
  - RACF - z/OS v1.7 or later
    - SETROPTS PASSWORD(MIXEDCASE)
      - Requests the RACF use of mixed-case
    - SETROPTS PASSWORD(RULE...)
      - Sets password content-keyword rules (MIXEDCONSONANT, MIXEDVOWEL, MIXEDNUM) to allow mixed case characters

Support for mixed-case passwords is requested through a new startup parameter PSWDC. Setting the value to M (mixed-case) assumes that RACF has also been set up for mixed-case support.

For reference purposes, the applicable RACF commands include:

- SETROPTS PASSWORD(MIXEDCASE|NOMIXEDCASE). MIXEDCASE indicates that all applications on this system and those that share the RACF database support mixed-case passwords. The syntax rules must also be modified to allow mixed-case characters. When this option is activated, the RACF ALTUSER, ADDUSER, PASSWORD and RACLINK commands will no longer translate passwords to uppercase, nor will applications that request mixed-case password support such as IMS systems that specify PSWDC=M. This option is inactive by default.
  
- SETROPTS PASSWORD(RULE...) defines up to 8 syntax rules for new passwords and will be used to verify that the new password meets the criteria. The rules specifying mixed-case characters should only be set when the MIXEDCASE option is in effect. When the password rules are changed, there will be no immediate impact on the users. The only time the change will have an effect is when the users change their passwords. The rules are only used to verify that a new password meets the criteria. Any existing passwords are just verified against what is entered and what is in the database. The users will not be asked to change their password just because the syntax rules have changed. If multiple rules are defined, a password that passes at least one rule is accepted.
  
- SETROPTS LIST can be used to display the current setting

## Support for Mixed-case Passwords ...

- IMS support affects:
  - ◆ /SIGN ON and /OPNDST
  - ◆ Reverification of a new password
  - ◆ Password in parentheses after transaction or command (excluding MFS OPT=3)
  - ◆ MFS password field in message input descriptor (MID)
  - ◆ MFS password field in device input format (DIF)
  - ◆ Password in parentheses after an IMS command parameter
  
- Consideration when mixed-case is in effect.
  - ◆ Users that used to enter passwords in lowercase when values were always converted to upper case will now need to enter their passwords in uppercase.

Since IMS provides several areas for a password to be entered, the new mixed-case support affects all these areas.

Be careful when enabling this capability. Users that were used to entering their passwords in any mode – lower, upper, mixed – may have their signon rejected if a specific case is expected.



## Security Auditing Improvements

- Enhanced performance of SMF logging requests during authorization processing
  - ◆ Single authorization call
    - FASTAUTH call uses LOG=ASIS specification
      - SMF Logging occurs as part of the same RACF call
        - Assumes RACF (or security product) has requested auditing
    - Provides consistency across IMS authorization requests
      - Some authorization requests in previous releases required two RACF calls
        - FASTAUTH call for the initial authorization
        - Optional second call using an AUTH call (normal authorization checking) to request the SMF logging

In previous releases, IMS authorization requests were inconsistent with respect to the auditing capability, i.e., SMF logging and writing the ICH408I message to the system console. Some SAF requests used the normal authorization request call (AUTH) which could determine whether the security product required auditing and requested the function as part of the call. Other requests used the fast authorization call (FASTAUTH) and, when auditing was needed, performed a second AUTH call; and yet other requests issued the FASTAUTH with the additional specification of LOG=ASIS to perform auditing, when required, as part of the fast authorization.

IMS V10 provides a consistent method of requesting auditing. IMS authorization requests have been changed, where needed, to use the FASTAUTH call with LOG=ASIS specification to honor SMF logging requests as part of the same SAF call thereby eliminating the optional second AUTH call that was previously required just to request SMF logging.

The RACF implementation of auditing and the way the installation requests this capability from RACF have not changed. RACF continues to perform auditing if the authorization check results in success (RC=0) or failure (RC=8), and determines that auditing is necessary based on the following conditions:

- the user's UAUDIT setting
- the AUDIT, GLOBALAUDIT, and WARNING options in effect for the resource
- the SETROPTS SECLABELAUDIT is in effect
- the AUDIT options in the resource SECLABEL profile
- the pre-processing or post-processing installation exit's indication of whether or not to do auditing.

## Security Auditing Improvements ...

- Additional enhancement during application AUTH call processing
  - ◆ New DFSDCxxx parameter that controls auditing calls even when the IMS system includes DFSTSE0 (Security Reverification Exit)
  - ◆ AUTHLOG = ALL | NONE | NOMSG
    - ALL – SMF log record written and ICH408I message to console (default)
    - NONE – No SMF log record and ICH408I message
    - NOMSG – Only SMF log record written

A new DFSDCxxx startup parameter provides a system level specification on how IMS is to handle auditing for application programs that issue the AUTH calls.

- AUTHLOG=ALL (default) requests that SMF logging occur and RACF error message ICH408I be issued when appropriate
- AUTHLOG=NOMSG allows SMF logging to occur when appropriate but suppresses the RACF error message ICH408I
- AUTHLOG=NONE requests suppress of both SMF logging and RACF error message ICH408I

## Security Auditing Improvements ...

- Additional enhancement during application CHNG or AUTH call processing ...
  - ◆ Prior releases
    - IMS would not perform auditing if DFSCCTSE0 existed in the system
      - If auditing was required, DFSCCTSE0 had to perform the function
  - ◆ IMS V10 provides new flags for DFSCCTSE0 (Security Reverification Exit Routine) to facilitate auditing
    - CTSEAUDR in flag CTSEFLG1
      - Tells the exit that the auditing function is needed
    - CTSEDAUD in flag CTSEFLG2
      - Allows the exit to tell IMS to perform auditing

Another issue in prior releases was that IMS would not perform auditing if the IMS user exit DFSCCTSE0 existed in the system. The documentation indicated that the user exit had to perform the auditing function.

In IMS V10, IMS provides new flags that allow the exit routine to request that IMS issue an authorization call in a form that will allow auditing to take place. To take advantage of this capability, the DFSCCTSE0 exit routine will need to check a new flag (CTSEAUDR in CTSEFLG1) which indicates that the auditing function is needed, and when needed, set another new flag (CTSEDAUD in CTSEFLG2) to tell IMS to issue the authorization call and request auditing. The exit will only be able to set CTSEDAUD if CTSEAUDR is on.

## Security Auditing Improvements ...

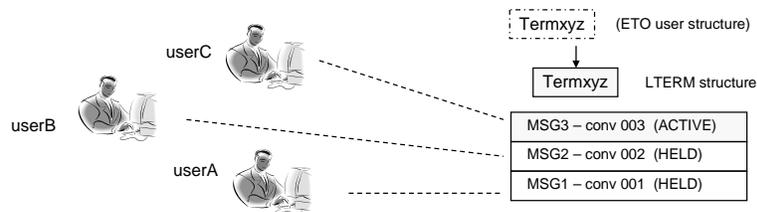
- Additional enhancement during application CHNG or AUTH call processing ...
  - ◆ IMS V10 auditing dependencies for CHNG, AUTH
    - The installation security product has requesting auditing
    - The existence of DFSCCTSE0
      - Whether or not auditing flags are set – CTSEAUDR and CTSEDAUD
    - The specification in the AUTHLOG parameter
  - ◆ Consideration
    - DFSCCTSE0 from prior releases will continue to work in IMS V10
      - No modification required
    - Leveraging the new capability requires modification

Security auditing in IMS V10 is based on:

- The installation's specifications that requests auditing of resources, and
- The presence/absence of the IMS user exit DFSCCTSE0 - if it exists, then the setting of the CTSEDAUD flag, and
- The specification of the AUTHLOG parameter requesting that a form of auditing be done

## Enhanced Security for IMS Conversations

- Ensures that on reconnecting to an active IMS conversation
  - ◆ After a system crash, session crash or normal termination
  - ◆ Only the userid authorized to an active conversation is allowed to access that conversation
  - ◆ Applicable to static terminals and ETO terminals where user structure is not unique to userid (e.g., LUname=USERname=LTERMname)
    - Previous releases - access to an active conversation is allowed for all userids associated with the active or any held conversations



IMS V10 enhances security for IMS conversational processing in the situation where a user attempts to signon from a terminal that is associated with an active conversation.

In prior releases, as long as a user signing on from the terminal was authorized to one of the conversations (the active one or any of the ones on hold), that user could gain access to the active conversation even if they were not authorized to the active conversation. This situation affected all static terminals as well as ETO terminals where the control block structure of the USER was not unique to a signing on userid. For ETO, the environment in question was one where all userids logging on from the terminal accessed the same control blocks, e.g., LUname=USERname=LTERMname.

## Enhanced Security for IMS Conversations ...

- With IMS 10,
  - ◆ Signon accepted only if:
    - User signing on is authorized to the active conversation, or
    - No active conversation exist, i.e., all conversations are held
  - ◆ Error results in DFS2469
  
  - ◆ Static terminals
    - If user signing on is not authorized to active conversation
      - Enter /HOLD, /SIGN ON, /RELEASE of desired conversation
  
  - ◆ ETO terminals
    - Only user authorized to active conversation can sign on
      - /HOLD is not allowed prior to a sign on
        - More restrictive

The IMS V10 change ensures that a signon will be successful only if:

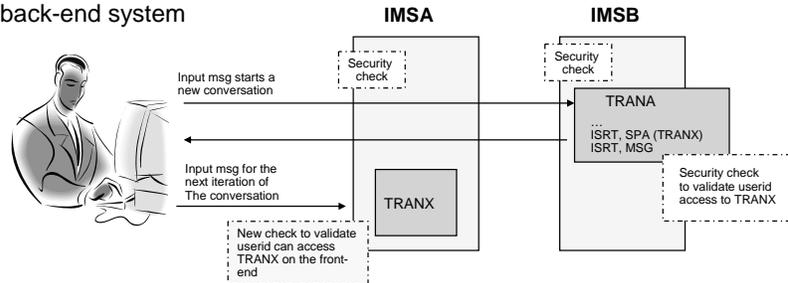
- (a) the userid attempting the signon is authorized to use the active conversation, or
- (b) no active conversations exist, i.e., all the conversations are held.

The impact to static and ETO terminals when an active conversation exists includes the following:

- Static: A user that is not authorized to the active conversation will fail signon. The user can issue /HOLD on the conversation and then reissue the /SIGN ON command. /RELEASE of the conversation to which the user is authorized can be entered to resume the appropriate interaction.
  
- ETO: Users that attempt a signon in environments that have generic naming conventions (e.g., LUNAME=USERNAME=LTERMNAME) must be authorized to the active conversation if one exists, otherwise the signon will fail. /HOLD is not allowed prior to a /SIGN ON.

## Enhanced Security for IMS Conversations

- When an appl pgm inserts a deferred conversational program switch
  - ◆ IMS validates that the user has authorization to access the new transaction for the subsequent iteration of the conversation when the next input is received
    - Enhances the security environment for MSC and Shared Queues
  - ◆ Addresses the issue when the application issuing the deferred switch runs on a back-end system



- Also delivered in IMS V8 (PK07022) and IMS V9 (PK31739)

Terminology: - A *deferred conversational program switch* is one that responds to the terminal but causes the next input from the terminal to go to another conversational program. An *immediate program switch* passes the conversation directly to another conversational program. This capability addresses the deferred model.

When an application program inserts a deferred conversation program switch, IMS security mechanisms provide a method to validate authorization to the new transaction name when the SPA is inserted. The authorization check is done wherever the program runs using the security authorizations of that IMS system. IMS V10 addresses the concern that the program issuing the deferred conversation program switch could run on a back-end MSC or Shared Queues system where the authorizations might differ from the system where the switched-to transaction might actually run.

IMS V10 ensures that the user is authorized to access the switched-to transaction by adding an authorization check on the subsequent input from the end user. This check is made to validate that the user is authorized to access the switched-to transaction. If the terminal is disconnected during the conversation, and the conversation remains active, then the authorization check is made when the next signon is attempted.

## SMU Support Removed

- IMS 10 removes SMU and SMU components
  - ◆ IMS-provided security
  - ◆ The Security Maintenance Utility
  - ◆ Application Group Name Exit Routine (DFSISIS0)
  - ◆ IMS.MATRIXx data sets
  
- IMS provides utilities to assist in migration to RACF
  - ◆ PK49538 - DFSKAGN0, DFSKCIMS, DFSKDIMS, DFSKSMU1, DFSKSMU2, DFSKSMU3, DFSKPDSM
    - Create comparable RACF and/or Stage 1 definitions
  
- Primary consideration
  - ◆ If migration from SMU to SAF/RACF has not already been done, migration to IMS 10 will also need to include migration from SMU to SAF/RACF

IMS V10 no longer supports the Security Maintenance Utility (SMU) capability. As a result, SMU components have been removed including the SMU Utility, the AGN Exit Routine (DFSISIS0) and the MATRIX data sets. Note that the IMS.MATRIXx data sets have been deleted and removed from all IMS procedures and logic.

A primary consideration in this area includes migration. IMS systems that use SMU must migrate to the SAF interface at the time that the upgrade to IMS V10 occurs.

## SMU Support Removed - Impact

- System definition macros - SMU specifications ignored
  - **COMM** OPTIONS= (<NOPSWD|PASSWD|FORPSW><,NOTERMNL|  
TERMINAL |FORCTERM>)
  - **IMSGEN** PSWDSEC=,TERMSEC=
  - **SECURITY** PASSWD=,TERMSEC=,TRANCMD=,  
TYPE=(<NOAGN|RACFAGN|AGNEXIT>)
  
- Utilities
  - ◆ SMU Utility no longer supported
  - ◆ Online Change Utility ignores MATRIX dataset DD cards

The impact of removing SMU affects the IMS environment in several ways.

- All SMU specifications in any of the system definition macros are ignored. These specifications were previously found in the COMM, IMSGEN and SECURITY macros.
  
- The Security Maintenance Utility no longer is available in IMS V10. Additionally, the Online Change Utility will no longer support the IMS.MATRIX data set. If the MATRIX dataset DD cards exist in the online change utility JCL, the utility will ignore those specific DD cards.



## SMU Support Removed - Impact

- Initialization, start-up parameters and procedures
  - ◆ Specifications that are ignored: AGN, AOI1=S, ISIS=<0|1|2>
  - ◆ Specifications that are no longer documented but are compatible with functionality in previous releases (requests for SAF and bypassing of SMU)
    - TRN=<E|X>, RCF=<B|R>, SGN=<D|E|W|X>
  - ◆ Specifications that have changed meanings
    - MSCSEC – values allow SAF/RACF or no security
      - SMU defaults no longer applicable

The changes to the startup parameters fall into several categories:

- (a) Parameter values requesting the use of SMU continue to be accepted in IMS V10 but are ignored. These include AGN (specification of an AGN name), AOI1=S (request to use SMU security for AOI Type 1 command authorization) and ISIS=<0|1|2>. The ISIS parameter is still supported for specification of combinations of SAF and user exit authorization. Only the three values of 0, 1, or 2 which were previously associated with SMU are now ignored.
- (b) Specifications that are no longer documented but are compatible with functionality in previous releases of IMS. Certain parameter values in previous releases allowed the use of SAF/RACF along with negating the loading of the signon security tables from the MATRIX data set. The specifications included: TRN=<E|X>, RCF=<B|R>, and SGN=<D|E|W|. Although these values are no longer documented in the IMS V10 System Definition Guide because they request negation of loading tables from the MATRIX data set which is no longer supported, the values will be accepted for compatibility purposes and function in the same manner as the supported counterparts. For example, TRN=E is equivalent to the supported value of TRN=F (TRN=E → TRN=F). This is because TRN=E, in previous releases, requested option F plus the negation of loading the SMU signon tables. Likewise, TRN=X → TRN=Y, RCF=B → RCF=A, RCF=R → RCF=S, SGN=D → , SGN=D → SGN=F, SGN=E → SGN=G, SGN=W → SGN=Y and SGN=X → SGN=Z.
- (c) Specifications that have changed their meaning because the SMU capability no longer applies include some of the values that can be specified. The MSCSEC parameter previously included values that allowed SMU security to be used for non-directed routing requests. In IMS V10 the parameter values specify the use of SAF/RACF or no security.



## SMU Support Removed – Impact ...

- Commands that are no longer valid
  - /CHANGE PASSWORD and /DELETE PASSWORD|TERMINAL
    - Rejected with: DFS181 INVALID OR MISSING KEYWORD
  
- Commands that support SAF/RACF security and no longer support SMU security
  - ◆ /SET, /LOCK, /UNLOCK
    - SAF/RACF enhancements in IMS V9
      - Userid access to transactions (TIMS/GIMS), PSBs (IIMS/JIMS), LTERMs (LIMS/MIMS), and databases (PIMS/QIMS)
        - Based on specification of LOCKSEC=Y|N
      - Password access to resources through RACF REVERIFY capability

Certain commands such as /CHANGE PASSWORD and /DELETE PASSWORD|TERMINAL were strictly associated with SMU security. These commands are no longer supported in IMS V10 and, if entered, will result in error message DFS181.

SAF/RACF support for the resources associated in the /SET, /LOCK and /UNLOCK commands was introduced in IMS V9 along with the LOCKSEC parameter and additional resource classes for PSBS (IIMS/JIMS) and LTERMs (LIMS/MIMS). IMS V10 removes the SMU check and supports the SAF/RACF security check which includes two checks: both a validation that the userid of the signed on user is authorized to invoke the /SET, /LOCK, or /UNLOCK command; and a second check that userid is authorized against the resource being accessed – Transactions, LTERMs, Programs, Databases.

Password security is different when using SAF/RACF versus the previous capability with SMU. SAF/RACF uses the signed on user's password in a reverify capability whereas SMU used a global password as defined in the SMU tables. Note that the use of a password after the parameter defining the resource will continue to be supported for all keywords except PTERM and NODE. This restriction has not changed. The SAF/RACF check is accomplished using the RACF REVERIFY support. The REVERIFY support assumes that the RACF profile for the IMS resource is defined with the parameter "APPLDATA('REVERIFY')", then IMS (assuming RVFY=Y is specified as an IMS startup parameter) checks that the password is the same as the user's signon password. If the resource is defined to RACF but is not authorized for use, the command is rejected with message DFS3689W USE OF <TRANSACTION|LTERM|DB|PROG> resourcename BY <LOCK|UNLOCK> REJECTED.

## SMU Support Removed – Impact ...

- Restart commands - /NRE and /ERE
  - ◆ SMU keywords are ignored
    - TERMINAL, NOTERMINAL, PASSWORD, NOPASSWORD, TRANCMDs, NOTRANCMDs
  
- Online Change commands
  - ◆ /Modify
    - PASSWORD, TERMINAL and TRANCMDs keywords are ignored
  
  - ◆ INIT OLC
    - PASSWORD, TERMINAL and TRANCMDs keywords
      - Ignored for IMS V10 systems
      - Passed on to other IMS V8 or V9 systems if multiple releases exist in the sysplex environment

All SMU keywords are ignored when any of the restart commands are issued.

For Online Change requests, the PASSWORD, TERMINAL and TRANCMDs keywords do not apply to the IMS V10 system for either a /MODIFY or INIT OLC command. For INIT OLC, the keywords are still processed, and the appropriate flags in the MWA are set, so that in a sysplexed environment that consists of a mixture of V8, V9 and V10 systems, the keywords can be passed on to the IMS systems at the V8 or V9 level.

## SMU Support Removed – Impact ...

- Documentation – areas that no longer apply and have been removed
  - ◆ Messages
    - DFS062, DFS066, DFS067, DFS095, DFS109, DFS123, DFS125, DFS126, DFS162, DFS171, DFS287, DFS288, DFS1913, DFS1919, DSF2181, DFS2468, DFS2556, DFS3436, DFS3437, DFS3440, DFS3458
  - ◆ Abend codes
    - ABENDU0171, ABENDU0901, ABENDU0902, ABENDU0903, ABENDU1050
  - ◆ MNOTEs
    - AGT001, AGT002, AGT003, AGT004, AGT005

The removal of the SMU support has also affected the documentation for certain messages and abend codes as well as specific application program status and return/reason codes. The documentation in the appropriate manuals has been changed to remove references to SMU-based security.

## SMU Support Removed – Impact ...

- Documentation changes
  - ◆ Messages
    - DFS158, DFS1990I, DFS1991I, DFS2854A, DFS3430I, DFS3480I, DFS3654, DFS3690
  - ◆ Abend codes
    - ABENDU0107, ABENDU0437, ABENDU0718
  - ◆ MNOTEs
    - G972
  - ◆ Application program - status codes and return/reason Codes
    - A4, 0108/0308

IMS documentation has also changed to remove references to SMU security.

## SMU to SAF/RACF Migration

- Migration to SAF (RACF or equivalent) can begin in IMS V8 or IMS V9
  - ◆ V9 includes RACF enhancements for SMU functions which previously had no alternatives
    - Enhancements include areas of AGN, AOI, TCO, MSC link receive, signon verification, and /LOCK and /UNLOCK
    - V9 is a transition release where SMU is still available
  - ◆ Migration from SMU to SAF and from IMS V8 to IMVS V10 is a valid option
    - Begin SMU to SAF migration in IMS V8
    - Migration using V9 enhancements will have to occur during the V10 migration
- Migration references
  - ◆ Chapter 6, IMS V9 Implementation Guide redbook (SG24-6398)
  - ◆ Chapter 4, IMS V9 Administration Guide: System (SC18-7807)
  - ◆ Chapter 3 and 4, IMS V9 Release Planning Guide (GC17-7831)

Both IMS V8 and V9 provide migration paths to the use of SAF/RACF security. IMS V9 provides migration capabilities that are not available with IMS V8.

# Transaction Manager

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## Transaction Manager

- MSC
- APPC
- Removal of BTAM Support

MSC



## Highlights

- Removal of old routing exit routines DFSCMTR0, DFSNPRT0, DFSCMLR0, DFSCMPR0
  - ◆ Replaced by DFSMSCE0 which was introduced in IMS V7
    - Several IMS releases provided dual support and the ability to migrate
- Increased bandwidth to improve MSC link performance
  - ◆ Capability to allow multiple messages to be sent in the same buffer
    - Bandwidth mode
  - ◆ Reduction of logger I/Os by reducing number of CHECK WRITE calls
  - ◆ Expansion of maximum link buffer size to 64K
    - Capability to dynamically increase or decrease size by command
  - ◆ Enhanced link QUERY Statistics command
- MSC VGR support

IMS V10 removes the routing exit routines that were replaced by the TM and MSC Message Routing and Control User Exit (DFSMSCE0) beginning in IMS V7. DFSMSCE0 consolidated and replaced the following exits: MSC Terminal Routing Exit (DFSCMTR0), MSC Input Message Routing Exit (DFSNPRT0), MSC Link Receive Routing Exit (DFSCMLR0), and the MSC Program Routing Exit (DFSCMPR0). Although the older exit routines were supported concurrently with DFSMSCE0 in V7, V8, and V9, they are now being removed in V10 and will no longer be supported or called. DFSMSCE0 must be used. Note: DFSMSCE0 can be used in both MSC and non-MSC environments, although not all routing options will apply to non-MSC systems.

To improve the performance and bandwidth requirements of high-volume MSC systems, many customers today use a large number of parallel MSC links between pairs of IMS systems. This scheme can complicate the operations of the IMS systems and adds to the complexity of the system configurations as well as load balancing schemes. IMS V10 introduces several enhancements to increase MSC bandwidth. These include:

- Blocking multiple messages and responses into a single buffer when sending messages across the MSC links. In previous releases, IMS only sent one message or response at a time.
- Reducing the logger I/O operations by reducing the number of CHECK WRITE calls.
- Expanding the maximum link buffer size to 64K (was 32K) so that more messages and responses can fit into a buffer. Additionally, the initial link buffer sizes set during the IMS system definition process can be increased or decreased and displayed dynamically with IMS commands.
- Providing a command to provide statistics on a link. A secondary issue associated with MSC bandwidth is the difficulty that IMS operators and system programmers can encounter when MSC link performance is inadequate due to a message backup or poor performance. Inadequate performance data in previous IMS releases often resulted in days or weeks of analyzing log records and traces to resolve the issue. In IMS V10, this issue is resolved with an enhanced link Query Statistics command.



## Old MSC Routing Exits Removed

- DFMSMCE0 user exit replaces DFSCMTR0, DFSNPRT0, DFSCMLR0, DFSCMPR0
  - ◆ Old exits were still supported in V7, V8, V9
  - ◆ DFMSMCE0 contains all the routing capabilities supported by the old exits plus more capabilities
- System Definition – COMM macro
  - ◆ NOMSPEX/MSPEXIT and NOMSLEX/MSLEXIT parameters ignored
    - G092 warning message
  - ◆ Old exits are no longer called by IMS even if they are linked into the NUCLEUS or SDFSRESL

IMS V10 only supports the TM and MSC Message Routing and Control User Exit Routine (DFMSMCE0) for routing. There is no longer any support for the older routing exit routines DFSCMTR0, DFSNPRT0, DFSCMLR0, DFSCMPR0. DFMSMCE0 was introduced in IMS V7 to provide an opportunity to migrate over several releases.

The COMM macro specification during system definition, therefore, ignores the NOMSPEX/MSPEXIT and NOMSLEX/MSLEXIT parameters. Previous releases of IMS allowed specification of the parameters NOMSPEX/MSPEXIT to exclude/include the MSC Program routing exit (DFSCMPR0) and NOMSLEX/MSLEXIT to exclude/include the MSC Link Receive routing exit (DFSCMLR0). IMS no longer recognizes these routines even if they are included in the IMS resource library.

If the older exit routines still exist in the IMS release from which the migration is being done, then migration to DFMSMCE0 becomes a required action for the IMS V10 migration. The IMS Customization Guide documents a sample DFMSMCE0 exit along with the user edit parameter list macro (DFMSMCEP) which provides information on using and customizing the exit. To include the DFMSMCE0 replacement exit into the IMS system, it must be bound (linkedited) into IMS SDFSRESL (or a concatenated library).

## Increased Bandwidth - Background

- Prior Releases
  - ◆ Input and output buffer to send messages on a physical link
    - Defined via BUFSIZE on MSPLINK macro at system definition
      - Applicable for the duration that the link is active
- Issues
  - ◆ Buffer size is fixed and may not account for increased traffic
  - ◆ Only one message or response can be sent per buffer
    - Even if the buffer is large enough to hold multiple messages/responses
  - ◆ The next message is not sent until the partner IMS responds that it has
    - Received, queued, and logged the message

To understand the changes for MSC bandwidth, a review of the issue is provided on this visual.

The definition of MSC physical links provides a specification for a BUFSIZE on the MSPLINK system definition macro. The buffer sizes specified are fixed at system definition. When the link is started, an input and output buffer is acquired and held for the duration of the link restart (i.e. link active), at the specified size to send and receive data (messages) across the link. Since each side (partner) of the link has a send and receive buffer, a message or response may be simultaneously sent each way. However, only one message or response is sent per buffer, even if the buffer is large enough to hold multiple messages/responses. Another message is not sent until the partner IMS responds that it has received, queued, and logged the message. For high-volume systems, the wait associated for a freed buffer can be unacceptable. To get around this issue, high-volume systems oftentimes are defined with a large number of parallel links to support the concurrent traffic from one IMS to another.

## Increased Bandwidth...

- Bandwidth mode
  - ◆ Enhanced blocking and response technique
    - Allows multiple messages to be sent in one buffer
      - MSC continually edits messages into the link send buffer
      - The buffer is sent when
        - It is full, or
        - There is no more data to send
    - The mode can only be set by a command - UPDATE

The MSC bandwidth mode in IMS V10 is a mechanism to determine whether or not to send multiple messages in one buffer. In non-bandwidth mode, MSC sends a maximum of one message or response per I/O operation (i.e. Send or write). In bandwidth mode, IMS attempts to maximize the capacity of a link by sending as many messages that are queued and ready to go, and responses that are owed for messages received, in the same buffer. By increasing the link buffer size, more and more messages and responses may be sent simultaneously.

Note that BANDWIDTH mode is not a system definition option. It can only be set ON with a command. The default is non-Bandwidth mode which allows MSC to function as in previous releases.

## Increased Bandwidth...

- Bandwidth mode ...
  - ◆ Considerations
    - Bandwidth mode requires both partner IMS systems to at IMS 10 level
      - Established by command on a link by link basis
        - Support for IMS 10 to IMS 10 links
        - No support for IMS 10 to IMS version 8 or 9 links
    - Non-bandwidth mode is compatible with V9/V8
      - No migration fixes required
        - Compatibility is handled on the IMS 10 side
    - Both sides of the link must specify the same bandwidth mode
      - Otherwise, link restart is rejected with a DFS3218 message

MSC bandwidth mode is only available on IMS 10 to IMS 10 connections.

The bandwidth mode may be set ON/OFF by the IMS UPDATE command on a link by link basis for all the CTC, MTM, or VTAM links.

The specified mode must be the same on both sides of the link or the link restart will be rejected with a DFS3218 message. IMS V10 MSC links that are connected to a down level release of IMS (i.e. V8, V9) will not be able to set bandwidth mode on the V8/V9 side of the link so the link, in effect, will not be able to operate in bandwidth mode.



## Increased Bandwidth...

- Reduced Logger I/O
  - ◆ Prior Releases
    - IMS Check Writes (CHKW) to the WADS
      - Recoverable messages
        - On the send side when the last part of a message is sent
        - On the receive side when the message is enqueued
  - ◆ IMS 10
    - Bandwidth mode
      - One CHKW per send buffer regardless of the number of messages in the buffer
        - E.g., 5 messages in one buffer, results in 1 CHKW on the send side
      - 1 CHKW per message on the receive side
    - Non-bandwidth mode
      - One CHKW per message on the send side (same as pre-V10 systems)
        - E.g., 5 messages are sent in 5 buffers and result in 5 CHKWs on the send side
      - 1 CHKW per message on the receive side

Turning bandwidth mode ON can also impact logger I/O. As a general rule, there are 2 CHKWs in the path of a recoverable message that is sent across an MSC link, one on the send side when the last part of a message is sent, and one on the receive side when the received message is enqueued. There are no CHKWs issued for non-recoverable messages. Note, however that even though a message that is sent from a front-end IMS to a back-end system is non-recoverable (therefore no CHKWs), its response is always considered recoverable and will incur CHKWs. Therefore, recoverable remote transactions incur 4 CHKWs, two for the message going to the back-end and two for the response. Non-recoverable remote transactions incur 2 CHKWs, none for the non-recoverable message that is sent to the back-end, and two for the reply which IMS always sets to recoverable.

The choice of bandwidth mode, however, does impact the number of CHKWs that can be issued in an IMS V10 environment. Bandwidth mode potentially reduces the number of CHKWs issued because only one CHKW is written per send buffer regardless of how many messages are contained in the buffer. For example, if there are five messages in the buffer then only one CHKW is written rather than five. Note that on the receive side, the back-end IMS continues to issue one CHKW per message. When the response messages are ready, the back-end IMS will attempt to buffer as many messages as can fit in a buffer and issue one CHKW for the buffer. The front-end IMS which is the receiving system for the responses will issue one CHKW per message.

Non-bandwidth mode provides the same processing as pre-IMS V10 systems. For example, if the front-end IMS has five messages to send, these messages are all sent in separate buffers and five CHKWs will occur, one for each message. On the receive side, IMS will again issue one CHKW per message. The same processing and number of CHKWs occur for the responses from the back-end IMS to the front-end system.



## Increased Bandwidth

- Increase in link buffer size range
  - ◆ System Definition
    - MSPLINK BUFSIZE=size where size is **1024** (from 160) to **65536** (from 32K)
      - Applicable to all link types: CTC, MTM and VTAM
    - If using Bandwidth mode, 4096 should be the minimum
  
    - IMS V10 initializes the buffers to the size specified
      - If link partner is IMS 10, no overhead is added
      - If link partner is version 9 or earlier, overhead is added for compatibility
        - CTC and MTM: 78 at definition + 28 at initialization
        - VTAM: 288 + 28 (restricted to values in the VTAM table)
        - Reference the VTAM table in the MSPLINK macro in the manual

IMS 10 increases the range of buffer size specifications. The new MSPLINK BUFSIZE range is from 1024 to 65536 and specifies the input and output buffer sizes for each logical link defined for a physical link. The range is standardized and applicable to CTC, MTM and VTAM links. Prior to version 10, the size for CTC and MTM links ranged from 160 to 32689 and from 208 to 30720 for VTAM links. Note that when bandwidth mode is used, a BUFSIZE of 1024 may be too small to take advantage of the ability to send multiple messages with one buffer especially if the messages include some of the extended headers that capabilities such as OTMA impose. A value of 4096 is more realistic.

Additionally, in prior releases IMS system definition added 78 bytes to the MSPLINK BUFSIZE for CTC and MTM links, and 288 bytes to VTAM links. IMS Initialization added another 28 bytes. This overhead has been removed in V10. IMS initializes the MSC buffers to the actual BUFSIZE specified. For V10 to be compatible with V9 and below, however, IMS will continue to add the overhead (i.e. 78+28 for CTC and MTM links, 288+28 for VTAM links), at link restart if the partner IMS is below a V10 level. This action insures that the buffer sizes are compatible. If the partner is at V10 or higher, the overhead is not added.

Also note that in prior IMS releases, VTAM required buffer sizes to reflect a formula of X times 2 to the power of Y, where X had to be a value of 8 through 15, and Y has to be a value from 3 to 13. This restricted the MSC VTAM buffer sizes to certain values that were documented in a VTAM table under the MSPLINK macro in the Installation Guide, Volume 2 manual. For V10, these restrictions are removed, but remain for compatibility when communicating to a V9 or earlier release of IMS. Any BUFSIZE from 1024 to 65536 is acceptable. The table in the manual has been updated to reflect the applicable sizes.

## Increased Bandwidth - Implementation

- System Definition ...
  - ◆ **label** MSLINK
    - Label field is new
    - Provides a name for the MSLINK
      - Useful for update commands
    - If not specified, the generated name is DFSLxxxx
      - Where xxxx = link number with leading zeroes
      - Link number is still generated internally
      - E.g., For logical link number 676, the generated name is DFSL0676

A label field has been added to the MSLINK macro to allow a name to be assigned to the logical link. The name, if provided, can be used for the new command capabilities that are provided to affect specific links. If not specified, IMS will generate the name DFSLxxxx where xxx is the link number. Link numbers, as in previous releases, continue to be assigned automatically by IMS based on the relative position of the MSLINK macro in the SYSGEN.

## Increased Bandwidth - Commands

- New command capability to change the link characteristics
  - ◆ Recoverable across a warm or emergency restart
  
  - ◆ Type 1 command
    - `/UPD MSLINK NAME (name) SET((BANDWIDTH(ON | OFF) BUFSIZE(xxxxx))`
  
  - ◆ Type 2 command
    - `UPDATE MSLINK NAME (name) SET((BANDWIDTH(ON | OFF) BUFSIZE(xxxxx))`
  
  - ◆ Note: Dynamic buffer size changes only apply to IMS V10
    - V9/V8 still requires a SYSGEN to change link buffer sizes

To support the increased bandwidth enhancements, IMS V10 introduces several new command capabilities.

The update command has been enhanced to provide a mechanism to change the characteristics of the link associated with the name provided. The name is either the label value on the MSLINK definition or the default DFSLKxxx value. Possible actions that control the bandwidth capacity of the link include increasing and decreasing link buffer sizes, setting a higher limit for buffer size, and setting the bandwidth mode off and on. The command can be entered as either a Type2 (UPDATE) command which uses the Operations Manager (OM) or a Type1 (/UPD) which does not require OM. Any accepted changes are kept across a warm start.

If the characteristics of the link need to be changed, the link must first be stopped and idle. The UPDATE command, when issued, must also be issued on both IMS systems on either side of the link to reflect identical specifications for bandwidth mode and buffer sizes.

## Increased Bandwidth - Commands ...

- Commands to show status and properties of the link
  - ◆ Display Command - Type 1
    - /DISPLAY LINK *number***
      - Existing command that displays link values and BANDWIDTH status if bandwidth mode is set on
    - /DISPLAY LINK *number* OPTION BUFSIZE**
      - New format of the command that displays the link parameters such as link#, linkname, bandwidth, bufsize, and status
  - ◆ Query Command - Type 2
    - QUERY MSLINK NAME (*name*) SHOW(ALL | BUFSIZE | BANDWIDTH))**

The /DISPLAY and QUERY commands show the links with their current buffer size and whether or not bandwidth Mode is on or off.

The screenshot shows a presentation slide with a dark header containing the text 'Information On Demand' and 'IMS Version 10'. The main content area is white and contains the following text:

## Statistics

- New capability to gather and show statistics on the MSC logical links
- Log records
  - ◆ New Type x'4513' at each system checkpoint
    - One record for each logical link containing the link name and number
      - Mapped by the DFSL4513 macro
- Query Command - Type 2
  - ◆ Supports a request to view individual statistics for each MSLINK
    - Assists in determining link performance, optimum buffer size, etc.
      - Shows message rates and message sizes

**QRY MSLINK NAME(*name*) SHOW(STATISTICS)**

- Three categories are kept and displayed
  - General, Send, Receive

IMS V10 also provides a new capability to gather and show statistics on the MSC logical links.

A new log type x'4513' is available to provide information on each logical link.

The QUERY command provides options to request statistics on the MSC links. This allows for quick and easy access to link performance. The information can be used to determine the efficiency of the link and assist in deciding on an optimum buffer size. Individual statistics for each MSLINK are collected in the DFSMSCWA workarea.

Note that link statistics are not displayed with the SHOW(ALL) keyword. SHOW(STATISTICS) must be used. This keyword also displays the statistics reset mode, RESET,CHKPT or NORESET,CHKPT.

There are three categories of statistics:

- General - such as, statistics start time, ITASK dispatch counts, ITASK processing times, and the rate and number of logger check writes
- Send - such as, messages sent, byte count sent, send message sizes, queue manager get counts and times, and send I/O times
- Receive - such as messages received, byte count received, receive message sizes, QMGR insert counts and times, and receive I/O times

## Statistics ...

- Update Command - Type 2
  - ◆ New options to *control the RESET mode*
    - UPD MSLINK NAME(*name*) START(STATISTICS) OPTION(RESET,CHKPT)**
      - Resets link statistics after each IMS checkpoint
        - Recording interval is from checkpoint to checkpoint
    - UPD MSLINK NAME(*name*) START(STATISTICS) OPTION(NORESET,CHKPT)**
      - Does not reset statistics at checkpoint
        - Recording interval is from restart or from last manual reset
  - ◆ New option to *reset the statistics*
    - UPD MSLINK NAME(*name*) START(STATISTICS) OPTION(RESET)**
      - Manually resets link statistics and sets start time to current time

The UPDATE MSLINK command can be invoked to reset the statistics counters and control how the resetting is to be done.

The first two forms of the command control the RESET mode:

- **RESET,CHKPT** mode causes the link statistics to be reset at each IMS checkpoint, after the statistics are logged. The recording interval, therefore, is from IMS checkpoint to checkpoint. This is the default mode and provides a reasonable interval for the statistics to be gathered. A longer interval might not be as useful in determining problems.
- **NORESET,CHKPT** mode does not reset the statistics at IMS checkpoint. To be reset, the operator must do so manually. The recording interval, therefore, is from IMS restart or when the last manual reset was issued until the time the command is issued. This mode is useful when running a benchmark or gathering statistics for a longer interval than between IMS checkpoints.

The third form of the command manually resets the link statistics, sets the start time to the current time, and begins a new recording interval.

## Statistics ...

- Statistics information

### General Statistics

Start_Time	Start time for statistics
Tot_DISP_CT	Number of times link ITASK was dispatched by IMS
Tot_Proc_Time	Total link ITASK processing time for all dispatches
Hi_Proc_Time	Highest link processing time per dispatch
Low_Proc_Time	Lowest link ITASK processing time per dispatch
Avg_Proc_Time	Average link ITASK processing time per all dispatches
chkw_CT	Number of logger check writes
chkwio_CT	Number of logger check writes that caused an I/O
chkw_Rate	Logger check write rate calculated by calculating chkw_ct divided by the statistics recording time

The next two pages provide an overview of the statistics provided in the QUERY command. This visual shows the General Statistics.

## Statistics ...

- Statistics information ...

Send Statistics		Receive Statistics	
Tot_Send_CT	Total # of send I/O	Tot_Rec_CT	Total # of receive I/O
Tot_MSG_Send_CT	Total # of msgs sent	Tot_Msg_Rec_CT	Total # of messages received
Tot_MsgByte_Send_CT	Total # of msg bytes sent	Tot_MsgByte_Rec_CT	Total # of msg bytes received
Tot_Byte_Send_CT	Total bytes of data sent	Tot_Byte_Rec_CT	Total bytes of data received
Hi_MSG_Send_SZ	Largest msg size sent	Hi_Msg_Rec_SZ	Largest msg size received
Low_MSG_Send_SZ	Smallest msg size sent	Low_Msg_Rec_SZ	Smallest msg size received
Avg_MSG_Send_SZ	Average msg size sent	Avg_Msg_Rec_SZ	Average msg size received
Send_Msg_Time	Interval bet. 1st & last msg	Rec_Msg_Time	Interval bet. 1st & last msg
Tot_Qget_CT	Total # of QMGR gets	Tot_Qput_CT	Total # of QMGR put calls
Tot_Qget_TM	Total tm to get msg off q	Tot_Qput_TM	Total proc tm for QMGR puts
Hi_Qget_Time	Longest QMGR tm to send	Hi_Qput_Time	Longest QMGR tm to rcv
Low_Qget_Time	Shortest QMGR tm to send	Low_Qput_Time	Shortest QMGR tm to rcv
Avg_Qget_Time	Average QMGR tm to send	Avg_Qput_Time	Average QMGR tm to rcv
Tot_SendIO_Time	Total I/O time to send msgs	Tot_ReclO_Time	Total I/O tm to rcv msgs
Hi_SendIO_Time	Longest send I/O time	Hi_ReclO_Time	Longest I/O tm to rcv msgs
Low_SendIO_Time	Shortest send I/O time	Low_ReclO_Time	Shortest tm to rcv msgs
SendIO_Req_Rate	Send I/O req. per second	ReclO_Req_Rate	Rcv I/O requests/sec
SendIO_Byte_Rate	Rate in bytes/sec sent	ReclO_Byte_Rate	Rate in bytes/sec received

This visual shows the type of information that can be analyzed by reviewing the Send and Receive statistics.

The Send statistics reference QGET calls. These calls are used to get messages off the queue for send processing.

The Receive statistics reference QPUT calls. These calls are used to put messages on the queue as part of receive processing.

## Statistics - Report example

```

IMS1 side
QUERY MSLINK NAME(LNK12V02) SHOW(STATISTICS)

MSLink      MSLink#  MbrName  CC   Option              Start_Time
LNK12V02    10       IMS1     0    NORESET,CHKPT      2006.261 19:03:58.77

Tot_Disp_CT  Tot_Proc_Time  Hi_Proc_Time  Low_Proc_Time  Avg_Proc_Time  Chkw_CT
98           0.176661      0.059530     0.000003      0.000853      33

ChkwIO_CT   Chkw_Rate     Tot_Send_CT   Tot_Msg_Send_CT  Tot_MsgByte_Send_CT
33           0.165016     26           20             10,461

Tot_Byte_Send_CT  Hi_Msg_Send_SZ  Low_Msg_Send_SZ  Avg_Msg_Send_SZ  Send_Msg_Time
22,403           578             502              523              2.408548

Tot_Qget_CT  Tot_Qget_Time  Hi_Qget_Time  Low_Qget_Time  Avg_Qget_Time  Tot_SendIO_Time
51           0.002054      0.001070     0.000004      0.000040      0.505401

Hi_SendIO_Time  Low_SendIO_Time  SendIO_Req_Rate  SendIO_Byte_Rate  Tot_Rec_CT
0.193435       0.000708        51.444298       44,327            26

Tot_Msg_Rec_CT  Tot_MsgByte_Rec_CT  Tot_Byte_Rec_CT  Hi_Msg_Rec_SZ  Low_Msg_Rec_SZ
20              10,503            22,445           584             502

Avg_Msg_Rec_SZ  Rec_Msg_Time     Tot_Qput_CT  Tot_Qput_Time  Hi_Qput_Time  Low_Qput_Time
525             2.320062        40            0.037326      0.015957      0.000008

Avg_Qput_Time  Tot_RecIO_Time  Hi_RecIO_Time
0.000933      0.070947       0.025376

Low_RecIO_Time  RecIO_Req_Rate  RecIO_Byte_Rate
0.000155       316,363        148,040.09

```

When the QUERY MSLINK NAME(*name*) SHOW(STATISTICS) command is issued, all the statistics information on the link is displayed.



## Changed Messages

- System Definition
  - ◆ G092 - Invalid COMM macro parameters for old exit routines
  - ◆ G441 - MSPLINK Bufsize must be in the range of 1024 to 65,536
  - ◆ G571 - Label field in the MSLINK macro is present and not 1-8 alphanumeric
- Messages
  - DFS3218 INVALID RESTART MESSAGE OR RESTART RESPONSE MESSAGE RECEIVED RSN=xyyy, LINK link#**
    - Expanded for the bandwidth enhancements and indicates invalid specifications
      - Terminates link restart

Several system definition messages have been changed to reflect the IMS V10 enhancements:

- G092 reflects the removal of the MSC exits on the COMM macro.
- G441 reflects the new BUFSIZE limits on the MSPLINK macro for V10 which must be in the range of 1024 to 65536 for all link types - CTC, MTM, and VTAM.
- G571 is issued if the specified MSLINK macro label field is not blank and is not a one-to-eight character alphanumeric name.

Additionally, Message DFS3218 has been expanded to support the bandwidth enhancements. When an MSC link is restarted, restart messages (referred to as a restart message and restart response message) are exchanged between the partner IMS systems. If the messages are invalid, unexpected, or contain incompatible information, a DFS3218 message will be issued on the IMS that detected the error, and the link restart will be aborted. Bandwidth support added more error conditions (e.g., Buffer sizes not equal, Bandwidth Mode not compatible on both sides). To more easily identify the error, a unique reason code was added for each error condition (for existing errors and new errors). The reason code identifies the module that detected the error and the error condition.

**DFS3218 INVALID RESTART MESSAGE OR RESTART RESPONSE MESSAGE RECEIVED  
RSN=xyyy, LINK link#**

**Example - Bandwidth Mode Setup**

- System Definition
 

```
PLNK12V MSPLINK TYPE=VTAM,NAME=L6APPL1,SESSION=3,BUFSIZE=1024
LNK12V02 MSLINK PARTNER=AK,MSPLINK=PLNK12V, OPTIONS=FORCSESS
LINK12V1 MSNAME SYSID=(20,10)
```
- Update
 

```
UPD MSLINK NAME(LNK12V02) SET(BANDWIDTH(ON), BUFSIZE(4096))
Response for: UPD MSLINK NAME(LNK12V02) SET(BANDWIDTH(ON),BUFS...
```

MSLink	MSLink#	MbrName	CC
LNK12V02	10	IMS1	0

**OR**

```
23/UPD MSLINK NAME(LNK12V02) SET(BANDWIDTH(ON) BUFSIZE(4096))
DFS3476I UPDATE MSLINK COMMAND COMPLETED, CC= 0
```

These next two visuals provide an example of MSC setup.

During system definition, three macros provide the mechanism to define the connection between 2 IMS systems. The MSPLINK macro has not changed but the range in values that can be specified for BUFSIZE reflect the new minimum and maximum limits. The MSLINK has changed to provide a label. In this example, the name is *LNK12V02* and is important because it will be used in the UPDATE command.

Once the system definition process is complete and IMS is initialized, the parameters on the MSLINK can be modified. Note that in this example, the UPD command identifies the specific MSLINK named *LNK12V02*. Two changes are made. The first is the setting of BANDWIDTH Mode to ON and the second is the increase of the BUFSIZE to 4096. Alternatively, the command can be issued as a Type 1 command using the /UPD form.

## Example - Bandwidth Mode Setup ...

- Query

**QRY MSLINK NAME(LNK12V02) SHOW(ALL)**

Response for: QRY MSLINK NAME(LNK12V02) SHOW(ALL)

More:

MSLink	MSLink#	MbrName	CC	MSPLink	CID	PID	RecdCnt	SentCnt
LNK12V02	10	IMS1	0	PLNK12V	00000000	AK	0	0

Bufsize Bandwidth LclStat

4096 ON STOCOMM,IDLE,COLDSSESS,FORCSESS,TRACE

- Display

**87/DIS LINK 10**

DFS000I	LINK	PARTNER	RECD	ENQCT	DEQCT	QCT	SENT
DFS000I	10	AK	0	0	0	0	0
DFS000I	PSTOPPED IDLE COLD FORCE TRA						

**88/DIS LINK 10 OPTION BUFSIZE**

DFS000I	LINK	LINKNAME	BUFSIZE	STATUS
DFS000I	10	<b>LNK12V02</b>	4096	PSTOPPED IDLE COLD TRACE
DFS000I	FORCE BANDWIDTH			

Once the changes to the link have been made, either the QRY command or the /DIS command can be used to display the link and ensure that the changes have actually been made.

## Performance results

Time in seconds to send 1000 queued messages,  
Data length = 100 bytes + PFX

### CTC Shared Queues

non-bandwidth mode 4k Time = 8.074355 sec  
bandwidth mode 4k Time = 5.279757 sec = 34% less  
bandwidth mode 8k Time = 5.036957 sec = 37% less  
bandwidth mode 16k Time = 4.588605 sec = 43% less  
bandwidth mode 32k Time = 4.47057 sec = 44% less

### VTAM Shared Queues

non-bandwidth mode 4k Time = 7.78207 sec  
bandwidth mode 4k Time = 6.97356 sec = 10% less  
bandwidth mode 8k Time = 5.252516 sec = 32% less  
bandwidth mode 16k Time = 4.829623 sec = 37% less  
bandwidth mode 32k Time = 4.446261 sec = 42% less

#### NOTE:

These results are from a defined and controlled environment and are intended as an example and NOT to provide exact percentages



Results vary based on:  
- Buffer sizes, and  
- Traffic (number of messages that are queued and ready to be sent)

This visual documents the results of a test comparing the use of Bandwidth Mode against a variety of buffer sizes. Note that the test results vary based on buffer size with a controlled message size and queue depth.

## Migration Considerations

- DFMSMCE0
  - ◆ Ensure migration from the older routing exit routines DFSCMTR0, DFSNPRT0, DFSCMLR0, DFSCMPR0
  
- Bandwidth
  - ◆ Migrate using the default of non-bandwidth mode in IMS V10
    - Compatible with previous releases
  - ◆ After migration, bandwidth mode can be enabled using the UPD command
    - Requires both partners of the link to be IMS V10 systems
    - Adjust buffer sizes
      - Minimum of 4096
      - To be effective, the buffers should be large enough to accommodate multiple messages

When migrating to IMS V10, ensure that the older routing exit routines, if any, have been converted to DFMSMCE0. This migration can be accomplished in any of the supported previous releases (V7, V8, V9) prior to the actual IMS V10 migration. If the exit routines still exist while the V10 migration is in progress then the V10 migration tasks need to include the upgrade of the previous releases to DFMSMCE0.

A like-for-like migration from a previous release to IMS V10 allows MSC to be initialized in non-bandwidth mode. This mode is compatible with MSC operations in previous releases.

The ability to turn on bandwidth mode is provided via the UPD command and requires both partners of the link to be at an IMS V10 level. In this mode, the minimum size of the buffers should be 4096. To be more effective, the buffer sizes should be defined to accommodate multiple messages.

## Migration Considerations ...

- Buffer size
  - ◆ MSPLINK buffer size ranges have changed
    - Minimum is 1024, maximum is 65,536
      - Increase over IMS V8/V9 definitions
      - VTAM sizes for IMS V10 can be any size and no longer follow an algorithm
    - Validate that partner IMS systems have matching buffer specifications
      - If the IMS V8/V9 systems have link buffer sizes less than 1024, they must be modified to a minimum of 1024

Note that the buffer size minimum and maximum ranges have changed in IMS V10. If the link is a VTAM link, the buffer size can now be any size defined in the range and no longer requires a size that fits into the previous formula of X times 2 to the power of Y. The MSPLINK macro description in the System Definition Guide still documents a table but only for compatibility purposes.

If the partner of the MSC link is a V8 or V9 IMS system then those definitions must be at a minimum of 1024.

## Benefits

- DFMSMCE0
  - ◆ Provides a standard exit routine and consistent set of routing capabilities
  
- Bandwidth enhancements - Bandwidth Mode and buffer size
  - ◆ Provide greater control over the bandwidth capacity of MSC links
    - Allows for reduction in MSC parallel links to support throughput
    - Supports a dynamic display and change of link buffer size
  - ◆ Improve the efficiency and performance of the link protocols
  - ◆ Reduce logger CHKWs
  
- New QUERY Statistics
  - ◆ Provide the ability to fine tune and analyze MSC link performance
    - Quick and easy access to link statistics
      - Information that can assist in defining optimum buffer sizes

The use of the TM and MSC Message Routing and Control User Exit (DFMSMCE0) routine consolidates the older message routing exits and provides a variety of enhanced options. By reducing the number of exit routines, a more consistent set of routing capabilities for all types of messages is provided along with a possible simplification of the coding and maintenance requirements.

Bandwidth is the rate at which data or messages can be sent and received across the MSC links. It is dependent on many factors such as: line speeds, processor speeds and other current activity going on in the system, I/O activity for logging and writing messages to the message queues, as well as the choice of protocols and buffer sizes. The bandwidth enhancements in IMS V10 address these many factors by improving the efficiency of MSC processing across the three link protocols - CTC, MTM and VTAM. Additionally, the new capability to view link statistics in the QUERY command can help determine how well the link is performing. The information can be used to optimize the buffer sizes based on actual traffic as messages flow through the system. This combination of being able to view the statistics and then dynamically change the link buffer sizes allows for more responsive control of the bandwidth capacity of MSC links.

## MSC VGR Support

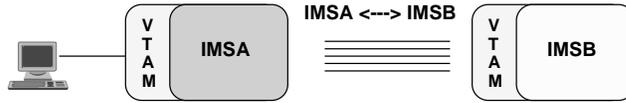
- Single MSC system image for the IMS instances in an IMSplex
  - ◆ Enhancement to the existing IMS VGR functionality
    - Access through MSC links using VTAM Generic Resources (VGR)
  - ◆ Initial implementation for MSC VGR
    - Local mode with VTAM-managed affinities
      - Local mode - No MSC data in CF, no support for the Resource Manager
    - Future - Global mode and RM

IMS already supports VGR for other terminal types including ISC. This function adds the MSC environment as a local mode VGR with VTAM-managed affinities.

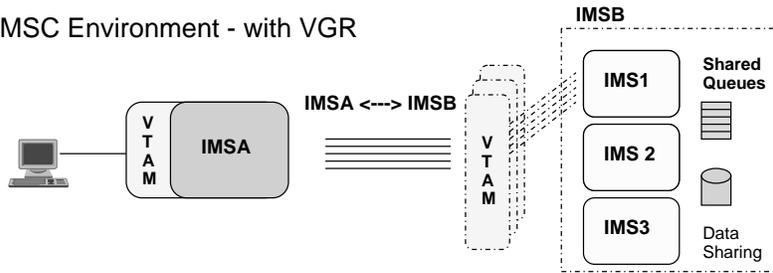
An affinity is a mapping of a node, and in the case of MSC all the parallel sessions associated with a link, to an IMS system.

## MSC VGR Support ...

- MSC Environment - without VGR



- MSC Environment - with VGR



MSC VGR support provides the ability to grow the capacity and capabilities of the IMS MSC environment.

## MSC VGR Support ...

- Definitions
  - ◆ Remote IMS can communicate using a single MSC link
    - To any of the IMS systems in the VGR group
  - ◆ IMS systems that are part of the local VGR group
    - Can clone MSC link definitions for communicating with a single remote IMS
- Implementation
  - ◆ All parallel MSC sessions are routed to the same IMS

The use of MSC VGR eases the requirements on the definitions that are needed. A remote IMS can use a single set of MSC link definitions to access any of the IMS systems in the VGR group. Likewise, IMS systems that are part of the local VGR group can clone definitions for MSC access to the single remote IMS.

Note that when VGR is used, all parallel sessions associated with the link are routed to the same IMS.

## MSC VGR Support ...

- Operational Considerations
  - ◆ MSC commands can be used to terminate/start links
  
  - ◆ Planned outage of one IMS in the VGR group
    - Terminate the parallel sessions on both sides of the link
      - Must be in cold or NRE status
    - Restart links
  
  - ◆ IMS failure of one IMS in the VGR group
    - Terminate the parallel sessions on the surviving partner IMS
    - Restart links
      - Note: Sessions that are reset from ERE to cold mode could result in lost or duplicate messages

MSC commands are available to terminate and restart the MSC links.

The information that MSC keeps about its sessions includes the link status, active or stopped, and the sequence numbers. If a planned outage is to occur, the parallel sessions on both sides of the link must be stopped and then restarted using the new link partner. To allow the information about sequence numbers to be cleared, the sessions need to be in cold or NRE status on both sides of the link.

On the other hand, if an IMS failure occurs where one IMS system terminates, the surviving IMS must also stop the parallel sessions. Note that if session status is changed from ERE to cold mode, messages could be duplicated or lost.

## MSC VGR Support ...

- Operational Considerations ...
  - ◆ If links need to be re-established between the same two IMS systems (the remote IMS and a specific instance of one of the local IMS instances in the VGR group)
    - Restart the link from the local IMS in the VGR group
- Benefits
  - ◆ Provides a single system view of all the IMS systems in an IMSplex
  - ◆ Enables simplified definitions

If the links need to be re-established between the same two instances of IMS, then a way to accomplish this would be to first start the links on the instance of the IMS in the VGR group where the connection is desired. This action establishes affinity for all parallel sessions which remains in effect through subsequent restarts and until the last parallel session is terminated. Once the affinities are established, the links can also be started on the remote IMS system.

# APPC

Information On Demand *IMS Version 10*

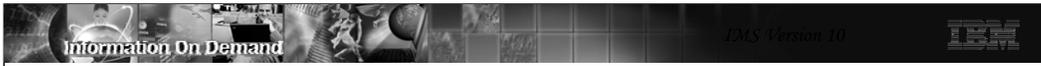
## Highlights

- Enhanced timeout granularity
- Support for /LOCK and /UNLOCK
  - ◆ From both APPC and OTMA clients
- Local LU Support

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APPC enhancements include the following three areas:

- Greater level of timeout granularity with support for APPC/MVS timeout in seconds
- Ability for APPC and OTMA clients to issue the /LOCK and /UNLOCK commands
- Local LU Support



## Enhanced Timeout Granularity

- Support for APPC/MVS timeout in seconds
  - ◆ Enhancement in z/OS V1R7
    - Prior releases provided the timeout capability in minutes
  - ◆ IMS enhancements to:
    - APPCIOT keyword in DFSDCxx member of IMS.PROCLIB
    - /CHANGE APPC TIMEOUT command

The APPC/MVS capability for timeout has been supported by IMS since V6. In z/OS V1.R7, APPC/MVS enhanced its timeout support to specify a lower level of granularity. Prior z/OS releases supported timeout in minutes with the shortest value being one minute. Even one minute, however, can be too long a time when resources are held. With IMS V10 and z/OS V1R7, the timeout capability as provided in the first parameter of the APPCIOT keyword and in the /CHANGE APPC TIMEOUT command allow a value that can be specified in seconds.

Providing the ability to set timeout in seconds is particularly helpful when slow downs in the network occur or when APPC clients that are unable to respond in a timely manner cause IMS dependent regions to hang. Another benefit is one that could affect command processing when a slow or non-responding client impacts the IMS command task DFSCMT10. For example, when an APPC node sends input for a transaction that is stopped, IMS replies to this condition by sending a DFS065 message. This error message is sent under the IMS command task which waits for a response from the APPC node. When this node fails to respond, the task hangs until the wait is broken by the APPC/MVS timeout facility. This task, however, is quite vital in the IMS environment and plays a major role in handling most commands. When the condition just described happens, a slowdown in IMS throughput could result. An APPC timeout value of 1 minute, therefore, could be too long when suspending the command task in a production environment.



## Enhanced Timeout Granularity - Implementation

- APPCIOT
  - ◆ Previous specification:
    - APPCIOT=(mmmmA, mmmmB)
      - where mmmmA = timeout value for APPC/MVS in minutes (0-1440)
      - mmmmB = timeout value for APPC/IMS in minutes (0-1440)
  - ◆ New specification:
    - APPCIOT=(mmmmA:ssA, mmmmB)
      - where mmmmA is 0-1440 and ssA= 0-59
      - mmmmB is 0-1440
  
- /CHANGE APPC TIMEOUT
  - ◆ Previous specification: /CHANGE APPC TIMEOUT mmmm
  - ◆ New specification: /CHANGE APPC TIMEOUT mmmm:ss

The APPCIOT keyword is an existing keyword in the DFSDCxxx member of IMS.PROCLIB. The first parameter of APPCIOT specifies the APPC/MVS time-out value expressed in minutes. This refers to an IMS wait for a requested APPC/MVS service to complete. IMS takes advantage of an APPC/MVS service to enforce the timeout with valid values between 0 and 1440 minutes. The second parameter which was introduced in IMS V9 provides an APPC/IMS timeout. This refers to an APPC/MVS wait for an IMS process to complete. For example, the timer begins when IMS receives a message from APPC/MVS and is reset when another APPC verb is issued, e.g., send of a reply, error message or deallocate. This second value is similar to putting a timeout on a queue to queue response. Like the first parameter, valid values are between 0 and 1440 minutes.

IMS V10 provides an enhancement for the first parameter which affects the APPC/MVS timeout specification. A value in this parameter can now be specified as (# of minutes : # of seconds). Note that the second parameter remains unchanged.

Similarly, the /CHANGE APPC TIMEOUT command has also been enhanced to provide a specification in minutes and seconds. Additionally, since the command can be issued during IMS execution, the value can be dynamically change as needed.



## Support for /LOCK and /UNLOCK

- New capability for APPC and OTMA clients to send in the /LOCK and /UNLOCK commands
  - ◆ Supports keywords DATABASE, PROGRAM and TRANSACTION
    - No support for keywords LTERM, PTERM and NODE
  - ◆ The /LOCK and /UNLOCK command functionality remains unchanged

The restriction to sending in the /LOCK and /UNLOCK commands from APPC and OTMA clients has been lifted. The support allows the DATABASE, PROGRAM, and TRANSACTION keywords but restricts the use of LTERM, PTERM and NODE. Note that the commands themselves are not changed.

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## Support for /LOCK and /UNLOCK ...

- Implementation
  - ◆ APPC Client sends
    - ALLOCATE... TPN=*command*
    - SEND *remainder of command*
    - RECEIVE...
      - Where *command* can now include /LOCK or /UNLOCK
  - ◆ IMS responds with
    - DFS058 Command completed
  - ◆ Example

```

ALLOCATE LUNAME=IMSLU, TPN=/LOCK. ...
SEND_DATA DB database1
RCV_AND_WAIT
DEALLOCATE

```

<-----DFS058 LOCK COMMAND COMPLETED

This visual gives an example of an APPC client that specifies the /LOCK command as a TPNAME on the ALLOCATE request and the remainder of the command in the subsequent SEND\_DATA verb. IMS responds with a DFS058 LOCK COMMAND COMPLETED which simply means that the command was accepted and processed by IMS. Note that the capability to send IMS commands from an APPC client is not new.

## Support for /LOCK and /UNLOCK ...

- Implementation ...
  - ◆ OTMA environment supports remote clients
    - IMS Connect: `LLLL IlzzIRM Ilzzcommand EOM`
      - Where the IRM header provides a command instead of a trancode
      - Where *command* can now include /LOCK or /UNLOCK
  - ◆ IMS responds with
    - DFS058 Command completed
  - ◆ Example

```
CONNECT
WRITE  LLLL Ilzz IRM (specify /LOCK in IRM_TRNCOD) Ilzz /LOCK DB database1
EOM
READ                                     <-----DFS058 LOCK COMMAND COMPLETED
DEALLOCATE
```

Similarly, OTMA clients such as IMS Connect and MQ can also send in the command requests. Each OTMA client provides its own interface for remote applications. The example on this visual shows a request coming in from a remote application through IMS Connect.



## Local LU

- Enhancement that allows greater control when specifying which LU name is to be used for asynchronous outbound conversations
  - ◆ Allows IMS application to request any LOCAL LU name through a new descriptor keyword for ALTPCB requests
  - ◆ Allows incoming LU name (if not the BASE) to be used for outbound asynchronous responses to the IOPCB
  - ◆ Terminology
    - Base LU - primary and default LU name associated with APPC/IMS
      - Defined as such in the APPCPMxx member of SYS1.PROCLIB
    - Local LU - name of an alternate LU that can also be associated with an APPC/IMS system

The APPC/IMS support which was introduced in IMS V4 provided the ability to define both a primary VTAM APPC LU name to be associated with IMS as well as multiple secondary LU names. The primary name is defined as the BASE LU and the alternate names as LOCAL LUs.

A Base LU is specified as such in the APPCPMxx member of SYS1.PROCLIB which contains the APPC/MVS definitions. Local LUs must also be specified in the same member as being associated with APPC/IMS. Note that an LU must be unique to an IMS system in an IMSplex.

IMS V10 enables IMS applications that use the alternate TP PCB (ALTPCB) for APPC asynchronous outbound requests to specify which LU name to use on the outbound ALLOCATE request through a new keyword in the DFS62DTx descriptor. Additionally, a new startup parameter APPCLU provides the ability to specify whether or not the incoming LU name (if different from the Base LU) is to be used for any associated asynchronous IOPCB outbound conversations.

As a reminder, asynchronous APPC conversations are those that are sent without waiting for a reply. The verb set used is Allocate, Send\_data, Deallocate. Synchronous conversations, on the other hand, are those that send a message and wait for a reply using the verb set Allocate, Send\_data, Receive\_and\_wait, Deallocate. The Local LU support in this section applies only to asynchronous conversation requests.

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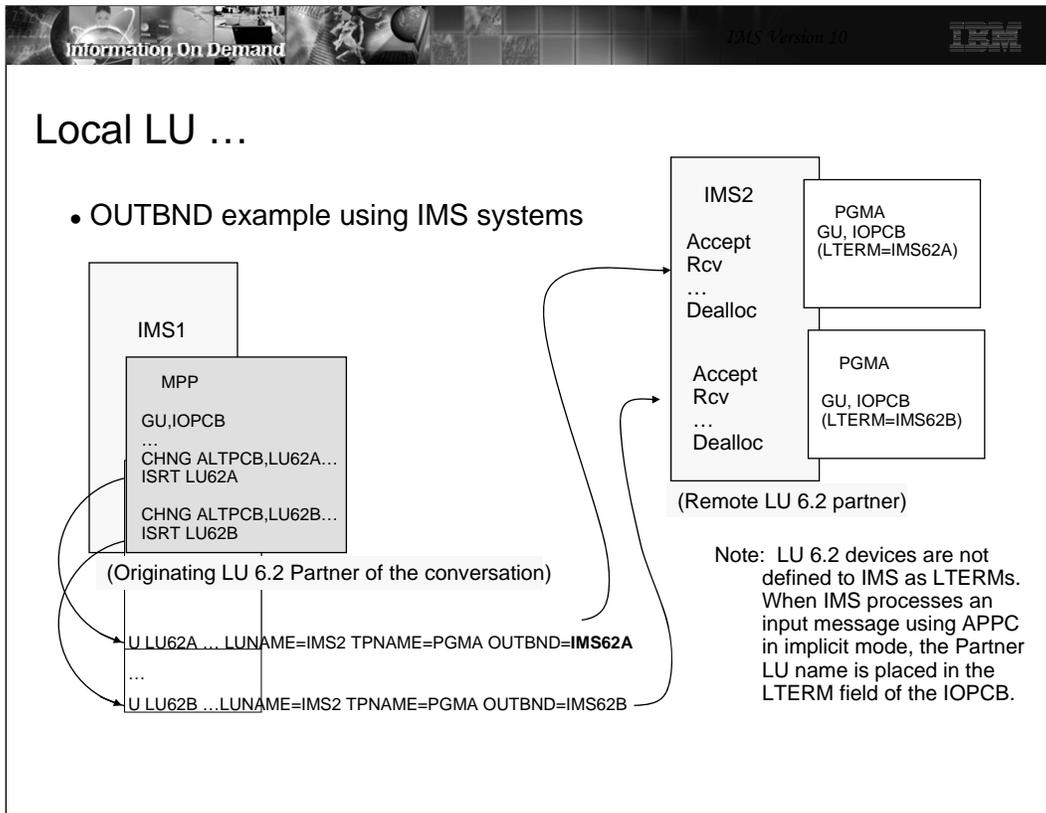
## Local LU ...

- New OUTBND keyword in the LU62 descriptor DFS62DTX
  - ◆ Affects asynchronous outbound ALTPCB messages
    - Specifies the APPC LU to be used
 

- U L62A LUNAME=L62RMT1 TPNAME=MYTRAN MODE=L62MODE1
      - U L62A SYNCLEVEL=C OUTBND=IMS62A
    - ALTPCB destination name = descriptor name
    - If OUTBND is not provided, the default Base LU name is used
- LU 6.2 Edit Exit Routine (DFSLUEE0)
  - ◆ Can change the Local LU name
    - Word 13 points to the name

A new OUTBND keyword has been added to the DFS62DTx IMS.PROCLIB member. IMS applications that produce ALTPCB messages control where and how the message is sent through specifications in an LU62 descriptor that is identified with the same name as the ALTPCB destination. IMS uses the information to create the appropriate APPC requests. If the OUTBND keyword is present and the Local LU specified is valid for this IMS then the outbound ALLOCATE is sent using the Local LU name. The partner APPC application sees the same name when it ACCEPTs the conversation. If the OUTBND keyword is not available, then the default Base LU name is used. Note: The DLI API has not been changed to add the OUTBND keyword to the CHNG call's LU 6.2 options.

The LU 6.2 Edit Exit Routine (DFSLUEE0), if it exists, is always called for inbound and outbound conversations managed by IMS. Word 13 in the exit interface points to the Local LU name and can be examined as well as modified by the exit code.



The example in this visual shows how specifying different Local LUs in the OUTBND parameter of two descriptors results in the remote partner seeing the different names. If the remote partner is IMS then the target application PGM1, in this example, sees a different LTERM name for each message.

Note that an APPC/IMS implicit environment is one where IMS functions as the LU 6.2 partner on behalf of the IMS application program. In this environment, IMS places the Partner LU name in the LTERM field of the IOPCB. A possible benefit of using the OUTBND capability is that the receiving IMS application can branch to different logic based on the LTERM name.

The remote partner can be any LU 6.2 partner.

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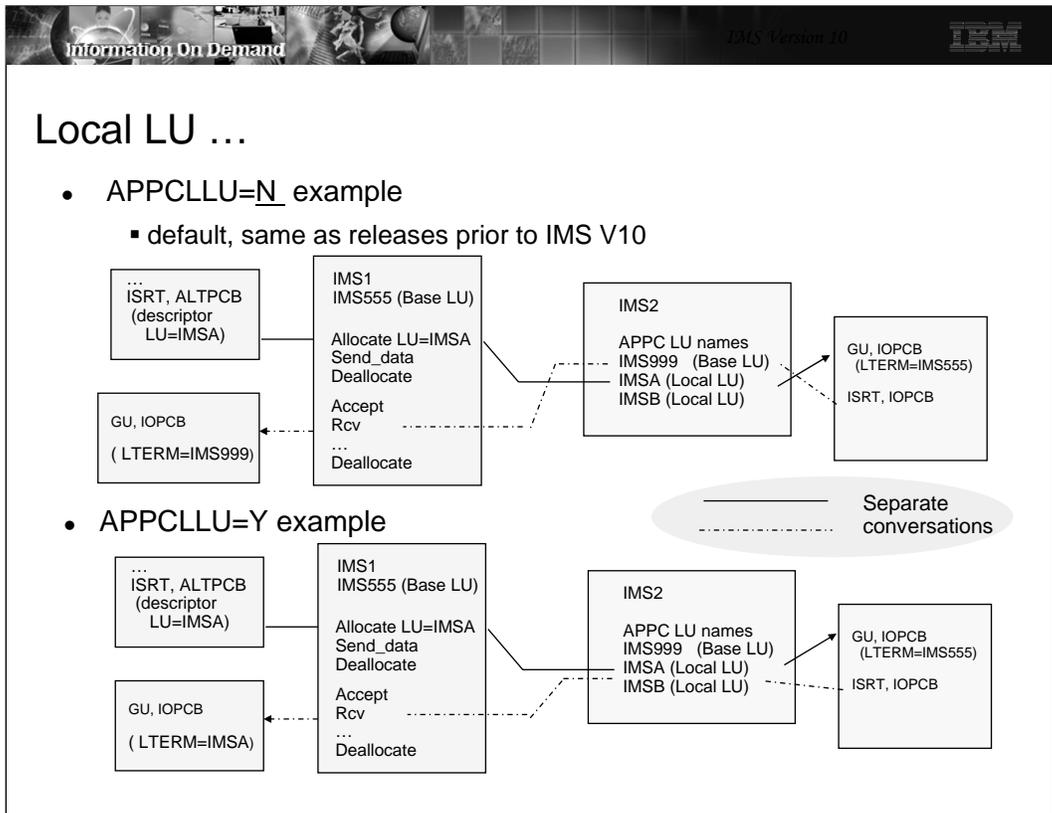
## Local LU ...

- New APPCLLU startup parameter in DFSDCxxx
  - ◆ Affects asynchronous outbound IOPCB messages

APPCLLU= Y | N

- Y requests that if a Local LU was used for the inbound message that the same Local LU be used for outbound processing
- N requests that the Base LU always be used

IMS V10 also provides a new startup parameter in the DFSDCxxx member of IMS.PROCLIB. APPCLLU affects asynchronous outbound messages that are inserted to the IOPCB. For this situation to occur, the message that the IMS application processed with a GU IOPCB had to originate in an APPC partner as an asynchronous inbound message.



The two examples on this visual illustrate the difference between the APPCLLU specifications of N and Y.

In the first example, APPCLLU=N, the IOPCB asynchronous output reply is sent using the Base LU name associated with IMS2 regardless of which LU name was used for the inbound asynchronous conversation.

In the second example, APPCLLU=Y, IMS2 uses the Local LU name of IMSA which is the same name used on the inbound asynchronous request. This capability is of value when the remote application is designed to expect a response from a specific partner LU name.

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## Local LU ...

- Commands that have been enhanced to support Local LU
  - ◆ /CHANGE DESC *descriptor* OUTBND *locallu*
    - Modifies the descriptor to use the specified *locallu* name for any new outbound asynchronous conversations associated with the *descriptor*
  - ◆ /DISPLAY DESC *descriptor* | ALL
    - Output includes Local LU names

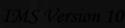
DESC	LUNAME	MODE	SIDE	SYNCLEVEL	TYPE	OUTBNDLU
L62A	IMS2	L62MDE02		CONFIRM	MAPPED	IMS62A
	TPNAME : PGMA					
L62B	IMS2	L62MDE02		CONFIRM	MAPPED	IMS62B
	TPNAME : PGMA					
L62TM	L62RMT1	L62MDE09		CONFIRM	MAPPED	
	TPNAME : RMTPGM					

Will use the Base LU

Some other enhancements provide support for the Local LU capability.

The /CHANGE DESC *descriptor* OUTBND *locallu* command modifies the descriptor to use the specified *locallu* name for any new outbound asynchronous conversations associated with the specified descriptor. Note that this impacts messages that use the descriptor after the command has been issued. Messages that are already on the queue but have not yet been sent are not affected by the change.

The /DISPLAY DESC command has also been enhanced to support the Local LU. If the OUTBND keyword exists in a descriptor then its value is displayed under the OUTBNDLU column. If the value for a descriptor displays as blanks then the Base LU will be used.



## Local LU ...

- Considerations
  - ◆ Remote partner receives the LU name used by IMS
    - Either the Base or Local LU
  - ◆ APPC LU names used by IMS must be unique within the IMSplex
  - ◆ Descriptors modified by the /CHA command affect new messages created after the change
  - ◆ Shared queues group
    - IMS V9 systems use the Base LU

Some areas to consider include the following:

Remote partners that receive an asynchronous conversation request from IMS have the ability to determine the LU name that IMS uses when sending a request. The Local LU capability provides the opportunity for different names to be provided.

Note that LU names are specific to IMS systems and cannot be shared within IMSplex members.

Any modifications that occur as a result of a /CHA command affect new messages that are created after the change.

## Local LU Security

- RACROUTE VERIFY
  - ◆ IMS V10 Passes the applicable LU (Local or Base) as the invoking application to the security product
  - ◆ Previous releases
    - Always passed the Base LU name even if the request came in through a Local LU name
      - Some transactions could pass APPC/MVS security and then fail in IMS with a security violation
        - Userid security access can differ based on LU names

When an inbound conversation in a secured environment is allocated with APPC/MVS, a security check is done using the target LU name for IMS (Base or Local). If authorization is granted, APPC/MVS passes the RACF object to IMS. The RACF object, similar to an ACEE, is used by the IMS security call to check if the userid is authorized to the transaction before scheduling the request. In the situation where the message was sent to IMS using a Local LU, the Local LU name is used. Once this is done, the RACF object is deleted. If RACF=FULL has been specified for APPC/IMS, the ACEE must again be built for the dependent region. Prior to IMS V10, the ACEE is always built using the Base LU. If a mismatch occurs because a secured message was sent in using a Local LU but the dependent region ACEE, using the Base LU, does not authorize the user, then the queued transaction will fail authorization. IMS V10 addresses this situation by using the applicable LU (Base or Local) that was used for the inbound message when building the dependent region ACEE.



## Benefits

- Enhanced timeout capability
  - ◆ Releases resources more responsively
    - In less than one minute when needed
- Support for /LOCK and /UNLOCK
  - ◆ Enhances command capability for APPC clients such as the IMS Command Control Facility
    - Implemented for OTMA clients also
- Local LU capability
  - ◆ Provides greater control of the LU names that IMS uses for asynchronous outbound requests
  - ◆ Enhances the security environment

The enhanced timeout granularity that provides values in the seconds range allows resources to be released more quickly when needed. The APPCIOT specification which is set at IMS initialization can be overridden dynamically by the /CHA command.

The support for /LOCK and /UNLOCK commands enhances the ability for tools such as the IMS Command Control Facility (CCF) which uses APPC to send commands to IMS.

The Local LU enhancement provides greater flexibility for the IMS environment to support multiple LU names. This is beneficial for application designs that rely on different partner names to trigger different events.

## Removal of BTAM Support

Information On Demand IMS Version 10

## Highlights

- IBM BTAM products were withdrawn from service several years ago
  - ◆ IMS continued to support BTAM through IMS V9
  
- IMS V10 removes BTAM support
  - ◆ Ignores all macro statements associated with the unsupported BTAM terminals during IMS system definition
    - Issues warning message
 

```
G411 MACRO STATEMENT ASSOCIATED WITH AN UNSUPPORTED BTAM
              TERMINAL
              - A severity code of 2 is issued to allow system definition to continue
```
  
  - ◆ Devices such as Spool, Reader, Printer, Punch, Tape and Disk are not affected.

Although IBM withdrew marketing and service of BTAM products several years ago, IMS continued to support the BTAM macros through IMS V9. IMS V10 removes this support. The following list shows the device types affected:

BTAM Device Type	Comments or Other Specifications
1050	Switched Terminal
2740	Non-Station-Control
2740	Non-switched, model 1
2740	Non-switched, model 2
2740	Switched Terminal, model 1
2741	Non-switched
2741	Switched Terminal
2260	Local
2780	
3270	Remote, Non-switched
3270	Local
3270	Switched Terminal
3275	Switched Terminal
3741	Switched Terminal
SYSTEM/3	
SYSTEM/7	BSC, BSC and Contention
SYSTEM/7	Start/Stop, Start/Stop and Contention

Warning message G411 will be issued if the macro statement operand has an unsupported BTAM terminal specification during the IMS STAGE 1 system definition process. In addition, a severity code of 2 will be issued to allow system definition to continue. This warning message and severity code will be documented in the IMS V10 Messages and Codes manual.



## Migration Considerations

- Affected macros that previously supported BTAM include:
  - ◆ CONFIG
  - ◆ CTLUNIT
  - ◆ DCLIST
  - ◆ IDLIST
  - ◆ LINE
  - ◆ LINEGRP
  - ◆ MSPLINK
  - ◆ NAME
  - ◆ POOL
  - ◆ STATION
  - ◆ SUBPOOL
  - ◆ TERMINAL
  - ◆ TYPE

This page lists the different IMS macros that previously supported BTAM specifications.

# Database

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## Database Enhancements

- Change Accumulation and Prefix Resolution Sort enhancement
- ACBGEN Exploitation of Storage Above the 16M Line
- HALDB Index/ILDS Rebuild enhancement
- Image Copy 2 Fast Replication
- Fuzzy User Image Copy support

# Database Utility Enhancements



## Change Accum and Prefix Resolution Sort

- Default sort size changed from 200K to MAX
  - ◆ CORE= parameter in JCL for Change Accumulation and Database Prefix Resolution
    - CORE= specifies the storage used by sort
      - MAX allows the installation default value for sort to be used
    - CORE limits the number of sort work data sets used by OEM sort programs
      - UCBs for these data sets are below 16M line for some OEM sort programs
- Benefit
  - ◆ Allows more sort work data sets to be used with OEM sort programs which create UCBs below the 16MB line
    - This could shorten the elapsed execution time of the utilities

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The default for the CORE= parameter on the Database Change Accumulation and Database Prefix Resolution utilities is changed in IMS V10 from 200K to MAX. When MAX is used, the IMS utility does not limit the amount of space used by sort. It is limited by the default value specified for the sort product. The sort space is particularly important for some non-IBM sort programs which create UCBs for sort work data sets below the 16M line. The sort space may limit the number of these data sets that may be used. By increasing the default space, the number of sort work data sets may be increased. This may shorten the elapsed execution time for these utilities.

A new message has been added to the Database Change Accumulation and Database Prefix Resolution utilities. It is issued when the CORE= parameter is not specified. The message is:

```
DFS3007I SORT CORE SIZE WILL DEFAULT TO CORE=MAX
```

If an installation wants to limit the sort space to less than the system default, it should code the CORE= parameter for the desired value.

## ACBGEN Exploitation of Storage Above the 16M Line

- Previous releases were limited in the number of PCBs per PSB
  - ◆ Limitation was due to use of "below the line" storage
    - PSBs with more than approximately 500 PCBs could result in S80A abend
  
- IMS V10 ACBGEN allocates most of its working storage above the 16M line
  - ◆ Eliminates these out-of-storage abends
  
- Benefit
  - ◆ Allows up to 2500 PCBs per PSB

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ACBGEN has been modified to allocate most of its working storage above the 16M line. In previous releases, this working storage was allocated below the line. Very large PSBs could require more storage than was available below the line. Requests for more storage than was available resulted in S80A abends with RC=10 in previous releases. Since V10 allocates storage above the line, it is not limited to the available storage below the line. This should eliminate these abends. Very large PSBs, including those with up to 2500 PCBs, are handled by ACBGEN in V10.

The limitations of 2500 PCBs per PSB and 30,000 SENSEGs per PSB are enforced by the macros used in PSBGENs.



## HALDB ILDS Rebuild Enhancement

- New option for HALDB Index/ILDS Rebuild utility (DFSPREC0)
  - ◆ ILDS entries (ILEs) are written to ILDS sequentially in load mode
    - Avoids CI/CA splits during rebuild
    - Creates free space according to data set definition
  - ◆ ILDS entries are sorted in data spaces before they are written
  - ◆ Invoked with RECOVTYP=ILEF or BOTHF
    - Uses 4 data spaces of 2 GB each
  - ◆ Free space creation may result in larger ILDS
- Benefits
  - ◆ Faster execution of DFSPREC0 when rebuilding an ILDS
  - ◆ Free space may improve performance of subsequent reorganizations
    - Reduce CI/CA splits

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The HALDB Index/ILDS Rebuild utility (DFSPREC0) is used to rebuild either a PHIDAM primary index, an ILDS, or both for a partition. This enhancement applies only to the rebuilding of the ILDS. When an ILDS is rebuilt, the utility reads the partition database data sets looking for segments which are targets of secondary indexes or logical relationships. An indirect list entry (ILE) is written to the ILDS for each target that is found. In previous releases, these writes are done when the target segments are found. This means that the writes are random. They must be done in update mode. The enhancement provides a new way of writing the ILEs. When using the enhancement, ILE entries are not immediately written to the ILDS. Instead, they are stored in data spaces, sorted in ILE key sequence, and then written. The writes are done in load mode. These writes are sequential. Load mode avoids CI/CA splits. These two characteristics can significantly reduce the elapsed time of the writes. Load mode also creates free space as defined in the IDCAM DEFINE for the ILDS.

The new option is invoked with new values for the RECOVTYP parameter. Previously, the valid parameter values were INDEX for rebuilding an PHIDAM index, ILE for rebuilding an ILDS, or BOTH for rebuilding both data sets. The new additional valid values are ILEF for rebuilding the ILDS sequentially or BOTHF for rebuilding both data sets and rebuilding the ILDS sequentially. The "F" in these values signifies that free space will be created.

Some installations limit the number of data spaces that address spaces may create. This is done with an z/OS IEFUSI exit. The default IEFUSI exit for z/OS allows the creation of the 4 data spaces used by DFSPREC0. If your installation has written its own exit, it may not allow 4 data spaces for most address spaces. In this case, you would need a modification to the exit to use the new option.

Since the ILDS that is rebuilt with the new option includes the defined free space, it may create a larger data set than was created in the past with this utility or by the HD Reload utility. The ILDS must be deleted and redefined (DELETE/DEFINE) before the execution of the utility. This is true with the old ILE and BOTH options and with the new ILEF and BOTHF options.

The use of the new option could significantly reduce the elapsed time required for rebuilding ILDSs. The creation of free space in the ILDS could improve the performance of subsequent HD Reload or Online Reorganization executions since the free space should reduce the need for CI/CA splits.



## Image Copy 2 Fast Replication

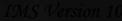
## Image Copy 2 Fast Replication

- Fast replication support
  - ◆ Exploits FlashCopy on Enterprise Storage Server (ESS) and DS8000
  - ◆ Exploits SnapShot on RAMAC Virtual Array (RVA)
- Prerequisites for fast replication
  - ◆ z/OS V1R8
  - ◆ Storage Subsystem that supports either
    - Data Set Level FlashCopy V2
      - ESS (Shark), DS8000, ...
  - or
  - SnapShot
    - RAMAC Virtual Array (RVA), ...

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IMS V10 adds fast replication support. Fast replication is a DFSMSdss function that exploits the FlashCopy capability of the Enterprise Storage Server (ESS or Shark) or TotalStorage DS8000 or the SnapShot capability of the IMS RAMAC Virtual Array (RVA). FlashCopy V2 must be installed on the ESS system. Fast replication also can be used with OEM storage devices which support the DFSMSdss Fast Replication interface.

This support is provided in the Image Copy 2 (DFSUDMT0) utility and the Database Recovery (DFSURDB0) utility. They use data set level Fast Replication functions of DFSMSdss which are only provided by z/OS V1R8.


## Image Copy 2 Fast Replication

- Fast replication
  - ◆ Uses DFSMSdss COPY command with FASTREP(REQ) parameter
  - ◆ Output is in same format as database data set
  - ◆ Only one image copy per database data set may be created
  - ◆ Output must be written to same storage system
  - ◆ Copy is done in one phase
    - Time is comparable to the logical copy time for concurrent copy
  - ◆ Issues DFS3141A message when clean image copy completes
    - May be used to indicate that database may be started on online systems
  - ◆ Requires DBRC database registration
  - ◆ Fuzzy image copies of KSDSs
    - Require BWO(TYPEIMS)
    - Require SMS management

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Fast replication is invoked with the DFSMSdss COPY command with the FASTREP(REQ) parameter. The output or “image copy” is an exact copy of the database data set. It must be written to a volume in the same storage system. Only one output data set may be created for each input data set. Unlike the concurrent copy process, the fast replication copy process is not split into a logical copy phase and a physical copy phase. If you are creating a clean image copy, the database is unavailable for the duration of the copy process; however, the fast replication process is comparable in speed to the logical copy phase of the concurrent copy process.

Message DFS3141A is issued when a clean image copy completes. The DFS3141A message may be used to indicate that the database may be started on online systems. The DFS3141A lists the database, partition, area, or group that was copied. It is followed by DFS3141I messages for each data set that was copied.

Databases must be registered with DBRC. The IDCAMS DEFINE must specify BWO(TYPEIMS) for KSDSs if fuzzy image copies are taken. Fuzzy image copies also require that the database data set be managed by SMS. If a split occurs during the logical copy phase for concurrent copy or the initialization of copy for fast replication, the copy is retried up to nine more times if only one data set is being copied. If multiple data sets are being copied, retries are not attempted. A failure causes DFSMSdss to issue message ADR944E and IMS to issue message DFS3145A. The form of the ADR944E message when a fast replication copy fails due to a CI/CA split during the initialization is:

```
ADR944E (ttt)-mmmmm(yy), DATA SET dsname IN CATALOG catalog_name ON VOLUME
volume_serial_number CANNOT BE PROCESSED BECAUSE IT WAS UPDATED DURING THE FAST
REPLICATION INITIALIZATION
```

The DFS3145A message is:

```
DFS3145A ATTEMPT TO COPY KSDS CONCURRENT WITH UPDATE ACCESS FAILED
```



## Image Copy 2 Fast Replication Invocation

- Image Copy 2 DBDS Control Statement
  - ◆ Used to specify a database data set to be copied
  - ◆ Position 62
    - 'F' invokes fast replication
  - ◆ Position 63
    - Blank indicates that DD statement is provided for output data set
      - Output DD name is in positions 22-29
      - DD statement for output must be in JCL
    - 'H' indicates that output data set is dynamically allocated

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Fast replication copies are invoked by placing an 'F' in position 62 of the DBDS control statement.

If a blank is in position 63 a DD statement must be supplied for the image copy output data set. The data set may either be created prior to the Image Copy 2 step or may be created by the DD statement.

If an 'H' is in position 63 the image copy output data set is created dynamically by DFSMSdss. The attributes of the image copy data set are derived from the database data set. An HLQ control statement is required when an 'H' appears in position 63 of the DBDS control statement. It is shown on the following page.

Other positions on the DBDS control statement have the same meaning that they have without the fast replication option. For example, an 'X' in position 58 invokes a clean image copy and an 'S' in invokes a fuzzy image copy.

Fast replication produces only one image copy data set for a database data set. You cannot specify multiple output data sets. This means that positions 30 through 57 must be blank.

Unlike concurrent copies, fast replication does not have logical copy and physical copy phases. The fast replication process is comparable in speed to the logical copy phase of the concurrent copy process. Since there are not separate logical and physical copy phases, position 59 should be left blank. Position 59 is used for concurrent copies to indicate whether the database becomes available for updates after the logical phase completes or after the physical phase completes.

Position 60 should be blank for fast replication. It is used for the compression option with concurrent copies.

## Image Copy 2 Fast Replication Invocation

- Image Copy 2 HLQ Control Statement
  - ◆ Used to specify the data set name of the image copy data set
  - ◆ Position 1
    - 'H' indicates this is an HLQ control statement
  - ◆ Position 3
    - 'Y' time-stamp trailer is appended to output data set name
    - 'N' time-stamp trailer is not appended to output data set name
  - ◆ Positions 4-29
    - High-level qualifier for output data set name
  - ◆ Positions 31-38
    - SMS storage class - optional
  - ◆ Positions 40-47
    - SMS management class - optional

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An 'H' in position 1 indicates that this is an HLQ (high level qualifier) control statement.

Position 3 indicates whether or not the time-stamp trailer is appended to the output data set name.

Positions 4-29 contain the high-level qualifier used in the output data set name.

Positions 31-38 may be used to specify the SMS storage class that is used by ACS routines.

Positions 40-47 may be used to specify the SMS management class that is used by ACS routines.

## IC2 Fast Replication Output Data Set Name

- Output data set name when dynamic allocation is used
  - ◆ If time-stamp is not chosen in HLQ control statement
    - hlq.dbdname.ddname
      - Example for hlq=MY.HLQ, database=DBNAME1, and DD=DDNAME1  
MY.HLQ.DBNAME1.DDNAME1
  - ◆ If time-stamp is chosen in HLQ control statement
    - hlq.dbdname.ddname.Dyyddd.Thmmss
      - Example for noon on January 1, 2007  
MY.HLQ.DBNAME1.DDNAME1.D07001.T120000

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This shows two examples of output data set names that are used when dynamic allocation is used for these data sets.

The first example is for a data set when the time-stamp trailer is not selected (position 3 on the HLQ control statement contains an 'N'). The high-level qualifier is MY.HLQ.

The second example is for a data set when the time-stamp trailer is selected (position 3 on the HLQ control statement contains a 'Y'). The high-level qualifier, database name, and DD name are the same as in the first example.



## DBRC with Fast Replication

- New GENJCL.IC parameters
  - ◆ SMSONLC - generate IC2 JCL for fuzzy IC with fast replication
  - ◆ SMSOFFLC - generate IC2 JCL for clean IC with fast replication
  - ◆ HLQ(hlq) - specifies high-level qualifier for output data set name
  - ◆ DSNSUF|NODSNSUF - date/time stamp as suffix in output data set name
  - ◆ STORCLAS(name) - specifies Storage Class use by ACS routines for allocating image copy data set
  - ◆ MGMTCLAS(name) - specifies Management Class use by ACS routines for allocating image copy data set

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SMSONLC and SMSOFFLC are new image copy types recorded in image copy records in the RECONS. Other previously existing image copy types were SMSCIC (IC2 fuzzy IC using concurrent copy), SMSNOCIC (IC2 clean IC using concurrent copy), CIC (concurrent image copy using Image Copy utility), ONLINE (fuzzy image copy using the Online Image Copy utility), and BATCH (clean image copy using the Image Copy utility. High Performance Image Copy (HPIC) V4 also supports fast replication copies, but does not invoke IC2. APAR PK33115 adds the use of SMSONLC and SMSOFFLC by HPIC V4 when it uses fast replication. The HPIC V4 Recovery fund and Create Image Copy function support these IC types as input.

The GENJCL.IC command has new parameters.

The SMSONLC and SMSOFFLC parameters are used to generate fast replication Image Copy 2 utility JCL for either a fuzzy or clean image copy. SMSONLC and SMSOFFLC are also new image copy types recorded in image copy records in the RECONS. Other previously existing image copy types were SMSCIC (IC2 fuzzy IC using concurrent copy), SMSNOCIC (IC2 clean IC using concurrent copy), CIC (concurrent image copy using Image Copy utility), ONLINE (fuzzy image copy using the Online Image Copy utility), and BATCH (clean image copy using the Image Copy utility. High Performance Image Copy (HPIC) V4 supports fast replication copies. APAR PK33115 adds the use of SMSONLC and SMSOFFLC by HPIC V4 when it uses fast replication. The HPIC V4 Recovery fund and Create Image Copy function support these IC types as input.

HLQ(hlq) is used to specify the high-level qualifier for the output data set name when the output data set is created dynamically. 'hlq' may be 1 to 26 characters. The value is placed in positions 31-56 of the DBDS control statement.

DSNSUF specifies that the date/time stamp suffix is to be added to the output data set name for dynamically created output data sets. NODSNSUF specifies that the date/time stamp suffix is not added. NODSNSUF is the default.

STORCLAS(name) and MGMTCLAS(name) are used to specify the storage class name and management class name to be used by the Access Control System (ACS) routines for allocating output data sets which are created dynamically.





## Fast Replication with Database Recovery

- Database Recovery Utility reads Fast Replication image copies
  - ◆ No user specification required
    - Utility uses DBRC information to determine that IC is fast replication IC
  - ◆ Uses COPY with FASTREPLICATION(PREFERRED)
    - If Fast Replication copy is on the same storage system with target data set and storage system supports fast replication, fast replication is used to restore the database data set from the image copy
    - Else, traditional copy is used
  - ◆ DBDS DD statement is optional when using Fast Replication IC input
    - 'D' in position 64 of control statement indicates DD statement not used
    - DBRC information is used to allocate the data set
  - ◆ GENJCL.RECOV has added support for Fast Replication
    - DBDSDD|NODBSDD parameters specify if DD statement is used

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The IMS Database Recovery utility (DFSURDB0) has been updated to read image copies created by using fast replication. In previous releases Database Recovery could read two kinds of image copies. Those in the original Image Copy format have header records followed by copies of the data. Those produced with concurrent copy were in DFSMSdss DUMP format. Fast replication image copies are exact copies of the database data sets, The Database Recovery utility uses DBRC information about the Image Copy to determine its format and how to read it.

Database Recovery invokes fast replication with the “preferred” option. This indicates that fast replication will be used if the image copy and the database data sets are on the same storage system and the storage system supports fast replication. If these conditions are not met, standard copy techniques are used to restore the image copy to the database data set. There are two reason primary reasons that the conditions for fast replication would not be met. First, the user may choose to recover the database data set to a different storage system. Second, the image copy data set may be been moved from its original storage system.

Without fast replication, the database data set must be specified on a DD statement. Dynamic allocation cannot be used. With fast replication this restriction is removed. The database data set may be dynamically allocated. To request dynamic allocation you must place a 'D' in position 64 of the Database Recovery utility control statement.

The DBRC GENJCL.RECOV command has been enhanced to support dynamic allocation of the database data set when using a fast replication image copy as input. This is done with the NODBSDD keyword. The DBDSDD keyword is the default. It indicates that dynamic allocation will not be used and that a DD statement for the database data set will be generated by the GENJCL.RECOV command.



## Fast Replication

- Benefits
  - ◆ Exploits FlashCopy and SnapShot
    - Single phase copies
    - Copies produced in seconds
  - ◆ Supports both clean and fuzzy image copies
  - ◆ Full GENJCL support
    - Image Copy 2 and Database Recovery utilities

# Fuzzy User Image Copies

## Fuzzy User Image Copy Support

- DBRC support for fuzzy user image copies
  - ◆ Fuzzy image copies taken by utility or tool without a DBRC interface
    - Pack dump, DFSMSdss DUMP or COPY not invoked by IC2, etc.
  - ◆ Support:
    - NOTIFY.UIC can specify a fuzzy user image copy
      - CIC and STOPTIME(time) parameters are used
    - GENJCL.RECOV can be used to generate recovery from logs after fuzzy user image copy has been restored
      - USERIC(time) or LASTUIC parameters are used

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IMS V10 has added support for fuzzy user image copies. User image copies are copies of database data sets that are done without a DBRC interface. Typically, these are done with utilities that are not IMS utilities. In previous releases IMS supported clean user image copies. IMS V10 adds support for image copies taken while the database data set is being updated.

The support has two parts.

First, the NOTIFY.UIC command has been extended to include a specification of a fuzzy image copy, sometimes called a concurrent image copy. The CIC keyword has been added to the NOTIFY.UIC command. It indicates that the user image copy is concurrent or fuzzy. When notifying DBRC of a fuzzy image copy you must specify the stop time of the image copy. This is in addition to the start time which is required for all image copies. The stop time is specified with the STOPTIME(time stamp) parameter.

Second, the GENJCL.RECOV command has been extended to generate the appropriate JCL to include the correct logs for recoveries using fuzzy user image copies. The USERIC(time stamp) parameter specifies the fuzzy user IC that has been restored. LASTUIC may be used instead of USERIC(time). It specifies that the last fuzzy user image copy recorded in the RECONS has been restored. When either of these parameters is used, GENJCL.RECOV selects the proper logs for input to the recovery. These are the logs that were created while the fuzzy user image copy was being taken and any created since that time. USERIC and LASTUIC cause the appropriate S and M control statements to be generated for the Database Recovery utility.

When recovering after restoring a fuzzy user image copy do not specify USEDBDS on the GENJCL.RECOV command. USEDBDS is only for use when a clean user image copy has been restored followed by a NOTIFY.RECOV identifying this clean user image copy.

## Fuzzy User Image Copy Support

- DB Recovery utility (DFSURDB0) control statement
  - ◆ 'M' required in column 63 of the S control statement
    - Indicates that a fuzzy user image copy has been restored
    - Indicates that an M control statement follows
  - ◆ M control statement
    - M is column 1
    - Runtime of the user fuzzy image copy in columns 2-32

```
|...+...1...+...2...+...3...+...4...+...5...+...6...
//SYSIN DD *
S  DHVNTZ02 VNT0A001 M
M061531233296-0600
```

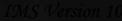
- ◆ M control statement is created by GENJCL.RECOV with USERIC(time) or LASTUIC

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The use of a fuzzy user image copy requires an M in column 63 of the S control statement used by the Database Recovery utility (DFSURDB0). The example shows that the database data set with DDNAME VNT0A001 in database DHVNTZ02 is being recovered. The M in column 63 indicates that a fuzzy user image copy has been restored. An M in column 63 requires that an M control statement also be supplied. The M control statement has an 'M' in column 1 and the runtime of the fuzzy user image copy in columns 2-32. The time is specified in standard time format. The example shows a compressed time of year 2006, day 153, hour 12, minute 33, second 29.6, with an offset of -6 hours. This offset is Central Standard Time in North America.

DBRC verifies that the specified user image copy is recorded in the RECONS.

When GENJCL.RECOV is used with a fuzzy user image copy, the proper M control statement is created. GENJCL.RECOV uses a fuzzy user image copy when either the USERIC(time) or LASTUIC parameter is specified.


## Procedures for Clean and Fuzzy User ICs

<ul style="list-style-type: none"> <li>• Clean user IC             <ol style="list-style-type: none"> <li>1. Create clean user IC</li> <li>2. NOTIFY.UIC ... RUNTIME(time1)</li> </ol> </li>   <li>• Recovery using clean user IC             <ol style="list-style-type: none"> <li>1. Restore clean user IC</li> <li>2. NOTIFY.RECOV ... RCVTIME</li> <li>3. GENJCL.RECOV ... USEDDBS</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>• Fuzzy user IC             <ol style="list-style-type: none"> <li>1. Create fuzzy user IC</li> <li>2. NOTIFY.UIC ... CIC RUNTIME(time1) STOPTIME(time2)</li> </ol> </li>   <li>• Recovery using fuzzy user IC             <ol style="list-style-type: none"> <li>1. Restore fuzzy user IC</li> <li>2. GENJCL.RECOV ... USERIC(time1) or</li> <li>2. GENJCL.RECOV ... LASTUIC</li> </ol> </li> </ul>
--	---

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This is a comparison of the procedures to use with clean and fuzzy user image copies.

After taking a fuzzy user image copy the NOTIFY.UIC must include both the CIC keyword and the STOPTIME parameter.

Surprisingly, the recovery with a fuzzy user image copy is bit simpler than the recovery with a clean user image copy. You do not have to issue the NOTIFY.RECOV command when using a fuzzy user image copy. The GENJCL.RECOV commands differ. USEDDBS is required after restoring a clean user image copy. The identification of the fuzzy user image copy is required after restoring a fuzzy user image copy. Either a specific copy may be specified with the USERIC(time1) parameter or the last copy may be specified by using LASTUIC. When recovering after restoring a fuzzy user image copy do not specify USEDDBS on the GENJCL.RECOV command. USEDDBS is only for use when a clean user image copy has been restored followed by a NOTIFY.RECOV identifying this clean user image copy.

The recovery processes shown here do not include setting the Recovery Needed flag with the CHANGE.DBDS ... RECOV command. Some installations prefer to set the flag to protect themselves from unintentionally authorizing the database before the recovery is done.



## Fuzzy User Image Copies

- Benefits
  - ◆ Expanded supported for fuzzy image copies
    - Non-disruptive to online system
  - ◆ DBRC support for fuzzy user image copies
    - Registration of these copies
    - GENJCL support for selecting the appropriate logs

# Fast Path

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## Fast Path Enhancements

- Command Enhancements
- Shared VSO enhancements
- Capacity enhancements
- Usability enhancement
- EMH enhancement



# Command Enhancements

## Starting All Areas with UPDATE DB command

- Option to start all areas when starting a DEDB
  - ◆ UPDATE DB NAME(name) START(ACCESS) AREA(\*)
    - AREA(\*) starts all areas of the database
      - There is NOT a capability to specify an area with AREA(...) parameter
    - Example TSO SPOC command and response:

```
UPDATE DB NAME(DEBJN) START(ACCESS) AREA( *)
```

DBName	AreaName	MbrName	CC
DEDEBJN	*	IMS1	0

- Benefit
  - ◆ Separate UPDATE AREA commands are not required for each area

4

This enhancements allows you to start all of the areas in a database when you also start the database. The only valid specification for the AREA parameter is AREA(\*).

If an area cannot be started, a separate line is provided for it in the response. Here is an example where area ARJN20 was not started:

```
UPDATE DB NAME(DEBJN) START(ACCESS) AREA( *)
```

DBName	AreaName	MbrName	CC
DEDEBJN	*	IMS1	8
DEDEBJN	ARJN20	IMS1	A5

The 8 completion code for the database indicates that the command completed with errors for one or more areas of the database. The A5 completion code for area ARJN20 indicates that the DBRC 'Prohibit Further Authorization' flag was on for this area.

## Keeping Randomizer Resident when Stopping DB

- Option to keep the randomizer resident when stopping access to DB
  - ◆ UPDATE DB NAME(name) STOP(ACCESS) OPTION(NORAND)
    - OPTION(NORAND) does not unload the randomizer

```
UPDATE DB NAME(DEBJN) STOP(ACCESS) OPTION(NORAND)
```

- Benefit
  - ◆ Avoids ECSA fragmentation from unloading and reloading randomizers

5

In previous releases if you made a DEDB inaccessible, its randomizer was unloaded from memory if the randomizer was not being used by any other DEDB. DEDBs are made inaccessible with either a /DBR DB command or an UPDATE DB STOP(ACCESS) command.

IMS V10 adds an OPTION(NORAND) parameter to the UPDATE DB STOP(ACCESS) command. This causes IMS to keep the randomizer module in memory. This helps to avoid fragmentation of ECSA which can occur when modules are unloaded and reloaded.

The /DBR DB command does not have a parameter that is equivalent to OPTION(NORAND) on the UPD DB STOP(ACCESS) command.





## Keeping Randomizer Resident when Stopping DB

- New status STOACC
  - ◆ Response to QUERY DB Command
    - Indicates that the database is not accessible
      - It has been /DBRed or an UPD DB STOP(ACCESS) command has been issued
- New implication for Status RNL
  - ◆ Response to QUERY DB Command
    - Indicates that the randomizer for the database is not loaded
    - This status previously also indicated that the database was not accessible
- Benefit
  - ◆ STOACC and RNL separately indicate that the database is not accessible or the randomizer is not loaded

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In conjunction with the OPTION(NORAND) parameter on the UPDATE DB STOP(ACCESS) command, a new status is available with the QUERY DB command. In previous releases one could tell that a database was inaccessible because the RNL status was associated with the database. RNL indicated that the randomizer module was not loaded. The absence of the RNL status no longer indicates that the database is accessible. A new status is available for this. The STOACC status in the response to a QUERY DB command indicates that the database is inaccessible. That is, the database has been /DBRed or an equivalent UPDATE DB STOP(ACCESS) command has been processed for the database.

The RNL status is now used only to indicate that the randomizer module is not loaded. The STOACC status is used to indicate that the database is inaccessible. The STOACC status is not returned by the /DISPLAY DB command. It is only returned by QUERY DB commands.

After you issued the UPDATE DB NAME(DEBJN) STOP(ACCESS) command, you would expect that the response to a QRY DB NAME(DEBJN) SHOW(STATUS) command would include:

DBName	AreaName	MbrName	CC	TYPE	LclStat
DEDBJN		IMS1	0	DEDB	NOTOPEN, STOACC, RNL

After you issued the UPDATE DB NAME(DEBJN) STOP(ACCESS) OPTION(NORAND) command, you would expect that the response to a QRY DB NAME(DEBJN) SHOW(STATUS) command would include:

DBName	AreaName	MbrName	CC	TYPE	LclStat
DEDBJN		IMS1	0	DEDB	NOTOPEN, STOACC

RNL is not included in the second response.



## Shared VSO Enhancements

## Shared VSO Private Buffer Pool Lookaside

- Previous releases for single area structures:
  - ◆ Lookaside must be specified in two places:
    - DBRC INIT.DBDS or CHANGE.DBDS command
      - LKASID or NOLKASID parameter
    - DEDB statement in DFSVSMxx member
    - If specifications conflict, DBRC value is used
- IMS V10
  - ◆ Lookaside specification in the DEDB statement is not required
- Multiple area structures have always ignored DBRC specification
  - ◆ Specification in DEDBMAS statement continues to apply
- Benefit
  - ◆ No longer required to specify parameter in DEDB statement that is ignored

8

In previous releases shared VSO users who had single area structures specified whether or not lookaside buffering would be used for an area in two places. It was specified in DBRC with an INIT.DBDS or CHANGE.DBDS command and also in the DEDB statement in the DFSVSMxx member as part of the private pool definition. If the specifications conflicted, the DBRC value was used. Only the DBRC value mattered, nevertheless, some value had to be specified in the DEDB statement. The requirement to specify a lookaside value in the DEDB statement has been eliminated in V10. You do not have to specify any value there.

The specification of lookaside for multiple area structures has not changed in V10. Multiple area structures were introduced in IMS V9. IMS continues to ignore any lookaside specification in DBRC for areas using multiple area structures. Only the specification in the DEDBMAS statement of the DFSVSMxx member is used.

## Shared VSO in XRF Tracking and FDBR Systems

- Previous releases:
  - ◆ XRF tracking systems and FDBR did not compress shared VSO private pools
    - Pools could expand but would not contract
- IMS V10
  - ◆ XRF tracking systems and FDBR compress shared VSO private pools
    - Compression done when expanded space is not used for two system checkpoint intervals
- Benefit
  - ◆ Reduced consumption of ECSA space

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In previous releases of IMS when shared VSO was used with XRF or FDBR, the XRF tracking system or FDBR system did not compress the shared VSO private pools. These pools can expand as more buffers are required for the areas in the pools. When the buffers are no longer needed, XRF active systems and non-XRF systems compress the pool by releasing buffers that were acquired for expansion. IMS V10 has enhanced XRF tracking systems and FDBR by compressing their pools just as non-XRF and active XRF systems compress pools. This will potentially reduce the use of ECSA by XRF tracking systems and FDBR for shared VSO users.



## /START AREA GLOBAL Enhancement

- GLOBAL parameter enhancements for /START AREA command
  - ◆ For PREOPEN areas
    - Preopen will occur on all systems
      - Previous releases only preopened the system on which the command was entered
  - ◆ For PRELOAD areas
    - Sharing systems preload their buffer pool
      - Preload limited to the primary allocation
- Benefit
  - ◆ Simplifies operations for systems using data sharing



# Capacity Enhancements

## Maximum Number of FP Buffers Increased

- Previous releases:
  - ◆ Maximum number of FP buffers was 65,535
- IMS V10
  - ◆ Theoretical limit is 4,294,967,295 FP buffers
    - Execution parameter DBBF= accepts values up to 4,294,967,295
    - Some log records have been modified to accommodate the new maximum
      - IMS maintains number of buffers in full word (4 bytes)
- Benefit
  - ◆ Fast Path can exploit large capacities of new processors

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The maximum number of fast path buffers that can be used has been increased from 65,535 to a theoretical value of 4,294,967,295. This is a theoretical value since a system is unlikely to have the storage for so many buffers. Any value up to the theoretical limit may be specified on the DBBF= execution parameter for the online system. In previous releases you could specify the number of Fast Path buffers on the FPCTRL macro. This macro is not used in IMS V10. The DBBF= execution parameter must be used to specify these buffers in V10.

The log records that have been modified include the following that are mapped by the DBFLSRT macro: 5950, 5951, 5952, 5953, 5953, 5956, and 5957.

Other modified records are mapped by the DBFLGRSD macro. They include: 5955 and 5958.

## Maximum Number of FP Output Threads Increased

- Previous releases:
  - ◆ Maximum number of FP output threads was 255.
    - OTHR cannot exceed MAXPST value.
- IMS V10
  - ◆ Maximum number of FP output threads is 32,767.
- Benefit
  - ◆ Fast Path can exploit large capacities of new processors

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In previous releases the maximum number of Fast Path output threads was the smaller of the MAXPST value or 255. In V10 the maximum is the 32,767.

This allows IMS V10 users to have many more output threads. This could be desirable as processor capacities increase.

There is another enhancement for Fast Path users in IMS Version 10. In previous releases most Fast Path control blocks and buffers were created in one module, DBFCONT0. This module resides in ECSA and it could be very large. IMS V10 places these control blocks and buffers in five modules. This allows installations to more efficiently use ECSA storage since smaller contiguous areas of ECSA may be used.

The major new modules and their contents are:

DBFCONT1: contains the ECNTs, MSDBs, and MSDB blocks

DBFCONT3: contains buffer headers (DHMRs) and buffers

DBFCONT4: contains DEDB blocks

DBFCONT5: contains output threads

DBFCONT6: contains BALGs (balancing groups)

## FDBR FPBUFF= Parameter Default

- FPBUFF= parameter in DFSFDRxx member controls location of FP buffers
  - ◆ Previous releases
    - FPBUFF=LOCAL placed DBFCONT0, HSSP, and HSRE buffers in extended private
      - DBFCONT0 includes database buffer pool (DBBF) and SVSO buffer pools
      - Recommended
    - Default was to place these blocks and buffers in ECSA
  - ◆ IMS V10
    - FPBUFF=LOCAL is the default
      - Places DBFCONTx modules and HSSP and HSRE buffers in extended private
      - Recommended
    - FPBUFF=ECSA places these modules and buffers in ECSA
      - Not recommended

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APARs PQ97745 for IMS V9 and PQ80264 and PQ97043 for IMS V8 added a new parameter in the DFSFDRxx PROCLIB member for FDBR. FPBUFF=LOCAL could be specified to place module DFSCONT0 and HSSP and HSRE buffers in extended private. There was no other valid value for FPBUFF=. If the parameter was not specified, the module and buffers were placed in ECSA.

IMS V10 changes the default. If the FPBUFF= parameter is not specified, DBFCONT1, DBFCONT3, DBFCONT4, DBFCONT5, DBFCONT6 and HSSP and HSRE buffers placed in extended private. A specification of FPBUFF=ECSA places these modules and buffers in ECSA. A specification of FPBUFF= LOCAL and allowing the parameter to default is recommended. There is no advantage to placing the modules and buffers in ECSA.



# Usability Enhancement

## DFSVSMxx Specification for QUITCI

- New DFSVSMxx parameter
  - ◆ SDEPQCI= S | D | B
    - S - Force QUITCI by Scan utility
    - D - Force QUITCI by Delete utility
    - B - Force QUITCI by both Scan and Delete utility
  - ◆ If SDEPQCI= is not specified, utility control statement determines the use of QUITCI
    - No change from previous releases
- Benefit
  - ◆ Eliminates need to specify a QUITCI control statement on each Scan or Delete utility execution
  - ◆ May be used to enforce the use of QUITCI

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QUITCI is an optional parameter specified in the SYSIN data set for the DEDB SDEP Scan and Delete utilities. It is used in data sharing environments to cause other IMS systems to release their current SDEP CI and any preallocated SDEP CIs. Any partially filled SDEP CIs are written to the area data set. This simplifies the running of the Scan and Delete utilities by making it easy to ensure that they process all committed SDEPs without waiting on CIs to be filled.

Some users want to ensure that QUITCI is used by all executions of the Scan and/or Delete utilities. The new SDEPQCI parameter in the DFSVSMxx member may be used to enforce the use of QUITCI, even when it is not specified on the SYSIN input to the utilities.



# EMH Enhancement



## EMH enhancement in IMS V10

- Command support to reset Fast Path Response Mode
  - ◆ In previous releases, hung FP response mode nodes and users typically require an IMS restart (or complex sequence of commands)
  - ◆ IMS 10 allows hung nodes and users to be reset without bringing IMS down
    - Applies to input response mode or output response mode with either local or shared EMH
    - Commands can be issued at any time
      - /STO NODE and /STA NODE for static nodes
      - /STO USER and /STA USER for dynamic users
        - Reset performed during /STA processing
- Enhanced DISPLAY command to show Fast Path input response mode
  - ◆ Hung users are typically in 'input' response mode, not 'output' response mode
  - ◆ New status – RESP-INP-FP

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This EMH enhancement addresses a rarely occurring situation; however, when it does occur, an IMS outage is likely needed to correct the problem.

Full function users have been able to reset response mode for hung terminals via the /RST, /STO, and /STA commands; this enhancement extends this support to Fast Path users. You cannot use the /RST command to reset response mode for Fast Path nodes/users as you can for full function users. This is because Fast Path requires a session to be in a quiesced state and /RST does not have this requirement.

RESP-INP-FP is a new status in IMS Version 10 that may be returned by the following /DIS commands

/DIS NODE, /DIS NODE RESPINP

/DIS USER, /DIS USER RESPINP

/DIS STATUS, /DIS STATUS NODE, /DIS STATUS USER

Input response mode is now indicated by two statuses, RESP-INP-FP for Fast Path, and RESP-INP for full function. If you have automation dependent on the RESP-INP status and use Fast Path EMH, your automation needs to be changed to handle both input response mode statuses.

## Fast Path Enhancements Summary

- Command Enhancements
  - ◆ Improved UPD DB and QRY DB commands
  - ◆ Improved use of ECSA
- Shared VSO enhancements
  - ◆ Simplified definition
  - ◆ Improved use of ECSA by FDBR and XRF tracking systems
- Capacity enhancements
  - ◆ Increased output thread and buffers
  - ◆ Improved use of ECSA
- Usability enhancement
  - ◆ Simple enforcement of QUITCI for SDEP Scan and Delete utilities
- EMH enhancement
  - ◆ Capability to reset Fast Path response mode


# Connectivity

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## Connectivity

- OTMA
- IMS Connect

# OTMA

## Highlights

- OTMA addresses high availability requirements through
  - ◆ Routing Enhancements
    - Destination Routing descriptors
    - Resume TPIPE security
  - ◆ Automatic flood detection and control of input messages
  - ◆ Time-out control
  - ◆ TPIPE storage clean-up
  - ◆ Member level security
  - ◆ Asynchronous message enhancements
  - ◆ Enhanced OTMA display information

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OTMA enhancements address several high availability requirements. These include the areas listed on the visual.

## Routing Enhancements

- Capability that enhances asynchronous outbound IMS application messages (ALTPCB) when OTMA is enabled
  - ◆ Through the use of OTMA Destination Routing descriptors
    - Without requiring the OTMA exit routines - DFSYPRX0, DFSYDRU0
      - Exits are invoked if they exist
  - ◆ Supports
    - Remote destinations through IMS Connect
    - Non-OTMA destinations such as LTERM destinations
      - SNA Terminals and printers
    - Future consideration for MQ
- Provides the OTMA support for the Callout function

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Prior to IMS V10, IMS systems that enabled OTMA and also produced ALTPCB outbound messages for external destinations required system programmers to code several assembler OTMA routing exits including DFSYPRX0 & DFSYDRU0. This requirement oftentimes inhibited or delayed the adoption of new connectivity implementations such as IMS Connect. IMS V10 introduces new OTMA Destination Routing Descriptors that can eliminate the requirement to code the OTMA exits by externalizing the definitions and specifications that the exits provide. Note, however, that if the exits exist, they will be called with the routing information provided by the descriptors already set. Additionally these Descriptors have the ability to route from OTMA to non-OTMA destinations such as SNA printers and terminals. Future support for MQ is under consideration.

## Routing Enhancements ...

- New 'D' descriptor type in DFSYDTx member of IMS.PROCLIB

### D *destname* **keywords**

Where:

Destname is destination name and can be masked by ending in an "\*"

Keywords are:

```

TYPE={IMSCON|NONOTMA}
TMEMBER=name
TPIPE=name
SMEM={NO | YES}
ADAPTER=adapname
CONVERTR=convname

```

- ◆ Up to 50 lines can be used in the specification of a descriptor
  - Columns 1 through 10 must be the same for each line of a continuation
- Read and initialized at IMS startup

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The new 'D' descriptor type for the DFSYDTx member of IMS.PROCLIB includes keywords as follows:

- TYPE= determines if output is destined for IMS Connect (IMSCON) or non-OTMA (NONOTMA). This is a required keyword.
- TMEMBER= 1 to 16 character client name. Required for TYPE=IMSCON. Ignored for TYPE=NONOTMA.
- TPIPE= 1 to 8 character TPIPE name. Optional for TYPE=IMSCON, defaults to Destination name. Ignored for NONOTMA.
- SMEM= indicates if this destination is a Super Member. Optional keyword for TYPE=ICON, defaults to SMEM=NO. Ignored for TYPE=NONOTMA. If "YES", the name defined in the TMEMBER keyword becomes the Super Member name and can only be 4 characters.
- ADAPTER= 1 to 8 character name of the IMS Connect Adapter to be used for the message, e.g., one example is an adapter for XML transformation. Optional for TYPE=IMSCON and ignored for TYPE=NONOTMA.
- CONVERTR= 1 to 8 character name of the Converter to be used by the Adapter. Required for TYPE=IMSCON if ADAPTER is specified. Ignored for TYPE=NONOTMA.

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## Routing Enhancements ...

- Example

```

M HWSICON1                DRU=DFSYDRU0 INPUT=5000 T/O=5
D OTMACL99 TYPE=IMSCON TMEMBER=HWS1 TPIPE=HWS1TP01
D OTMACL*  TYPE=IMSCON TMEMBER=HWS2
D PRNTR3A  TYPE=NONOTMA
D SOAPGW1  TYPE=IMSCON TMEMBER=HWS2 TPIPE=HWS2SOAP
D SOAPGW1  ADAPTER=XMLADPTR CONVERTR=XMLCNVTR
D SOAPGW*  TYPE=IMSCON TMEMBER=HWS3 TPIPE=HWS3SOAP
D SOAPGW*  ADAPTER=XMLADPTR CONVERTR=XMLCNVT3

```

Masked descriptor →

continuation →

Masked descriptor ↪

Also note that for this specific example, all destination matches for any destination beginning with SOAPGW... will be routed to the single TPIPE HWS3SOAP

Note: any descriptors that result in syntax errors are ignored

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Multiple OTMA descriptors can be defined in the same DFSYDTx member.

This example illustrates six descriptors:

- The first is a TMEMBER descriptor specifying the DRU exit for TMEMBER “HWSICON1”.
- The second is a Destination Routing descriptor for destination OTMACL99 that will be routed to IMS Connect TMEMBER “HWS1” with TPIPE “HWS1TP01”.
- The third is a Destination Routing descriptor for destinations matching the mask “OTMACL\*”. The messages will be routed to a TMEMBER of “HWS2” with a TPIPE of the destination matching the mask, e.g., OTMACL04 if the destination using this descriptor was OTMACL04. Note that this along with the second descriptor illustrate that more specific destinations must be coded ahead of generic ones.
- The fourth is a Destination Routing descriptor for destination “PRNTR3A” that will be routed to legacy IMS.
- The fifth is a Destination Routing descriptor for “SOAPGW1” that will be routed to IMS Connect TMEMBER “HWS2” with TPIPE “HWS2SOAP” and will result in XML translation.
- The sixth is a masked Destination Routing descriptor for destinations that begin with “SOAPGW\*”. This last descriptor will not be used for SOAPGW1 because the previous descriptor already specifically addressed that destination name. Note that all the destination matches for this descriptor will be routed to the one specified TPIPE “HWS3SOAP”.

## Routing Enhancements ...

- Usage
  - ◆ Application programmers
    - Ensure IMS application ALTPCB destination name matches the name of a Destination Routing descriptor
  - ◆ System programmers
    - Define the new 'D' descriptors in DFSYDTx
      - Code more specific descriptors before generic definitions
        - Searched and used in the order coded
  - ◆ Error message enhancement
  - ◆ DFS2385E SYNTAX ERROR FOR DESCRIPTOR = *descriptor errortext*
    - New error text for the 'D' descriptors
    - Also issued if a previous release of IMS attempts to read DFSYDTx with the new descriptors

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To correctly enable the use of the new callout descriptors, application programmers must code the destination of an asynchronous output message switch (ALTPCB) to match the destination name of a corresponding descriptor. IMS systems programmers or system administrators, on the other hand, will also need to create the sure descriptors in the DFSYDTx member of IMS.PROCLIB. Because descriptors can be masked (end in an "\*\*") and are searched in the order they are coded, more specific descriptors should appear before generic ones.

The DFS2385E error message has been enhanced to catch syntax errors associated with the new descriptor keywords. New error text include:

- DESTINATION NAME NOT GIVEN OR BEGINS AFTER COLUMN 3
- DESTINATION NAME LONGER THAN 8 CHAR
- INVALID TYPE SPECIFIED
- DUPLICATE TYPE KEYWORD
- TMEMBER REQUIRED FOR TYPE=IMSCON
- TMEMBER MUST BE 1 TO 16 CHARACTERS LONG
- DUPLICATE TMEMBER KEYWORD
- TPIPE MUST BE 1 TO 8 CHARACTERS LONG
- DUPLICATE TPIPE KEYWORD
- SMEM MUST BE YES OR NO
- DUPLICATE SMEM KEYWORD
- ADAPTER MUST BE 1 TO 8 CHARACTERS LONG
- DUPLICATE ADAPTER KEYWORD
- CONVERTR MUST BE 1 TO 8 CHARACTERS LONG
- DUPLICATE CONVERTR KEYWORD
- CONVERTR REQUIRED WITH ADAPTER



## Resume TPIPE Security

- Addresses security exposure
  - ◆ Asynchronous output messages retrieved by a Resume TPIPE request
- New RIMS SAF/RACF security resource class
  - ◆ Security definition association between
    - TPIPE name
    - Userid/group that can access the TPIPE
- OTMA security user exit routine DFSYRTUX
  - ◆ Invoked after the call to SAF/RACF regardless of result
  - ◆ Always invoked if it exists regardless of whether or not RIMS is defined

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The next enhancement addresses security in the destination routing environment.

IMS transactions and commands that flow through OTMA from various clients are protected by current security classes, namely: TIMS and CIMS. The responses are guaranteed to be delivered to the client that initiated the transactions and commands. Output messages in the hold queue that are generated as a result of asynchronous processing, however, are not protected by any security class. When those messages are retrieved by an OTMA client using RESUME TPIPE, a security exposure can occur. The function provided by Resume TPIPE Security protects these output messages by establishing a security class named RIMS within RACF or any non-IBM security product. Within this class, the security definitions are associated with the TPIPE name along with the list of user IDs or group names under this TPIPE. The enhancement, therefore, allows IMS installations to optionally authorize the user ID, together with the TPIPE name that is contained in the Resume TPIPE command message before any of these messages are sent to a client.

OTMA also provides the DFSYRTUX security exit routine as an opportunity to overrule the SAF/RACF decision or to extend the security check to allow modifications as needed by the environment.

## Resume TPIPE Security ...

- Implementation
  - ◆ SAF/RACF security server
    - Supports a new resource class Rxxxxxxx in SAF/RACF
      - Where xxxxxx is the RCLASS value defined in the SECURITY macro or in the DFSDCxxx member
        - Default is RIMS
      - Authorizes TPIPE access from the userid/group
  - ◆ IMS
    - Provides a sample user security exit DFSYRTUX
      - Default routine always provides zero return code for compatibility
      - Must be modified if further protection is required
  - ◆ OTMA Client, e.g., IMS V10 IMS Connect
    - Passes information from the Resume TPIPE request to OTMA
      - TPIPE name in the OTMA CTL prefix and userid in the OTMA security prefix

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To take advantage of Resume TPIPE Security, the following actions are required:

- Define a new resource class, TPIPE name, and user IDs in RACF (refer to SA22-7683 *Security Server RACF Security Administrator's Guide*) or applicable security server for the environment. The resource class comprises the resource class type of "R" and the resource class name whose value is taken from the RCLASS parameter of the SECURITY macro or in the DFSDCxxx member of Proclib. If RCLASS is omitted, the resource class name defaults to "IMS." The resulting class, then, is "Rxxxxxxx" where 'xxxxxxx' is the value of RCLASS or "RIMS" as the default.
- If needed, code, assemble, and bind the user exit in a library that is concatenated with IMS SDFSRESL under DD name STEPLIB or JOBLIB.
- Ensure that the OTMA client, e.g., IMS Connect, is at the correct IMS V10 level to pass in the TPIPE name in the OTMA CTL prefix and the userid/group in the security prefix header as part of the message for the Resume TPIPE command.

## Resume TPIPE Security ...

- Remote client impact
  - ◆ Previous releases
    - Always returned the message if the Resume TPIPE request specified the correct clientid (TPIPE)
      - Userid authentication may have been done (RACF=Y) but no further check for authorization of userid access to the TPIPE
  - ◆ With Resume TPIPE security
    - Userid/group must be authorized to issue Resume TPIPE from a particular clientid (TPIPE)

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The implementation of Resume TPIPE Security could possibly impact existing clients. In previous releases, a userid that was provided in the Resume TPIPE request was authenticated if IMS Connect was configured with security enabled. As long as the Resume TPIPE request, however, passed in the correct TPIPE name (clientid) then the associated asynchronous output messages could be retrieved.

In IMS V10, if the Rxxxxxxx | RIMS resource class is defined then security violations can occur where they previously did not. When retrieving the asynchronous output from IMS, the client signals IMS with a Resume TPIPE command and an IRM timeout value. This timeout value expires if there are no messages received by the client. Additionally, with the new support, a security check can result in success or failure. If the security validation is a success, normal processing takes place. On the other hand, if a security violation occurs, a new NAK message is sent to the client.

## Message Flood Detection and Control

- Capability that automatically monitors the growth of active input messages
  - ◆ Sets a default max threshold of 5000 active input messages
  - ◆ If the IMS system has more than 5000 unscheduled, unprocessed, or orphaned input messages from an OTMA member
    - Any new input message from the same member is rejected
  
- Prevents possible S40D IMS Abends due to large number of OTMA control blocks associated with the queued requests
  
- Also delivered in IMS V8 and IMS V9:
  - ◆ V8: PK04461, V9: PK04463

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The next enhancement is the Message Flood Detection and Control capability. This function provides a mechanism to automatically monitor the growth of active input messages through OTMA and the control blocks associated with these requests. Specifically, when an OTMA member or client sends a transaction to IMS, OTMA internally creates a control block called the TIB (Transaction Instance Block) to track each active input message. For a send-then-commit (CM1) message, the control block is used for input and output processing after which the storage is freed or reused. For a commit-then-send (CM0) message, the control block is only used for input processing. If, however, several thousand OTMA input transactions are received and waiting to be processed, thousands of control blocks representing the requests could fill up LSQA storage below the line and possibly cause the IMS system to fail with an S40D abend. To prevent this type of OTMA message flood condition, OTMA supports the suppression or control of the input messages for OTMA based on a maximum value for the number of TIBs allowed for an OTMA member in the system.

## Message Flood Detection and Control ...

- Implementation
  - ◆ Flood detection and control capability is set on by default to 5000
  - ◆ Override order:
    - At initialization, DFSYDTx descriptor value is checked for override
    - During processing, /START TMEMBER command activates new override
    - As each OTMA member joins the group
      - The client-bid optionally provides a new INPUT value
        - Only accepted if less than the value in effect by descriptor or command
      - **Note:** an INPUT value of 0 in the descriptor or command deactivates the control
        - Subsequent client-bid values are ignored

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By default, the message flood detection and control capability is always on and the maximum threshold value set to 5000. To override this default, several choices are available:

- The OTMA descriptor DFSYDTx in the IMS.PROCLIB library can provide a value which IMS detects at initialization. It is not, however, until the TMEMBER associated with the descriptor is actually started that IMS implements the override value.
- At any time, an operator can issue the /START TMEMBER command that not only starts the member but also provides an override flood detection value that supersedes anything provided in the descriptor.
- As a member joins the group, the client-bid protocol message can also provide an override. This value is honored only if it is less than the value that is already in effect based on the overrides provided by the descriptor or /START TMEMBER command.

Note that the deactivation of the input message flood control capability can be requested by either the DFSYDTx descriptor or the /START TMEMBER command by specifying an INPUT value of 0. A client-bid message cannot override this specification.





## Message Flood Detection and Control ...

- Details
  - ◆ OTMA descriptor in **DFSYDTx** of IMS.PROCLIB:
 

**M member-name DRU=...,INPUT= 0 to 9999**
  - ◆ Commands:
 

**/START TMEMBER member-name ... INPUT 0 to 9999**  
**/STOP TMEMBER member-name | ALL**
  - ◆ OTMA Member (e.g., IMS Connect) interface
    - **New settings in the state data section of the client-bid protocol message**
      - 2-byte field at offset **x'3E'** specifies the override value
        - Value must be less than the value set by IMS Command or OTMA descriptor
      - Flag **TMAMMAXI x'80'** in offset **x'2D'** specifies the new function request

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The specifics of the implementation are as follows:

- A new INPUT parameter in the OTMA descriptor DFSYDTx in IMS.PROCLIB. The parameter allows values from 0 to 9999. If the value is set to 0 then the capability for the message flood detection is disabled. Values between 1 and 200 are set to 200 and anything over 9999 is set to 9999.

- The /STOP TMEMBER member-name | ALL command which suppresses new input transactions or commands from a specific OTMA member or all OTMA members. This command does not affect the rest of communications between the stopped member and IMS. That means the following operations can still be performed for a stopped member: the client and server XCF connection remains unchanged; all of the running transactions currently scheduled in the IMS can still be processed, and the responses can be delivered; IMS conversational transactions can continue processing the existing conversation until it ends; all of the OTMA protocol commands including ACK/NACK can still be processed by OTMA. Note that after this command has been issued, a STO-INPUT status will be displayed on a subsequent /DISPLAY TMEMBER command for the appropriate OTMA members.

- The /START TMEMBER INPUT command with the same range and meaning of the values 0 to 9999.

- New fields in the client-bid protocol interface between the OTMA member and OTMA. For the client-bid protocol message, a new 2-byte field in the offset x'3E' of the state data can specify the maximum number of active input message for the member. The value can be specified between 0 and 9999. If the value is 0, OTMA will take the default of 5000 for the maximum active input message limit (note that specifying 0 does not turn the capability off). If the value is between 1 and 200, it will be treated as 200. If it is over 9999, it will be set to 9999. A further restriction is that the specified request must be less than any value previously set by a descriptor or command. If the client-bid tries to send in a higher value, it will be reset to the value established by the descriptor or command. Additionally, a new flag TMAMMAXI x'80' in the offset x'2D' of the state data needs to be set to inform the OTMA server that the maximum active input message checking function is requested. During processing, if OTMA detects that the active input message limit has been reached, a new NAK code of x'30' will be sent the OTMA member.

OTMA monitors the growth of the active input messages from members. A warning message DFS1988W is sent to the console to indicate that the input message buildup is approaching the maximum limit. The message will be sent starting at 80% of the message limit and every 5% thereafter. When the maximum limit is reached, an error message DFS1989E is sent to the console and any subsequent OTMA input messages are rejected with a new OTMA sense code x'30'. Once the situation has been alleviated, DFS0767I is issued.

## CM1 (Send-then-Commit) Time-out Control

- New Time-out control capability for CM1 (Send-then-Commit) interactions
  - ◆ For Synclevel=confirm or synclevel=syncpt processing
    - IMS waits for an ACK/NAK after sending the response
      - **“Wait-Syncpoint” or “Wait-RRS” status**
        - Locks are held, dependent region is occupied
  - ◆ New backout logic implements time-out capability
    - If ACK/NAK is not received within a time limit
      - Default time-out value is 120 seconds

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The next capability that OTMA provides is a time-out control option that is applicable for CM1 message processing. For an OTMA send-then-commit (CM1) response message with synclevel=confirm or synclevel=syncpt, IMS expects an ACK/NAK from the OTMA client. Due to the possibility of a client programming error or a network failure or delay, the expected ACK/NAK may not be received by IMS. A missing or delayed ACK/NAK results in a “wait-syncpoint” condition for the IMS dependent region that processed the OTMA transaction. To resolve this situation, OTMA has been enhanced to detect this “wait-syncpoint” condition and take an appropriate time-out action. The default time-out value is 120 seconds.

## CM1 (Send-then-Commit) Time-out Control ...

- Implementation

- ◆ Time-out is set on by default to 120 seconds
  - Range of values: 0 to 255
- ◆ Override order:
  - At initialization, DFSYDTx descriptor value is checked for override
  - During processing, /START TMEMBER command activates new value
  - As each OTMA member joins the group an override can be set
  - And optionally, each input message can set its own value
- **Note:** an INPUT value of 0 in the descriptor or command deactivates the control
  - Even if the feature is off, warning message DFS0808W will be issued to the system console when an expected ACK/NAK is not received within 120 seconds

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The default 120 second timeout value for CM1 (send-then-commit) messages can be overridden in several ways:

- During IMS initialization with a new parameter in the OTMA descriptor member DFSYDTx. It is not until the member is actually started that the override value is honored.
- At any time with a new TIMEOUT specification in the /START TMEMBER command.
- By OTMA member request either when the member joins the group using the client-bid protocol message or, at a lower level of granularity, whenever a CM1 (send-then-commit message) flows into OTMA.

If none of the above methods is used to set the time-out value, the OTMA default of 120 seconds is used to determine when to perform the time-out action.

If needed, the /START TMEMBER TIMEOUT command and the OTMA descriptor can deactivate the OTMA time-out function by specifying a timeout value of 0. Once the function is deactivated, OTMA will not perform the time-out action. However, OTMA will still detect a long-waiting dependent region for a missing ACK or NAK and issue the following warning message: DFS0808W IMS REGION region-id IN BACK-END IMS aaaa HAS BEEN IN [WAIT-SYNCPOINT] or [WAIT-RRS] FOR otma-membername/tpipename FOR xx seconds.

## CM1 (Send-then-Commit) Time-out Control ...

- Details
  - ◆ New parameter in the OTMA descriptor **DFSYDTx**:
 

**M member-name ... T/O= 0 to 255**
  - ◆ Command:
 

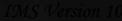
**/START TMEMBER member-name TIMEOUT 0 to 255**
  - ◆ OTMA Member (e.g., IMS Connect) interface
    - New settings in the state data section of the client-bid protocol
      - 1-byte time-out field at offset **x'41'** specifies time-out value
        - Value must be less than the value set by IMS Command or OTMA descriptor
      - Flag **TMAMTMOT x'20'** at offset **x'2D'** specifies that time-out is requested

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The details of the implementation are as follows:

- A new T/O parameter in the OTMA descriptor member **DFSYDTx** in **IMS.PROCLIB**. The new parameter defines the time-out value in minutes for OTMA send-then-commit response messages. The value specified can be between 0 and 255 seconds. If the value is 0, OTMA will deactivate the time-out function. If it is over 255, it will be set to 120 which is the default.
- A new **TIMEOUT** specification in the **/START TMEMBER** command.
- New specification in the OTMA member request either when the member joins the group using the client-bid protocol message or, at a lower level of granularity, whenever a CM1 (send-then-commit message) flows into OTMA.

If a client-bid protocol message is used to specify the time-out value, the criteria of choosing the time-out value is provided through new flag specifications. Note that the client-bid cannot override the time-out specified by an OTMA descriptor or command. If the client-bid time-out value is equal to or greater than the current time-out value set by descriptor or command, OTMA will ignore the time-out value in the client-bid message. If the client-bid time-out value is less than the current time-out value set by the command or descriptor, the value from the client-bid will be used for the time-out action for this member.


## CM1 (Send-then-Commit) Time-out Control ...

- Details ...
  - ◆ OTMA Member...
    - On an individual message level
      - 1-byte reserved field at offset **x'1E'** of the message control information prefix
        - Specifies time-out value for the input transaction
      - New flag **TMAMTTMO, x'08'** in byte 5 of the state data section
        - Specifies that OTMA can take the message level time-out value specified in the control data

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On an individual message basis, additional flags have been provided for an even lower level of time-out specification. This capability supports a message time-out value which can be different from the time-out value set for the entire member. Note, however, that this value follows similar restrictions in that it cannot override the member time-out value set by an OTMA descriptor or IMS command.

When an OTMA time-out occurs, OTMA will first back-out the transaction in order to get out of the wait-syncpoint or wait-RRS condition for any missing ACK/NACK region. Subsequently, an OTMA CM1 deallocation message will be sent to the member with the existing ABORT flag and the new "time-out" flag. The IMS system console operator will also receive a DFS0809E message "IMS REGION region-id IN BACK-END IMS aaaaaaa HAS TIMED OUT FOR otma-membname/tpipename FOR xx MINUTES". When OTMA takes the time-out action, byte 3 TMAMCCCI, of the OTMA commit-confirmation flag in the message control data prefix is set to TMAMCTMO, X'08', to indicate that the transaction was aborted due to the OTMA time-out condition.

## TPIPE Storage Clean-up

- Enhancement to release unused storage
  - ◆ Supports the removal of unused TPIPEs
    - Idle for two checkpoints
  
- This capability is available in IMS V8 and IMS V9
  - ◆ IMS V8: PQ99983, IMS V9: PK00386

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The next enhancement provides a more efficient way to control unused storage associated with idle TPIPEs. TPIPEs (Transaction Pipes) are OTMA control blocks that represent logical connections between the client and IMS. They are analogous to an IMS logical terminal (LTERM) and allow IMS to associate all input and output with a particular OTMA client. Once created, they occupy storage whether or not they are used again. This clean-up enhancement determines whether or not an inactive TPIPE can be deleted and its storage released. A TPIPE is considered inactive if it has been idle for 2 consecutive checkpoints.

## TPIPE Storage Clean-up ...

- Implementation
  - ◆ New clean-up logic applies to consecutive IMS system checkpoints
    - The first checkpoint
      - Scans all the existing TPIPEs to see if input or output activities have occurred
        - If yes, then the TPIPE is not idle
        - If no activities, then the TPIPE is marked idle
    - In the subsequent checkpoint,
      - If an idle TPIPE is found and there has still been no activity the TPIPE is a candidate for removal
      - **Note:** Certain TPIPEs are never considered as candidates for clean-up
        - Synchronized TPIPEs from MQ
        - TPIPEs with status conditions such as TRA, STO, and TMP

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The TPIPE storage clean-up function is activated when OTMA is activated in an IMS system. Logic added to IMS system checkpoint processing determines whether a TPIPE is active or idle based upon whether or not there are any input or output messages associated with the control block in addition to whether or not any TPIPE status conditions exist. TPIPEs that are idle for two consecutive checkpoints are deleted.

Active TPIPEs include those that are processing commit-then-send (CM0) messages in a shared queues environment, have incomplete send-then-commit (CM1) messages, or have queued commit-then-send (CM0) output messages.

Certain TPIPEs are never considered for removal. These include synchronized MQ TPIPEs and TPIPEs with outstanding status indicators.

## Member Level Security

- New /SECURE OTMA command capability
  - ◆ Allows each OTMA member to define its own security setting
    - FULL, CHECK, NONE, or PROFILE
  - ◆ Dynamic change of security level
    - Note - Messages are processed with the security level that was in effect when the message was received
  
- Prior Releases
  - ◆ OTMA security was a system-wide setting for all OTMA members

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Prior to IMS V10, OTMA does not allow different security levels defined for various members. The security setting requested is considered a system-wide setting for all of OTMA members. In V10, the OTMA command, /SECURE OTMA, has been enhanced to allow specification of member security so that each OTMA client can have its own security level.

Note - Messages are always processed with the security level that was in effect when the message was received. Even if a new security level is introduced by command, the security level associated with the message is based on the level in effect at the time of message receipt.

## Member Level Security...

- Implementation

- ◆ `/SECURE OTMA security-option TMEMBER member-name`
  - Where *security-option* is FULL | CHECK | NONE | PROFILE

- ◆ `/DISPLAY TMEMBER` command
  - Enhanced to show security status for a specific member

<code>/DISPLAY TMEMBER MQ1</code>			
Response ET:			
<code>GROUP/MEMBER</code>	<code>XCF-STATUS</code>	<code>USER-STATUS</code>	<b>SECURITY</b>
<code>IMSGROUP</code>			
<code>-MQ1</code>	<code>ACTIVE</code>	<code>ACCEPT TRAFFIC</code>	<b>CHECK</b>

<code>/DISPLAY TMEMBER ICONN01</code>			
Response ET:			
<code>GROUP/MEMBER</code>	<code>XCF-STATUS</code>	<code>USER-STATUS</code>	<b>SECURITY</b>
<code>IMSGROUP</code>			
<code>-ICONN01</code>	<code>ACTIVE</code>	<code>ACCEPT TRAFFIC</code>	<b>FULL</b>

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The addition of the TMEMBER keyword to the /SECURE OTMA command provides the ability to define any of the security options for a specific OTMA member.

The /DISPLAY command has also been enhanced to provide a mechanism to display the security option in effect for a specific member.

## Asynchronous Message Enhancements

- Asynchronous messages
  - ◆ CM0 - Commit-then-Send messages
  - ◆ Undelivered IOPCB and all ALTPCB messages
  
- Enhancements - only apply to IMS Connect
  - ◆ Super Member capability
  - ◆ Purge
  - ◆ Reroute

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Several enhancements are available to address asynchronous CM0 messages in OTMA environments that use IMS shared queues as well as those that implement load balancing or IP spraying techniques such as Sysplex Distributor or the WebSphere Edge Server. These enhancements extend the capabilities of IMS Connect.

## Asynchronous Message Enhancements ...

- Super Member capability
  - ◆ Facilitates delivery of IMS asynchronous messages
    - By a set of OTMA clients running in the sysplex
      - Multiple instances of IMS Connect
        - Supports load balancing / IP Spraying solutions such as Sysplex Distributor
    - By IMS systems in a shared queues environment
      - Multiple front-end and back-end IMS systems
        - Removes affinity to a particular IMS
- Also delivered in previous releases:
  - IMS V9 and IMS Connect: PK09946, PK30086, PK10911
  - IMS V8: PK09944, PK30103, IMS Connect V2.2: PK10910

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The Super Member capability in OTMA facilitates the delivery of asynchronous (CM0 Commit-then-send) messages by any instance within a set of IMS Connects and IMS subsystems. With this function, affinity to a particular IMS or IMS Connect is removed and the use of shared queues as well as solutions such as Sysplex Distributor become more viable.

## Asynchronous Message Enhancements ...

- Super Member capability ...
  - ◆ A group name given to a set of OTMA members
    - E.g., IMS Connect instances
      - Allows any IMS Connect instance to retrieve the message
  - ◆ Generic structure name in IMS on which the messages are queued
    - OTMA members that share a super member name
      - Recognized by IMS by both their specific name and super member name
    - For Shared Queues, no affinity to an IMS system
      - Any IMS can deliver the message

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A super member is a special OTMA member name which can be shared by a set of IMS Connects to handle the CM0 hold queue messages.

When an IMS Connect attaches to IMS, OTMA creates a regular member structure name unique to that instance to track the connection status and to record the connection options for later transaction processing. If a super member name, which could be considered a group name for a set of IMS Connects using Sysplex Distributor or similar mechanism, is given by an IMS Connect during the connection time, OTMA will additionally create a member structure called the super member structure. If the super member structure already exists, OTMA will use it instead of creating a new one. A regular member structure is dedicated exclusively to the IMS Connect for which it was created. However, a super member structure is shared among a set of IMS Connects so that a Resume TPIPE can be issued from any IMS Connect. The role of the super member is to store and deliver the CM0 hold queue messages.

## Asynchronous Message Enhancements ...

- Super Member - Implementation
  - ◆ IMS Connect HWSCFGxx configuration file
    - HWS statement

**HWS ... SMEMBER= *smember-name***

      - *Smember-name* can be 1-4 characters
      - Cannot be the same name as an existing OTMA member
- Command support
  - ◆ /DISPLAY OTMA
    - Display output includes a new SMEM column
  - ◆ /TRA TMEMBER... TPIPE..., /STA or /STO OTMA
    - Can be issued to a super member name
    - When issued with a regular member name
      - Output is expanded to include any related super members

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IMS Connect has been enhanced to support the Super Member capability. The HWSCFGxx configuration file member provides a new SMEMBER= parameter in the HWS statement. The value provided must be different than the value provided in the MEMBER= parameter of the DATASTORE statement and must follow the OTMA naming conventions.

When the client-bid protocol message is sent from an IMS Connect member that has specified a Super Member value, the state data of the OTMA prefix carries the defined SMEMBER value in a new 4-byte field at the offset of x'36' in the state data section. In addition to the super member name in the client-bid message, a new flag TMAMFGSM (x'08') at the offset x'2D' of the state data informs OTMA that the super member processing is requested.

Additionally, the /DIS, /TRA, /STA and /STO commands have been enhanced to support the Super Member capability. The /DISPLAY OTMA command output includes a new SMEM column to display the Super Member name if one exists. The /TRA TMEMBER ... TPIPE, /STA OTMA and /STO OTMA commands can be issued against either a Super Member name or regular IMS Connect.

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## Asynchronous Message Enhancements ...

- Super member capability - the issue

Resume TPIPE for clientx through IMS Connect (generic) and IMS (generic)

Will only retrieve MSGx if the connection is correctly established with IMS Connect B and IMS1

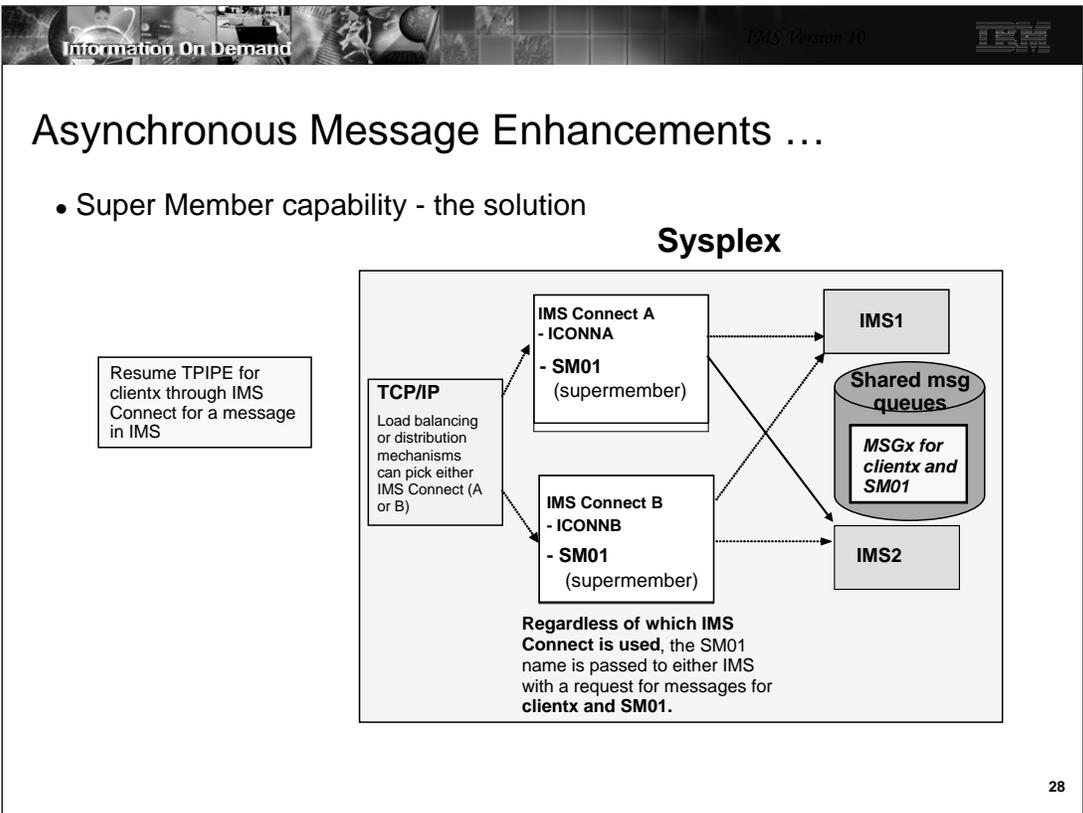
If connection is established through any other path, this program will either disconnect or timeout at some point.

### Sysplex

Possible connections:  
 IMS Connect A to IMS1  
 IMS Connect A to IMS2  
**IMS Connect B to IMS1**  
 IMS Connect B to IMS2

This and the next visual attempt to illustrate the value of the Super Member support.

Asynchronous CMO output messages in IMS are queued to a message queue construct that is identified by TMEMBER and TPIPE and, therefore, associated with a specific IMS Connect instance. As a result, there is a potential issue when using any of the load balancing or sysplex distribution mechanisms or even when a message is processed in a back-end IMS in a shared queues group. To retrieve the message, the remote program needs to establish a connection through the appropriate IMS Connect to the actual IMS system that queued the message. This can be a challenge because there is no easy mechanism for a remote program to discover the required connection path, i.e., a specific IMS Connect to a specific IMS. Additionally, the remote programs may not want to know specific connection paths to IMS because that would negate the value of using load balancing and distribution mechanisms.



The OTMA Super Member function resolves the issue by allowing a RESUME TPIPE request to retrieve CM0 output across all combinations of IMS Connect and IMS systems. If multiple IMS systems are involved, then those IMS systems must also have IMS shared queues implemented. If there is only one IMS system but multiple IMS Connects, then shared queues support is not required. As shown in the illustration on this visual, the Resume TPIPE request for clientx can be routed through any load balancing or distribution mechanism to either IMS Connect A or IMS Connect B. Both systems are identified to IMS1 and IMS2 by their unique XCF member names as well as the global Super Member name of SM01. The request to retrieve the output message for TPIPE clientx can be sent to either IMS1 or IMS2 because both have access to the shared queues and, more specifically, to all the messages under the shared queues construct for SM01 and TPIPE clientx.

## Asynchronous Message Enhancements ...

- REROUTE and PURGE Support
  - ◆ For OTMA hold queue capable clients ONLY
    - OTMA members, e.g. IMS Connect
      - That keep asynchronous messages on the IMS message queue until requested by the remote application
    - ◆ Extended support that allows remote applications to
      - Reject (NAK) or request action on asynchronous messages
        - **Purge** from the IMS message queue
        - **Reroute** to an alternate destination
        - When both REROUTE and PURGE are specified for a message
          - Neither action is performed
          - OTMA issues DFS2407W message
          - Stores the message onto the hold queue of the inputting TPIPE
- Also delivered in previous releases

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OTMA asynchronous message enhancements has been extended to provide greater flexibility for messages that cannot be delivered or are rejected by the remote client. The two actions, which are mutually exclusive of each other, are to reroute messages that cannot be delivered to an alternate destination or to purge them.

The REROUTE enhancement provides a mechanism for an IMS Connect client to request that undeliverable Commit Mode Zero (CM0) output associated with a send/receive from the client application be rerouted to an alternate IMS Connect destination. When a Client Reroute Request is made, IMS Connect notifies OTMA to remove the message from the current queue and requeue it to the provided Reroute name queue.

The Purge Not Deliverable extension allows the remote client application or the appropriate User Message Exit to specify whether or not the output should be purged if it is not deliverable. Note that if both capabilities are requested, neither action is performed and DFS2407W message is issued.

This capability was delivered in previous releases as follows: IMS V9 and IMS Connect: PK16934, PK22480, PK24907, PK09543, PK12013; and for

IMS V8: PK21868, PK09542, IMS Connect V2.2: PK12012

## Asynchronous Message Enhancements ...

- REROUTE and PURGE - Implementation ...
  - ◆ REROUTE
    - OTMA
      - OMUSR\_FLAG1                      new setting of OMUSR\_REROUT (X'01')
      - OMUSR\_ARCLEV                    new setting of OMUSR\_AL02 (X'02')
      - Field OMUSR\_REROUT\_NM        holds the reroute name
    - IMS Connect
      - IRM\_ARCH                        new setting of IRM\_ARCH1 (X'01')
      - IRM\_F3                          new setting of IRM\_F3\_REROUT (X'08')
      - New field IRM\_REROUT\_NM      holds the reroute name
  - ◆ PURGE
    - OTMA
      - OMHDRPND EQU X'10'            purge if not deliverable
    - IMS Connect
      - IRM\_F3 has a setting of IRM\_F3\_PURGE (X'04')

Both the OTMA headers and the IMS Connect headers have been enhanced to request either the PURGE or REROUTE capability.

## Asynchronous Message Enhancements ...

- IMS Connect support
  - ◆ Resume TPIPE
    - Protocol provides flags for PURGE and REROUTE requests
    - When a Resume TPIPE request is in progress
      - Subsequent Resume TPIPE request is queued instead of rejected
  - ◆ Send-Only messages
    - Can specify a reroute queue name for the output
      - Also delivered in IMS V9: PK17421, PK18555

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IMS Connect has been enhanced to take advantage of the new capabilities. The Resume TPIPE protocol provides flags to indicate one or the other type of request.

Another enhancement in this area allows RESUME TPIPE requests to be queued when requested for the same TPIPE name.

Additionally, the Send-Only protocol allows specification of a reroute queue name for the output in the case of an initial rejection of the output reply. This capability allows IOPCB output from the Send-Only input transaction to be rerouted to a dedicated TPIPE instead of the inputting TPIPE. The user of the IMS Connect Send-Only transaction will need to turn on the reroute flag and specify a reroute TPIPE name in the input stream to activate the capability. Note that this is not supported by the local option capability, HWSIMSO0, HWSIMS01 and HWSJAVA0.

## OTMA /DISPLAY Command Enhancements

- /DIS OTMA and /DIS TMEMBER output has been expanded
  - ◆ Additional information
    - Message flood threshold value, Current number of active input messages, Time-out value, Super Member name, DRU exit name
  - ◆ New USER-STATUS indicators
    - SMQ BACKEND
    - STO-INPUT
    - FLOOD
- /DIS TMEMBER TPIPE
  - ◆ Enhanced to display the number of input messages
    - New column "INPCT"
      - Number wraps after 65535

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The /DISPLAY OTMA and /DISPLAY TMEMBER command outputs have been enhanced to provide more information about the OTMA environment and specific TMEMBERS. To contain all the information, the single line display output has been increased to two lines.

Several new USER-STATUS indicators provide the following information:

- SMQ BACKEND - This status indicator on a TMEMBER line shows up on a back-end IMS in a shared queues group. It shows that OTMA has duplicated the specific TMEMBER environment and control blocks needed on the back-end to process a message that was received from that TMEMBER which is attached on the front-end. The same member name on the front-end IMS is shown in 'connected' state and no SMQ BACKEND indicator. Whereas the corresponding control blocks on the back-end IMS which processes the message is shown in 'disconnected' state with an SMQ BACKEND indicator.
- STO-INPUT - This status shows that the /STOP TMEMBER command has been issued for a specific member-name and no new input can be accepted.
- FLOOD - This status indicator shows that a specific TMEMBER is in a message flood condition and that the maximum input message count that was specified has been reached.

Additionally, the /DIS TMEMBER TPIPE command has been enhanced to show the number of input messages currently on the queue.

## OTMA Processing during Restart

- New OTMA=M option in DFSPBxx
  - ◆ Option to control OTMA functionality during all restarts including ERE
    - IMS does not enable OTMA during the system initialization
    - /START OTMA commands are not recovered during restarts
  
- /START OTMA NOCHECK
  - ◆ Command to start OTMA as a non-recoverable request during restart
    - Capability is introduced for OTMA=N users
  
- Also delivered in IMS V8 and IMS V9
  - ◆ IMS V8: PK14679, IMSV9: PK14680

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In addition to the existing OTMA values of Y and N, IMS V10 introduces the option of OTMA=M (manual). When IMS first initializes, the value of OTMA=M functions similarly to OTMA=N such that OTMA is not started. Once IMS is up and running, the /STA OTMA command can be issued but becomes non-recoverable. The setting of OTMA=M, therefore, takes effect when IMS terminates either normally or abnormally and has to be restarted. During restart processing, OTMA is not automatically restarted. This capability was introduced to prevent looping abend situations where IMS may have terminated as a result of OTMA error conditions.

An additional impact on OTMA restart processing is introduced for environments where IMS is initialized with OTMA=N. If a /START OTMA NOCHECK command is issued, the command is also not recovered during either a warm start or emergency restart.

## Migration Considerations

- Message flood control
  - ◆ Default limit of 5000 is set at initialization
    - To deactivate the function, define the INPUT parameter in the DFSYDTx descriptor or issue the /STA TMEMBER INPUT command
- Time-out
  - ◆ Default is set to 5 minutes
    - To deactivate the function, define the T/O parameter in the DFSYDTx descriptor or issue the /STA TMEMBER TIMEOUT command
- /DIS OTMA and /DIS TMEMBER command enhancements
  - ◆ Single line output has been expanded to two-line output in order to include DRU exit name info and time-out info.
  - ◆ New information in the /DISPLAY TMEMBER TPIPE provides the input message count

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The considerations listed on this visual address issues that should be considered when migrating from a previous release of IMS. The assumption is that migration to IMS V10 is based on existing functionality without adding any new capabilities during the migration process.

The message flood control enhancement in IMS V10 is automatically enabled with a default limit of 5000 messages. To provide compatibility with previous releases and deactivate the support, either specify an INPUT value of 0 in a descriptor or issue the /STA TMEMBER INPUT command.

Likewise, the timeout support for synchronous CM1 message is automatically enabled with a default value of 5 minutes. To provide compatibility with previous releases and deactivate the support, specify T/O value of 0 in a descriptor or issuing the /STA TMEMBER TIMEOUT command.

Note that the /DISPLAY command output associated with OTMA and TMEMBER requests has been expanded to two output lines and includes new information. As a migration consideration, this is a key issue for automated operations.

## OTMA Enhancements - Benefits

- Destination Routing support
  - ◆ Facilitates outbound messages through an architected OTMA layer
    - Minimizes the need for coding OTMA exit routines through descriptors
    - Enables growth of e-business environments using the IMS Connector for Java and the IMS SOAP Gateway
  
- Resume TPIPE security
  - ◆ Ensures that only authorized users can retrieve output messages in the hold queue
    - Supports IMS Connect clients using Resume TPIPE commands
  
- Message Flood protection
  - ◆ Provides a mechanism to prevent OTMA clients from flooding the IMS message queues and causing S40D abends

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The next three visuals summarize the enhancements in this section.

## OTMA Enhancements - Benefits...

- Time-out
  - ◆ Allows automatic detection and resolution of “hung” conditions identified as wait-synpoint or wait-RRS
  
- TPIPE clean-up
  - ◆ Greater efficiency of storage usage for OTMA control blocks
  
- Member level security
  - ◆ Greater control of security environment for OTMA
    - Allows different options on a member level

## OTMA Enhancements - Benefits...

- Asynchronous message enhancement
  - ◆ Super Member support
    - Ensures delivery of CM0 messages in a Shared Queues environment or with the use of IP load balancing techniques
  - ◆ Purge and Reroute
    - Provide greater control of output messages that cannot be delivered to original destination
  
- /DIS OTMA and /DIS TMEMBER output display enhancements
  - ◆ Provide more comprehensive information on the environment
  
- OTMA=M option and /STA OTMA with NOCHECK option
  - ◆ Protect IMS from restarting an OTMA system that has caused IMS to terminate abnormally



# IMS Connect Enhancements

## Highlights

- ACEE aging value support
- Client password change request
- RACF mixed case password
- CM1 timeout
- Message flood control
- Asynchronous message enhancements
  - ◆ Super member, Reroute and Purge Not Deliverable
  - ◆ Port affinity
  - ◆ Alternate clientid
- XML Adapter support
- IMS SOA Composite Business Application Support

IMS Connect provides several usability, availability and security enhancements.

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## ACEE Aging Value Support

- New OAAV parameter in the DATASTORE statement of the HWSCFGxx file
  - ◆ OTMA ACEE aging value in seconds
    - 0 to 2147483647 (x' 7FFFFFFF' in OTMA)
      - Values between 0 and 300 are reset to 300
    - Example: DATASTORE ID=... OAAV=360
  - ◆ OTMA aging value in effect can be displayed
    - ◆ VIEWHWS/VIEWDS command output
    - ◆ MVS Modify Command QUERY MEMBER and QUERY DATASTORE output
      - Example: RACF APPL NAME=  
OTMA ACEE AGING VALUE=360

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The Access Control Environment Element (ACEE) is a control block that represents a verified userid to IMS. The ACEE is used to determine the user's authorization to the IMS command or IMS transaction requested in the input message. Once built in OTMA, the ACEE for each userid is cached and the aging value associated with each OTMA client, e.g., IMS Connect, is kept in a table. The aging value is then used to determine when the cached control block should expire and be refreshed. IMS re-creates the ACEE if a message associated with the userid is received but the age of the current ACEE is greater than the aging value. The aging value is used to balance performance (possible RACF I/O to refresh the ACEE) and integrity. For IMS Connect, the ACEE expiration value is specified during the client-bid process and is set to a default of no expiration.

IMS V10 provides a new parameter, OAAV, in the DATASTORE statement of the HWSCFGxx file for specification of an OTMA ACEE aging value. If not specified, the default continues to be 2147483647 which, in essence, means no expiration and is the maximum value supported by OTMA.

The VIEWHWS, VIEWDS, QUERY MEMBER and QUERY DATASTORE command output displays have all been enhanced to show the aging value that is in effect for the associated environment.





## Client Password Change Request

- New mechanism for a remote client to request that a SAF/RACF password be changed
 

**HWSPWCH** old-password / new-password-1 / new-password-2

  - Where new-password-1 and new-password-2 are the same value
- HWSPWCH
  - ◆ Defined keyword supported by HWSSMPL0, HWSSMPL1, HWSJAVA0
  - ◆ To enable the function
    - HWSPWCH0 address must be established in the exit routine
      - Include the HWSPWCH0 object code
      - Define 'INCLUDE TEXT(HWSPWCH0)' statement in the Binder JCL

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IMS Connect provides a new mechanism that allows a remote client to request that the SAF/RACF password associated with a userid be changed.

As provided, the new capability will be supported in the HWSSMPL0, HWSSMPL1 and HWSJAVA0 exit routines. The routines check for a leading keyword of 'HWSPWCH' to determine whether it is a request to change the password. This 'HWSPWCH' string can be viewed as a transaction code but new logic in the routine, HWSPWCH0, is called to process the special request. HWSSMPL0, HWSSMPL1 and HWSJAVA0 can be modified to define the HWSPWCH constant with a unique keyword value other than 'HWSPWCH'.

The exit routines pass HWSPWCH0 the request keyword length in IMSEA\_PWCHKEYL field. This allows HWSPWCH0 to process the password change request independently from the request keyword. After regaining control, the exit routines check the return code in register 15. A zero return code means the request is successful. If it is a non-zero return code, the exit routine checks the IMSEA\_ERCD field for a valid error code, and replies back to the client with an error message specified in IMSEA\_MSGTEXT and IMSEA\_MSGLEN fields.

In order to establish the HWSPWCH0 address, the HWSPWCH0 object code must be included in the exit routine and an 'INCLUDE TEXT(HWSPWCH0)' statement added to the exit routine JCL for the binder (link-edit) step. During execution, if a request for password change is received and the HWSPWCH0 address does not exist, the exit routine will send a message back to the client stating that the password change function is not supported.

## Client Password Change Request ...

- Remote client support
  - ◆ IMS TM Resource Adapter (formerly IC4J)

```
LLLL | IRM | OTMA | LLZZ HWSPWCH old-password / new-password1 / new-password2 / EOM
```

- ◆ Other clients

```
LLLL | IRM | LLZZ HWSPWCH old-password / new-password1 / new-password2 / EOM
```

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The password change support in HWSJAVA0 can be invoked by the IMS TM Resource adapter (formerly called IMS Connector for JAVA or IC4J) client. After the OTMA headers, the message sent begins with the defined keyword HWSPWCH followed by the old and new passwords.

Similarly, other clients that invoke exit routines based on HWSSMPL0 or HWSSMPL1 can supply the HWSPWCH request after the IRM header.

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## RACF Mixed Case Password Support

- Enhancement to enable RACF mixed case passwords
  - ◆ PSWDMC parameter in HWS statement in IMS Connect HWSCFGxx
 

HWS ...PSWDMC = Y | N
  - ◆ IMS Connect command
 

SETPWMC ON | OFF
  - ◆ IMS Connect UPDATE command
 

F imskonproc, UPDATE MEMBER TYPE(IMSCON) SET (PSWDMC(ON | OFF))
- Requires that RACF support is enabled
 

RACF SETROPTS(MIXEDCASE)

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The support for RACF mixed case password in IMS Connect is aligned with the IMS V10 support for mixed case passwords. The capability in IMS Connect allows the password to be preserved exactly as the remote client provided and pass the string to RACF without translation to upper case.

The function can be turned on as follows:

A new parameter, PSWDMC= in the HWS= statement, defines the option of mixed case passwords where PSWDMC=N is the default. This setting can be changed using the IMS Connect SETPWMC or UPDATE command.

IMS Connect also provides a command, SETPWMC, that can override the HWSCFGxx specification.

The PSWDMC keyword is also available to the IMS Connect UPDATE command as another way to request the support.

The IMS Connect support requires that RACF enable mixed case passwords through the RACF SETROPTS(MIXEDCASE) command. Note that the RACF enablement of this support does not constitute the IMS Connect usage of this support. Also note that the mixed case support for IMS Connect can only take effect when RACF is enabled.

## CM1 (Send-then-Commit) Time-out Control

- Time-out Control capability for CM1 interactions
  - ◆ Supports the associated function in the OTMA Enhancements section
    - Resolves “Wait-Syncpoint” and “Wait-RRS” situations
  
- New **ACKTO=** parameter in the DATASTORE statement of the HWSCFGxx file
  - ◆ ACKTO = 0 to 255 seconds. Default in OTMA is 120.
    - Example: 

DATASTORE ID=..., ACKTO=120
-----------------------------
    - Adjustment of values:
      - If specified as 0, reset to 120 or value specified in OTMA
      - If specified outside the 0-255 range, reset to the OTMA value
      - Not accepted if value is greater than value in OTMA set by descriptor or command

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IMS Connect supports the new OTMA time-out control function for send-then-commit CM1 interactions. OTMA provides a default value of 120 seconds after which transactions that are held in “Wait-Syncpoint” or “Wait-RRS” status are released and backed out. If provided, the value in the ACKTO parameter of the IMS Connect configuration DATASTORE statement is passed to OTMA during client-bid processing.

Note the following considerations:

A specified value of 0 is reset to 5.

Any value specified in error between 60 and 255 is reset to 60.

Any value outside the 0-255 range Results in an Abend U3401.

Value cannot be greater than what is defined in OTMA - If the CM1TO value is equal to or greater than the time-out specified in IMS by an OTMA descriptor or /STA TMEMBER command, OTMA will ignore the IMS Connect request. On the other hand, if the CM1TO value is less than the current time-out value set by the OTMA descriptor or command then the value which is passed to IMS by the IMS Connect client-bid process will be used for the time-out action for this member.

## CM1 (Send-then-Commit) Time-out Control ...

- Command support
  - ◆ VIEWHWS, VIEWDS, QUERY MEMBER, QUERY DATASTORE
    - Display output

```
...  
OTMA ACEE AGING VALUE=value  
OTMA CM1 TIMEOUT VALUE=value
```

- If time-out occurs
  - ◆ Remote Client receives a deallocate of the connection and an RSM status message

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IMS Connect command output has been enhanced to display the CM1 timeout value. The applicable commands include: VIEWHWS and VIEWDS output command and the MVS MODIFY command for QUERY MEMBER and QUERY DATASTORE.

## Message Flood Control

- Capability that monitors the growth of active input messages
  - ◆ Supports the associated function in the OTMA Enhancements section
    - Prevents flooding IMS with input messages if they cannot be processed in a timely manner
  
- New **MAXI=** parameter in the DATASTORE statement of HWSCFGxx
  - ◆ MAXI = 0 to 9999. Default in OTMA is 5000.
    - Example: `DATASTORE ID=..., MAXI=5000`
    - Adjustment of values:
      - If specified as 0, reset to 5000
      - Between 0 and 200, reset to 200
      - Between 9999 and 65535, reset to 9999
      - If specified outside the 0-65535 range, Abend U3401
      - Not accepted if value is greater than value in OTMA set by descriptor or command

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IMS Connect also takes advantage of the OTMA Message Flood Control capability to automatically monitor the growth of active input messages. OTMA provides a default value of 5000 messages after which input messages from a specific IMS Connect instance will be rejected. If provided, an override value in the MAXI parameter of the IMS Connect configuration DATASTORE statement is passed to OTMA during client-bid processing.

Note the following considerations:

A specified value of 0 is reset to 5000.

A value between 0 and 200 is reset to 200.

Any value specified in error between 9999 and 65535 is reset to 9999.

Any value outside the 0-65535 range Results in an Abend U3401.

Value cannot be greater than what is defined in OTMA - If the MAXI value is equal to or greater than the INPUT value specified in IMS by an OTMA descriptor or /STA TMEMBER command, OTMA will ignore the IMS Connect request. On the other hand, if the MAXI value is between 1 and 200, a value of 200 will be sent to IMS. If the IMS Connect value is less than the value specified in OTMA, then the IMS Connect MAXI value will be used.

## Message Flood Control ...

- Command support
  - ◆ VIEWHWS, VIEWDS, QUERY MEMBER, QUERY DATASTORE

- Display output

```
...  
OTMA ACEE AGING VALUE=value  
OTMA CM1 TIMEOUT VALUE=value  
OTMA MAX INPUT MESSAGE=value
```

- If input messages are rejected due to message flood protection
  - ◆ Remote Client receives RSM status message

IMS Connect command output has been enhanced to display the maximum input message value. The applicable commands include: VIEWHWS and VIEWDS output command and to the MVS MODIFY command for QUERY MEMBER and QUERY DATASTORE.

## Asynchronous Message (CM0) Enhancements

- Functions that are documented and described in the OTMA Enhancements section
  - ◆ Super member support
  - ◆ Reroute
  - ◆ Purge

There are several enhancements for CM0 processing that are described in detail in the OTMA Enhancements section. The detail in the OTMA section includes specifics for IMS Connect.

## Resume TPIPE Enhancements - Port Affinity

- Enhancement to ensure proper delivery of CM0 (Commit-then-Send) messages to the correct Resume TPIPE *clientid* requestor
  - ◆ Supports environments that require concurrent requests using the same clientid across multiple ports
  - ◆ New PORTAFF= parameter in the TCPIP statement of the HWSCFGxx file

```
TCPIP ...MAXSOC=...,PORTAFF= Y | N, PORTID=...
```

- ◆ Also delivered in previous releases
  - IMS Connect with IMS V9: PK23660
  - IMS Connect V2.2: PK17072

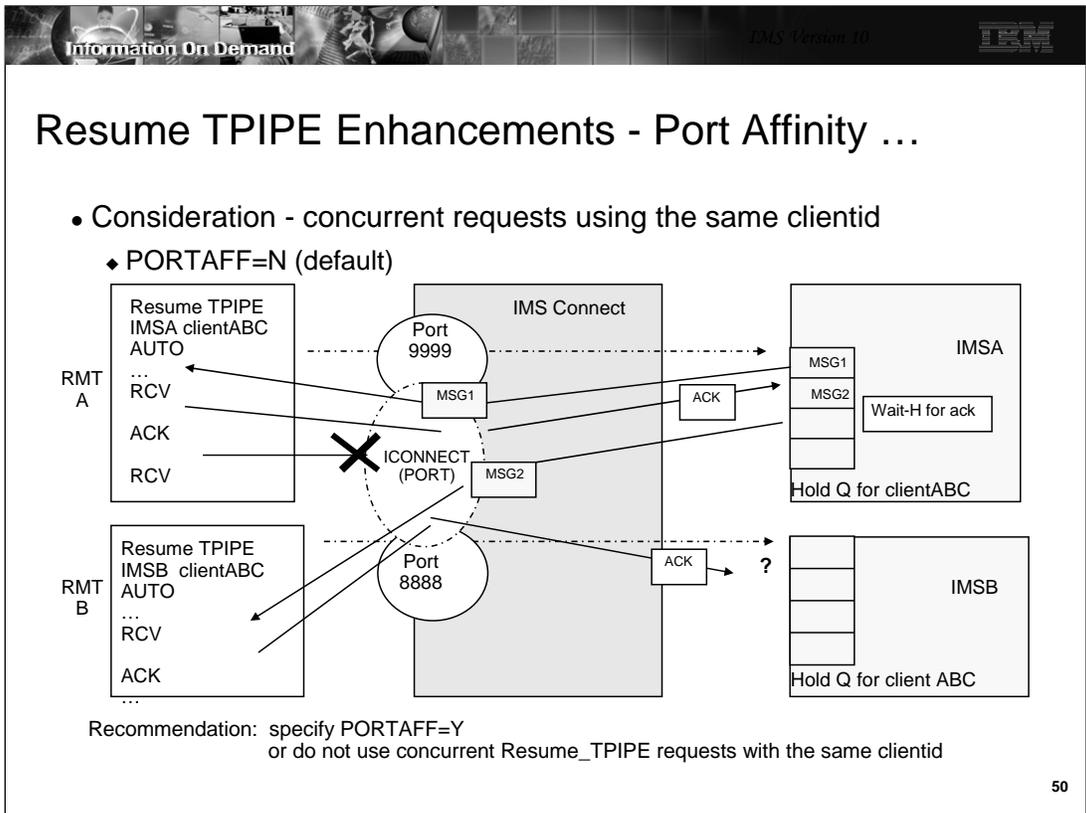
49

Using concurrent Resume TPIPE connection requests of the same clientid across several ports may cause problems such as keeping an IMS OTMA TPIPE in WAIT-H status. To address the issue and support this concurrency requirement, IMS Connect provides a new parameter to enforce all the correlated interaction such as the retrieval of a message and associated ACK or NAK to the same remote client instance. The PORTAFF parameter in the TCPIP statement controls whether commit-then-send (CM0) output messages sent by IMS to an IMS Connect system have affinity to the port on which IMS Connect received the original input message.

When PORTAFF=Y is specified, IMS Connect returns all CM0 output for this IMS Connect client through the same port on which it received the original input message.

When PORTAFF=N is specified, IMS Connect attempts to return the CM0 output to the first client it finds on any available port with an outstanding request from this clientid.

NOTE: If running in a sysplex environment that has implemented redundancy, load balancing, and supermember support, etc., PORTAFF=N is a reasonable choice. Using the same instance of a single clientid across multiple ports is not recommended.

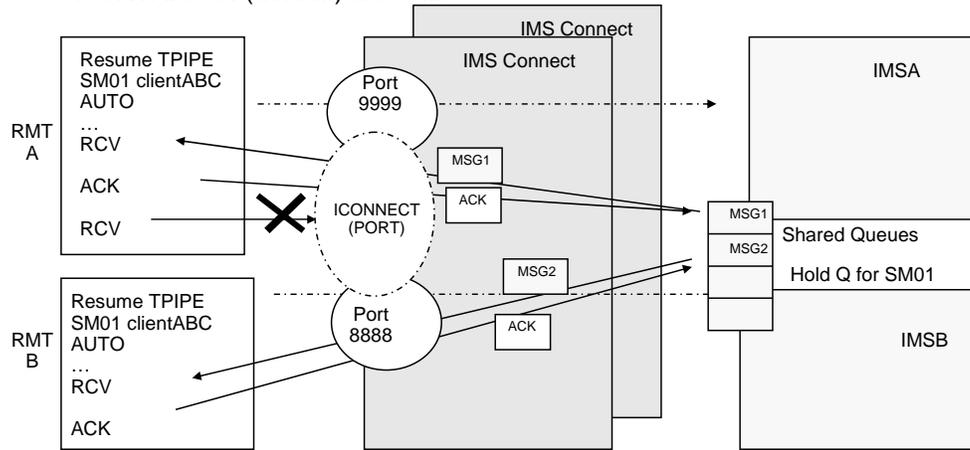


As mentioned in the previous visual, when PORTAFF=N, IMS Connect attempts to return the CM0 output to the first port found on which the client ID of this IMS connect is present. PORTAFF=N is the default. There is a consideration in this area because if a message is retrieved from the Hold Queue, then the PORTID in OMUSER\_PORTID is ignored and IMS Connect assumes the portid is the generic ICONNECT port. This assumption tends not to be a problem unless an error such as a connection failure occurs. When that happens and a message has been received in IMS Connect for delivery, IMS Connect scans all the ports under the generic ICONNECT port and delivers the message to the first one that it finds.

The example on this visual shows a situation where two Resume\_TPIPE AUTO requests specifying the same clientid, clientABC, are sent into a single IMS Connect. One request (from RMTA) is sent to IMSA and the other (from RMTB) is sent to IMSB. IMSA has two messages, MSG1 and MSG2, on the Hold Queue. IMSB has no messages at the moment and so clientABC on RMTB just waits. IMSA sends MSG1 to IMS Connect which delivers the message to the outstanding request for clientABC on RMTA which responds with an ACK. In this scenario the connection fails for one of several reasons - ACK timeout, network problem, etc. Since the Resume\_TPIPE had originally specified AUTO, IMSA sends MSG2 after the ack for MSG1 is received. When IMS Connect receives the message, it detects that the connection to RMTA is no longer there and scans the ports under ICONNECT to find the first one available. IMS Connect sends MSG2 to the waiting clientABC on RMTB. This instance of ClientABC retrieves the message and sends an ACK back to IMSB which is not expecting an ACK. Meanwhile, IMSA's Hold Queue for clientABC is in WAIT-H status waiting for an ACK that will never be received.

## Resume TPIPE Enhancements - Port Affinity ...

- In a Sysplex Distributor, Super Member, Shared Queues environment
  - ◆ PORTAFF=N (default) is feasible



In an environment that supports full redundancy including Shared Queues, Super Member support, Sysplex Distributor, etc., specifying PORTAFF=N is feasible. This configuration with concurrent Resume\_TPIPE clients using the same clientid presumes that any of the remote clients can retrieve any of the messages.

## Resume TPIPE Enhancements - Alternate Clientid

- Capability to request and retrieve asynchronous output messages that are queued to another client
  - ◆ Supports a generic or server application that retrieves messages originally destined for another application
  - ◆ Resume TPIPE request specifies an alternate clientid
    - OTMA delivers output messages queued to the alternate name to the requesting application
  - ◆ Note: this new support differs from but leverages the Reroute capability which only addresses undeliverable and/or NAK'ed messages

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IMS Connect introduces a new protocol that allows client applications to specify an alternate clientid in the RESUME TPIPE request. IMS Connect forwards the alternate clientid to OTMA, and OTMA returns the asynchronous messages that are queued to the TPIPE of the alternate clientid name to the client application that issued the Resume TPIPE request.

This Alternate Clientid function differs from the Reroute capability that was discussed earlier. Reroute requests address the situations when messages cannot be delivered or are NAK'ed. In these situations, OTMA queues the message onto the TPIPE name associated with the reroute request when the undeliverable condition occurs. The Alternate Clientid function, on the other hand, supports Resume TPIPE requests that retrieve messages which are already queued to a TPIPE name but the name is different. This new capability could be used to provide a programmable solution in the OTMA/IMS Connect environment that is comparable to the way that IMS users can assign an LTERM and all messages queued to it to a different node.

## Resume TPIPE Enhancements - Alternate Clientid ...

- Supported by IMS Connect user message exits
  - ◆ HWSSMPL0, HWSSMPL1, HWSSOAP1, HWSJAVA0
    - IRM Header
      - IRM\_RT\_ALTCID 8 bytes specifying the alternate clientid
        - Occupies same offset as reroute name IRM\_REROUT\_NM field
    - OTMA header
      - OMUSR\_RT\_ALTCID 8 bytes specifying the alternate clientid
        - Occupies the same offset of OMUSR\_REROUT\_NM field
- Resume TPIPE security (discussed in the OTMA section)
  - ◆ IF RIMS|Rxxxxxxx resource class is enabled
    - Required userid access to the alternate clientid (TPIPE)

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This support applies to: remote client applications that invoke user message exits HWSSMPL0 and HWSSMPL1; IMS SOAP Gateway client applications using user message exit HWSSOAP1; IMS Connector for Java (IC4J) client applications using user message exit HWSJAVA0; and any other user-written IMS Connect message exits. No support is provided for the local option, HWSIMSO0 and HWSIMSO1.

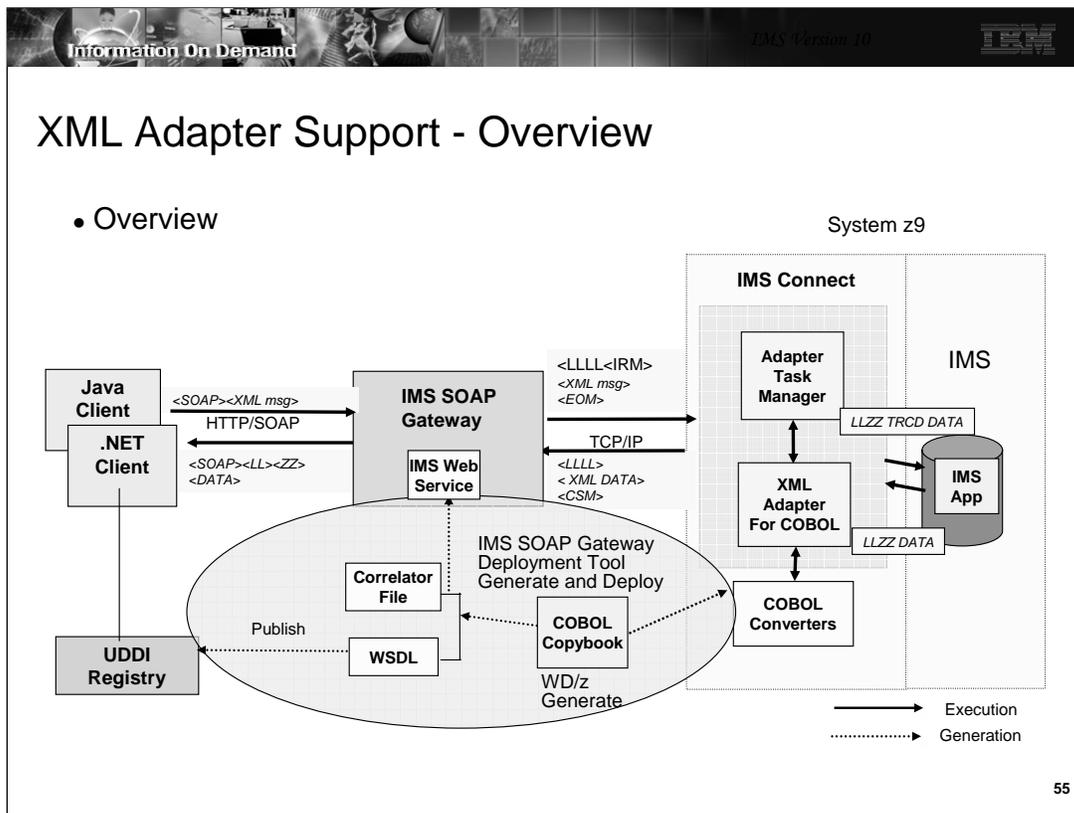
To take advantage of the new capability, optional fields have been added to both the IRM and OTMA headers. Either field, IRM\_RT\_ALTCID in the IRM or OMUSR\_RT\_ALTCID can be used to set a valid alternate clientid value. The feature is not enabled if the fields are both set to blanks.

## XML Adapter Support

- Capability that supports translation between XML messages and IMS messages
  - ◆ IMS Connect client, e.g., IMS SOAP Gateway (available with IMS V9)
    - Sends an XML message with a request for translation
  - ◆ IMS Connect
    - Inbound: invokes the XML Adapter to translate message for IMS
      - Removes XML tags
      - If necessary, convert from UNICODE to EBCDIC
    - Outbound: invokes the XML Adapter to prepare an XML message
      - If necessary, convert from EBCDIC to appropriate UNICODE encoding schema
      - Create XML tags
- IMS V9 Support - PK24912, PK29938

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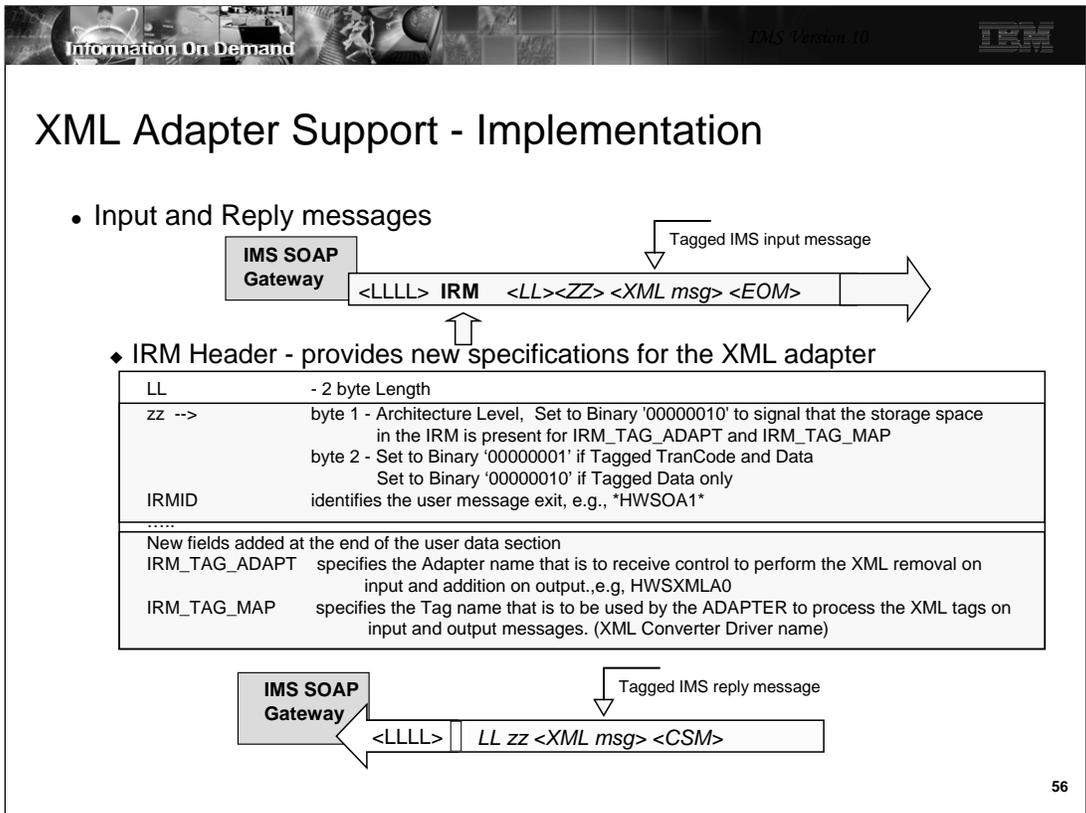
The XML Adapter support opens up IMS Connect to: receive and recognize messages containing XML tags; provide the conversion into a message format for IMS including unicode to EBCDIC translation if needed; receive IMS Application reply messages that do not contain XML tags; and perform the conversion to XML as well as any EBCDIC to unicode translation prior to replying to the remote client.



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This overview visual shows the current supported configuration for the XML Adapter Support in IMS Connect. The IMS Soap Gateway is an IBM-provided function that must be at a minimum level of V9.2 to take advantage of the XML Adapter in IMS Connect.

WebSphere Developer for zSeries (WDz) supports the generation of XML Converters for COBOL applications using COBOL copybooks. The XML Adapter support in IMS Connect, in conjunction with the generated WDz XML Converters, facilitates the conversion of XML transactional requests into byte stream application data structures, and vice versa. Clients can send transactional requests in XML to IMS Connect, where the XML Adapter calls the user specified WDz XML Converter to convert it to byte streams that the IMS application understands, and then IMS Connect sends it to IMS. Responses when received by IMS Connect will be converted to XML before being sent back to the clients. Each IMS application expects its messages to be in a certain data structure; therefore, one XML Converter is needed for each IMS application.



Input messages must adhere to the application protocol, as defined and documented for IMS Connect, by providing an IRM header that provides the name of the message exit routine that is to be called. For XML Adapter support, the IRM provides flags and values that can be used to invoke the appropriate functions.

The IRM header always begins with an LL (2 byte length field) followed by 2 bytes that are usually zeroes for non-XML message processing. When the XML Adapter is to be invoked, the first zz byte can be used to signal the inclusion of 16 bytes in the user data section of the IRM header for specification of the TAG and ADAPTER names. The second byte details whether the tagged data includes the trancode or not.

At the end of the of the user data section, two fields provide the information for the XML environment:

The IRM\_TAG\_MAP field provides 8 bytes to specify the TAG name. This is the name of the COBOL Driver, the XML or whatever is required for the Adapter to call or use to perform the XML transformation.

The IRM\_TAG\_ADAPT field provides 8 bytes to specify the ADAPTER name. This is the name of the routine that is to gain control from IMS Connect to remove/add the XML tags, defined by the TAG name. The same Adapter that processes the input message (removes the XML Tags) will be required to process the output message (add the XML Tags).

Reply messages are sent back by IMS connect in tagged format. When the message is sent by IMS to IMS Connect, the user message exit invokes the Adapter to process the byte array data and convert it to XML tagged data before sending the message to the remote client.

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## XML Adapter Support - Implementation ...

- Configuration file HWSCFGxx
  - ◆ ADAPTER statement
 

```
...
DATASTORE ID=...
ADAPTER XML=Y|N
```
- New PROCLIB member, e.g., HWSEXIT0
  - ◆ EXITDEF statement
    - Contains XML Adapter (HWSXMLA0) definitions
 

```
EXITDEF(TYPE=XMLADAP,EXITS=(HWSXMLA0),
        ABLIM=8,COMP=HWS)
```
- BPE Configuration file BPECFGxx
  - ◆ EXITMBR statement
 

```
EXITMBR=(HWSEXIT0,HWS)
```

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To enable the support in IMS Connect, several definitions have to be created:

A new ADAPTER statement in the HWSCFGx file provides the option of identifying the presence or absence of the XML adapter support. The parameter XML= provides two values. XML=Y/N. Y(es) requests the XML adapter function. The default of N(o) disables the function.

The only adapter that is currently supported is the IBM-provided Cobol Adapter HWSXMLA0. The definitions for the adapter are provided in an EXITDEF statement in a special PROCLIB member. The name of the member can be HWSEXIT0, as shown in this example, or it can be any name that is meaningful to the installation. The name that is chosen must also be defined to IMS in the BPE configuration file statement EXITMBR. The values of the EXITDEF statement are as follows:

TYPE=XMLADAP must be coded as is and defines the exit as an XML adapter plug-in to IMS Connect.

EXITS=HWSXMLA0 also must be coded as shown for the IBM-supplied Cobol Adapter.

ABLIM = 0 (unlimited), 1, up to 2,147,483,647 defines the abend limit which is the number of times the XML ADAPTER can abend before it is disabled

COMP=HWS must also be coded as is and requests the HWS component of IMS Connect.

IMS Connect detects the name of the PROCLIB member which contains the adapter information in the EXITDEF statement in the BPE configuration file.

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## XML Adapter Support - Implementation ...

- User Message Exit HWSSOAP1
  - ◆ OCO
  - ◆ IRMID \*HWSOA1\*
    - Existing functions as in other exits
    - New functions
      - RXML - Process client XML input
      - EXML - Process adapter output error
    - New fields in the EXPRM parameter list
      - EXPRXML\_TAGNM
      - EXPRXML\_ADPTNM
      - EXPRXML\_RETCODE
      - EXPRXML\_RSNCODE

**IMS Connect**

```

graph TD
    subgraph IMS_Connect [IMS Connect]
        HWSSOAP1[HWSSOAP1 Exit routine]
        ATManager[Adapter Task Manager]
        XMLAdapter[XML Adapter For COBOL]
        HWSSOAP1 <--> ATManager
        ATManager <--> XMLAdapter
    end
  
```

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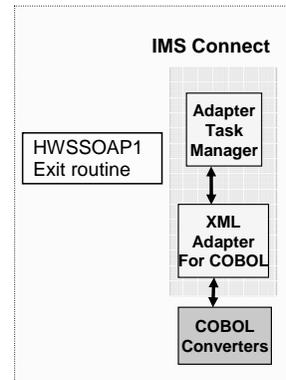
IMS Connect provides a new user message exit routine that specifically understands the XML interface. In addition to the existing message functions of READ, XMIT, INIT and TERM, the new exit routine, HWSSOAP1, includes new interfaces: RXML and EXML. On input from the IMS Connect Client Application, IMS Connect calls HWSSOAP1 with the function type set to 'RXML' which translates the IRM header and returns the ADAPTER name and the TAG name back to IMS Connect. Upon returning to IMS Connect, error analysis will be performed. If an error exists, function 'EXML' is invoked to process the error message. If no error exists, IMS Connect calls and passes control to the ADAPTER passing a set of parameters which determine: if this ADAPTER should process the message; if translation is required or not; and what XML processing is required. When the reply is ready to be sent back, IMS Connect receives the message and invokes the 'XMIT' function. Again the ADAPTER is called to prepare the reply in a tagged format.

New fields in the EXPRM parameter list include the following:

- EXPRXML\_TAGNM Defines an output field and contains the TAG NAME to be used by the ADAPTER, the TAG name would represent one of the following: XMI name for user purposes, COBOL Driver name for IMS Connect support of COBOL ADAPTER, user Map Name for user purposes
- EXPRXML\_ADPTNM Defines an output field and contains the Adapter name to be used by IMS Connect to load the correct ADAPTER.
- EXPRXML\_RETCODE - Return code returned by the User Message Exit back to IMS Connect.
- EXPRXML\_RSNCODE - Reason code returned by the User Message Exit.

## XML Adapter Support - Implementation ...

- XML converter routines
  - ◆ Cobol source code
    - Provide the information needed to perform conversion from tagged data to a byte stream
      - Unique to each message definition
    - Can be generated by WDz toolkit
  - ◆ Compiled and bound into file that is concatenated into IMS Connect STEPLIB



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To perform correct conversion for each message, the Adapter requires information on how this is to be done. This information is called an XML Converter. XML Converters are Cobol programs generated from WebSphere Developer for zSeries (WDz) using the target IMS COBOL application's copybook. For each copybook, WDz generates three COBOL programs - an Inbound Converter (XML schema), an Outbound Converter (XML schema), and a Driver (Cobol code). These three programs are combined into one file and are referred to as an XML Converter. An XML Converter has to be created for each IMS COBOL transaction application that wants to support XML transaction messages. For details on generating XML Converters using WDz, see the WDz documentation.

On an inbound request to IMS, the XML Adapter calls the COBOL XML Converter Driver and passes it the inbound function code. The COBOL XML Converter Driver calls the Inbound Converter to parse the incoming XML message, convert the parsed message into the COBOL data structure byte streams, and then return it to the XML Adapter. On an outbound reply from the IMS application program, the XML Adapter calls the COBOL XML Converter Driver with an outbound function code, which then calls the Outbound Converter. The Outbound Converter converts the IMS output message into XML and passes it back to the XML Adapter which then sends it to IMS Connect to be sent back to the client.

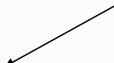
## XML Adapter Support - Implementation ...

- IMS Connect JCL

```
                IMS Connect

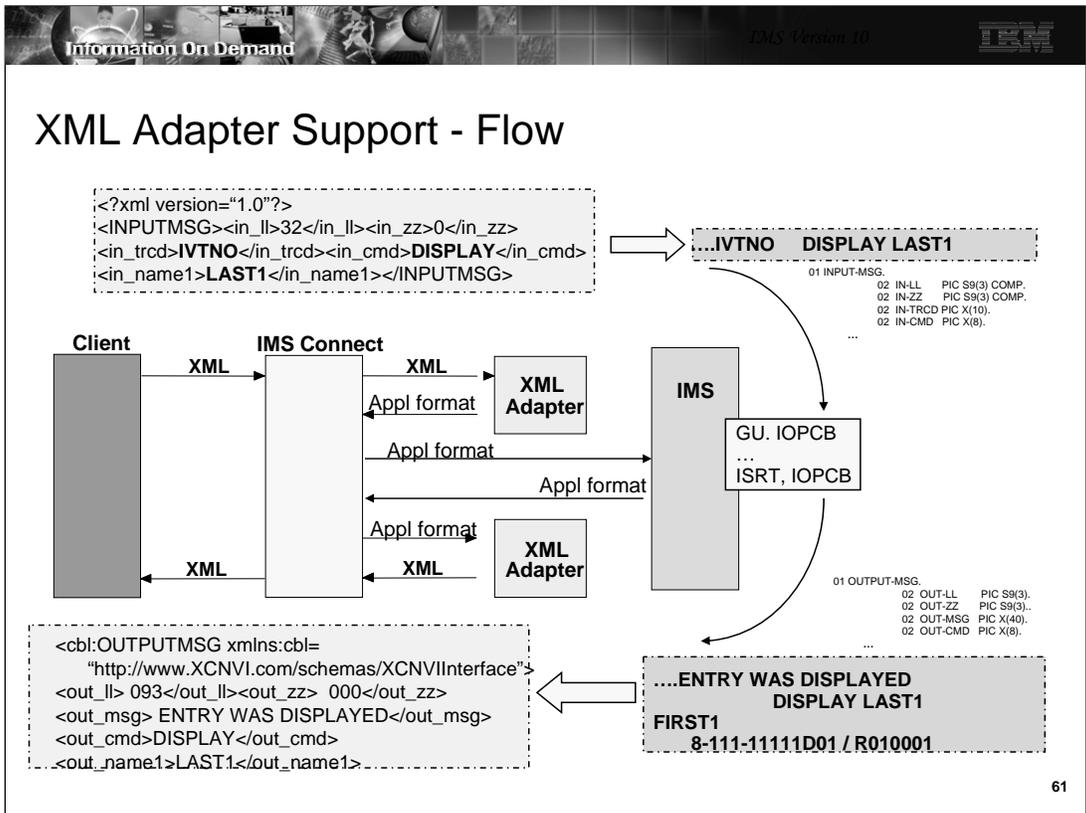
//HWS  PROC
//STEP1 EXEC PGM=HWSHWS00, REGION=5M,
// PARM='BPECFG=BPECFG00, HWSCFG=HWSCFG00'
//STEPLIB DD DISP=SHR,DSN=IMS10.SDFSRESL
//*       SSL SUPPORT DATASETS
//       DD DISP=SHR,DSN=CEE.SCEERUN
//       DD DISP=SHR,DSN=SYS1.CSSLIB
//       DD DISP=SHR,DSN=GSK.GSKLOAD
//*       COBOL XML CONVERTER DRIVERS
//       DD DISP=SHR, DSN=IMS.XML.DRIVERS
//PROCLIB DD DISP=SHR,DSN=IMS10.PROCLIB
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//HWSRCRD DD DISP=SHR,DSN=IMS10.HWSRCRD
```

APF authorized



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The Cobol XML Converter routines must be added into an APF-authorized library that it concatenated into the STEPLIB list of the IMS Connect startup JCL.



This visual gives a high level view of the flow of messages. When an IMS Connect Client sends a transaction message in XML to IMS Connect, IMS Connect receives the input message and checks a flag in the IRM that indicates whether the input message is in XML or not. If it is XML, IMS Connect calls the XML Adapter. The XML Adapter converts the XML input message into the COBOL Application input data structure, sends it back to IMS Connect. IMS Connect processes the returned stream and forwards it on as an LLzz\_trancode\_data message to IMS so that the IMS Application can process the input message. The IMS COBOL Application returns an output message to IMS Connect. IMS Connect again calls the Adapter. The XML Adapter converts the IMS COBOL Application output message into an XML output message, sends it back to IMS Connect. IMS Connect processes the message from the XML Adapter and sends the XML output message to its Client.

The IMS COBOL Application is not aware of any message conversions. It receives messages in the same application specific format as it normally expects. The diagram below shows the message formats received by each component.

## XML Adapter Support - Considerations ...

- Error messages are sent back to the remote client in XML tags
  - ◆ XML Converter Driver and XML Adapter errors
    - `<XMLAdapterError> </XMLAdapterError>`
      - If message can be converted to codepage
        - `<XMLAdapterError>HWS..... </XMLAdapterError>`
          - Several new HWS... error messages have been added
        - Otherwise, XML Adapter Status Message (XASM)
          - `llzz*XADPST* rc rs`
            - where rc= 4 byte return code, rs= 4 byte reason code
    - ◆ IMS errors
      - `<IMSDFSMMessage>DFS.....</IMSDFSMMessage>`

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There are two types of runtime errors generated in the XML Adapter - the errors from WDz COBOL XML Converter Drivers, and the errors from the XML Adapter. Both types of error messages are returned from the XML Adapter in XML-tagged messages if the output codepage is available. IMS Connect does not distinguish between the two types of errors. If the output codepage is not available, the XML Adapter returns a XML Adapter Status Message (XASM). The XASM includes a return and reason code to indicate the type of error.

Besides these two types of errors, the XML Adapter also passes other error messages from/to IMS Connect, for example, the DFS error messages generated by IMS transactions. For any DFS messages, either errors or non-errors, the XML Adapter wraps the messages with XML tags and passes them back to the caller. The DFS message in XML format is defined as `<IMSDFSMMessage>DFS.....</IMSDFSMMessage>`.

## XML Adapter Support - Considerations ...

- IMS Connect Restart
  - ◆ Required when new XML Converters are to be changed
    - Adding or deleting an XML Converter does not require a restart
  
- BPE UPDATE command to refresh the Adapter exit
  - F ICONN01, REF USRX NAME(XMLADAP)
  - Value:
    - Refresh request to bring in a new version of the ADAPTER plug-in user exit routine
  
- LE environment is required
  - ◆ XML Adapter brings up an LE environment during initialization
  
- Restriction
  - ◆ Single-segment messages only (multi-segment support is coming)

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An IMS Connect restart is required to recognize any changes that have been made to the dataset containing the XML Converters. On the other hand, a refresh of the Adapter exit routine can be done while IMS Connect is active by using the BPE refresh capability.

Note that the COBOL XML Converter Driver requires an LE environment to run. The XML Adapter brings up an LE environment during its initialization processing.

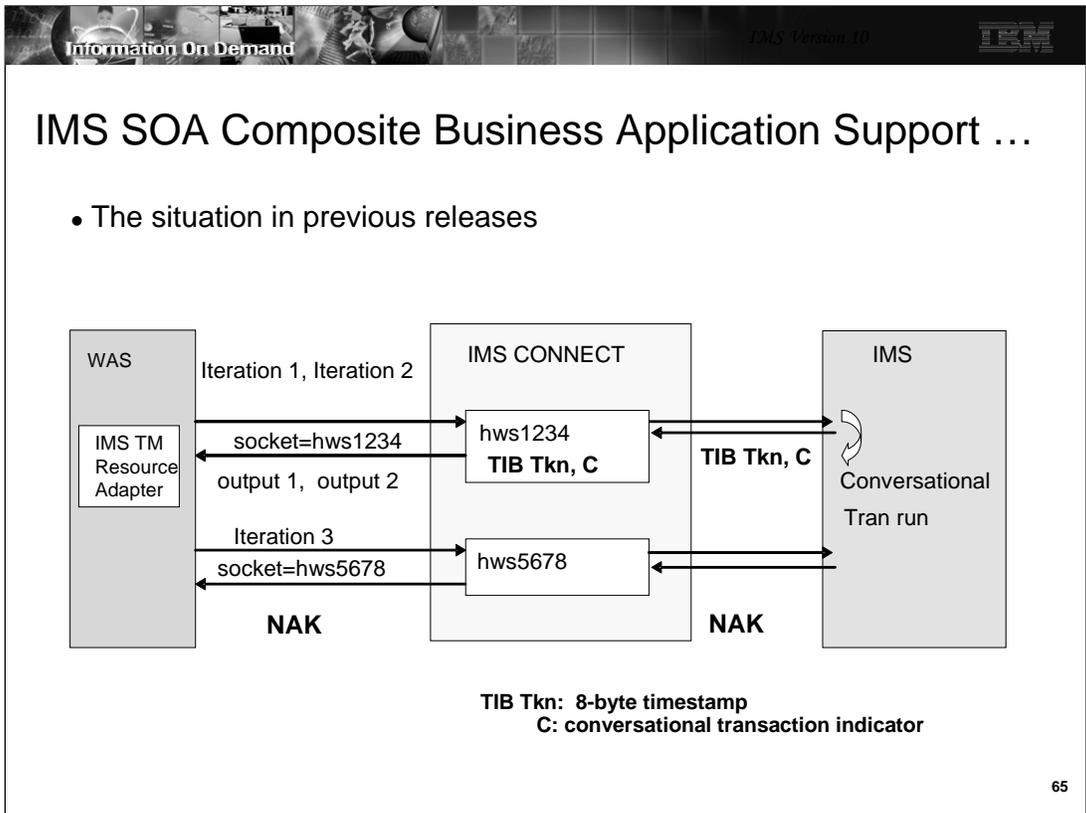
## IMS SOA Composite Business Application Support

- New capability for IMS TM Resource Adapter clients that invoke IMS conversational transactions
  - ◆ Allows iterations of the conversation to span shareable persistent sockets
    - Application Server on which IMS TM Resource Adapter runs may use different sockets for each iteration
    - IMS TM Resource Adapter client does not have control of the socket that is used
- Supports the WebSphere Process Server
  - ◆ Process Choreography function

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IMS TM Resource Adapter (formerly IC4J) applications running in a WebSphere Application Server (WAS) can take advantage of either dedicated or shareable persistent sockets. A dedicated persistent socket remains dedicated to a particular user-specified clientid for commit-then-send CM0 interactions until released by a client application's request. Shareable persistent sockets, on the other hand, can be shared (serially reused) by multiple applications in the WAS server running either send-then-commit CM1 or commit-then-send CM0 interactions. For the latter type of socket, IC4J generates a clientid and does not allow user-specified clientid's.

Although the IMS TM Resource Adapter has supported interactions with IMS conversational transactions, IMS V10 enhances this capability by allowing the iterations between a conversation to span multiple shareable sockets.



This visual discusses the flow and a potential issue in the existing implementation.

The first request from the IMS TM Resource Adapter application invokes the first iteration of an IMS conversational transaction flow. The IMS TM Resource Adapter either uses an existing shareable persistent socket connection or generates a new one. For this example, the generated clientid is hws1234. At this point, neither the remote client nor IMS Connect are aware of whether the input is a conversational transaction. When the first reply message for this conversational iteration is created, IMS includes a conversational indicator (C) and a Transaction Instance Block token (TIB Tkn) in the message prefix that is sent back to IMS Connect. IMS Connect then saves these two pieces of conversational information in an internal control block associated with the clientid, hws1234. IMS Connect also sends the C indicator and the TIB Tkn with the output of the first iteration to the IMS TM Resource Adapter which returns them to the Java application.

When the second iteration of the same conversation begins, the message is routed to one of the shareable sockets in the pool. If the second iteration comes in through the same socket hws1234, IMS Connect uses the saved information in its internal control block to associate this conversation iteration with the previous one.

If the third iteration is routed to a different socket in the WAS pool, for example, HWS5678, IMS Connect cannot associate the request with the intended internal control block (hws1234) and the conversation information saved in it. IMS Connect, therefore, creates a different internal control block for hws5678 which has no knowledge of the existing conversation. When IMS receives the the input, it rejects the request with a NAK.

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## IMS SOA Composite Business Application Support ...

- New conversation option for IMS TM Resource Adapter requests
  - ◆ IMS conversational transaction process choreography request
    - Set in the first input message

HWSOMUSR: User Data Header				
Field	Length	Hex Offset	FieldValue	Description and Settings
OMUSR_FLAG1	1	3C	OMUSR_CONV_OPTION X'80'	Use IMS Conv txn with Process choreography

- Requests indicators to be passed back to the IMS TM Resource Adapter client
  - TIB token, IMS conversational transaction indicator, new conversation option
  - Client has the responsibility of passing all the information back in to continue the IMS conversation
  - IMS Connect does not keep track of conversation information

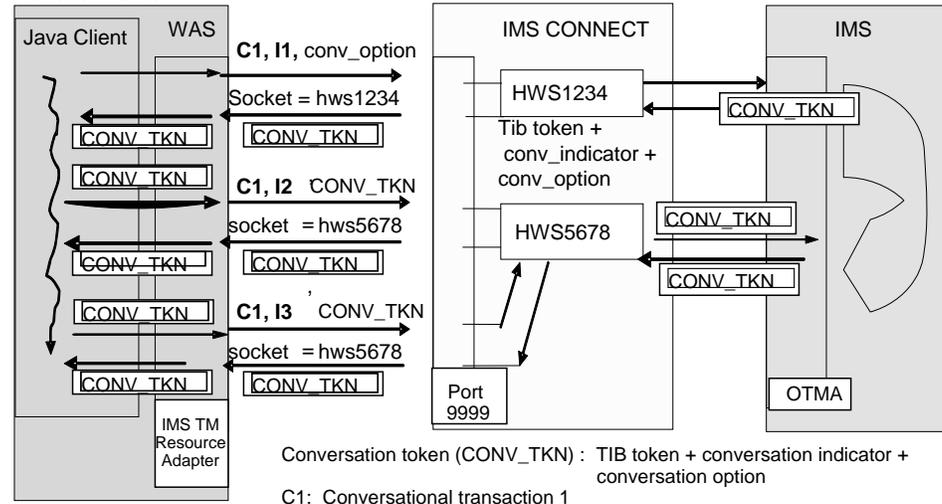
66

IMS Connect defines a new conversational option which is available to IMS TM Resource Adapter applications. Setting the OMUSR\_CONV\_OPTION to true (X'80') invokes the function. If the function is not enabled, IMS Connect uses the existing conversational logic. Note that setting the OMSUSR\_CONV\_OPTION to false (X'00') does not imply a non-conversational transaction.

IMS Connect creates the conversation token (the TIB token, Conversation indicator and conversation option flag), cleans up the internal control blocks, and passes the conversation token to the IMS TM Resource Adapter. The Adapter passes the information to the application which has to maintain the information to pass back on the next iteration of the conversation. This architecture allows the conversation to be continued by IMS Connect and passed to IMS on any of the sockets that are available to the remote client.

## IMS SOA Composite Business Application Support ...

- The new capability – allows the conversation to be resumed on a different connection



This visual illustrates the new capability. When receiving a transaction reply from OTMA, IMS Connect checks to see whether the reply message contains the conversational transaction indicator, the Transaction Instance Block (TIB) token, and the new conversational option flag. If so, IMS Connect passes the conversation token back to the IMS TM Resource Adapter and cleans up all the internal knowledge about this conversational iteration. The Adapter then returns the conversation token back to the Java client. The Java client maintains responsibility for sending the conversation token back in the subsequent iterations of a conversation or in the SYNC\_END\_CONVERSATION interaction to end a conversation. The conversation token is composed of the 8-byte timestamp of the TIB token, the conversational transaction indicator, and the new conversational option indicator. The conversation token is passed back and forth between the Java client, the IMS TM Resource Adapter, IMS Connect, and OTMA. IMS Connect uses the conversation token to track the conversation within a single iteration.



## IMS SOA Composite Business Application Support ...

- **Error conditions**

HWSP1510E MESSAGE CONTAINS INVALID CONVERSATION INFORMATION  
C=*clientid*, M=*mc*

where C is the client name and M identifies the module issuing the message

  - ◆ Issued when IMS Connect detects that the conversational transaction information in the input message conflicts with the conversation being managed
    - Possible causes:
      - Conversational option flag is reset from one iteration to the next
- **Command Output**
  - ◆ VIEWHWS and QUERY MEMBER TYPE(IMSCON)
    - When the conversational option is specified
      - CONV status displayed only if command is entered during an iteration
      - Conversational status is not kept across iterations and the CONV status is not displayed

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If the new conversational option flag and other conversational information are set in an input message, IMS Connect assumes that this is a subsequent iteration of a conversational transaction and uses the conversational information to resume the conversation. If IMS Connect determines that the conversational transaction information from the input message does not conflict with any conversation it manages, IMS Connect continues processing the input. Otherwise, IMS Connect issues the HWSP1510E error message. This scenario could happen when the conversational option flag is flip-flopped from FALSE in one conversational iteration to TRUE in a subsequent one.

The IMS Connect commands VIEWHWS and QUERY MEMBER TYPE(IMSCON) display the CONV status if a client is running an IMS conversational transaction. When the new conversational option is specified, IMS Connect no longer keeps track of the conversational status of the client across iterations of the conversational transaction. The output of the commands, therefore, will not be able to display the CONV status. Only when the display command is entered during the instance that a conversational iteration is in progress will the CONV status be displayed.

## IMS Connect Enhancements Benefits

- Better control and management of IMS Connect environment
  - ◆ HWSCFGxx parameters for ACEE aging value, CM1 Timeout value, and Message Flood Control
  
- Improved security capability
  - ◆ Ability to change passwords and support mixed case
  
- Integrated XML support
  - ◆ XML Adapter opens the IMS environment to XML applications
  
- IMS SOA Composite Business Application support
  - ◆ Expands conversational processing to environments with connection pooling, sysplex distributor, and cloned application servers

# IMS Integration Suite Enhancements

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## IMS Integration Suite

- IMS TM Resource Adapter
  - ◆ IMS Connector for Java
- IMS SOAP Gateway
- IMS MFS Web Support
- IMS DB Resource Adapter
  - ◆ IMS JDBC Connector
- IMS DLIModel utility
- IMS XML DB

2

The IMS™ Integration Suite is a collection of IMS middleware functions and tools that support your IMS on demand systems and your distributed IMS application environment. Some of these middleware functions and tools are generally available, whereas others might be part of an open beta program or technology preview program. All of these functions and tools require IMS Version 9 (or later), and are not supported for previous releases of IMS.

The IMS Integration Suite includes the following IMS middleware functions and tools:

IMS TM Resource Adapter - formally know as IMS Connector for Java

IMS SOAP Gateway

IMS MFS Web support

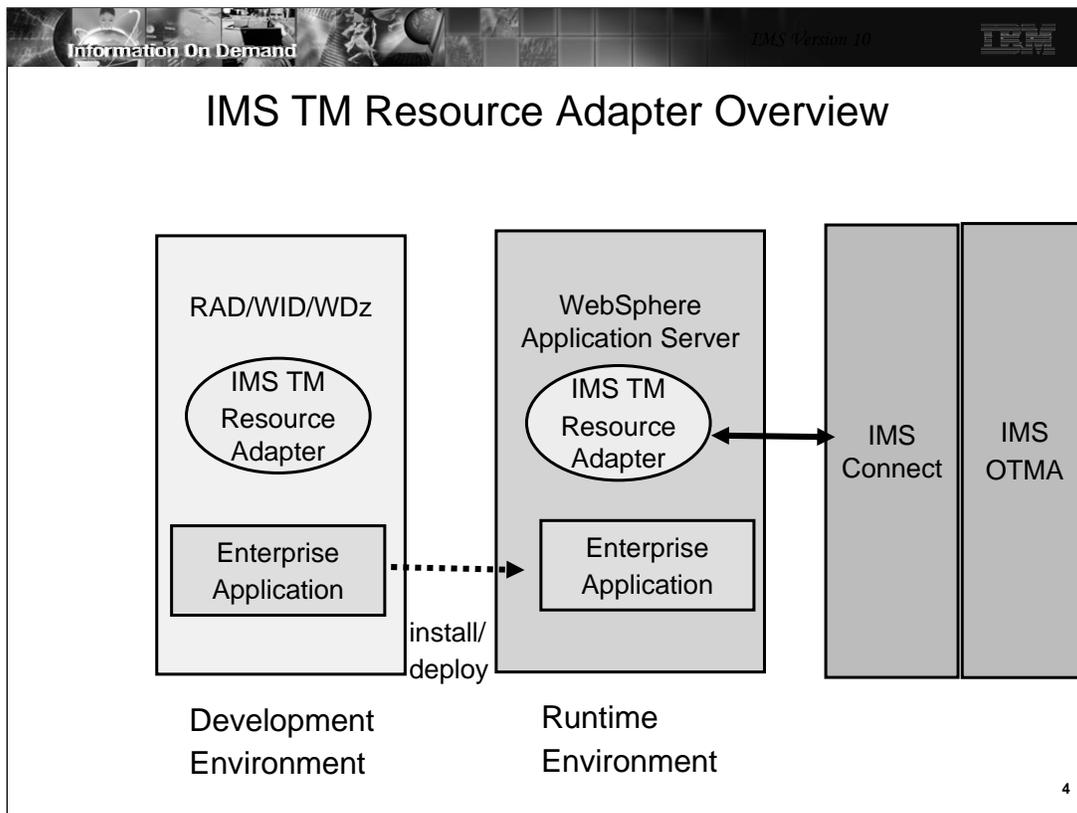
IMS DB Resource Adapter – formally known as IMS JDBC Connector

IMS DLIModel utility

IMS XML DB



# IMS TM Resource Adapter



IMS TM Resource Adapter is a J2EE Connector Architecture (J2C) resource adapter that supports IBM Java integrated development environments (IDEs) to create Java applications that can access IMS transactions. The IDEs import C, COBOL and PL/I source to generate the Java data bindings for the IMS transaction input/output message segments.

This diagram shows the dual functions of IMS TM Resource Adapter. To provide IDE support and to provide runtime environment support to access IMS applications using IMS Connect as the interface to IMS via OTMA.

The following IDEs are supported by IMS TM Resource Adapter:

Rational Application Developer (RAD)

Rational Software Architect

WebSphere Integration Developer (WID)

WebSphere Developer for zSeries (WDz)

WebSphere Studio Application Developer Integration Edition (WSAD-IE)

The IMS TM Resource Adapter also provides a plug-in for a J2EE application server by using the standardized system contracts. IMS TM Resource Adapter provides runtime support for WebSphere Application Server on distributed and z/OS platforms

A J2EE Application Server provides the runtime environment for application code.

WebSphere Process Server (WPS) – extends an application server by providing a business process engine that executes business processes.

WID is the development tool used to create standards based business processes that are deployed to WPS.

## IMS TM Resource Adapter

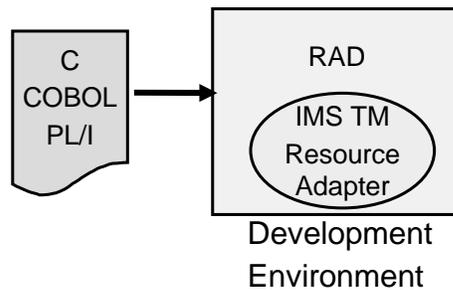
- Pre-IMS 10 enhancements
  - ◆ PL/I source message structures
  - ◆ Commit Mode 1, Sync Level CONFIRM
  - ◆ Retrieve output using alternate clientID on shareable persistent sockets
  - ◆ Enhanced SSL cipher configurability

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This is the list of enhancements IMS TM Resource Adapter provided after IMS V9 and before IMS V10.

## PL/I source message structures

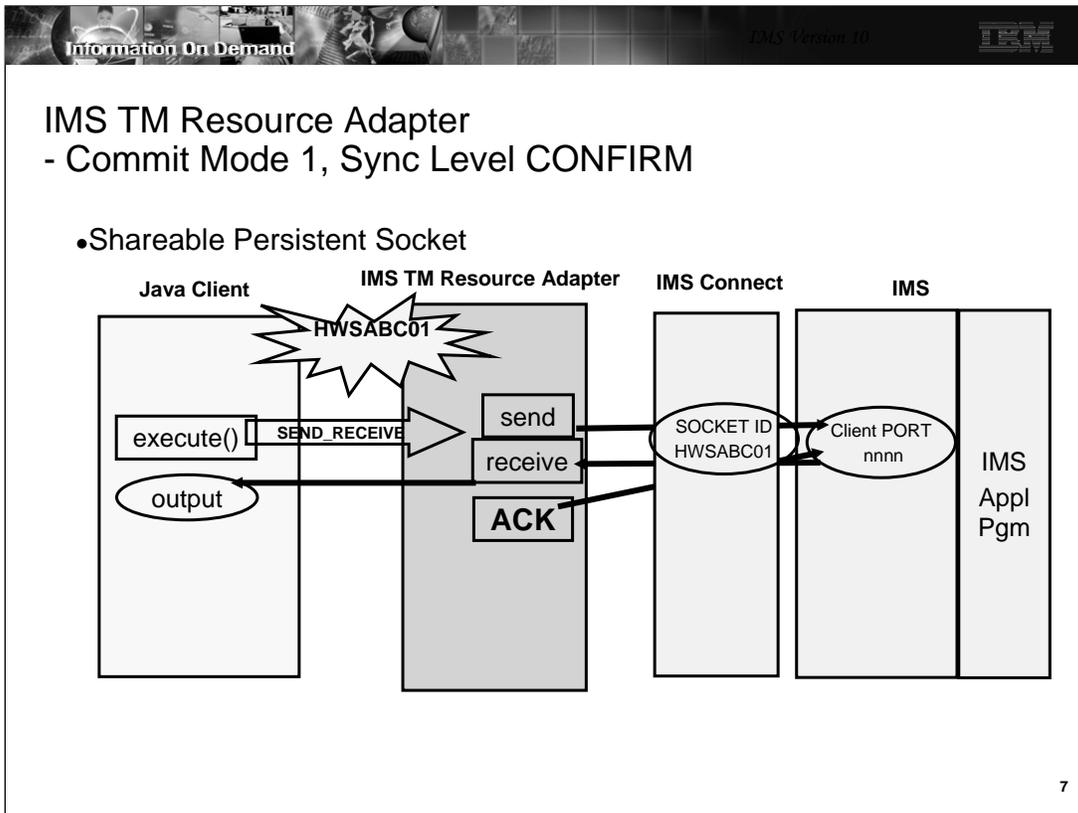
- Capability to parse PL/I copybooks
  - ◆ Used to create Java data bindings for the input and output messages
- Implementation
  - ◆ Shipped in Rational Application Developer
- Benefits
  - ◆ Simplifies building Java data bindings for IMS PL/I application programs



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RAD imports C , COBOL or PL/I definitions of the IMS transaction input and output messages and creates Java data bindings for the input and output messages.

Prior to this support the customer would have to create a COBOL copybook version of the IMS PL/I input/output message structure.



Commit Mode 1 is only supported using a shareable persistent socket.

IMS TM Resource Adapter uses persistent socket connections to communicate with IMS Connect. A persistent socket connection prevents the overhead of opening and closing the socket for each use by an application. IMS TM Resource Adapter provides two types of persistent socket connections.

1. Dedicated persistent – a dedicated persistent socket connection is restricted to Commit Mode 0 (Commit then Send protocol) and the client application provides the clientid to be used as the socket identifier.
2. Shareable persistent – a shareable persistent socket connection supports Commit Mode 0 and Commit Mode 1 (Send then Commit protocol). However, The client application does not provide a clientid for a socket identifier. IMS TM Resource Adapter generates a clientid.

The support for CONFIRM provides the ability for IMS TM Resource Adapter to respond ACK to the output message which activates the IMS sync-point process. In this case the client application is not running under a Global Transaction.

This provides the ability for IMS TM Resource Adapter to notify IMS that it has received the IMS application output message without requiring a Global Transaction.

In this example the Java client is using a shareable persistent socket Commit Mode 1 Sync Level CONFIRM. IMS TM Resource Adapter generates HWSABC01 for a socket ID and sends the input message to the IMS application program via IMS Connect and OTMA. To provide a message queue anchor for the Commit Mode 1 output message OTMA creates a transaction pipe (TPIPE) and will use the TCP/IP generated Client Port number provided by IMS Connect for the TPIPE name. When IMS TM Resource Adapter receives the output message from IMS Connect it responds with an ACK. IMS Connect will send the ACK to OTMA to activate the IMS sync point process.

Note the Java Client application cannot respond with an ACK.

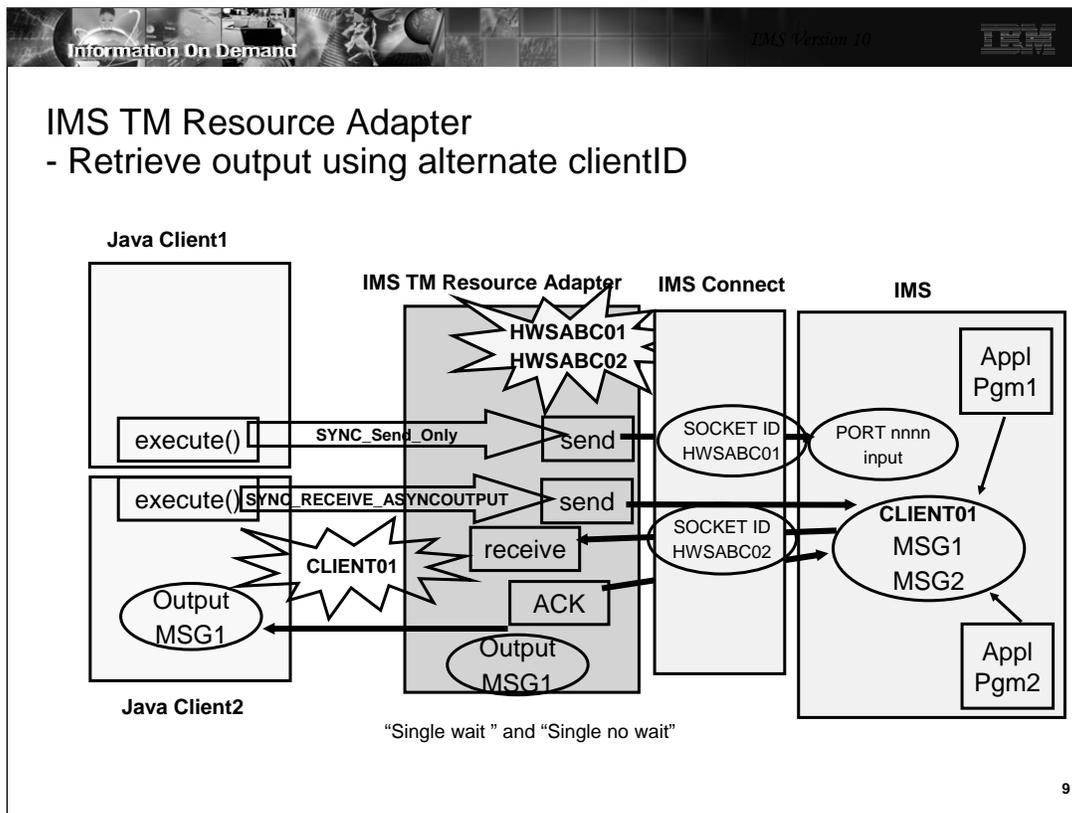
## Commit Mode 1, Sync Level CONFIRM

- Implementation
  - ◆ Shipped in Rational Application Developer
- Considerations
  - ◆ IMS TM Resource Adapter sends ACK
  - ◆ CM1 (Send-then-Commit) Time-out Control
- Benefits
  - ◆ IMS TM Resource Adapter can notify IMS that it has received the IMS application output message without requiring a Global Transaction
  - ◆ Reduce the need of a compensating transaction
  - ◆ IMS TM Resource Adapter compatible with APPC sync level support

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Commit Mode One Synclevel None has the potential to discard an output message without a ROLLBack of the database in the event IMS Connect is not able to deliver the output message to IMS TM Resource Adapter. As a result, a compensation transaction may have to be executed to reverse the database changes. Adding the Commit Mode One Synclevel Confirm could reduce the necessity of using a compensation transaction because an ACK will be performed by IMS TM Resource Adapter.

APPC provides CM1 sync levels NONE,CONFIRM and SYNCPT. Customers who have APPC client applications accessing IMS using CM1 sync level CONFIRM can now provide IMS TM Resource Adapter clients with the same sync levels.



For Shareable Persistent Sessions the client application can not specify a clientID since it is generated by IMS TM Resource Adapter. This can prevent the retrieving of failed IOPCB output or ALTPCB output messages. For the current IMS TM Resource Adapter support the message originating client application can only request asynchronous output while the generated id for the socket remains connected.

In this example Java Client1 submits a Send\_Only input message to IMS. IMS TM Resource Adapter generates HWSABC01 Socket ID and sends the input message to IMS Connect. The IMS application program does not respond to the I/O PCB but does insert a message to ALTPCB using CLIENT01 for a TPIPE name. Java Client2 submits a SYNC\_RECEIVE\_ASYNCOUTPUT to IMS TM Resource Adapter to obtain the output queued to CLIENT01 TPIPE. IMS TM Resource Adapter generates HWSABC02 socket ID and uses the new "Resume tpipe with alternate clientid" protocol to retrieve the output message.

Notice with this protocol a different Java Client application can be used to retrieve asynchronous output generated from processing the originating java client application request.

IMS TM Resource Adapter supports the “Single wait ” and “Single no wait” options.

For the Single message with wait option only one message is returned for a RESUME TPIPE request. If no message is present OTMA waits for a message to arrive and then sends that single message to IMS Connect. The timer set on RESUME TPIPE can expire before a message is returned to IMS Connect. If that occurs, IMS Connect will NAK the message when sent to IMS Connect by OTMA.

For Single message nowait only one message is returned following the RESUME TPIPE. If no message is present OTMA does not wait for a message and the IMS Connect timer causes a timeout to occur based on the timeout value specified.

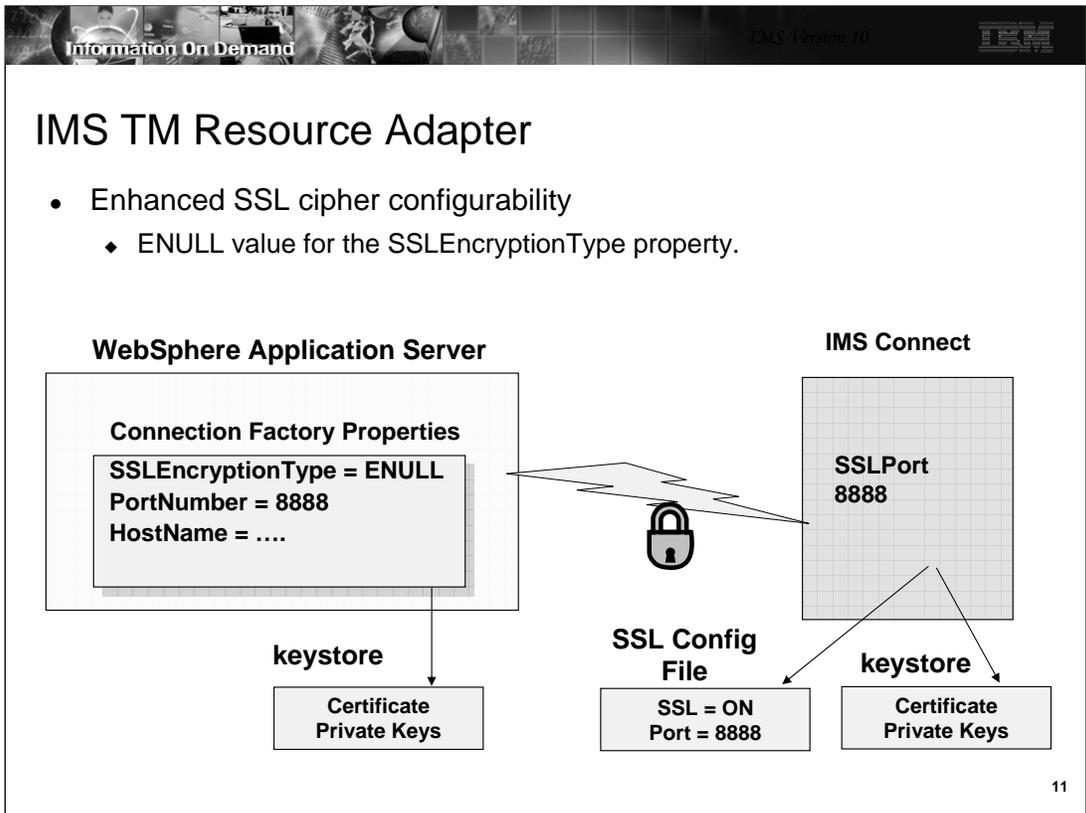
## Retrieve output using alternate clientID

- Implementation
  - ◆ Requires IMS Connect APAR PK24907
  - ◆ Only “Single wait ” and “Single no wait” options supported
- Error considerations
  - ◆ IMS Connect cannot send output
    - NACK do not de-queue output message
- Benefits
  - ◆ Can use shareable persistent socket to retrieve asynchronous output
  - ◆ Simplify IMS Connector for Java Client programming

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IMS Connect APAR PK24907 supports a new protocol "Resume tpipe with alternate clientid" that provides the IMS TM Resource Adapter client application the ability to specify an alternate clientid in the SYNC\_RECEIVE\_ASYNCOUOUTPUT interaction.

If IMS Connect cannot send the output message to IMS TM Resource Adapter then IMS Connect will respond NACK to OTMA. OTMA will not de-queue the output message.



The Secure Socket Layer (SSL) protocol ensures that the transfer of sensitive information over the Internet is secure. Currently, IMS TM Resource Adapter allows customers to specify only “strong” or “weak” as the SSLEncryptionType for all connections created by an IMS connection factory. Enhanced SSL cipher configurability allows customers to specify a new value, “ENULL” for SSLEncryptionType. When “ENULL” is specified, IMS TM Resource Adapter will attempt to use a cipher spec whose name contains the string “NULL”

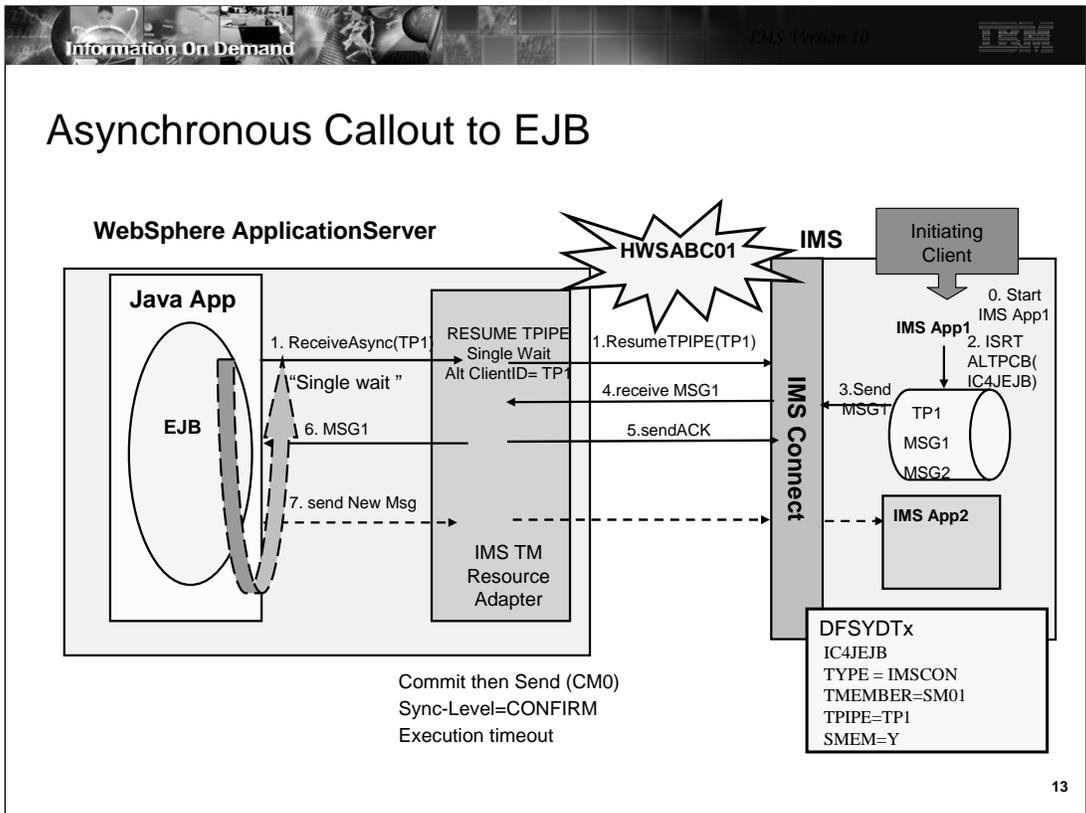
Null encryption will allow for authentication to take place during the SSL handshaking process as is currently the case. Once the handshaking process for a socket has completed including authentication as required, all messages will flow in the clear over that socket.

An example is the passing of non-confidential data between IMS TM Resource Adapter and IMS Connect, both of which are located behind a firewall.

## IMS TM Resource Adapter

- Enhancements for IMS 10
  - ◆ Asynchronous Callout to EJB/MDB
  - ◆ Change RACF password using IMS TM Resource Adapter and IMS Connect
  - ◆ IMS TM Resource Adapter EWLM's policy-based performance management
  - ◆ IMS SOA Composite Business Application support
  - ◆ CM0 multiple PURG calls

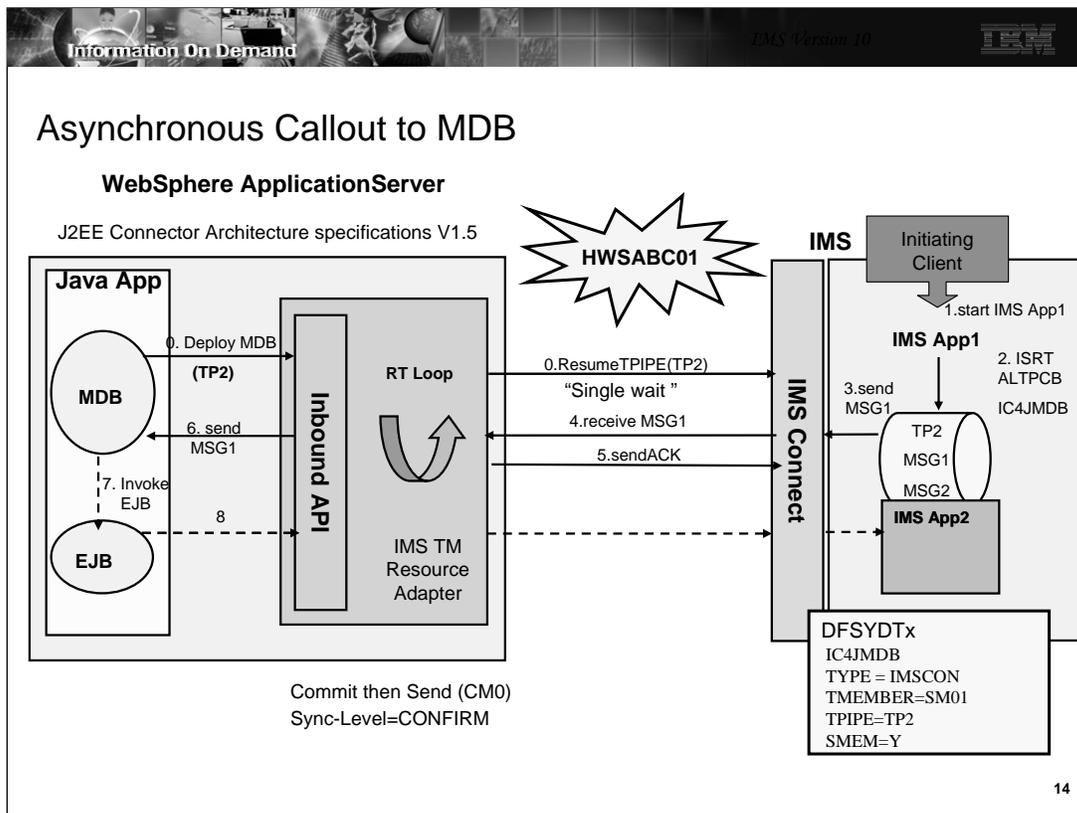
This is the list of enhancements IMS TM Resource Adapter provides for IMS V10.



IMS TM Resource Adapter has been enhanced to support access to Enterprise Java Beans (EJB) from an IMS application program. In this scenario an EJB uses the SYNC\_RECEIVE\_ASYNC\_OUTPUT\_SINGLE\_WAIT (1) alt-clientID=TP1 to request a message queued to TP1. IMS TM Resource Adapter uses the IMS Connect "Resume tpipe with alternate clientid" protocol to wait for a message to retrieve (1). IMS Connect receives the request and notifies OTMA to send a message. An already scheduled (0) IMS Application program does an insert to an ALTPCB for a destination defined in an OTMA destination routing descriptor (2). The OTMA destination routing descriptor is used to define the OTMA TPIPE for the en-queue of the message (TP1). OTMA sends the message to IMS Connect (3) and IMS Connect will return the message to IMS TM Resource Adapter (4). IMS TM Resource Adapter receives the message and notifies IMS Connect with an ACK(5). IMS Connect will forward the ACK to OTMA and the message will be de-queued.

IMS TM Resource Adapter receives the message and returns it to the EJB (6).

An optional step is the EJB creates a response to the message request. IMS TM Resource Adapter sends the response to IMS (7). This results in the scheduling of an IMS Application program to process the response.



IMS TM Resource Adapter also supports access to Message Driven Beans (MDB) from an IMS application program. The J2EE Connector Architecture specifications V1.5 describes how an enterprise application can access a J2EE application environment. This is known as Inbound processing. IMS TM Resource Adapter is providing Inbound processing for IMS application programs. From an IMS application perspective this is Asynchronous Callout processing.

In this scenario IMS TM Resource Adapter uses the IMS Connect "Resume tpipe with alternate clientid" protocol to wait for a message to retrieve (0).

An already scheduled(1) IMS Application program does an insert to an ALTPCB for a destination defined in an OTMA Descriptor (2). The OTMA Descriptor is used to define the OTMA TPIPE for en-queue of the message. OTMA sends the message to IMS Connect (3) and IMS Connect will return the message to IMS TM Resource Adapter (4). IMS TM Resource Adapter receives the message and notifies IMS Connect with an ACK(5). IMS Connect will forward the ACK to OTMA and the message will be de-queued.

An MDB running inside WebSphere Application server will use the standard JCA 1.5 interfaces to listen to callout request from IMS applications. IMS TM Resource Adapter receives the message send it to the MDB (6).

The MDB will invoke the EJB (7) to process the message.

An optional step is the EJB creates a response to the message request. IMS TM Resource Adapter sends the response to IMS (8). This results in the scheduling of an IMS Application program to process the response.

## Asynchronous Callout

- Implementation
  - ◆ IMS V10 Connect Resume TPIPE with Alternate Clientid
  - ◆ IMS V10 OTMA Resume TPIPE Security
  - ◆ IMS V10 OTMA Destination Routing Descriptors
- Migration
  - ◆ No impact to existing IMS Application
    - ISRT ALTPCB
      - the OTAM Destination Routing Descriptor provides destination information
- Benefits
  - ◆ Provides ability for IMS application to access a Web Service
    - IMS application does not have to change

## IMS TM Resource Adapter

- RACF Password Change
  - ◆ Provides ability to change RACF password using IMS TM Resource Adapter
- Implementation
  - ◆ IMS Connect V10 Client Password Change Request
- Benefits
  - ◆ Customers can now change their RACF password after expiration

```
LLLL | IRM | OTMA | LLZZ HWSPWCH old-password/new-password1/new-password2 | EOM
```

IMS TM Resource Adapter has been enhanced to change a RACF password during interactions with IMS Connect. When a J2EE application requires access to an IMS transaction that is password protected the RACF password may have expired. Using this facility the J2EE application can prompt the client for a new password and provide the new password to facilitate completion of the business process.

## IMS TM Resource Adapter

- Client sample

```
package sample.ims.hwspwcdh;
import com.ibm.connector2.ims.ico.*;

public class HWSPWCHIMSCnect
{
    public static void main(String[] args)
    {
        try
        {
            INMSG input = new INMSG();
            input.setInll((short) 31);
            input.setInzz((short) 0);
            input.setIncmd("HWSPWCH CURPSWD/NEWPSWD/NEWPSWD");
            HWSPWCHIMSProxy proxy = new HWSPWCHCmdIMSProxy();
            proxy.setINMSG(input);
            // Run the IMS service.
            proxy.execute();
        }
    }
}
```

## IMS TM Resource Adapter

- Enterprise WorkLoad Mangement (EWLM)
  - ◆ Built into z/OS V1 R8 or OA12935 for z/OS V1 R7
- Implementation
  - ◆ WebSphere Application Server V6.1 EWLM enable instrumentation
  - ◆ IMS V10 OTMA
  - ◆ IMS TM Resource Adapter obtains EWLM correlator from WAS
    - CM0 Send\_Receive and all CM1 flows will be instrumented by EWLM
- Benefits
  - ◆ Ability to track workflow from

LLLL | IRM | OTMA User Data (EWLM 64 byte correlator) | LLZZ TRANCODE data / EOM

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The Enterprise Workload Management (EWLM) support requires the EWLM CICS/IMS Support that is built into z/OS Version 1 Release 8 or provided in APAR OA12935 for z/OS Version 1 Release 7.

IMS TM Resource Adapter obtains the EWLM correlator from WebSphere Application Server, then passes the correlator to IMS by inserting the correlator into the OTMA prefix for the transaction. When the transaction returns to IMS TM Resource Adapter after processing is complete, IMS TM Resource Adapter reports the status of the transaction to WAS.

If the incoming transaction does not contain an EWLM correlator, the existing function is unchanged.

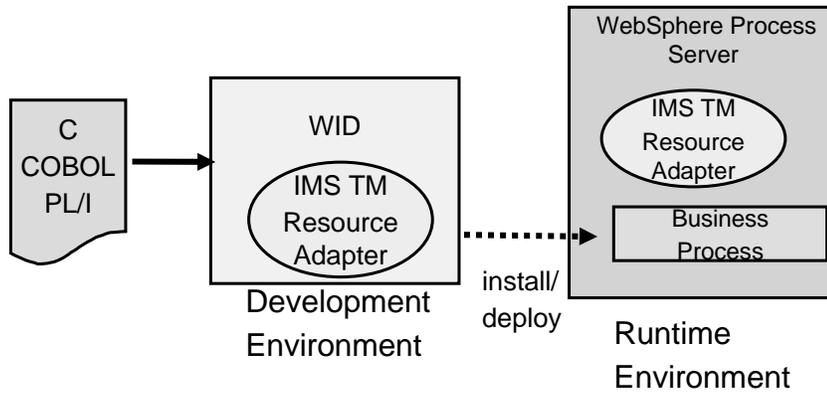
CM0 Send Only flows will not be instrumented by EWLM. IMS TM Resource Adapter does not receive a correlator for CM0 send only transactions. Therefore, the transaction will be sent to IMS with the correlator field zeroed out, and IMS will call the existing non-EWLM version of the WLM services

If the correlator is provided then IMS TM Resource Adapter will pass it to IMS. If the correlator is not provided then the OTMA prefix field will be set to zero.

If an EWLM enabled transaction is routed from a V10 IMS to a backlevel IMS, the transaction passes through the backlevel system with the EWLM data unchanged and the existing WLM function is unchanged on the backlevel system. No APAR is required for prior versions of IMS.

## IMS TM Resource Adapter

- IMS SOA Composite Business Application support
  - ◆ Provides multi-connection IMS Conversational Transaction support
    - Only available to IMS TM Resource Adapter clients
    - Supports WebSphere Process Server Business Process Flows

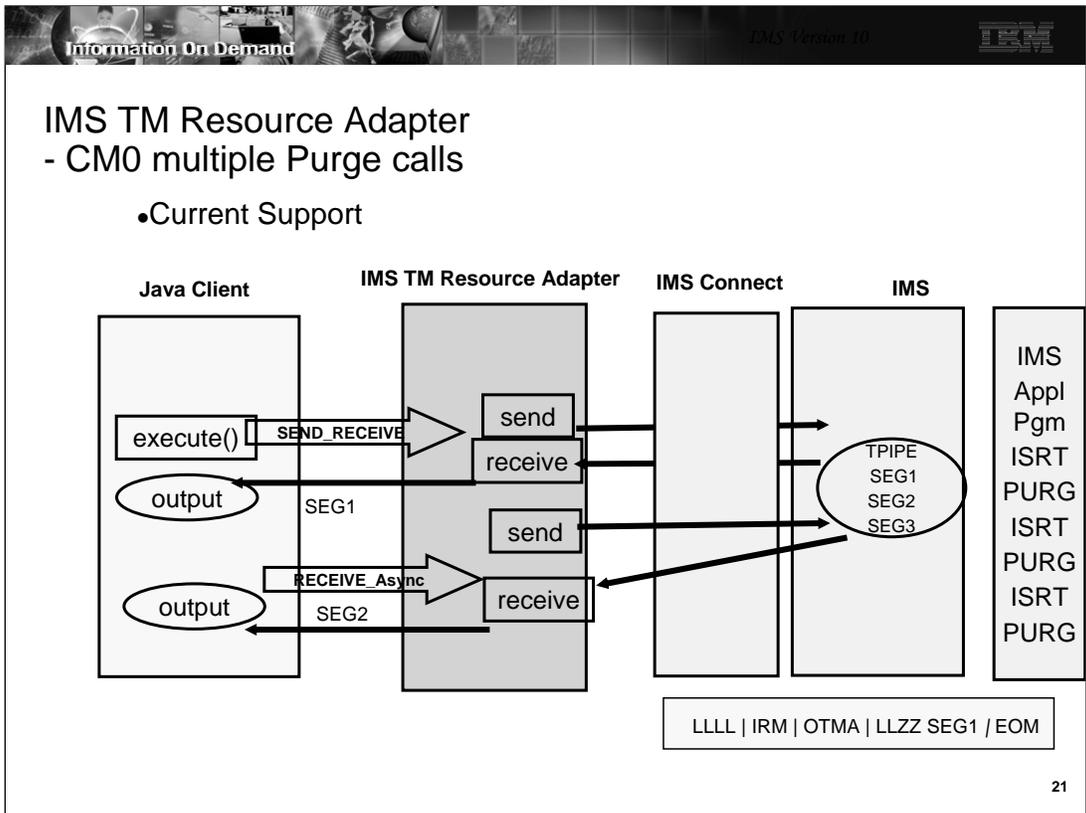


## IMS SOA Composite Business Application support

- Migration
  - ◆ Replace Connection ID with Conversation Token
  - ◆ Only supports CM1 Synch level NONE or CONFIRM
  - ◆ IMS TM Resource Adapter
    - Used to pass IMS conversation token
- Considerations
  - ◆ IMS TM Resource Adapter Client must manage IMS conversation token
  - ◆ Supports only one IMS
- Benefits
  - ◆ Provides multiple connections IMS conversational transaction support

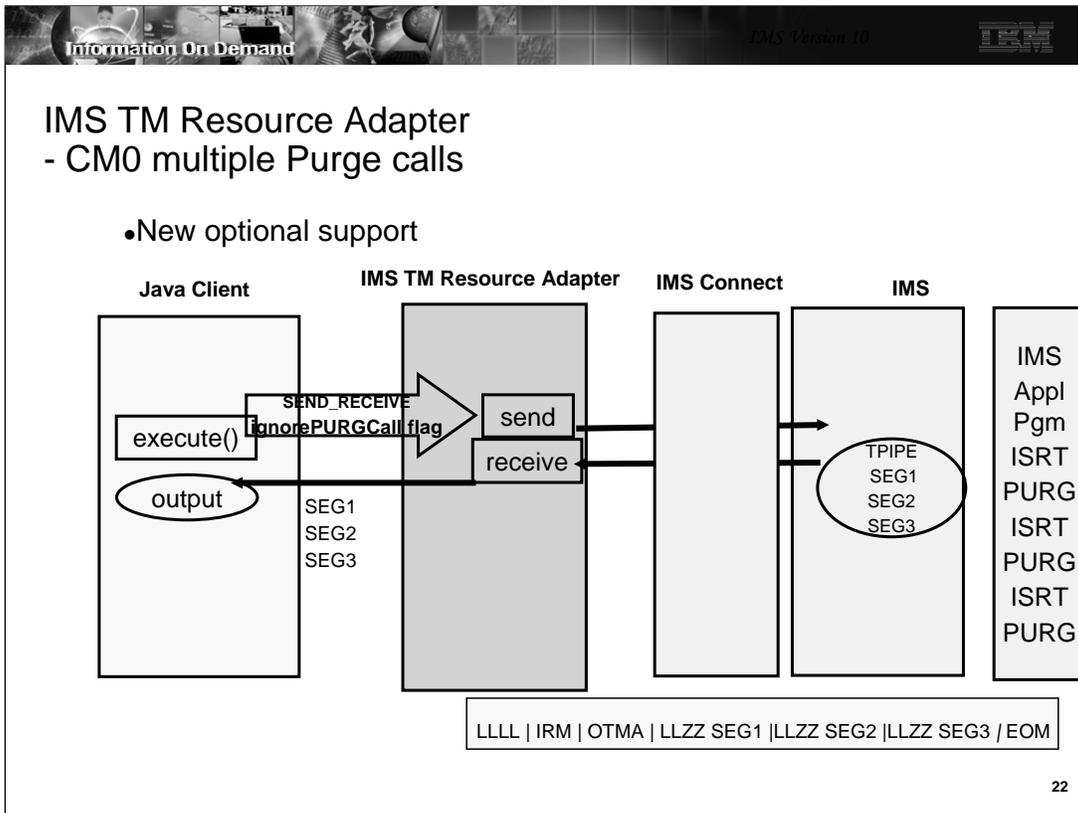
20

Because an IMS Conversational transaction is a commit mode 1 type of transaction, IMS Connect only supports commit mode 1 conversational input messages with synch level of none or confirm from IMS TM Resource Adapter client applications.



When there are multiple ISRT and PURG calls in the IMS application, OTMA sends one response message with multiple output segments if the client application uses Commit Mode 1 interaction. If the client application uses Commit Mode 0, OTMA will send multiple output response messages, one for each PURG call. OTMA introduces an enhancement so that the customer using CM0 with multiple PURG calls in the TP PCB can ignore the PURG calls to generate one output message with multiple segments. This provides consistent output message processing for CM0 and CM1.

A new property called ignorePURGCall will be added to the IMSInteractionSpec.



Commit Mode 1 is only supported using a shareable persistent socket.

IMS Connector for Java uses persistent socket connections to communicate with IMS Connect. A persistent socket connection prevents the overhead of opening and closing the socket for each use by an application. IMS Connector for Java provides two types of persistent socket connections.

1. Dedicated persistent – a dedicated persistent socket connection is restricted to Commit Mode 0 (Commit then Send protocol) and the client application provides the clientid to be used as the socket identifier.
2. Shareable persistent – a shareable persistent socket connection supports Commit Mode 0 and Commit Mode 1 (Send then Commit protocol). However, The client application does not provide a clientid for a socket identifier. IC4J generates a clientid.

The support for CONFIRM provides the ability for IC4J to respond ACK to the output message which activates the IMS sync-point process. In this case the client application is not running under a Global Transaction.

This provides the ability for IMS Connector for Java to notify IMS that it has received the IMS application output message without requiring a Global Transaction.

In this example the Java client is using a shareable persistent socket Commit Mode 1 Sync Level CONFIRM. IC4J generates HWSABC01 for a socket ID and sends the input message to the IMS application program via IMS Connect and OTMA. To provide a message queue anchor for the Commit Mode 1 output message OTMA creates a transaction pipe (TPIPE) and will use the TCP/IP generated Client Port number provided by IMS Connect for the TPIPE name. When IC4J receives the output message from IMS Connect is responds with an ACK. IMS Connect will send the ACK to OTMA to activate the IMS sync point process.

Note the Java Client application cannot respond with an ACK.

## IMS TM Resource Adapter

- CM0 multiple PURG calls
  - ◆ Provides CM1 and CM0 consistent output message processing
  - ◆ IMS V10 OTMA optional output processing enhancement
- Implementation
  - ◆ IMS TM Resource Adapter Client
    - IMSInteractionSpec new ignorePURGCall property

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When there are multiple ISRT and PURG calls in the IMS application, OTMA sends one response message with multiple output segments if the client application uses Commit Mode 1 interaction. If the client application uses Commit Mode 0, OTMA will send multiple output response messages, one for each PURG call. OTMA introduces an enhancement so that the customer using CM0 with multiple PURG calls in the TP PCB can ignore the PURG calls to generate one output message with multiple segments. This provides consistent output message processing for CM0 and CM1.

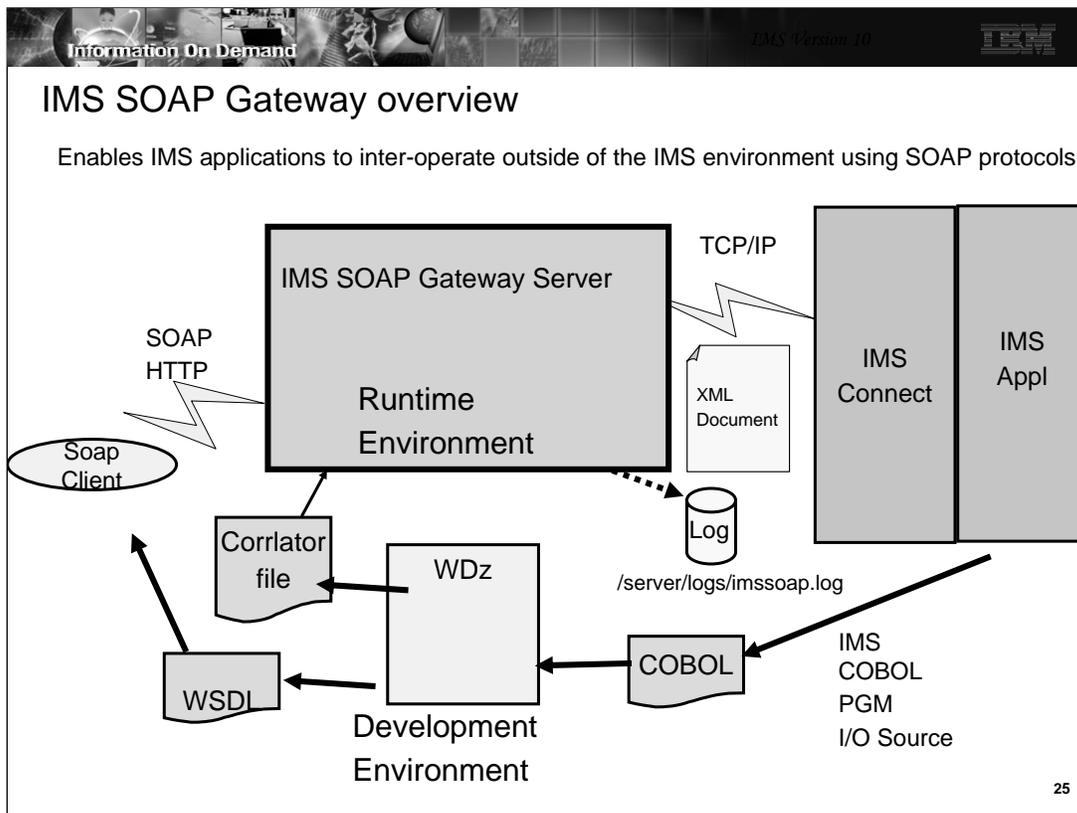
A new property called ignorePUGRCall will be added to the IMSInteractionSpec.



# IMS SOAP Gateway

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IMS SOAP Gateway is a separate product that is available free of charge from the IMS Web site



The IMS SOAP Gateway is an XML-based connectivity Web service solution that is an HTTP endpoint for a SOAP client and supports access to IMS applications in a Service-Oriented Architecture (SOA) environment. This diagram shows a SOAP client accessing IMS via the IMS SOAP Gateway Server. SOAP (simple object access protocol) is a protocol for exchanging the XML-based messages over a network using HyperText Transfer Protocol (HTTP).

To deploy an IMS application as a Web service, you need to create a WSDL (Web service description language) file. A WSDL file is an XML document that describes a Web service. WSDL files are used by others (for example, the client that invokes the service) to discover the service and to understand how to invoke the service. It specifies the location of the service and the operations that the service exposes.

WebSphere Developer for zSeries (WDz) can be used to generate a WSDL file.

Information On Demand IMS Version 10

## IMS SOAP Gateway Deployment Utility

- The Deployment Utility has the following Options.

```

=====
Enable your IMS application as a Web Service :
  Task 1: Enable your IMS application as a Web Service from start to finish

Administrative tasks :
  Task 2: Start IMS SOAP Gateway
  Task 3: Stop IMS SOAP Gateway
  Task 4: Update IMS SOAP Gateway properties
  Task 5: Create, Update or View correlator properties for Web Service
  Task 6: Create, Update, Delete or View connection bundle
  Task 7: Deploy the WSDL file
  Task 8: Generate Java client code
  Task 9: Undeploy Web Service
  Task 10: Exit deployment utility
=====
> Enter your selection here:

```

26

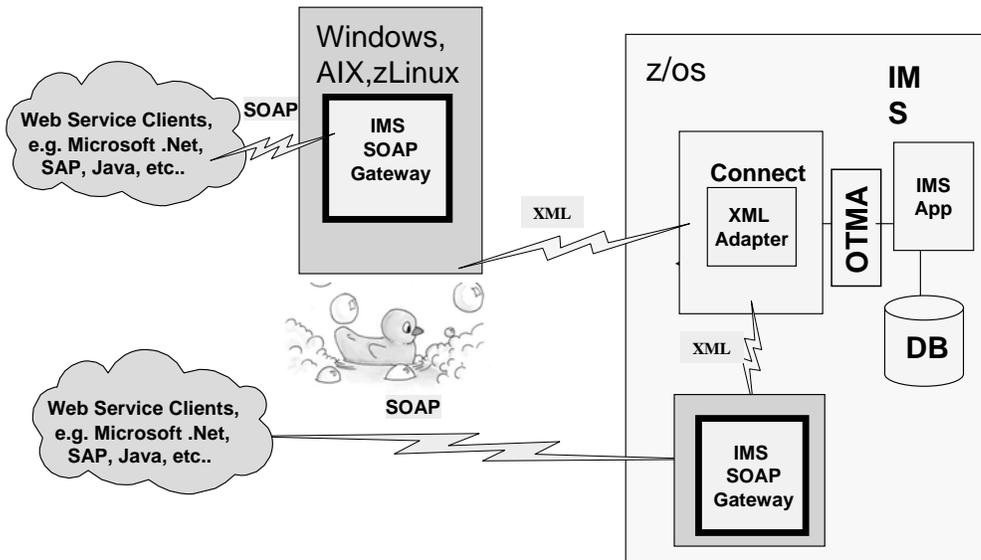
The IMS SOAP Gateway also provides a deployment utility that generates the connection bundle, the correlator file, and the Server properties file. The connection bundle specifies the connection and security properties between IMS SOAP Gateway, IMS Connect, and IMS. The correlator file specifies transaction, and runtime properties and the information that the IMS SOAP Gateway needs to match incoming requests to the appropriate back-end IMS application. It also identifies the Connection Bundle. The Server Properties file is used to configure the IMS SOAP Gateway Server runtime environment

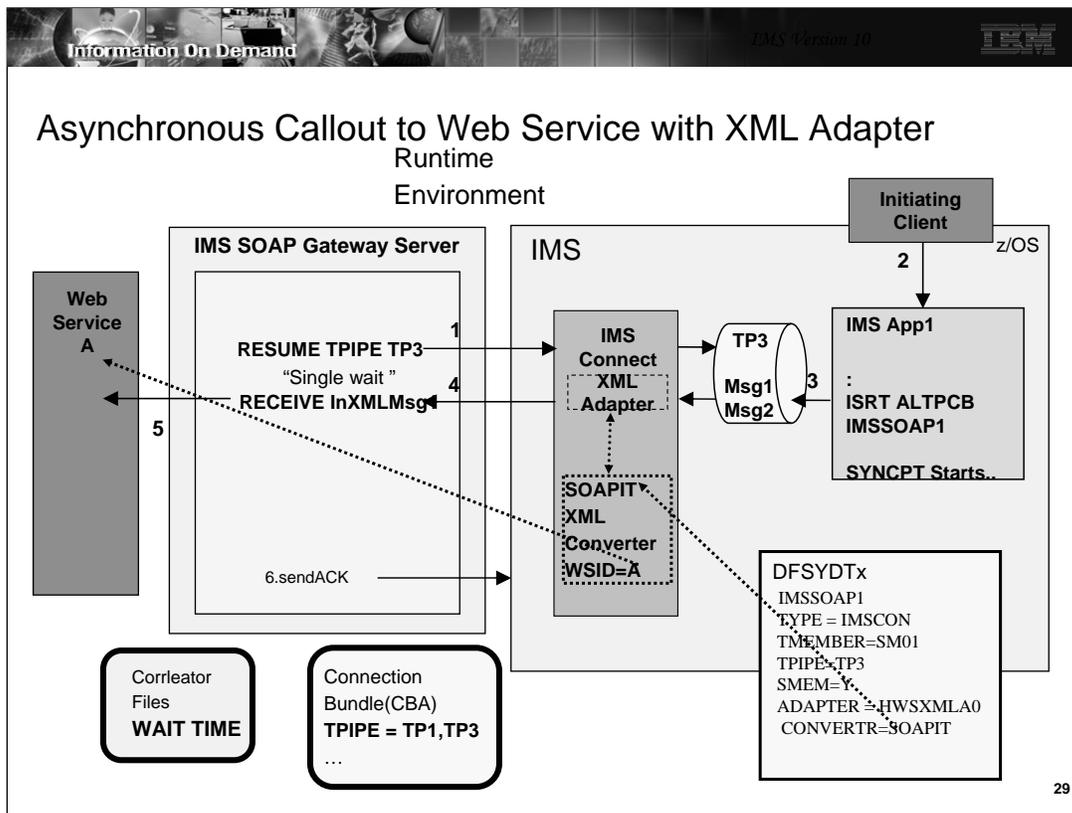
The Deployment Utility runs in the Windows DOS Command prompt.

## IMS SOAP Gateway V10 Enhancements

- Support on z/OS
- Asynchronous Callout to Web Service
  - ◆ Requires IMS V10
    - IMS Connect Resume TPIPE with Alternate Clientid
    - IMS OTMA Resume TPIPE Security
    - IMS OTMA Destination Routing Descriptors

# Support on z/OS with IMS 10



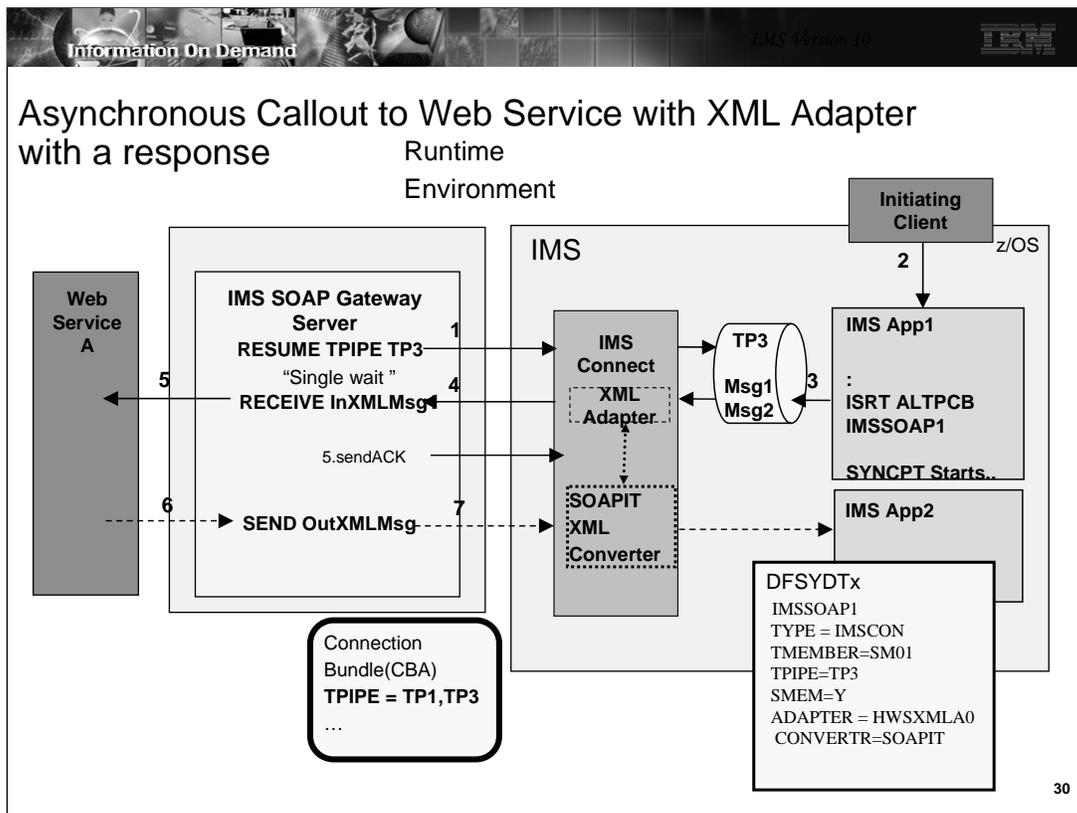


In this scenario an IMS Application program does an insert to an ALTPCB whose destination is an OTMA Descriptor. The OTMA Descriptor is used to define the OTMA TPIPE for en-queue of the message.

Steps 1, 2 and 3 schedule the IMS application which results in the insert to ALTPCB defined by the OTMA Descriptor that represents IMS SOAP Gateway.

IMS SOAP Gateway will use the Resume TPIPE Alt-ClientID protocol to retrieve the message(1). IMS Connect will invoke the COBOL adapter to perform XML transformation of the message and send the message to the IMS SOAP Gateway(4). IMS SOAP Gateway receives the messages and sends it to the Web Service(5).

An optional step is the Web Service creates a response to the message request. IMS SOAP Gateway sends the response to IMS (6). This results in the scheduling of an IMS Application program to process the response.

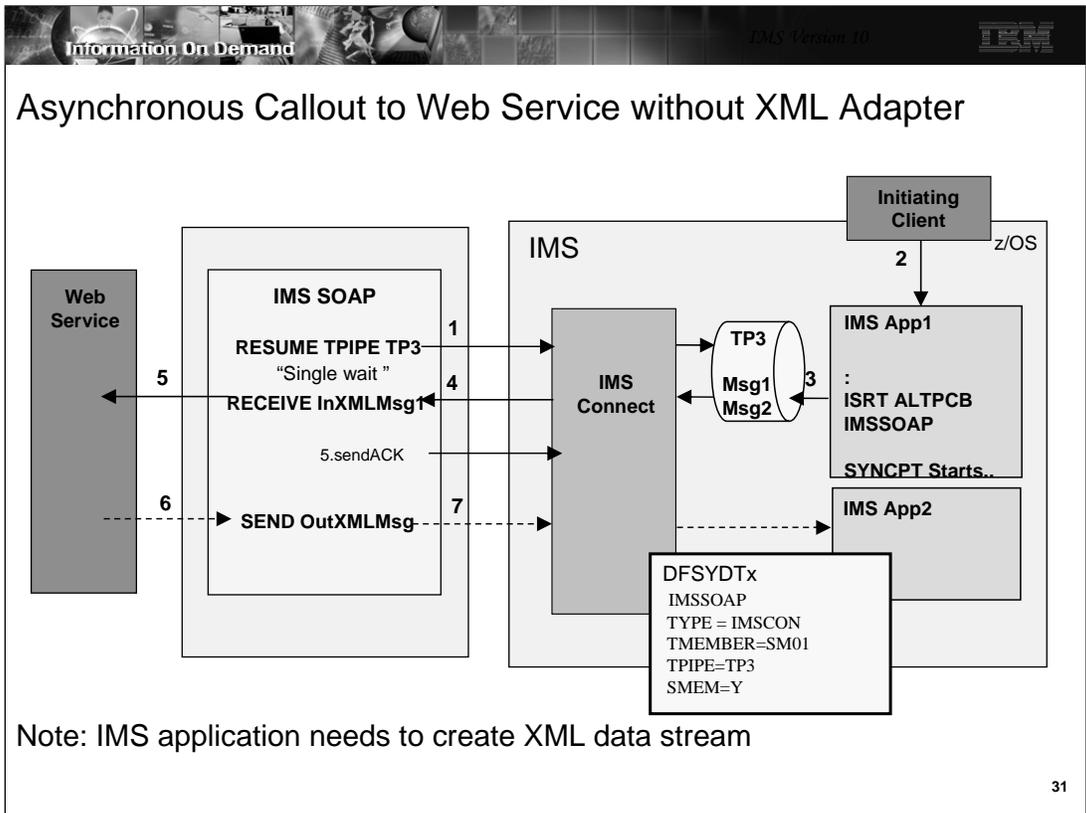


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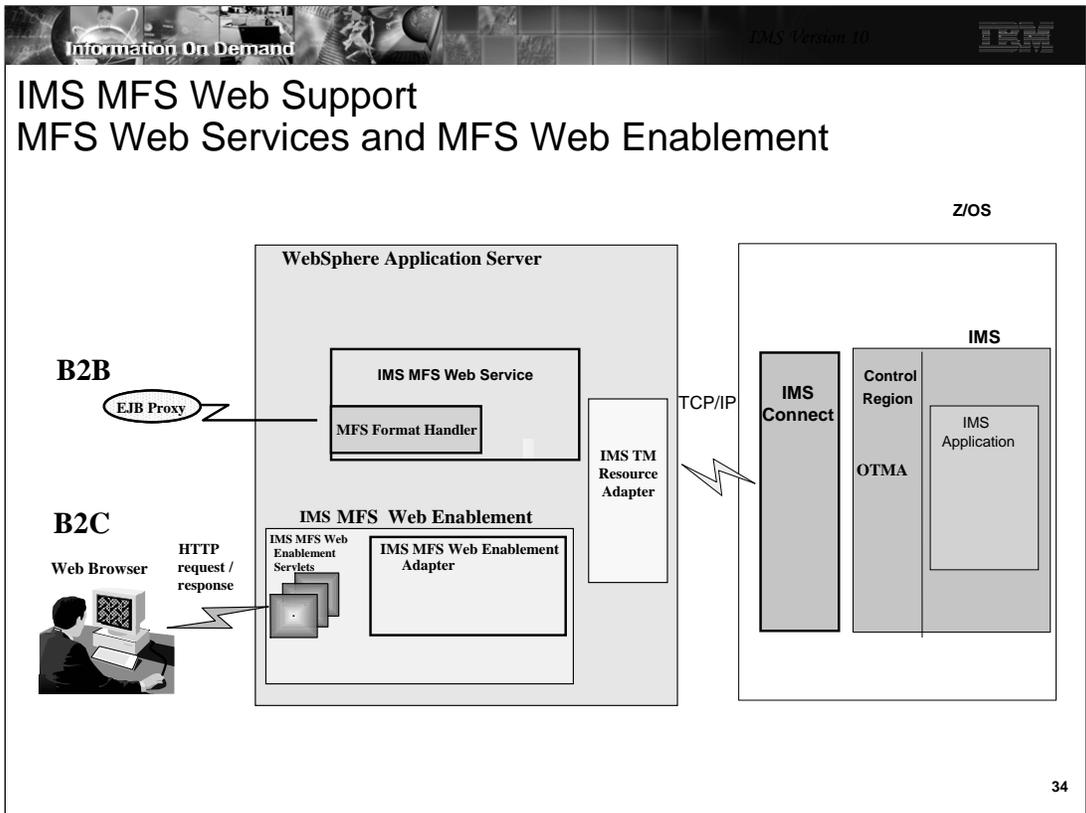
## Asynchronous Callout

- Migration
  - ◆ ISRT ALTPCB
    - OTMA Destination Routing Descriptor
- Benefits
  - ◆ Provides ability for IMS application to access a Web Service

The OTMA Callout Descriptors need to be created.



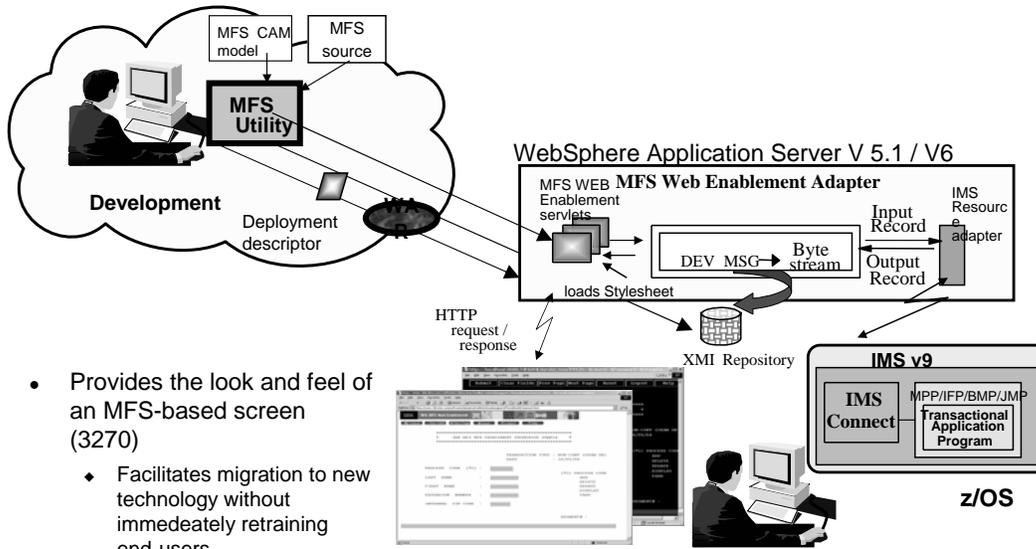
# IMS MFS Web Support



IMS MFS Web support provides two solutions to re-use existing MFS-based IMS business logic.

1. IMS MFS Web services support allows you to submit MFS-based IMS transactions as Web services.
2. IMS MFS Web enablement support replaces the MFS online processor and allows you to seamlessly navigate MFS-based Web pages that all have a similar look and feel.

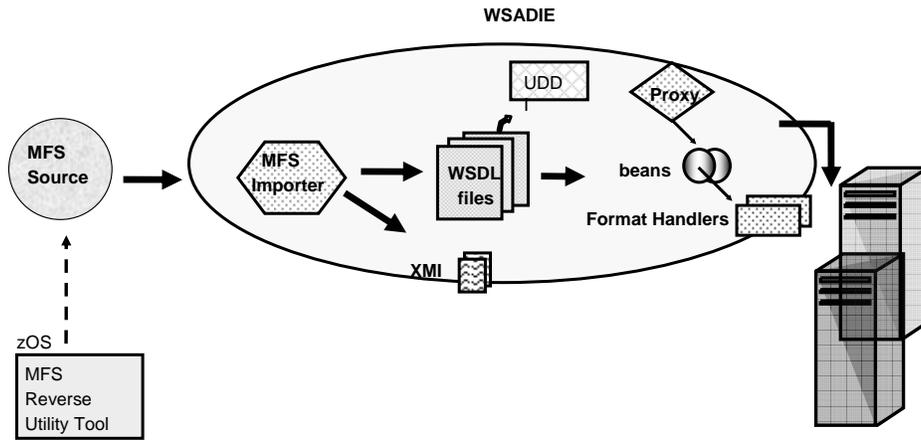
# MFS Web Enablement

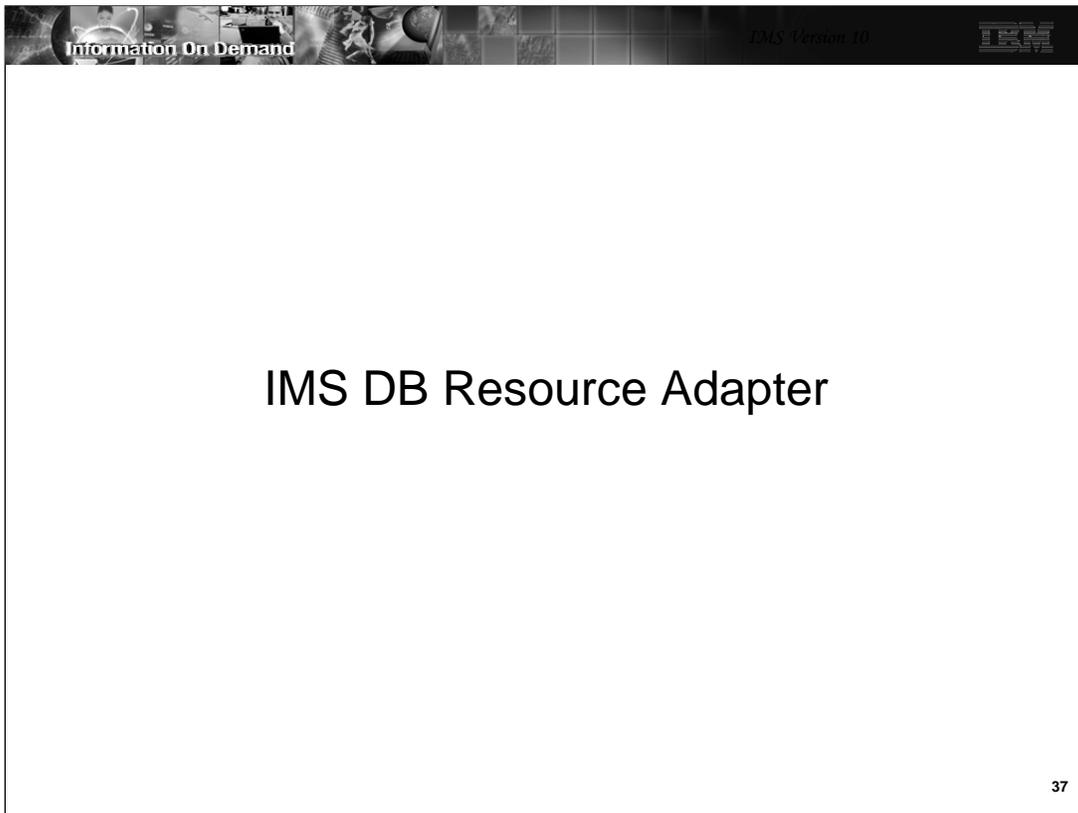


- Provides the look and feel of an MFS-based screen (3270)
  - ◆ Facilitates migration to new technology without immediately retraining end-users

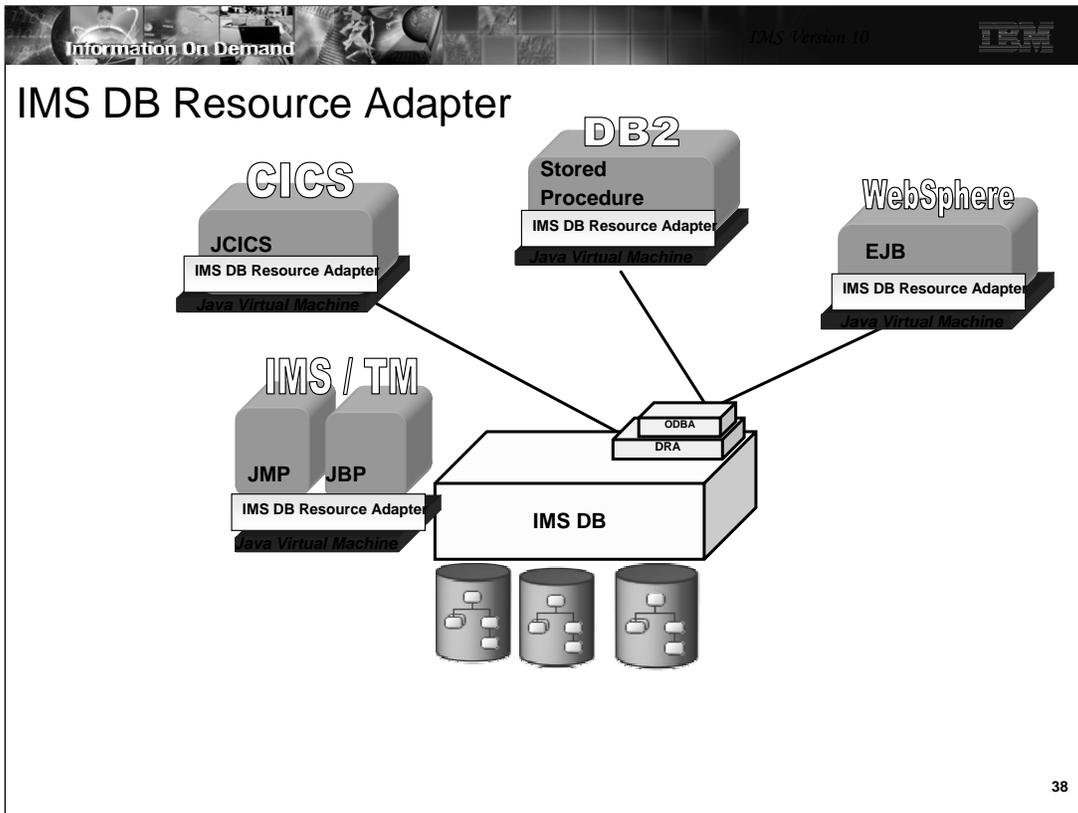
# MFS Web Services – SOA support

- A capability that takes advantage of MFS source to generate web services





The IMS DB Resource Adapter is a function of IMS that enables a programmer with minimal IMS knowledge to write Java application programs that access IMS databases



The IMS DB Resource Adapter enables JDBC access to IMS DB from IMS TM JMP/JBP environments, CICS Java application, DB2 Java Stored procedure, and Enterprise Java Beans running on WebSphere distributed and z/OS environments.

## IMS DB Resource Adapter

- DB2 Java Stored Procedure return DB2 Result Sets
- GSAM Metadata
- IBM SDK V5 for z/OS support

The IMS DB Resource Adapter has been enhanced to support DB2 Java Stored Procedures returning DB2 result sets instead of returning IMS result sets. GSAM access has been enhanced to use IMS Java Metadata generated by DLIModel Utility. Changes were also made to support IBM SDK V5 for z/OS.

## DB2 Java Stored Procedure return DB2 Result Sets

- Implementation
  - ◆ IMS DB Resource Adapter
    - DB2 global temporary table (GTT)
  - ◆ DB2 Stored Procedures Client
    - Stored procedure clients are READ\_ONLY
- Migration
  - Update Stored Procedure to specify type of DB2 Global Temp Table
  - Modify the output parameters to return a result set instead of individual fields
  - Update the client application to process the DB2 Result Set
- Benefits
  - Simplifies processing of IMS Results Sets data
  - Provides data independent processing
  - Consistent Result Set Processing with DB2

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The IMS DB Resource Adapter has been enhanced to create a DB2 global temporary table (GTT) in the DB2 Stored Procedure Address Space and moves the IMS data returned from IMS ResultSet into the DB2 GTT. The DB2 Result Set returned to the client application will iterate the DB2 GTT for result set processing.

The stored procedure clients are READ\_ONLY. This means that the client cannot update or delete IMS data using the DB2 result set returned to it by the stored procedure because it is not possible send a change in a DB2 temp table back to an IMS database

Existing DB2 Stored Procedures using the IMS V10 DB Resource Adapter can continue to run without modifications

To update existing stored procedures to return DB2 result sets instead of individual fields you need to update the stored procedure to specify the use of a created or declared type of DB2 Global Temp Table. After the Stored Procedure application queries the IMS database the IMS DB Resource Adapter API is used to convert the IMS ResultSet to a DB2 Result Set using the GTT.

The output parameters defined for the Stored Procedure need to be changed to return a result set instead of individual fields.

The client application needs to be modified to accept a DB2 result set instead of IMS individual fields.

The use of DB2 Results Sets provides a consistent and easier programming interface for processing output from a DB2 Stored Procedure that uses IMS JDBC Connector to access IMS data.

## IMS DB Resource Adapter

- GSAM Metadata support
  - Ability to utilize the IMS Java data conversion routines
  - Ability to utilize IMS Java DLIDatabaseView metadata
- Migration
  - ◆ Existing Java Batch Processing applications not affected
  - ◆ To convert an existing application
    - Use IMS V10 DLIModel utility to create GSAM DLIDatabaseView
    - Use new GSAM fields generated by DLIModel utility
    - Use new GSAM API
- Benefits
  - ◆ Automatic data conversion is done by the Java class libraries
  - ◆ Supports all data types to be stored into and read from a GSAM database record

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IMS DB Resource Adapter support for GSAM was enabled by Small Programming Enhancement PQ93785/UQ93241. This provided a Java Batch Processing application program with a Java API to open read write and close GSAM databases. However, the application was required to know the complete details of the GSAM database

Given a DLIDatabaseView name, the IMS Java class library will use the metadata information to capture the correct sequence of bytes in the record, read that sequence of bytes, and convert that sequence of bytes into the appropriate data type as defined by the metadata.

Java Batch Processing applications that use the IMS V9 GSAM database support will not be affected

The DLIModel utility for IMS V10 provides new GSAM record & field options. This will be described in the DLIModel utility section.

IMS V10 GSAM enables all of the supported data types to be stored into and read from a GSAM database record and provides automatic data conversion on behalf of the application. GSAM database support is now consistent with the IMS Java class libraries support for all other IMS database types.

## IMS DB Resource Adapter

- IBM SDK V5 for z/OS support
  - ◆ Contains a re-engineered Java 2 virtual machine
    - Provides cache class sharing
      - Replaces persistent reusable function
    - z/OS APAR OA11519
      - Cache class sharing
    - IBM 31-bit and 64-bit SDKs for z/OS, Java 2 Technology Edition, Version 5 SDK and Runtime Environment User Guide
      - <http://www-03.ibm.com/servers/eserver/zseries/software/java/pdf/sdkguide.zos.pdf>
  - ◆ IMS Java Dependent Region Programming Model
    - IMS Java and OO COBOL Interoperability
      - GU and CHKP processing

z/OS delivers a complete Java 2 Software Developer Kit (SDK).

Previous versions of the SDK provided a reusable function to support transactional runtime environments like IMS. This capability allowed the Java Virtual Machine (JVM) to be initialized during IMS Java dependent region startup and to be “re-set” after the IMS application program completed processing. This avoided the overhead of loading the JVM for each IMS application program schedule.

The new SDK provides a Class Sharing capability to replace the persistent reusable function.

z/OS APAR OA11519 is recommended for cache class sharing.

The User Guide can be downloaded from the specified URL.

IMS message GU/CHKP processing was altered for Java Dependent Regions (JDRs) when JDRs were initially implemented. For JDRs, an IMS message GU meant to get the message only, do not perform sync point processing. CHKP processing meant perform sync point processing only, do not get the next message. In the standard IMS model, message GU and CHKP meant perform sync point and retrieve the next input message.

For IMS V10, IMS JDRs GU/CHKP processing will be consistent with the IMS standard model.

## IBM SDK V5 for z/OS support

- Migration for IMS Java Dependent Regions setup
  - ◆ Xresettable is not supported
    - Must remove -Xresettable , -Xjvmset , -Xscmax
  - ◆ XPLINK= and JVMOPWKR= are obsolete and will be ignored if specified
  - ◆ The following JVM options are not supported
    - "-Dibm.jvm.shareable.application.class.path="
    - "-Dibm.jvm.trusted.middleware.class.path="
  - ◆ Pathname for the application class files and IMS Java ".jar" files:
    - -Djava.class.path=
    - or
    - -Xoptionsfile=
  - ◆ ENVIRON=
    - LIBPATH= change to SDK V5
    - DEBUG= can be removed
      - -Xdebug environment variable can be specified

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The serial reusability feature of the IBM SDK for z/OS, version 1.4.2 (31-bit) and earlier is not supported. If you specify -Xresettable -Xjvmset or -Xscmax the JVM will issue an error message and will not start.

The JVM shared library libjvm.so is installed in directory jre/bin/j9vm.

The IMS Java dependent region ENVIRON= member needs to have the LIBPATH changed to LIBPATH=JavaHome/bin/j9vm:JavaHome/bin:ImsjavaPath

ENVIRON= can now be used to specify any Java environment variables. This can be used to replace the DEBUG= parameter. The Java environment variables are presented as Java system properties at runtime and are therefore accessible by a Java application running in the JDR.

-Xdebug starts the JVM with the debugger enabled. By default, the debugger is disabled

## IBM SDK V5 for z/OS support

- Migration for IMS Java Dependent Regions programming model
  - ◆ Current applications do not need to change unless:
    - Applications that use U118 Abend for ROLLBACK
    - Applications that use explicit CHKP call
      - Now receives next input message after CHKP call

An IMS Java application that does not issue explicit ROLLBACK but uses U118 abend for rollback processing must be changed. An IMS Java application that uses the IMS Java hierarchical database interface for CHKP call processing must be able to process the next message off the message queue.

## IBM SDK V5 for z/OS support

- Migration for IMS Java Application Programs
  - ◆ `com.ibm.ims.application.IMSApplication` is deprecated
    - Recommend begin changing existing IMS Java applications
  - ◆ `com.ibm.ims.base.DLISecondaryIndexInfo` class has been removed
    - DLIModel generated meta data
      - No impact unless application explicitly used the class
  - ◆ `com.ibm.ims.db.SecondaryIndexInfo` class has been renamed
    - `com.ibm.ims.base.SecondaryIndexInfo` class
      - DLIModel generated meta data
      - No impact unless application explicitly used the class

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The IMS DB Resource Adapter class `com.ibm.ims.application.IMSApplication` is deprecated in IMS Version 10.

A class marked as deprecated is considered obsolete but still works in IMS Version 10.

You do not have to change your applications, but it is highly recommended.

The `com.ibm.ims.base.DLISecondaryIndexInfo` class has been removed from the library. This will only impact you if you did not use DLIModel to generate the meta data classes (the database view) or if you use the `DLISecondaryIndexInfo` class explicitly in your code.

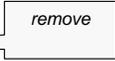
The `com.ibm.ims.db.SecondaryIndexInfo` class has been renamed to `com.ibm.ims.base.SecondaryIndexInfo`.

You will be impacted only if you use the class directly in your code. The metadata that is generated by the DLIModel utility is not affected.

## IBM SDK V5 for z/OS support - IMS Java Application sample API

### Current

```
public class CustomerApplication extends IMSApplication {  
    public static void main(String args[]) {  
        CustomerApplication myapp = new CustomerApplication();  
        myapp.begin();
```



remove



remove

### Modified

```
public class CustomerApplication {  
    public static void main(String args[]) {  
        CustomerApplication myapp = new CustomerApplication();
```

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The applications that subclass IMSApplication can be modified as follows:

Remove the "extends IMSApplication" from the class declaration line.

For example, "public class CustomerApplication extends IMSApplication" becomes "public class CustomerApplication".

The main method of the application no longer needs to call the IMSApplication.begin() method.

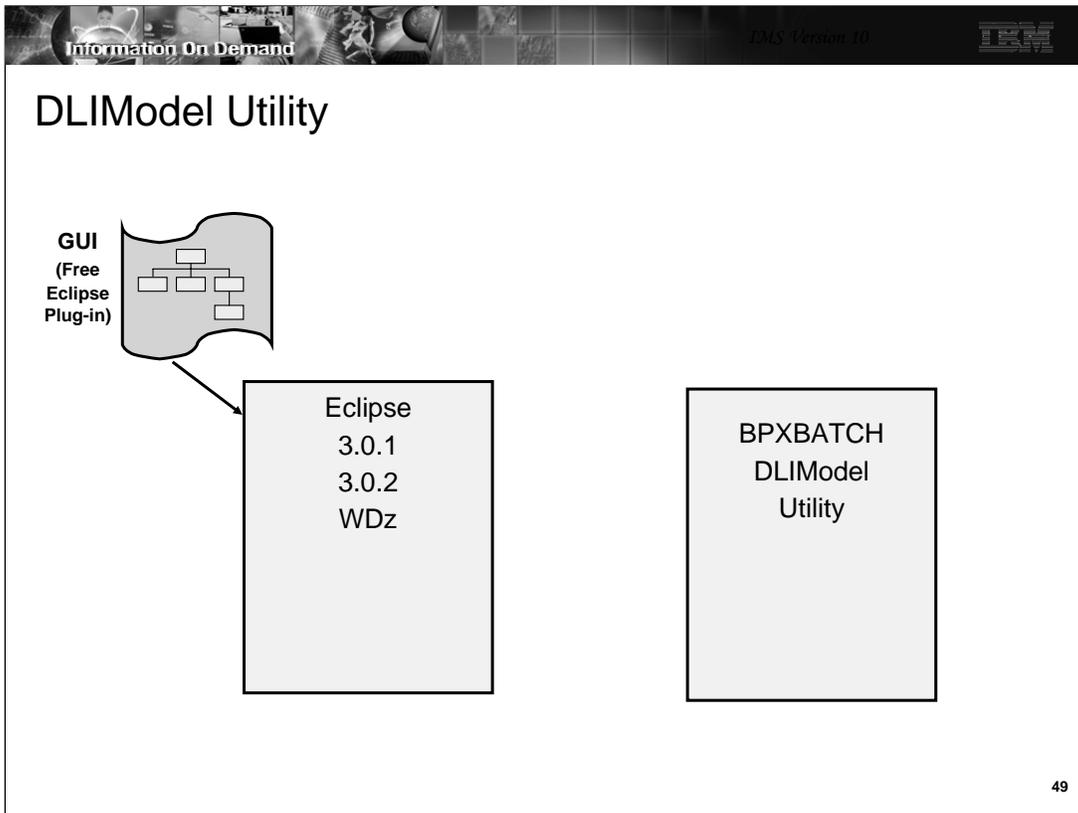
Instead, the main method can directly call the public void doBegin() method or simply move the logic from the doBegin() method to the main method and delete the doBegin() method.

## IBM SDK V5 for z/OS support

- Benefits
  - ◆ IMS participates in industry standards
  - ◆ Can be used with existing IMS Java applications
  - ◆ Reduces virtual memory consumption
  - ◆ Reduces JVM startup time



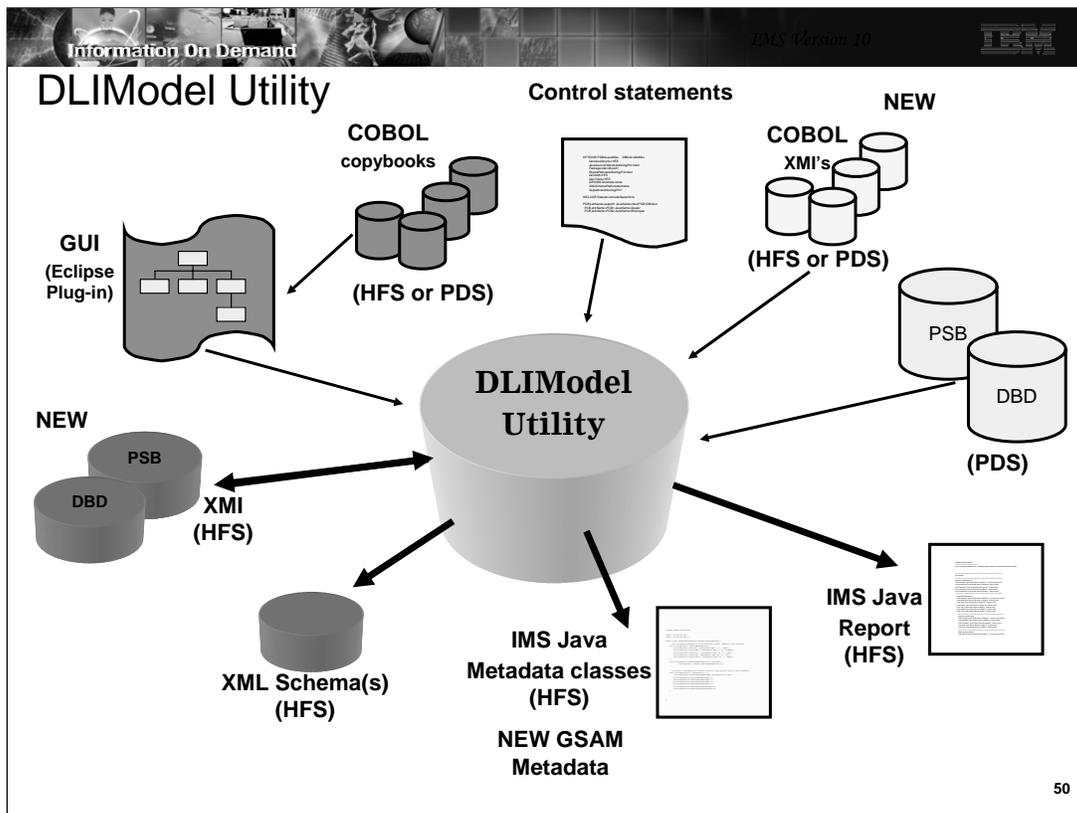
# IMS DLIModel utility



Two versions of the IMS DLIModel utility are available:

1. An IMS-shipped version that runs from System Services or from the z/OS® BPXBATCH utility
2. A technology preview IMS Web free download version that runs as a plug-in to Eclipse

The GUI can be installed in an Eclipse 3.0.1 or 3.0.2 level tool. It can also be installed in WebSphere Developer for z IDE.



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The IMS DLIModel utility has been enhanced to generate XMI from PSB and DBD source. The generated XMI can also be used as input to the DLIModel utility.

GSAM now uses the GSAMDLIDatabaseView IMS Java class for metadata information about the GSAM database. The DLIModel Utility now supports GSAM databases.

**Input:**

Shows the inputs and outputs of the DLIModel utility. The actions of the utility are directed by control statements that you supply. PSB and DBD source members are read from their PDS or PDSE data sets and parsed by the utility to build an in-memory object model of the database structure and the PSB's view of that structure.

Note IMS COBOL copybooks can only be processed by the GUI and the BPXBATCH utility can only process COBOL XMI representations of the COBOL copybooks.

**Output:**

The utility generates various outputs that were requested through control statements. You can specify to have an IMS Java metadata class be generated for the PSB processed, together with a corresponding easy-to-read DLIModel Java Report for the Java programmer to use.

You can specify an XMI description of the entire in-memory model (one description covers the PSB and all DBDs processed in the run).

You can also request a detailed trace file of the utility execution if one is necessary for problem resolution.

**IMS Java metadata classes**

The DLIModel utility produces the necessary metadata classes needed to develop IMS Java applications. However, the Java developer needs only to reference the DLIModel Java Report for information about the classes.

**DLI Model Java Report**

The DLIModel Java Report summarizes the structure of the IMS databases in a way that allows you to create IMS Java applications and to code SQL queries against the databases. With the DLIModel Java Report, you do not have to interpret the syntax of the IMS Java classes or refer to the DBD or PSB source.

**XMI Description of databases**

An XMI file, written in UTF-8 encoding, is produced by the utility if you specify genXMI=YES in the OPTIONS control statement. It describes all of the PCBs and their referenced DBDs processed in the entire run of the utility. The XMI that is produced by the utility is based on a metamodel of IMS database defined in UML. This model is a package with a number of inheritance relationships to the OMG Common Warehouse Metamodel (CWM). However, only the IMS package itself is included and used in the DLIModel utility.

**XML Schema**

The generated XML schema, written in UTF-8 encoding, is an XML document that describes an IMS database based on a PCB. An XML schema is required to retrieve or store XML in IMS. IMS uses an XML schema to validate an XML document that is either being stored into IMS or being retrieved from IMS. The XML schema, not the application program, determines the structural layout of the parsed XML document in the database during storage and the of the generated XML document during retrieval.

**DLIModel Utility GUI Download**

IBM Software - DLIModel utility - IMS Integration Solutions Suite - Microsoft Internet Explorer

Address: http://www-306.ibm.com/software/data/ims/toolkit/dlimodelutility/install.html

Country/region [select] Terms of use

Home Products Services & industry solutions Support & downloads My account

Software > Information Management Software > IMS Family > IMS DLIModel Utility >

**IMS DLIModel Utility Plug-in**

**Software Requirements**

The DLIModel utility plug-in technology preview requires one of the following software packages:

- Eclipse version 3.0.1 or 3.0.2, which is available for download from the [Eclipse Web site](#).
- WebSphere® Developer for zSeries® (WDz) version 6.0.0, which is available for download on the [WebSphere Developer for zSeries Web site](#).
- Rational Application Developer (RAD) for Websphere Software version 6.0 which is available for download on the [Rational Application for Websphere Software Web site](#). You will also need to install the J2C optional feature.

If you are using Eclipse, you will also need the following:

- Java™ runtime (JRE) or Java development kit (JDK) 1.4.2 or later
- Eclipse Modeling Framework (EMF) 2.0.1
- Graphical Editing Framework (GEF) 3.0.1
- Hyades 3.0.1

**Downloads**

- DLIModel Utility Plug-in Technology Preview
- COBOL to XMI WebSphere Studio Plug-in

**Information Management software**

- DLIModel Utility Overview
- IMS Java Guide and Reference

**Feedback & Support**

- E-mail Us

This is the IMS web site to download the DLIModel Utility Plug-in



## DLIModel Utility GUI

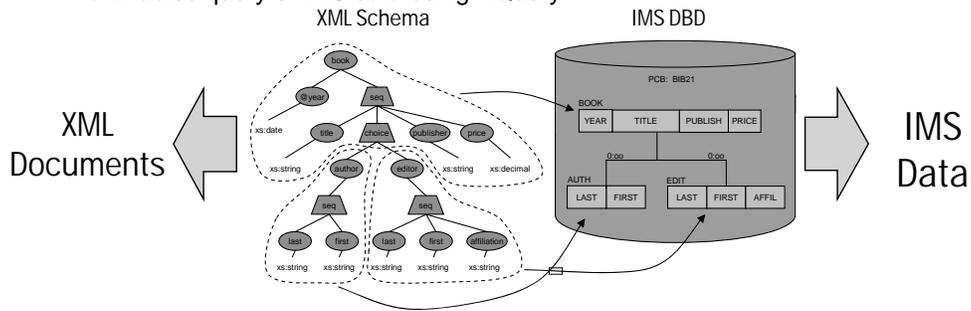
- Migration
  - ◆ Eclipse version 3.0.1 or 3.0.2
  - ◆ Download DLIModel Utility plug-in
- Benefits
  - ◆ Direct import of COBOL Copybook
  - ◆ IMS Perspective for Integrated Development Environment



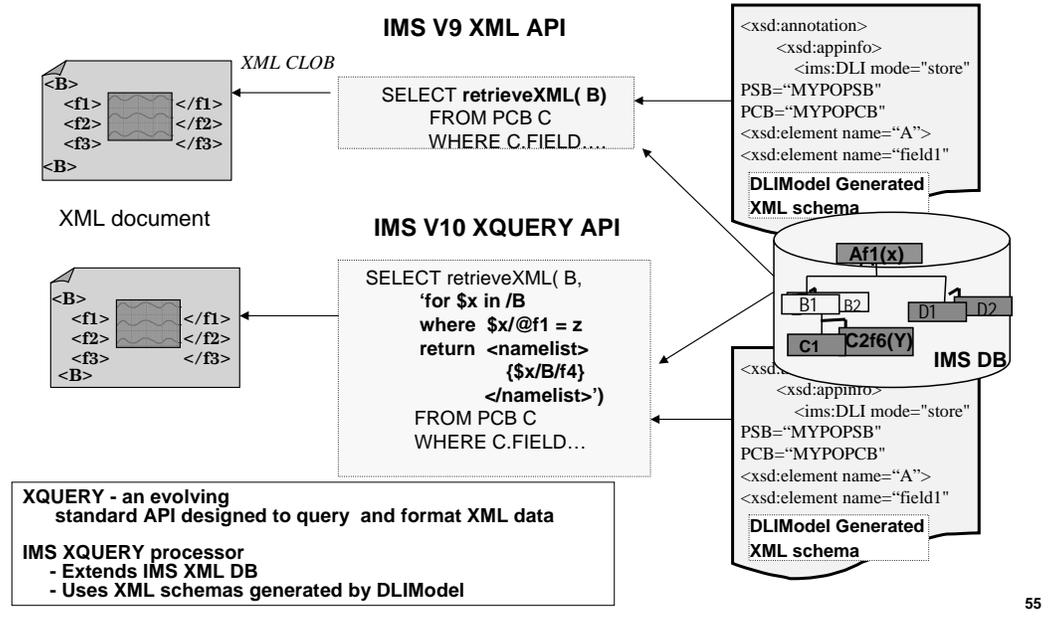
IMS XML DB allows applications to view a traditional IMS database as an XML database and to use an IMS database to store XML documents.

## XML Database - Review

- Introduces a way to view/map native IMS hierarchical data to XML documents
  - ◆ Aligns IMS Database (DBD) with XML Schema
- Allows the retrieval and storage of IMS Records as XML documents
  - ◆ Enables query of IMS data using XQuery



# IMS DB Resource Adapter XML APIs



## IMS DB Resource Adapter XQuery API

- XQuery is a language for querying XML data
  - ◆ Note XQuery is currently a read only language
- IMS XQuery extends IMS V9 XML database support
  - ◆ View entire IMS database as XML Document and return specific IMS data
- Supports the XQuery 1.0 and XPath 2.0 Data Model
  - ◆ XQuery is based on the structure of XML to provide query capabilities
- Extends IMS DB Resource Adapter API

```
SELECT retrieveXML( <segment>, <xquery> )
FROM <pcb.segment>
WHERE <predicate>
```
- ◆ Package in it's own jar file:
  - imsxquery.jar

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XQuery is a functional programming language that was designed by the World Wide Web Consortium (W3C) to meet specific requirements for querying XML data.

XQuery is based on the structure of XML and leverages this structure to provide query capabilities for the same range of data that XML stores.

The IMS DB Resource Adapter XQuery support extends the *retrieveXML* User Defined Function (UDF) by adding a second parameter. The second parameter allows the passing of an XQuery 1.0 expression.

The expression is evaluated relative to the *retrieveXML* context and returned to the result set as a CLOB value.

This implementation views the entire IMS DB as an XML document and enables the return of specific IMS data based on the XQuery.

For IMS XQuery support the XQuery 1.0 and XPath 2.0 Data Model serves two purposes.

First, it defines the information contained in the input to be used by the IMS XQuery processor.

Second, it defines all permissible values of expressions in the XQuery, and XPath languages that can be evaluated by the IMS XQuery processor.

The IMS DB Resource Adapter is packaged in *imsjava.jar*.

The IMS XQuery function resides in a separate package (*imsxquery.jar*).

## IMS DB Resource Adapter XQuery

- Benefits
  - ◆ IMS participates in industry standards
  - ◆ Can use Application Development tools that support XQuery
  - ◆ Can be used with existing IMS data and IMS XML Schemas

# DBRC

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## DBRC Enhancements and Migration

- DBRC Timestamp Precision
  - ◆ Accurate to a microsecond
- RECON READONLY Access and SAF Enhancements
  - ◆ Eliminates SAF CONTROL authority requirement
- SCI DBRC Registration
  - ◆ Support for multiple sets of RECONS
- DBRC API Enhancements
  - ◆ Includes RECON update support
- Parallel RECON Access
  - ◆ Concurrent access from multiple DBRC instances
- RECON Migration and Coexistence
  - ◆ IMS V9 and IMS V8 to IMS V10 support

# DBRC Timestamp Precision

Information On Demand IMS Version 10

## DBRC Timestamp Precision

- DBRC timestamps will be recorded to microsecond
  - ◆ Previously recorded to tenth of second
    - Could lead to duplicate timestamps (log open, log close, allocation)
  - ◆ Increased precision not in effect until MINVERS('10.1') is specified
    - For compatibility with previous releases
  - ◆ Abbreviated timestamps still supported
    - Unspecified part of time will be padded with zeros

```

LIST.LOG OLDS(DFSOLP00) SSID(SYS3) TIMEFMT(L,O,P,4)

2006.114 18:31:24.167342 -07:00      LISTING OF RECON                PAGE 0002
-----
PRIOLD
SSID=SYS3                # DD ENTRIES=1
EARLIEST CHECKPOINT = 2006.114 16:01:03.123456 -07:00

DDNAME=DFSOLP00  DSN=IMSTESTL.IMS01.OLDSP0
START = 2006.114 16:00:59.123456 -07:00  FIRST DS LSN= 0000000000000001
STOP  = 2006.114 16:13:10.185501 -07:00  LAST  DS LSN= 0000000000000042C
...

```

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IMS V10 will record timestamps to the microsecond when MINVERS('10.1') is in effect. Previous releases record timestamps to the tenth of a second. When a user specifies a timestamp, it may be abbreviated. That means that times to the microsecond do not have to be specified. Unspecified parts of the time are padded with zeros.

When using GENJCL, the precision value may be coded on the TIMEFMT parameter of the %SET statement in skeletal JCL. It is a value from 1 to 6. The default in previous releases was 1. In IMS V10 the default depends on the MINVERS value. MINVERS('10.1') sets the default to 6. MINVERS values less than '10.1' sets the default to 1.

The output from a DBRC LIST command includes full precision timestamps. In previous releases, the timestamp in the listing included only tenths of seconds. If you request the time zone offset to be listed, it follows the timestamp. Since the timestamp is larger by five bytes, the offset is moved by five bytes. In general there were at least five blanks following timestamps in listings from previous releases. This means that other information did not have to be moved for full precision timestamps in V10. The exception is the timeline information in the listing created by a LIST.HISTORY command. The timeline at the end of LIST.HISTORY outputs still has only tenths of seconds. There was not room to add the additional five bytes to these timestamps in the listing.



## DBRC Timestamp Formats

- External timestamp format in V8 and V9
  - ◆ Example: '2007.318 10:30:23.4 PST'
- External timestamp format in V10
  - ◆ Example: '2007.318 10:30:23.456789 PST'
    - Omitted trailing digits are assumed to be zeros
- Internal timestamp format is not changed in V10
  - ◆ Internal format in V8, V9, and V10 RECONS:
    - yyyydddFhhmmssthijmuFqq
      - F - hexadecimal 'F'
      - hijmu - hundredths, thousandths, etc. of second
        - hijmu are ignored in V8 and V9
        - hijmu are ignored in V10 unless MINVERS('10.1')
      - qq - quarter hour offset for time zone
      - s - sign for offset

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The timestamp used in DBRC commands and utility control statements is expanded in V10. In previous releases it may include times to one tenth of a second. In V10 it may include times to a microsecond.

Compressed and punctuated timestamp formats continue to be used. The change is the additional significant digits for hundredths through millionths of a second. The examples shown here are punctuated timestamps. The corresponding compressed timestamps would be:

V8 or V9:        063181030234 -8  
 V10:            06318103023456789 -8

The internal format of the timestamp in the RECONS is not changed in V10. The format has included microseconds since IMS V6. The PRILOG start times have had zeros in these positions. Most other RECON records have had actual values. Nevertheless, they have been ignored by other processing. IMS V10 stores actual values in all time fields. When MINVERS('10.1') is used with IMS V10, these positions become significant and are not ignored.

The internal timestamp format is used by the DBRC API. It has not changed in V10.



## DBRC Commands

- Abbreviated timestamps are supported
  - ◆ Year and day are required
  - ◆ Other values are padded with zeros
  - ◆ Examples:
 

```
LIST.LOG TOTIME('2007.178')
```

```
LIST.LOG TOTIME('2007.178 16:23')
```
- Commands using timestamps to identify a record or information within a record require full precision
  - ◆ Example:
 

```
CHANGE.IC DBD(ABC) DDN(ABC01) -
```

```
RECTIME('2007.178 16:23:31.123456 -08:00') -
```

```
ICDSN(NEW.DSN)
```

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The first example lists all log records or OLDS entries that have start times on or before day 178 in 2007. Full precision is not required on the TOTIME value. The next example lists all log records or OLDS entries that have start time on or before day 16:28 (4:28 p.m.) on day 178 in 2007.

Many RECON records include the timestamp as their keys. When a RECON record is recorded with a full precision timestamp, commands for that specific record require full precision in their timestamps. The second example shows a command where the full precision timestamp is required. An image copy record was created with a full precision timestamp. The timestamp is part of the key. The CHANGE.IC command in the example changes the data set name of the image copy of the database data set with DDNAME ABC01 in the ABC database which was run at the time specified in the RECTIME parameter.

Commands requiring full precision timestamps are

- CHANGE.BKOUT, CHANGE.CA, CHANGE.IC, CHANGE.PRILOG RLDS, CHANGE.PRILOG SLDS, CHANGE.PRILOG TSLDS, CHANGE.SECLOG RLDS, CHANGE.SECLOG SLDS, CHANGE.SECLOG TSLDS, and CHANGE.UIC
- DELETE.CA, DELETE.IC, DELETE.RECOV, DELETE.REORG, and DELETE.UIC

If you enter a command with a timestamp that has with less than six digits for microseconds, DBRC uses zeros for the missing digits. Since NOTIFY commands create new information in the RECONs, their timestamps do not have to match existing data. You can use timestamps without all six digits for microseconds for NOTIFY commands. Zeros will be used for any of the missing digits.



## Change Accumulation and Database Recovery

- Change Accumulation and Database Recovery utilities
  - ◆ Utility control statements have increased timestamp field sizes
  - ◆ May be used for increased precision timestamps
    - Increased precision is not required
  - ◆ Does not depend on MINVERS value
  - ◆ GENJCL.CA and GENJCL.RECOV create correct control statements

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The Database Change Accumulation utility DB0 and DB1 control statements have been modified to support timestamps with greater precision. The new expanded timestamp format may be used in V10 but it is not required. DB0 control statements are used to specify the database data sets that are accumulated to the new change accumulation data set. DB1 control statements are used to specify the database data sets that are written to the new output log data set. Since the timestamps now may occupy more columns in the control statements, the position of the database data set DDNAMEs have moved and only three may be specified on one control statement. Previous IMS versions allowed four to be specified on a control statement.

The S control statement for the Database Recovery utility is used to specify the database and DDNAME for the database data set that is to be recovered. If the recovery is a timestamp recovery, the timestamp is also specified. The new expanded timestamp format may be used in V10 but it is not required. In previous releases column 57 was used for an indicator. The indicator could specify that a user image copy had been restored or that an RSR receive was done. Since the timestamp may use column 57, the indicator is now coded in column 63 when needed. There is another small change in the coding of the timestamp. In previous releases there was not a space between the time and the sign for the time zone offset.

GENJCL.CA has been updated to create the new format of the control statements. These changes to the control statements will have no effects on users who create Change Accumulation JCL and control statements with GENJCL.CA. This is the vast majority of IMS installations.

GENJCL.RECOV has been updated to create the new format of the control statement for timestamp recovery. The change in the control statement will have no effects on users who create Database Recovery JCL and control statements with GENJCL.RECOV. This is the vast majority of IMS installations.



## DBRC Timestamp Precision

- Migration Considerations
  - ◆ Full precision used after MINVERS('10.1') specified
    - Fallback to MINVERS < 10.1 requires deletion of RECON log records
  - ◆ Utility control statement changes are unlikely to affect users
    - GENJCL.CA and GENJCL.RECOV create correct statements
      - Used by almost all users
  - ◆ RECON listings and message outputs include full precision timestamps when MINVERS('10.1')
  - ◆ Abbreviated timestamps supported for most uses
  - ◆ No changes for DBRC API
    - Timestamps continue to be 12 byte internal timestamp format
- Benefits
  - ◆ Avoids possible duplicate timestamps

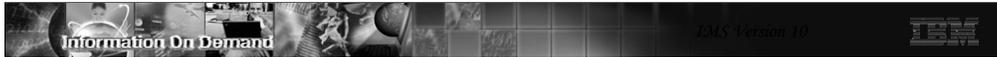
8

Full precision timestamps are not implemented unless the RECONs have MINVERS('10.1') specified. Even when MINVERS is set to a lower value, the IMS V10 Change Accumulation and Database Recovery utility control statements require new formats which accommodate full precision timestamps. Nevertheless, this is unlikely to be a concern to users since GENJCL.CA and GENJCL.RECOV in IMS V10 always produce control statements with the V10 formats.

If you wish, you may specify abbreviated timestamps for most uses. DBRC will interpret the time correctly. Full precision timestamps are required in CHANGE and DELETE commands when a full precision timestamp is part of the RECON record key.

When MINVERS('10.1') is set log records are created with the full precision timestamps. If you fallback to MINVERS('9.1') or MINVERS('8.1'), the log records created with full precision timestamps must be deleted before the CHANGE.RECON MINVERS(...) command is issued. The records that must be deleted include PRILOG, PRISLD, PRIOLD, etc. and the ALLOC records associated with these log records.

# RECON READONLY Access and SAF Enhancements



## SAF (RACF) Support for RECONS

- SAF supports four levels of data set authority
  - ◆ READ, UPDATE, CONTROL, and ALTER
- Previous releases of IMS
  - ◆ CONTROL or higher (ALTER) was required for RECONS
    - ALTER required for DELETE and DEFINE
  - ◆ Users only wanting to read data from RECONS required CONTROL authority

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System Authorization Facility (SAF) products, such as RACF, support four levels of data set authority. In ascending sequence of authority these are READ, UPDATE, CONTROL, and ALTER. Previous releases of IMS required at least CONTROL authority for all users of the RECONS. IDCAMS DEFINE and DELETE of a RECON data set required ALTER.

Previous IMS releases opened the RECONS for update with CONTROL specified in the VSAM ACB for the RECONS. This required CONTROL authority for open. This was true even if the user only wanted to read the RECONS as would be done for a LIST command.



## READONLY Support for RECONS

- V10 READONLY support
  - ◆ Specification:
    - PARM=READONLY on DSPURX00 EXEC statement
    - READONLY=YES on DBRC API FUNC=STARTDBRC macro
  - ◆ Required for users with READ authority
    - Causes RECONS to be opened for input
- IMS V10 SAF authority for RECONS
  - ◆ READ is sufficient for readers
  - ◆ UPDATE is sufficient for all accesses except DELETE and DEFINE
  - ◆ ALTER required for DELETE and DEFINE
  - ◆ CONTROL is never required
- Benefits
  - ◆ Users need only READ authority to list RECON contents
  - ◆ Users need only UPDATE authority for other DBRC commands

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IMS V10 adds READONLY support for the RECONS. This is invoked with PARM=READONLY on the EXEC statement for the DBRC utility (DSPURX00) or by specifying the new READONLY=YES parameter on the DBRC API FUNC=STARTDBRC macro. When READONLY is specified, the RECONS are opened for read. This means that only READ authority is required in SAF (RACF).

IMS V10 has made another change to open. Due to this change, CONTROL does not have to be specified for users who update the RECONS. Only UPDATE authority is required. Of course, ALTER is still required for users who DELETE and DEFINE the data sets. In previous releases DBRC opened the RECONS with CONTROL specified in the VSAM ACB for the RECONS. This required CONTROL authority for open. In IMS V10 the open has changed. If READONLY is not specified, the open is done for update but CONTROL is not specified in the ACB. This means that only UPDATE authority is required.

As with previous releases, if you invoke the DBRC utility from your program you may use the DSPURXRT entry point. IMS V10 has added the capability to specify READONLY through a parameter passed to the entry point in the first word of the argument list.



## READONLY Support for RECONS

- Error recovery is not attempted for READONLY users
  - ◆ Cannot recover from RECON errors
    - Cannot write to spare RECON
  - ◆ Cannot recover for failed DBRC instances
    - Cannot update RECON for another DBRC instance
- Updates attempted by READONLY users result in error message and ABEND
  - ◆ DSP0030E RECON IS READ MODE ONLY - xxxxxxx IS NOT ALLOWED
    - xxxxxxx indicates attempted function, e.g. INSERT

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Since READONLY causes IMS to open the RECONS for input, users of READONLY cannot invoke recovery processes for the RECONS. There are two kinds of recovery processes. The first is recovery from RECON errors. If an I/O error occurs on a RECON data set, updaters can reconfigure the RECONS. This includes copying the good RECON to the spare. READONLY users cannot do writes, so they cannot do this recovery process. The second recovery process is recovering from a failed DBRC instance. When a DBRC instance (batch job, utility, or online system) updates multiple RECON records it first writes a Multiple Update Record (MUP) to the RECONS. It then does the updates and, finally, deletes the MUP record. If it fails in the middle of this process, another DBRC instance recovers. The other DBRC reads the MUP record and either completes or backs out the changes. If the other DBRC instance is a READONLY user, it cannot perform this recovery because it cannot write.

If a READONLY execution attempts to update the RECONS, message DSP0030E is issued and the application abends. The variable text in the message indicates the operation that was attempted. The possible values are:

<b>CONFIG</b>	An attempt was made to reconfigure the RECON data sets.
<b>DELETE</b>	An attempt was made to delete a record from the RECON.
<b>INSERT</b>	An attempt was made to create a new RECON record.
<b>UPDATE</b>	An attempt was made to update an existing RECON record.
<b>UPGRADE</b>	An attempt was made to upgrade the RECON data sets.
<b>MODE-SW</b>	An attempt was made to switch accessing mode.

# IMSPLEX SCI Registration



## IMSPLEX SCI Registration

- IMS V8 and V9
  - ◆ First DBRC to specify an IMSPLEX name set the value in the RECONS
  - ◆ Problem:
    - Users could mistakenly set IMSPLEX name by specifying IMSPLEX= parameter on a job
    - Subsequent users would be denied access to RECONS
- IMS V10
  - ◆ IMSPLEX name set only by CHANGE.RECON IMSPLEX(name) command
- Benefit
  - ◆ Users will no longer mistakenly set the IMSPLEX value with job execution parameter

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When the IMSPLEX name is set in the RECONS, all subsequent users must specify the same IMSPLEX name. They must either include the IMSPLEX= execution parameter with the correct value or the DBRC SCI Registration exit must specify the correct value.

In previous releases some installations reported that users mistakenly specified the IMSPLEX= execution parameter. This caused subsequent jobs to fail until the IMSPLEX name could be removed from the RECONS with a CHANGE.RECON NOPLEX command. The change in IMS V10 will prevent this situation from occurring. Now the IMSPLEX name will only be set by the CHANGE.RECON IMSPLEX(name) command.

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## DBRC Sharing Group ID

- DBRC Sharing Group ID is stored in RECONS
  - ◆ Used to distinguish multiple sets of RECONS in the same IMSplex
  - ◆ Set/changed with `CHANGE.RECON IMSPLEX(plexname,groupid)`
  - ◆ Specified by DBRC SCI registration
    - DBRC SCI user exit (DSPSCIX0) or EXEC parameter (DBRCGRP=)
- Benefit
  - ◆ ARLN and Parallel RECON Access viable for multiple sets of RECONS

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The DBRC Group ID is new in IMS V10. It is used so that Automatic RECON Loss Notification (ARLN) can distinguish between the different sets of RECONS. The IDs ensure that a reconfiguration of the RECONS is only processed by the DBRCs using that set of RECONS.

When upgrading RECONS from a previous release where the plexname was specified, the group ID defaults to 001. If there is no plexname in the RECONS when they are upgraded, the DBRC Group ID is not set.

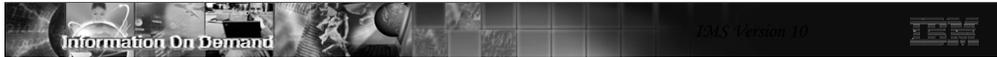
The DBRC Group ID is set or changed with `CHANGE.RECON IMSPLEX(plexname,groupid)` command. If the DBRC Group ID is not set before the command is issued, it defaults to 001.

DBRC SCI registration must include the DBRC Group ID along with the IMSplex name.

The example on this slide shows an IMSPLEX with two sets of RECONS. One set uses the DBRC Group ID of GPA. The other set uses GPB. The DBRCs using the GPA RECONS must specify GPA to SCI registration. The DBRCs using the GPB RECONS must specify GPB to SCI registration.



IMS V10 introduces several enhancements to the DBRC API. This class provides an overview of these enhancements. You should refer to the IMS V10 System Programming API Reference manual for specific information on using this API.



## DBRC API Enhancements

- Alternate RECON and IMS DD names
- RECON update capability
  - ◆ Updates are made by using DBRC commands (INIT, CHANGE, NOTIFY)
- Register as subsystem
  - ◆ Allows application to authorize databases
- Database authorizations
  - ◆ Allows application to do utility functions
- QUERY enhancements
  - ◆ DBDS, Partition, Log, and wildcard support
- Security enhancements
  - ◆ Extension of DBRC command authorization
- Miscellaneous enhancements

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The DBRC API is described in the *IMS V10 System Programming API Reference* manual. It contains details on the DSPAPI macro, its parameters and usage, and on the control blocks created by DBRC API requests.



## Alternate RECON and IMS DD Names

- Alternate DD names may be specified for RECONS and IMS DDs
  - ◆ Facilitates changing RECONS with one execution of DBRC API program
    - Multiple RECONS can be processed by one program execution
  - ◆ MDA members must be created if dynamic allocation is used
    - DFSMDA supports new DDnames for RECONS
  - ◆ Restriction: Only one set of RECONS may be open at any time
    - STOPDBRC must be issued before second STARTDBRC

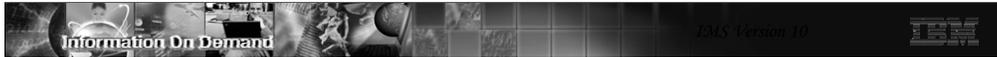
18

Programs using the DBRC API may use alternate names for the IMS (DBDLIB) and RECON DDNAMEs. This could make it easier to develop programs which access multiple sets of RECONS. In V9 these programs had to use dynamic allocation (SVC 99) to change the data sets for RECON1, RECON2, and RECON3 to access a different set of RECONS. In IMS V10 they may use JCL to allocate multiple sets or they may use DFSMDA to create dynamic allocation members for the different RECONS.

The DFSMDA macro has been enhanced to support the alternate DD names for RECONS. A new parameter, DDNAME=, has been added to the DFSMDA macro for TYPE=RECON.

Programs using the DBRC API are still restricted to accessing only one set of RECONS at a time. A FUNC=STOPDBRC request must be processed before a second set of RECONS may be opened with a second FUNC=STARTDBRC request.

As with previous releases, if you invoke the DBRC utility from your program you may use the DSPURXRT entry point. IMS V10 has added the capability to specify alternate DD names for the RECON data sets. This is done through the expansion of the list of DDNAMEs passed to the entry point in the second word of the argument list.



## DBRC API RECON Update Capability

- Implemented with API command facility
  - ◆ Application program issues DBRC commands
    - INIT, CHANGE, DELETE, NOTIFY, GENJCL, BACKUP, and RESET
    - LIST commands are not valid
      - FUNC=QUERY should be used to list data from the RECONS
  - ◆ Uses FUNC=COMMAND on DSPAPI macro
  - ◆ JCL requirements are the same as DSPURX00
    - IMS DD statement may be required.
    - GENJCL commands require JCLPDS and JCLOUT DDs
      - Unless overridden by JCLPDS and JCLOUT command parameters
  - ◆ Output of command is returned within standard API output block

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The DBRC API has been extended. It was introduced in IMS V9. The original implementation of the DBRC API allowed you to query the data in the RECONS by issuing DSPAPI macros. The extensions to the API in V10 allow you to update the RECONS. Updates are done by allowing invoking DBRC commands. Commands such as INIT, CHANGE, DELETE, NOTIFY, and RESET may be used to update the RECONS. This interface may also be used to issue GENJCL and BACKUP commands which do not update the RECONS. LIST commands are not valid. The DSPAPI FUNC=QUERY function should be used to list data from the RECONS.

The output from commands is returned in an API output block. This block has the same format as the QUERY blocks that were introduced in V9. Details of the command blocks are shown later.



## DBRC API Subsystem Registration

- Application may register as a subsystem
  - ◆ Sign on is part of DSPAPI FUNC=STARTDBRC processing
  - ◆ Required for database authorizations
  - ◆ User supplies the subsystem name
  - ◆ DBRC creates a subsystem (SSYS) record in the RECONS
    - LIST output shows SSTYPE=DBRCAPI
    - Support added to QUERY TYPE=SUBSYS, LIST.SUBSYS, and NOTIFY.SUBSYS
  
- DSPAPI FUNC=STOPDBRC deletes subsystem record
  - ◆ Unauthorizes databases

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The STARTDBRC function is enhanced to support the creation of subsystem records. The user application may register with DBRC as a subsystem. This is required for authorizing databases. Database authorization support has also been added to the DBRC API. It will be explained later. Subsystem registration is done by adding an SSID= parameter to the DSPAPI FUNC=STARTDBRC macro. The meanings of the other parameters on the macro are unchanged.

A new type of subsystem has been added to the those that are stored in the SUBSYS record. This type is DBRCAPI. It is used when DSPAPI FUNC=STARTDBRC is used to create the SUBSYS record.

Support for this new type has been added to QUERY TYPE=SUBSYS, LIST.SUBSYS, and NOTIFY.SUBSYS.

QUERY TYPE=SUBSYS: This QUERY request has been enhanced to include SSTYPE=DBRCAPI to limit the returned information to only DBRC API subsystems. A new flag bit meaning has been added to the output block created by a QUERY TYPE=SUBSYS. It indicates that the subsystem is a DBRC API subsystem. The bit is only set when VERSION=2.0 is specified on the QUERY.

LIST.SUBSYS and LIST.RECON: The output of the LIST.SUBSYS and LIST.RECON commands includes SSTYPE=DBRCAPI for DBRC API subsystems. You can list only DBRCAPI subsystems by using the DBRCAPI keyword on the LIST.SUBSYS command.

NOTIFY.SUBSYS: The NOTIFY.SUBSYS command has been enhanced. The new DBRCAPI keyword causes the command to create a DBRC API subsystem record.

The DBRCAPI subsystem records are deleted by DSPAPI FUNC=STOPDBRC macros. If any databases are authorized to the subsystem, they are unauthorized when the macro is processed.



## DBRC API Database Authorization

- DBRC API allows database authorizations and unauthorizations
  - ◆ Databases, partitions, and areas may be authorized
    - Authorizations control sharing of databases, partitions, and areas
  - ◆ Application must be registered as a subsystem
    - Cannot be READONLY
  - ◆ Access intents of RD, RO, and EX are allowed
    - UP is not allowed
  - ◆ Utility privileges may be granted
    - Allows authorization when some authorization flags are on
- Usage
  - ◆ May be used to provide DBRC interface for applications with utility functions

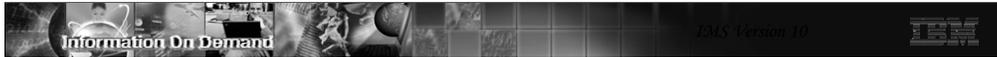
21

Applications using the DBRC API may authorize and unauthorize databases, partitions, and areas. Databases are authorized to subsystems, so authorization requests come from applications that are registered as subsystems. Since authorizations update the RECONS, the application cannot be using READONLY.

When a database, partition, or area is authorized, its access intent may be specified. Block level data sharing is not supported for DBRC API users, therefore, UP is not allowed. If any changes are to be made to a database, partition, or area, EX access must be used.

Utility privileges may be granted with an authorization. This allows authorizations even though the 'Prohibit Further Authorization,' 'Image Copy Needed,' or 'Read Only' flags are on. This is explained further on the next page.

Authorizations may be needed when the DBRC API application is providing functions similar to IMS database utilities, such as back up, recovery, or reorganization.



## DBRC API FUNC=QUERY Enhancements

- LOG queries on a range of log records
  - ◆ DSPAPI FUNC=QUERY macro with TYPE=LOG may specify:
    - STARTIME=, FROMTIME=, TOTIME=, or FROMTIME= and TOTIME=
- HALDB partition queries
  - ◆ New TYPE=PART keyword on the DSPAPI FUNC=QUERY macro
    - Returns blocks for partition(s) without database blocks
- DBDS queries
  - ◆ New TYPE=DBDS keyword on the DSPAPI FUNC=QUERY macro
    - Returns blocks for database data sets without database blocks
- Wildcards in name parameters
  - ◆ Allowed for DB, GROUP\*, OLDS, SUBSYS, and BACKOUT queries
    - \* Group includes: CAGROUP, DBGROUP, DBDSGROUP, RECOVGROUP, and GSGROUP

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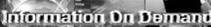
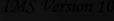
The DBRC API QUERY capability has been enhanced in several ways.

Queries for logs may request log records from a range of times. Queries for HALDB information may request data for partitions without requesting database data.

Database data set data may requested without requesting the data for the database in which the data set or data sets reside.

A wildcard capability has been added to several query types. This is the use of an asterisk (\*) when specifying a name. The queries where this may be used are:

Query TYPE=	Asterisk allowed with
DB	DBNAME=
*GROUP	NAME=, GROUP=
OLDS	SSID=
SUBSYS	SSID=
BACKOUT	SSID=

## DBRC API Security Authorization

- DBRC command authorization security includes DBRC API requests
  - ◆ Requests are treated like commands for security checking

API FUNC=	Resource Defined to RACF
STARTDBRC and STOPDBRC	hlq.STDBRC.ssid
FUNC=QUERY	Equivalent resource for LIST command e.g. hlq.LIST.DB.dbname for TYPE=DB DBNAME=dbname
FUNC=COMMAND	Command resource e.g. hlq.CHANGE.DB.dbname
AUTH and UNAUTH	hlq.AUTH.dbname
FUNC=RELBUF	Not applicable; security authorization not checked

- ◆ Wildcards in API QUERY requests are converted to ALL resource name
- ◆ AUTH and UNAUTH validate each entry in the AUTHLIST

- Security was not checked for API in V9

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DBRC command security was introduced in IMS V8. It may be used to invoke authorization checking for DBRC commands. RACF, or any SAF security product, may be used. Alternatively, an exit routine may be invoked or both the security product and the exit routine may be invoked. Commands are authorized by defining a resource representing the command. In RACF this is done with an RDEFINE statement.

This authorization is extended to the DBRC API in IMS V10. API requests invoke command authorization checking. Command authorization checking uses resources which are defined to secure specific commands or API requests. Resource names have the following form:

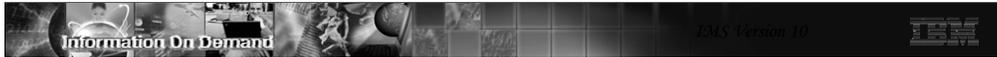
hlq.verb.resourcetype.resourcename

The high level qualifier (hlq) in the resource identifies a set of RECONS. “verb” identifies a DBRC command or API request type. “resourcetype” identifies a resource type on which the command or request operates. For example, a LIST.DB command operates on the database resource type. “resourcetype” is optional. “resourcename” identifies a specific resource instance. For example, a LIST.DB DBD(XYZ) command operates on the XYZ resource instance or name. “resourcename” is optional.

This scheme has been extended for API requests as shown in the table.

TYPE=STARTDBRC and TYPE=STOPDBRC requests are checked using resource of hlq.STDBRC.ssid. ssid specifies a subsystem and is optional. It restricts the use of the requests for a specific subsystem.

Security was not checked for any DBRC API requests in IMS V9. It is possible that a program which executed successfully in IMS V9 will fail security when executed in IMS V10.



## RECON Open

- RECONS may be initialized or upgraded using API
  - ◆ If VERSION=2.0 (V10) is specified on FUNC=STARTDBRC
    - STARTDBRC succeeds even with RECON not initialized or upgraded
      - RC=4 with reason code
      - Allows DBRC API program to INIT.RECON or UPGRADE
    - ◆ If VERSION=1.0 (V9) is specified on FUNC=STARTDBRC
      - STARTDBRC fails if RECON is not initialized or upgraded

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The IMS V10 DBRC API has added the capability to open a set of RECONS which are not initialized or which are at a previous release level. This allows the application program to initialize the RECONS with an INIT.RECON command or to upgrade them with a CHANGE.RECON UPGRADE command. This could be useful for utility-like programs which create and upgrade RECONS.



## VERSION parameter in DSPAPI macros

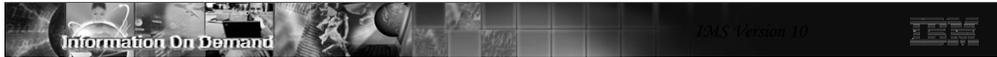
- New functions and options require VERSION=2.0
  - ◆ IMS V10 macros default to VERSION=2.0
- Applications are release independent
  - ◆ VERSION=1.0 will run with IMS V10
    - Reassembly is not required
  - ◆ Applications can be reassembled with IMS V10 macros
    - Will run unchanged if VERSION=1.0 is specified
    - May require changes if VERSION= defaults to 2.0
  - ◆ Recommendation
    - Always specify VERSION= parameter
      - Allows reassembly in future releases without changes

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Each DBRC API macro includes the VERSION= parameter. New functions, such as AUTH, and new options, such as READONLY=YES, require VERSION=2.0. In IMS V9 the only valid value for VERSION was 1.0. It was also the default. In IMS V10 VERSION= defaults to 2.0.

Applications written in IMS V9 will continue to run in V10 without change. Reassembly is not required. In fact, reassembly could cause the program to change due to the change in the default for VERSION=. In some cases, the default of VERSION=2.0 may cause different results from the previous default of VERSION=1.0. This is not always the case. Some of the changes are only the use of previously reserved bytes in the control blocks that are produced. In any case, if you wrote a program for IMS V9 and reassemble it using an IMS V10 macro library, it is safest to specify VERSION=1.0 on the DFSAPI macros before the reassembly.

Since the VERSION= parameter defaults to the latest level of the macros and later levels may produce different results, it is safest to specify the VERSION= parameter value explicitly. This will ensure that future assemblies of DBRC API programs will produce the same results.

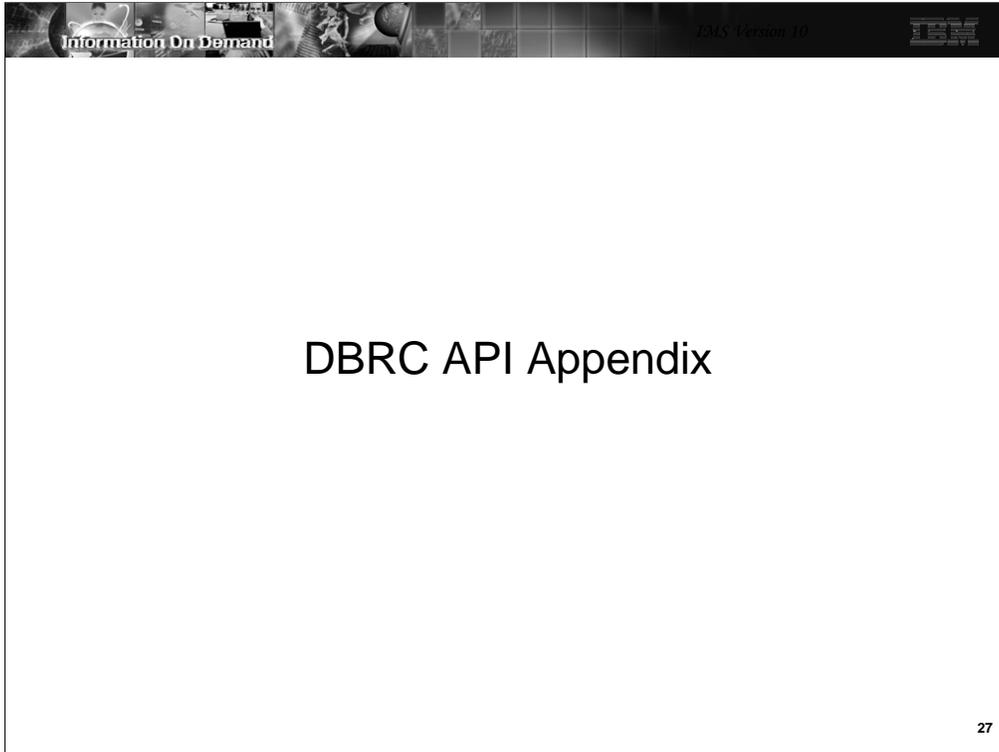


## DBRC API Enhancements

- Benefits
  - ◆ RECON update capability
    - Includes upgrade and INIT of RECONs
  - ◆ Database authorization capability
    - Especially useful for utility-like functions
  - ◆ QUERY enhancements
    - Including wildcard support
  - ◆ Security enhancements
    - Authorization control by function

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The DBRC API is described in the *IMS V10 System Programming API Reference* manual. It contains details on the DSPAPI macro, its parameters and usage, and on the control blocks created by DBRC API requests.



This appendix has more information on the DBRC API.

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## Alternate RECON and IMS DD Names

- Macro for opening alternate RECONS

```
DSPAPI FUNC=STARTDBRC IMS=imsddname
      RECON1=r1ddname RECON2=r2ddname RECON3=r3ddname
      ...
```
- DFSMDA statement for RECON alternate DDNAME

```
DFSMDA TYPE=RECON,DSNAME=dsname,DDNAME=ddname
```

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The first example shows the DFSAPI FUNC=STARTDBRC macro with the parameters for specifying alternate RECON and IMS DD names.

The second example shows the DFSMDA macro to specify an alternate DD name for a RECON. A new parameter, DDNAME=, has been added to the DFSMDA macro for TYPE=RECON.

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## DBRC API Command Function

- DSPAPI FUNC=COMMAND

```
DSPAPI FUNC=COMMAND COMMAND=cmdaddr TOKEN=taddr,
      OUTPUT=output BUFFERLENGTH=number | 4096
      SUPPRESS=YES | NO ...
```

- ◆ *cmdaddr* - address of command header and command
  - Command is preceded by a 4-byte header specifying its length
- ◆ *taddr* - address of 4-byte API token
- ◆ *output* - address of address of output block from command
  - Block may be released with RELBUF API request
- ◆ *number* - command output length (minimum size is 4096)
- ◆ If SUPPRESS=YES and RC=0, no output block is returned (*output* is 0)
  - Command is successful
  - FUNC=RELBUF not required to release buffers

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FUNC=COMMAND is used on the DSPAPI macro to issue a DBRC command. The COMMAND= parameter specifies the address where the command resides. The command consists of a header followed by a DBRC command. The header is a full word containing the length (in bytes) of the following command. The output block address is returned at the address specified on the OUTPUT parameter. The output of the DBRC command is written in this output block. This block is shown on the next page.

The BUFFERLENGTH= parameter specifies the size of the buffer used for the output of the command. The output is written in the output block produced by the request. It is formatted for display to a terminal rather than printed to a SYSPRINT data set. The output buffer consists of:

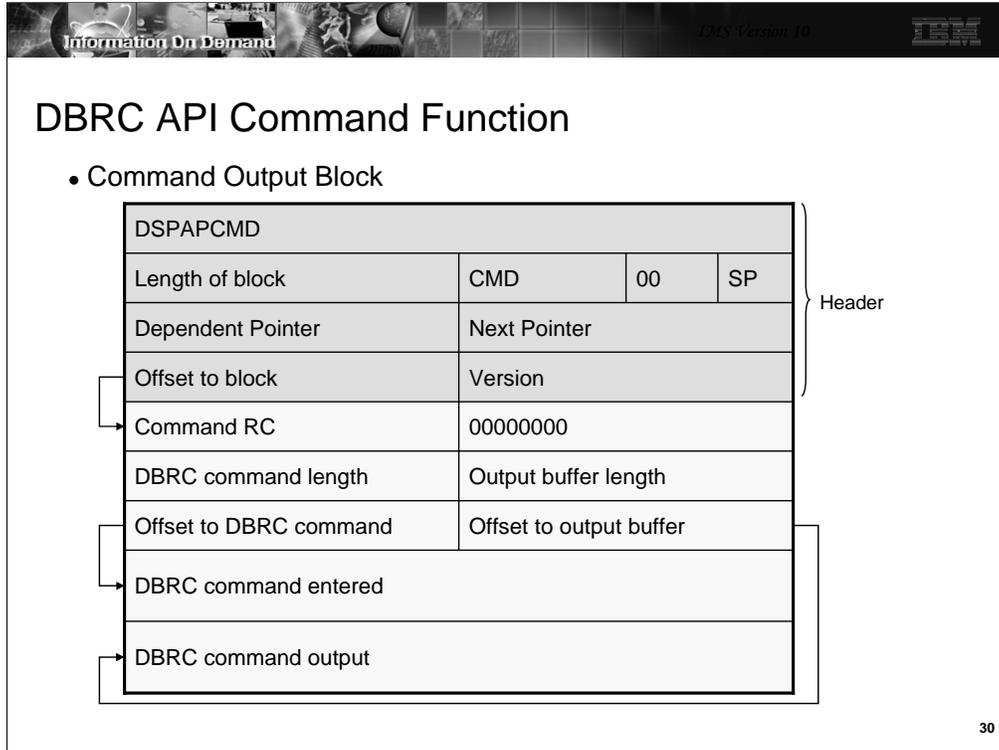
- A halfword containing the length of the buffer which includes this halfword.
- A halfword of zeroes.
- One or more generated lines of output.

Each generated line consists of:

- A halfword containing the length of the line which includes this halfword.
- A halfword of zeroes.
- The generated line of output.

Carriage control characters are removed from each line. Each line is terminated with a New Line (NL) character (X'15'). Blank lines are removed from the output. The output buffer has a default length of 4,096 bytes. A buffer up to 32,760 bytes may be requested. If the buffer is not large enough to hold all the lines of output, the last line is DSP0057I MESSAGE BUFFER FULL, OUTPUT TRUNCATED.

SUPPRESS=YES may be used so that no output block is created when a return code of 0 is returned. This eliminates the possible need to release the storage for the block with a FUNC=RELBUF request. SUPPRESS=NO is the default.



This shows the format of the output block created by DSPAPI with FUNC=COMMAND. It has the same structure as the blocks created by DSPAPI with FUNC=QUERY. The first 32 bytes are the prefix of the block. The lines in the diagram, other than the last two line, represent 8 bytes.

- DSPAPCMD is the name of the mapping macro for this block. It is stored in the first 8 bytes of the block.
- CMD is a 2-byte indicator that this is a command block.
- 00 is one byte of x'00'.
- SP is the subpool in which this block is stored.
- The dependent pointer and next pointer are not used in the command output block. These blocks are not chained to other blocks.
- Version is the version of this block. It's value is 2.0 in IMS V10.
- Command RC is the return code from the command.
- 00000000 is four bytes of x'00'.
- DBRC command length is the length of the command passed by the DSPAPI FUNC=COMMAND macro.
- DBRC command entered is the DBRC command entered by the DSPAPI FUNC=COMMAND macro. It is copied from the address specified in the macro to this block.
- Output buffer length is the length of the output buffer that was specified in the DSPAPI FUNC=COMMAND macro.
- The offset fields are 4-byte offsets to the indicated fields in the block.

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## DBRC API Subsystem Registration

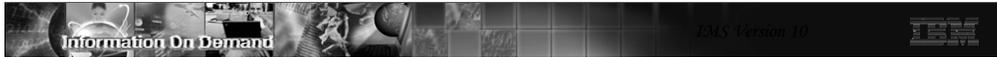
- Macro to register as a subsystem
  - ◆ Sign on is part of DSPAPI FUNC=STARTDBRC processing

```
DSPAPI FUNC=STARTDBRC SSID=subsysname ...
```

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The STARTDBRC function is enhanced to support the creation of subsystem records. Subsystem registration is done by adding an SSID= parameter to the DSPAPI FUNC=STARTDBRC macro. The meanings of the other parameters on the macro are unchanged.

A new type of subsystem has been added to the those that are stored in the SUBSYS record. This type is DBRCAPI. It is used when DSPAPI FUNC=STARTDBRC is used to create the SUBSYS record.



## DBRC API Subsystem Registration

- Deleting the DBRCAPI subsystem record
  - ◆ Sign off is part of DSPAPI FUNC=STOPDBRC processing
    - Subsystem name is not specified
    - Any databases authorized to subsystem are unauthorized
  - ◆ If application abends or terminates without issuing STOPDBRC, the subsystem record is not deleted
    - Databases remain authorized
    - Subsystem record is deleted with DBRC commands:
      - CHANGE.SUBSYS ... STARTRCV
      - CHANGE.SUBSYS ... ENDRECOV
      - DELETE.SUBSYS ...

The DBRCAPI subsystem records are deleted by DSPAPI FUNC=STOPDBRC macros. If any databases are authorized to the subsystem, they are unauthorized when the macro is processed.

If a DBRCAPI application abends or if it terminates normally without issuing the DSPAPI FUNC=STOPDBRC, its subsystem record is not deleted. Any databases authorized to the subsystem remain authorized. The subsystem record may be deleted by issuing the same commands that delete any subsystem record. If the application has authorized databases, then the CHANGE.SUBSYS STARTRCV and CHANGE.SUBSYS ENDRECOV are used to delete the authorizations. Database authorizations must be deleted before the subsystem record can be deleted. The DELETE.SUBSYS command is used to delete the subsystem record.

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## DBRC API AUTH Function

- DSPAPI FUNC=AUTH

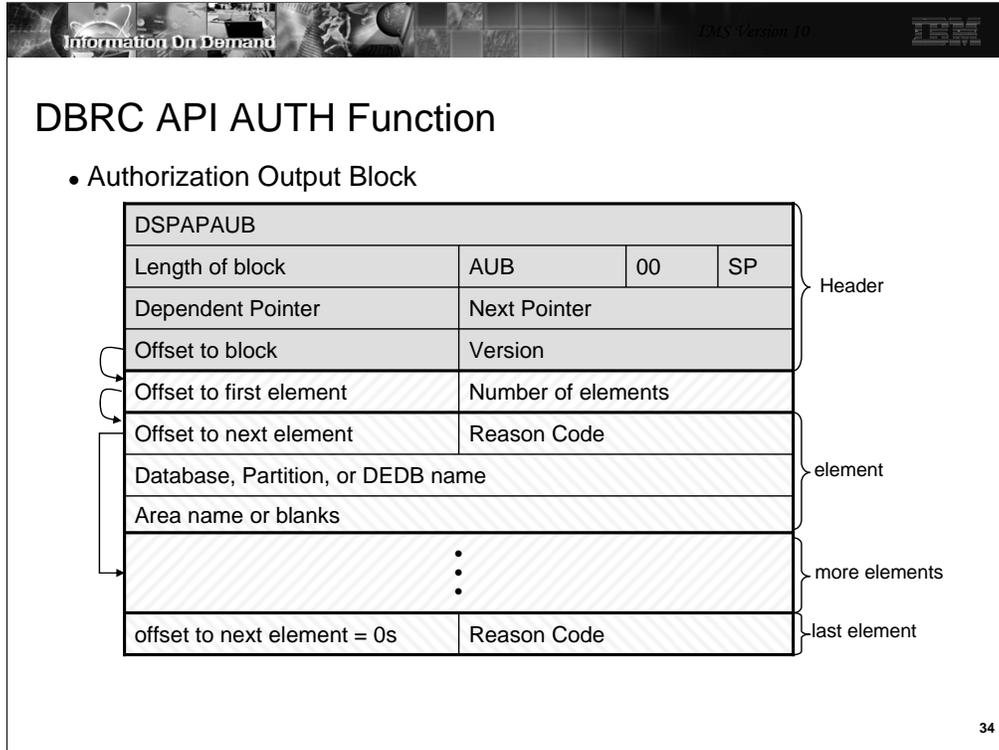
```
DSPAPI FUNC=AUTH ACCESS=EX | RD | RO TOKEN=taddr
AUTHLIST=aaddr UTILITY=IC | RECOV | REORG | NONE
OUTPUT=oaddr . . .
```

- ◆ ACCESS parameter specifies the authorization level for the databases, partitions, and/or areas
- ◆ *taddr* - address of 4-byte API token
- ◆ *aaddr* - address of authorization list
  - List of databases, partitions, and/or areas
- ◆ UTILITY parameter specifies the utility function being authorized
- ◆ *oaddr* - address of address of the output block
  - Block may be released with RELBUF API request

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AUTHLIST= specifies the address of the list of databases, partitions, and/or Fast Path areas to be authorized. The list consists of a fullword that contains the number of elements in the list, a fullword that contains the length of an element, followed by one or more elements. Each element consists of an 8-character database name, partition name, or Fast Path DEDB name and 8 characters of blanks (X'40') or a Fast Path area name.

The UTILITY= parameter is designed to be used by applications that perform utility functions. UTILITY= values other than NONE specify that DBRC is to evaluate the authorization request as it would a request from the indicated utility. Utility authorization requests bypass some of the database and data set status indicators. Image Copy (IC) can get authorization when the Image Copy Needed or Prevent Further Authorization flags are on. Reorganization (REORG) can get authorization when the Image Copy Needed, Prevent Further Authorization, or Read Only flags are on. Recovery (RECOV) can get authorization when any of the status flags are on. These include the Image Copy Needed, Prevent Further Authorization, Read Only, Recovery Needed, and Backout Needed flags.



This shows the format of the output block created by DSPAPI with FUNC=AUTH. The prefix is like the prefix of other blocks created by DSPAPI. The first 32 bytes are the prefix of the block.

- DSPAPAUB is the name of the mapping macro for this block. It is stored in the first 8 bytes of the block.
- AUB is a 2-byte indicator that this is an authorization block.
- 00 is one byte of x'00'.
- SP is the subpool in which this block is stored.
- The dependent pointer is not used in the authorization block. The next pointer points to the next authorization block if one exists.
- The offset to block is the pointer to the data after the prefix.
- Version is the version of this block. It's value is 2.0 in IMS V10.
- Offset to first element points to the first element.
- Number of elements is the number of elements stored in this block.
- Each element has four fields.
  - The first field is a pointer to the next element. The last element has zeros in this pointer.
  - The reason code is the indication of the success of the authorization attempt for this database, partition, or area.
  - The name of the database or partition is in the next field.
  - For Fast Path areas, the area name is in the next field. For full function databases, including HALDB partitions, this field is blanks.

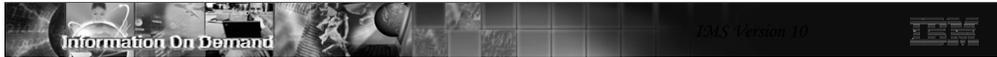
## DBRC API Database Unauthorization

- DBRC API databases are unauthorized by
  - ◆ DSPAPI FUNC=STOPDBRC (implicit unauthorization)
  - ◆ DSPAPI FUNC=UNAUTH (explicit unauthorization)

```
DSPAPI FUNC=UNAUTH TOKEN=taddr AUTHLIST=aaddr
```

- ◆ *taddr* - address of 4-byte API token
- ◆ *aaddr* - address of unauthorization list
  - List of databases, partitions, and/or areas
  - Same format as authorization list
    - List could be used for authorization and unauthorization
- ◆ Unauthorization output block is similar to authorization output block

Application programs which authorize databases can also unauthorize them. The STOPDBRC function unauthorizes all of the databases that were authorized. Individual databases may be unauthorized explicitly by using FUNC=UNAUTH.



## DBRC API FUNC=QUERY Enhancements

- LOG queries
  - ◆ Enhanced to allow queries on a range of log records
    - TYPE=LOG function for DSPAPI FUNC=QUERY macro enhanced
    - New FROMTIME= and TOTIME= parameters
      - SSID= may also be used to specify a subsystem
    - V9 queries required valid STARTIME= value
      - Returned information for one log
    - V10 queries may specify
      - STARTIME=
      - FROMTIME=
      - TOTIME=
      - FROMTIME= and TOTIME=

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The IMS V9 implementation of FUNC=QUERY TYPE=LOG has been enhanced in V10. QUERY requests for TYPE=LOG required a STARTIME= parameter. This specified the start time of a log. V10 adds the capability to request information about a range of logs. If FROMTIME= is specified without TOTIME=, all logs from the specified time to the present are returned. If TOTIME= is specified without FROMTIME=, all logs up to the specified time are returned. If both FROMTIME= and TOTIME= are specified, all logs within the time range are returned. Since information about multiple logs may be returned with these time range requests, the LOGINFO blocks (DSPAPQLI) may be chained with their “next” pointers.



## DBRC API FUNC=QUERY Enhancements

- HALDB partition queries
  - ◆ New TYPE=PART keyword on the DSPAPI FUNC=QUERY macro
    - Returns blocks for partition(s) without database blocks
    - May request by partition name or database name
  - ◆ Must specify either DBNAME= or PARTNAME=
  - ◆ Use LOC= parameter to qualify the request
    - LOC=SPECific only with PARTNAME= (default with PARTNAME=)
    - LOC=PREV|NEXT only with PARTNAME=
    - LOC=ALL only with DBNAME= (default with DBNAME=)
    - LOC=FIRST|LAST only with DBNAME=
  - ◆ DBDS information may be requested
  - ◆ Allocation, image copy, recovery, and reorg information may be requested

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The IMS V9 implementation of FUNC=QUERY TYPE=DB could be used to get information about HALDB partitions. This was done by specifying a database name. Information about all of the partitions was returned. IMS V10 adds FUNC=QUERY TYPE=PART. This allows you to get information about a partition without specifying the database name. It also allows you to retrieve partition information without retrieving the database information.

Either the PARTNAME= or DBNAME= parameter must be specified. Both of these parameters may not be specified on the same macro.

When you specify PARTNAME= you may request the a specific partition by name. Alternatively, you may request the next or previous partition relative to the partition specified.

When you specify DBNAME= you may request all of the partitions in the database. Alternatively, you may request the first or last partition in the database.

As with FUNC=QUERY TYPE=DB you may request DBDS information for the partitions returned and you may request allocation (ALLOC), image copy (IC), recovery (RECOV), and reorganization (REORG) information for these database data sets.

Partitions in a HALDB database may be disabled. This is done with a CHANGE.PART command with the DISABLE keyword. Definitions for disabled partitions remain in the RECONS, but they are not actively used. That is, they are no longer part of the definition of their master database. Disabled partitions are not returned by FUNC=QUERY TYPE=PART macros where LOC=ALL, FIRST, LAST, PREV, or NEXT is specified. They can be returned with PARTNAME= LOC=SPEC.



## DBRC API FUNC=QUERY Enhancements

- DBDS queries
  - ◆ New TYPE=DBDS keyword on the DSPAPI FUNC=QUERY macro
    - Returns blocks for database data sets without database blocks
    - Provides for navigation through DBDS records
  - ◆ Must specify either DBNAME= or GROUP=
  - ◆ GROUP= returns block for all data sets in the DBDS group or CA group
  - ◆ DBNAME= required with LOC=FIRST or DDN=
    - DDN=\* returns all DBDSs in the database
    - LOC=FIRST returns first DBDS in the database
    - DDN= with LOC=SPEC returns information about the specified DBDS
    - DDN= with LOC=NEXT returns information about the DBDS after the specified DBDS
  - ◆ Allocation, image copy, recovery, and reorg information may be requested

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The IMS V9 implementation of FUNC=QUERY TYPE=DB could be used to get information about database data sets. This was done by specifying a database name and requesting DBDS information. Information about a specific data set in the database, all data sets in the database, or none of them could be requested. IMS V10 adds FUNC=QUERY TYPE=DBDS. This provides an alternate way of getting this information. It also allows you to retrieve information about the first DBDS in a database with one request and the next DBDSs with subsequent requests.

Either the GROUP= or DBNAME= parameter must be specified. Both of these parameters may not be specified on the same macro.

When you specify GROUP= information about all of the database data sets in the group is returned. A group is either a DBDS group or a CA group. You cannot specify a database group or a recovery group.

When you specify DBNAME= the information returned is determined by the DDN= and LOC= parameters. If DDN=\* is specified, blocks for all data sets in the database are returned. DDN=\* is the default. If LOC=FIRST is specified without DDN=, the first data set in the database is returned. If DDN= is specified with LOC=SPEC, a block for the indicated data set is returned. If DDN= is specified with LOC=NEXT, the dataset after the specified data set is returned.

As with FUNC=QUERY TYPE=DB you may request allocation (ALLOC), image copy (IC), recovery (RECOV), and reorganization (REORG) information for these database data sets.

## DBRC API FUNC=QUERY Enhancements

- GROUP queries
  - ◆ TYPE=CAGROUP, DBGROUP, RECOVGROUP, and GSGROUP allow use of GROUP= instead of NAME=
    - NAME= and GROUP= have the same meaning
    - Only NAME= was allowed in IMS V9
    - NAME= may be used with V10 for compatibility
  - ◆ This capability was added since FUNC=QUERY TYPE=DBDS uses GROUP= to specify a group name

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The IMS V9 FUNC=QUERY with a TYPE= value of CAGROUP, DBGROUP, RECOVGROUP, or GSGROUP used the NAME= parameter to specify the name of the group. IMS V10 allows the use of the new GROUP= parameter to specify the name of the group. This produces exactly the same results as the use of NAME=. The use of GROUP= was added to be compatible with FUNC=QUERY TYPE=DBDS where GROUP= is used for the name of the group. NAME= is still supported when TYPE= specifies a group.

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## DBRC API FUNC=QUERY Enhancements

- Wildcards in name parameters
  - ◆ Useful for returning a group of objects that follow a name pattern
  - ◆ An asterisk may be used at the end of a name value
    - At least one alphabetic character must precede the asterisk
    - Not all name parameters support this wildcard

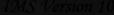
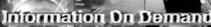
Query TYPE=	Asterisk allowed with
DB	DBNAME=
*GROUP	NAME=, GROUP=
OLDS	SSID=
SUBSYS	SSID=
BACKOUT	SSID=

\*GROUP includes CAGROUP, DBGROUP, DBDSGROUP, RECOVGROUP, and GSGROUP

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V10 has added a capability to use an asterisk as a wildcard in some parameters on DSPAPI TYPE=QUERY macros. This can be especially useful when a naming pattern is used for databases, subsystems, or groups. The asterisk can only be used at the end of parameters with names as values. At least one alphabetic character must precede the asterisk. Some parameters accept this wild card. Some do not.

The table shows for which parameters the asterisk is valid. The first column indicates the type of request. The row with "\*GROUP" in the first column applies to QUERY requests with TYPE= values of CAGROUP, DBGROUP, DBDSGROUP, RECOVGROUP, and GSGROUP. The parameters which require names and that accept the asterisk are listed in the "Asterisk allowed with" column.



## User-Specified Subpool

- User may specify storage subpool used for blocks created by requests
  - ◆ QUERY, COMMAND, AUTH, AND UNAUTH requests
  - ◆ V9 always used subpool 0
- New SUBPOOL= parameter on DSPAPI
  - ◆ FUNC=STARTDBRC establishes the default subpool for later requests
    - Default is 0
  - ◆ Requires VERSION=2.0 parameter on DSPAPI
- Subpool ID stored in block header
  - ◆ Previously reserved byte

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The new SUBPOOL= parameter may be used on DSPAPI macros which create blocks. It determines which subpool will be used for the block. This new parameter is only available when VERSION=2.0 is also specified on the DSPAPI macro. The FUNC=STARTDBRC request establishes the default for the SUBPOOL= parameter on later requests. If it is not specified on the FUNC=STARTDBRC request, the default is subpool 0.

The header of blocks has been enhanced to include the subpool ID. It is stored in a previously reserved byte of the header.

Users should see the *z/OS Authorized MVS Assembler Services Guide* for valid subpools for their programs.



## Same TCB Restriction

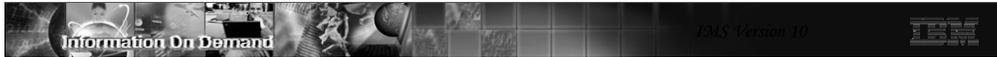
- All DBRC API requests must use the same TCB as the STARTDBRC request
  - ◆ Enforced on requests other than FUNC=STARTDBRC and FUNC=DSECT
    - Violation of restriction results in new reason code
      - Return Code x'0C'                      Reason Code x'C900000A'
  - ◆ A task cannot issue STARTDBRC then ATTACH a new task to issue requests
  - ◆ Prevents ABENDs when a CLOSE of a RECON is required
    - VSAM requires CLOSE and OPEN to be done under the same TCB
    - CLOSE could be required for any request to RECONS
      - RECON data set extensions, reconfigurations, etc.

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IMS V10 enforces the “same TCB” restriction. All DBRC API requests from a STARTDBRC through a STOPDBRC request, must be done under the same TCB. An attempt to make such a request under a different TCB will result in a failure with return code x'0C' and reason code x'C900000A'. This is a new reason code in V10.

This enforcement is done to avoid a possible ABEND. VSAM requires that a close of a data set be done under the same TCB as the open was done. Closes under different TCBs result in ABENDs. Any access to the RECONS might require a close. One example occurs when a RECON data set is extended. If an instance of DBRC accesses the RECONS and determines that a RECON data set has new extents, it closes and reopens the data set to get the new extent information. Another example occurs when a DBRC instance determines that the RECONS have been reconfigured. That is, a RECON data set has been lost and the old spare RECON is now one of the active RECONS. This DBRC instance closes the lost RECON.

# Parallel RECON Access



## Parallel RECON Access

- Allows multiple DBRC instances to access the RECONs concurrently
  - ◆ DBRC instance: IMS Online subsystem, batch job, or utility
  - ◆ Parallel RECON Access is optional
- Eliminates serialization of accesses between DBRC instances
  - ◆ Data set RESERVE (or global enqueue) eliminated
- Reduces RECON contention
  - ◆ Could provide better responsiveness from IMS online and batch
  - ◆ Removes growth constraint

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Parallel RECON Access (PRA) is a new optional capability in IMS V10. It allows multiple DBRCs to access the RECONs at the same time.

Without PRA each DBRC instance must take its turn in accessing the RECONs. Multiple DBRCs may have the RECONs open at the same time, but only one may do I/O to the RECONs at any time. This restriction is eliminated with PRA. Serial access uses RESERVEs or global enqueues to serialize access to the RECONs. PRA eliminates this serialization. This reduces contention for the RECONs. It could provide better responsiveness, especially in situations where multiple online, batch, or utility executions of IMS are doing many I/Os to the RECONs.



## Parallel RECON Access

- Uses Transactional VSAM
  - ◆ System facility that provides locking, logging, caching, and commit for concurrent updates to VSAM data sets (RECONs)
    - Exploits Parallel Sysplex
- Prerequisites
  - ◆ Hardware
    - Parallel Sysplex environment
      - Requires Coupling Facility
  - ◆ Software
    - z/OS DFSMS Transactional VSAM (DFSMStvs)
      - Requires RRS for DFSMStvs (IMS use of RRS is not required)
      - DFSMStvs is an optional feature
        - Software license required
        - Special bids will be considered

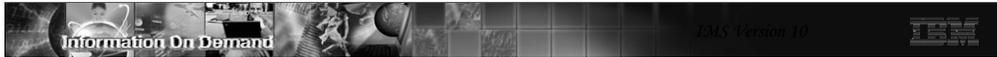
45

PRA uses Transactional VSAM. This is a system facility that is provided by DFSMS. Transactional VSAM provides locking, logging, caching, and commit coordination for VSAM data sets such as the RECONs. It requires and exploits Parallel Sysplex.

PRA requires a Parallel Sysplex including a Coupling Facility. This is true even when all of the DBRC instances are running in only one z/OS system.

PRA requires DFSMStvs. This is an optional feature of DFSMS. There is a licensing fee associated with this feature. Special bids will be considered for IMS customers using the Parallel RECON Access function, who do not already have DFSMStvs, to acquire DFSMStvs for use restricted to IMS.

DFSMStvs uses Resource Recovery Services (RRS). RRS is used for commit coordination. IMS use of RRS is not required. That is, the RRS=Y IMS execution parameter is not required.



## Parallel RECON Access

- Requests are processed in parallel
  - ◆ Reduces RECON contention
  - ◆ Service times for individual requests may be increased
    - Due to locking, logging, CF accesses, etc.
  - ◆ Service times for some requests may be decreased
    - Due to elimination of I/Os and caching
- Requires new operational procedures
  - ◆ New failure scenarios
  - ◆ New recovery procedures
- Parallel RECON Access is optional
  - ◆ A set of RECONS is defined to use it

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Since PRA allows RECON requests to be processed in parallel, it potentially reduces RECON contention. On the other hand, service times for individual requests may increase due to the overhead of locking, logging, and Coupling Facility accesses that are required. Some services times may be decreased. This is due to the caching of RECON information in buffer pools and the CF.

PRA requires new operational procedures for recoveries. There are new possibilities for failures when the DFSMSStvs environment is used.

PRA is optional in IMS V10. It is specified for a set of RECONS. There is a DBRC command for specifying PRA for a set or RECONS. Some RECON sets may use PRA while others continue to use serial access.



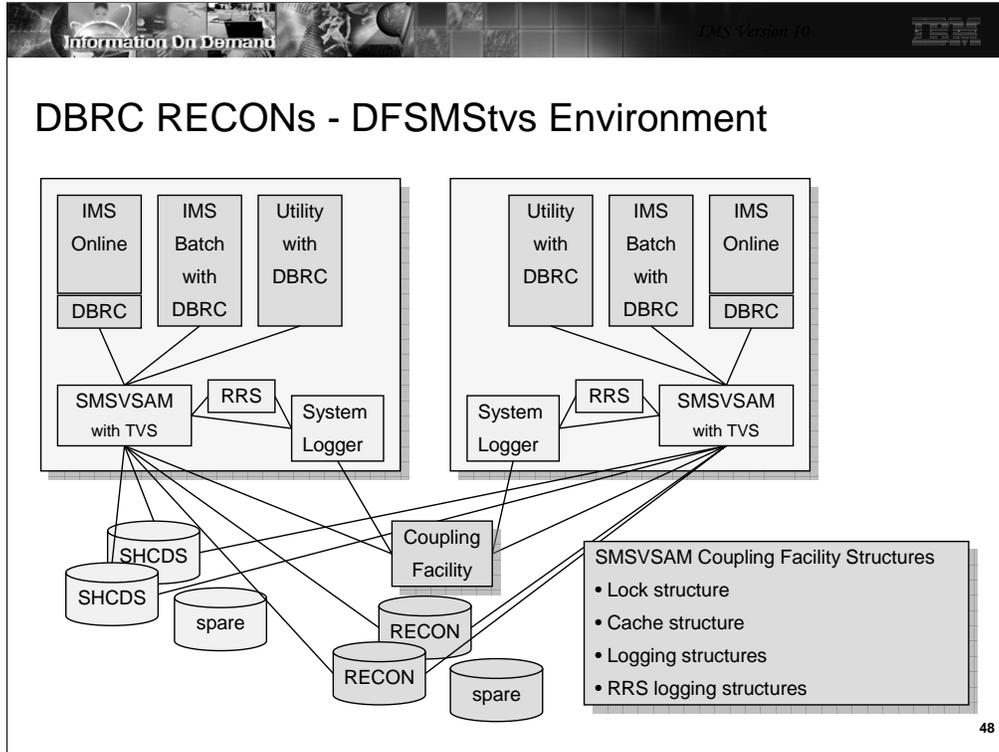
## Transactional VSAM (DFSMSStvs) Overview

- DFSMSStvs is an enhancement to VSAM RLS (record level sharing)
  - ◆ RLS uses locking and data caching in CFs
    - Typically used by CICS to allow concurrent updates to VSAM files by multiple CICSs
  - ◆ DFSMSStvs adds logging, commit, and backout processing to RLS
    - Typically used to allow concurrent batch and CICS updates to VSAM files
    - Used by IMS V10 DBRC to provide Parallel RECON Access
- SMSVSAM address space
  - ◆ System address space which is started at z/OS IPL
  - ◆ Provides RLS and TVS services
  - ◆ One address space per LPAR

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DFSMSStvs (TVS) is based on VSAM Record Level Sharing (RLS). RLS uses locking and data caching to provide data sharing capabilities for VSAM files used by CICS systems. It allows multiple CICS systems to concurrently update VSAM files. RLS relies on the logging, commit coordination, and back out processing provided by CICS online systems. TVS adds its own logging, commit coordination, and back out support. This allows batch update jobs to share VSAM files between each other and CICS. PRA is using this same capability to allow multiple DBRC instances to do concurrent updates to the RECONS.

RLS and TVS execute in the SMSVSAM address space. This is a system address space that is typically started at z/OS initialization. There is only one SMSVSAM address space per LPAR. It provides RLS and TVS services to all users in the LPAR. This includes all instances of DBRC.



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This is an illustration of a DFSMSStvs environment with multiple instances of DBRC using PRA. There is an SMSVSAM address space in both z/OS systems. This address space provides TVS services to the DBRCs in the LPAR. The illustration shows that there is an IMS online system, an IMS batch job (DLI or DBB), and a IMS utility in each system. TVS uses the system logger and RRS. RRS also uses the system logger. The system logger has structures in the coupling facility. The SMSVSAM address space also connects to the coupling facility for its own structures. These are cache structures and a lock structure. There are a pair of share control data sets (SHCDS) for the VSAM data sets. These data sets contain information about the use of VSAM data sets that are being shared. There is also a spare SHCDS. Of course, there are the RECON pair and spare.



## Transactional VSAM (DFSMStvs) Overview

- Recovery of failed users
  - ◆ Each DFSMStvs instance has an undo log
  - ◆ Used for backout after failures
- Recovery for failed SMSVSAM address space
  - ◆ Restarted automatically if it fails
    - Backs out in-flight work and releases retained locks
- Recovery for failed z/OS system
  - ◆ Peer recovery
    - Back outs done by another SMSVSAM address space
    - Locks released

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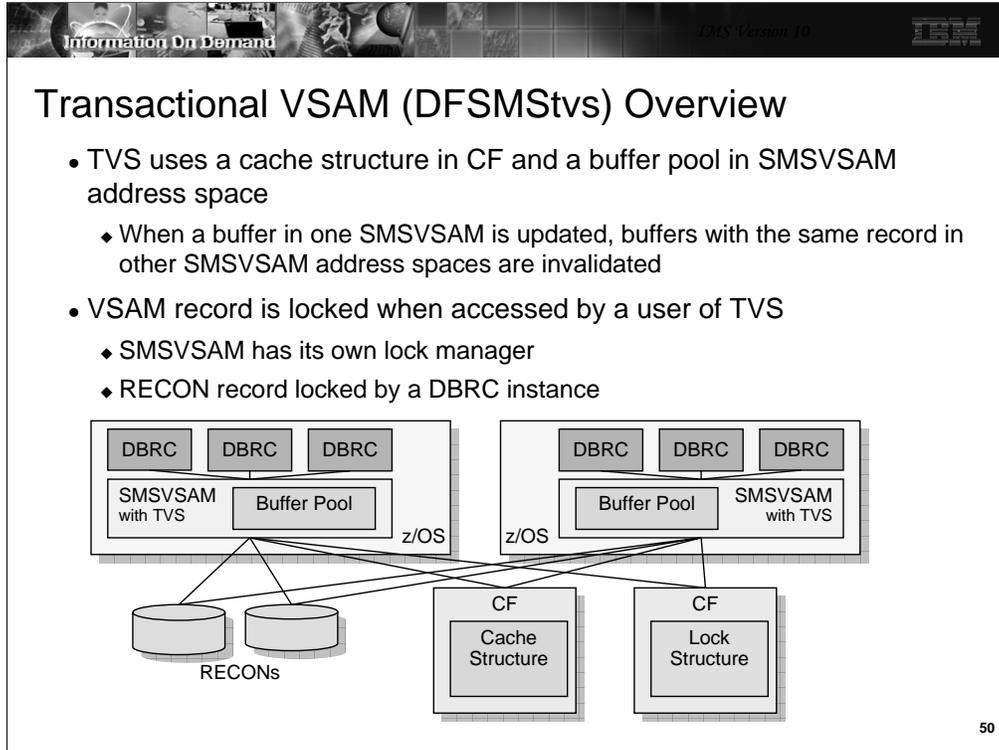
DFSMStvs has recovery capabilities to handle various kinds of failures.

Each DFSMStvs instance has its own undo log. These are log records which have the "before images" of records. If a user of DFSMStvs, such as DBRC fails, its uncommitted updates are backed out by DFSMStvs. The undo log is used for this purpose.

If DFSMStvs fails or the SMSVSAM address space fails, it is automatically restarted. When it restarts it backs out any in-flight work and releases any locks held by the in-flight transactions.

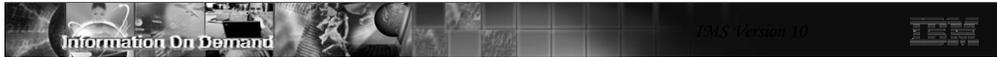
If a z/OS system fails, peer recovery is invoked. Back outs are done for the failed DFSMStvs by using another SMSVSAM address space in the Parallel Sysplex. The locks held for the failed work are released.

More information on these processes is provided later.



This illustrates a DFSMSStvs environment with DBRC users. When a DBRC instance accesses a VSAM record in the RECONS, the request is processed by TVS in the SMSGVSAM address space. The SMSGVSAM address space has its own buffers. The buffer pools are maintained in data spaces owned by the SMSGVSAM address space. When using TVS, DBRC does not have its own buffers for RECON processing. Instead, it uses the SMSGVSAM buffers. These buffers are shared with all users of the SMSGVSAM address space. These are all of the VSAM data sets in the z/OS system which are using RLS or TVS. SMSGVSAM also uses cache structures in the Coupling Facilities. Each shared data set is assigned to a structure. When a VSAM record in an SMSGVSAM buffer pool is updated, if it resides in buffers in other systems those buffers are invalidated. This is done using the cross invalidation capability associated with cache structures and Parallel Sysplex.

The processing of VSAM requests includes lock requests. SMSGVSAM has its own lock manager. It does not use the IRLM, however, its lock manager provides functions similar to those provided by IRLM for IMS and DB2 databases. The owner of a lock request is the DBRC instance. This is an IMS online system, an IMS batch job, or an IMS utility. Lock information is held in a lock structure in the CF.



## Parallel RECON Access Definition and Set Up

- IMS definitions
- RECON definitions
- SYS1.PARMLIB member definitions
- SHCDS data set
- Log stream definitions
- Structure definitions
- RACF specifications
- IMSplex preparation

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Defining Parallel RECON Access includes several specifications. These will be described on the following pages.



## IMS Definitions for Parallel RECON Access

- All IMSs must be V10
  - ◆ MINVERS in RECON must be '10.1'
- SCI registration is required
  - ◆ Identifies IMSPLEX name and DBRC Group ID
  - ◆ DBRC SCI Registration Exit routine (DSPSCIX0) is recommended

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PRA requires IMS V10. To ensure that all users of a set of RECONs are using V10, a MINVERS value of '10.1' must be specified for the RECONs. This prevents any lower release level of IMS from using the RECONs.

SCI registration is required for PRA. This means that a CSL environment is required. Each system where an IMS using PRA will be run must have an SCI address space. Since SCI registration is required, the use of a DBRC SCI Registration Exit routine (DSPSCIX0) is recommended. This ensures that consistent registration is done by all DBRC users and it eliminates the need to add the IMSPLEX= parameter to the JCL for online systems, batch jobs, and utilities. In addition to the IMSPLEX value which is assigned by the IMSPLEX= parameter of the exit routine, IMS V10 has added the DBRC group ID. This ID may also be assigned by the exit routine.



## RECON Definitions for Parallel RECON Access

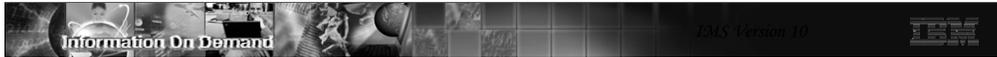
- SMS management required for RECONs
- Storage class for RECONs must have a cache set value assigned
  - ◆ Cache set is a set of cache structure names used for the storage class
    - Recommendation:
      - Assign RECONs to their own storage class
      - Storage class should have its own cache set
      - One structure is sufficient
- Data class determines caching of data in cache structure
  - ◆ Controlled by RLSCFCACHE value for the data class
    - ALL - all CIs that are read from DASD are also written to the structure
    - UPDATESONLY - only CIs which are updated are written to the structure
    - NONE - no CIs are written to the structure

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When using PRA the RECONs must be under SMS management.

The RECONs must be defined with a storage class which has a cache set value. A cache set value assigns CF cache structures to the storage class. Many data sets (spheres) may have the same storage class. Multiple storage classes may use the same cache set. You can simplify the management and understanding of caching for the RECONs by assigning the RECON data sets to a storage class with its own cache set. The cache set needs only one structure defined to it. If the RECONs are the only RLS or TVS data sets in the storage class, they will have their own cache structure.

The data class for the RECONs determines the caching option. This is controlled by the RLSCFCACHE parameter for the data class. ALL specifies that all CIs read from DASD are also stored in the structure. UPDATESONLY specifies that CIs which are updated are written to the structure when they are written to DASD. NONE specifies that no CIs are stored in the structure. When NONE is specified, the structure is used only for buffer invalidation processing. There is another parameter which affects caching. This is the RLS\_MAXCFFEATURELEVEL parameter on the IGDSMSxx member of SYS1.PARMLIB. This will be explained when IGDSMSxx is covered later in this section of the class.



## RECON Definitions for Parallel RECON Access

- LOG(UNDO) is required in data set definition
  - ◆ This creates a backout log for the data set
    - Required by TVS
  - ◆ DBRC will ALTER RECON if LOG(UNDO) is not specified
    - Requires RACF ALTER authority
    - Recommendation: DEFINE or ALTER RECONS with LOG(UNDO)

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LOG(UNDO) is required in the definition of the RECONS for the use of Transactional VSAM. This creates a backout log for the data set when TVS is used. DBRC automatically sets this definition. If Parallel RECON Access is being used and LOG(UNDO) is not specified for the RECONS, DBRC will issue an ALTER to set the parameter to LOG(UNDO). If Parallel RECON Access is not being used, DBRC will ALTER RECON to LOG(NONE) if another value is defined. Of course, you can set LOG(UNDO) by issuing the DEFINE or ALTER with IDCAMS. In either case, the ALTER requires ALTER security from the security system, such as RACF.

Do not specify LOG(ALL) or a LOGSTREAMID parameter for the RECONS. LOG(ALL) creates a forward recovery log which is identified by the LOGSTREAMID. DBRC does not support forward recovery of the RECONS.

## IFAPRDxx Member of SYS1.PARMLIB

- Product Enablement Policy
  - ◆ Used to enable separately priced features, such as DFSMStvs.
  - ◆ Example:

```
PRODUCT OWNER('IBM CORP')  
  NAME('Z/OS')  
  ID(5694-A01)  
  VERSION(*) RELEASE(*) MOD(*)  
  FEATURENAME(DFSMSTVS)  
  STATE(ENABLED)
```

DFSMStvs is a separately priced feature of z/OS. It must be enabled with a product enablement policy which is defined in the IFAPRDxx member of SYS1.PARMLIB.



## SHCDS Data Sets

- RLS and TVS require VSAM data sharing control data sets (SHCDS)
  - ◆ Contain name of lock structure, list of subsystems, status of subsystems, list of open spheres (data sets), etc.
  - ◆ Multiple actives and spare(s)
  - ◆ Name: SYS1.DFPSHCDS.qualifier.Vvolser
  - ◆ See *DFSMSdfp Storage Administration Reference* for definition information
  - ◆ Activated with commands:

```
V SMS,SHCDS(qualifier.Vvolser),NEW
V SMS,SHCDS(qualifier.Vvolser),NEWSPARE
```

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If you have not implemented RLS, you must defined SHCDS data sets. If you already have implemented RLS, you already have these data sets defined. These data sets are used to hold the name of the lock structure, the list of subsystems, and a list of open VSAM spheres (data sets). It also contains information about the spheres such as which subsystems have them open.

There can be multiple SHCDS data sets. Two is typical. Spares may also be defined. Having a pair and a spare provides recovery capabilities similar to those for a pair and spare for the RECONS.

The data set name for an SHCDS is always of the form SYS1.DFPSHCDS.qualifier.Vvolser where qualifier is whatever you want it to be and volser is the volume serial for its volume. See the *DFSMSdfp Storage Administration Reference* manual for complete information on defining SHCDS data sets.

VARY commands are used to make a data set an active SHCDS or a spare.



## SYS1.PARMLIB Members

- IEFSSNxx
  - ◆ Must include a statement for SMS
- IGDSMSxx parameters include:
  - ◆ SYSNAME (name1 , name2 , ... )
    - Names associated with each TVS instance
  - ◆ TVSNAME (n1 , n2 , ... )
    - Unique numbers associated with each TVS instance
  - ◆ AKP (n1 , n2 , ... )    AKP = ( 1000 , 1000 , ... ) recommended
    - Number of logging operations between activity key points. Used to delete log records no longer needed for backouts and shunt some records.
    - AKP = ( 1000 , 1000 , ... ) recommended
  - ◆ RLSINIT ( YES | NO )
    - Determines if SMSVSAM addr. space is started at system initialization

*continued on next page*

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SMS must be defined to MVS as a subsystem. This is done by including a statement for SMS in the IEFSSNxx SYS1.PARMLIB member.

The names associated with each TVS instance are defined in the SYSNAME parameter. Similarly, each TVS instance is assigned a unique number with the TVSNAME parameter.

AKP controls the occurrence of activity key points. Separate numbers may be specified for the different systems. At these times log records which are no longer needed for backouts are deleted. Log records for units of recovery that have not logged in two AKPs are moved to the shunt log.

The IGDSMSxx member of SYS1.PARMLIB is described in the *z/OS MVS Initialization and Tuning Guide*. Some of the most important parameters for TVS users are shown here.

If RLSINIT(YES) is not specified, the SMSVSAM address space must be started with a V SMSVSAM,ACTIVE command.



## IGDSMSxx Member of SYS1.PARMLIB

- IGDSMSxx parameters include:
  - ◆ RLS\_MAX\_POOL\_SIZE (nnnn)
    - Max. size of VSAM local buffer pool in MBs
    - DBRC does not have its own buffer pools
      - DSPBUFFS is not used with TVS
  - ◆ RLS\_MAXCFFEATURELEVEL (A | Z)
    - Z - Only CI sizes <= 4K are cached in structure
    - A - All CI sizes are cached
  - ◆ DEADLOCK\_DETECTION (nnnn , mmmmm)
    - nnnn - Local deadlock detection cycle time
    - mmmmm - Number of local cycles in a global cycle.
    - DEADLOCK\_DETECTION(1,1) recommended
  - ◆ MAXLOCKS (nnnn , mmmmm)
    - Sets threshold and increment counts for sending warning messages about number of currently held locks.

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RLS\_MAX\_POOL\_SIZE specifies in megabytes the maximum size of the VSAM local buffer pool in SMSVSAM. This pool is created in a data space. For serial access (not Parallel RECON Access) to the RECONS IMS uses the DSPBUFFS specification to determine the number of buffers used by a DBRC instance. This defaults to 60 index buffers and 120 data buffers. You may have specified a different value. As a starting point, you may make the SMSVSAM local buffer pool the size of the buffer pools for all of the concurrent DBRC instances that will be run. For example, if you took the default DSPBUFFS, have a RECON CI size of 16K, and have 10 concurrent DBRC instances, you could start with a buffer pool of  $10 \times (120 + 60) \times 16K = 29M$ . Of course, a larger size might provide better performance by keeping more CIs in the pool and potentially avoiding some reads.

The RLS\_MAXCFFEATURELEVEL parameter is used to specify if CIs larger than 4K will be cached in the SMSVSAM cache structure. 'Z' specifies that only 4K and smaller CIs will be cached. 'A' specifies that all may be cached. Since RECON CI sizes should be larger than 4K, you will need to specify 'A' to cache RECON CIs.

DEADLOCK\_DETECTION(nnnn,nnnn) is used to specify the number of seconds in a local deadlock detection cycle and the number of local cycles in a global cycle. These default to 15 seconds and 4. Most installation will want faster deadlock detections. DEADLOCK\_DETECTION(1,1) is recommended.

MAXLOCKS is used to control the issuing of warning messages about the number of locks held. These are messages IGW859I and IGW10074I. You might want to set these values to 50% and 80% of the number of record list entries in the lock structure.

RLSTMOUT may be specified but DBRC overrides this value. This is the time that a lock request will wait before it is timed out. DBRC always uses a value of 2 seconds.

CF\_TIME is used to specify at what interval SMF type 42 records containing information and statistics on CF cache and lock structures are gathered.



## Log Streams

- Backout or undo log stream
  - ◆ Each instance of DFSMStvs has its own backout log stream
  - ◆ Name: IGWTVnnn.IGWLOG.SYSLOG
    - 'nnn' is TVSNAME from IGDSMSxx member
  - ◆ Used to hold back out records for updates
    - Updates to RECONs and other data sets using TVS
- Shunt log stream
  - ◆ Each instance of DFSMStvs has a shunt log stream
  - ◆ Name: IGWTVnnn.IGWSHUNT.SHUNTLOG
  - ◆ Used when backout requests fail and for long running units of recovery
    - Log data is moved from undo log to shunt log
  - ◆ Allows the undo log stream to be trimmed
    - Oldest records are removed from the undo log

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DFSMStvs maintains an "undo" log stream for each instance of SMSVSAM. This means that there is one per z/OS system using DFSMStvs. The log stream contains "before" images of updates made by users of this DFSMStvs instance. It is used to back out any updates that have been done by units of recovery which fail or are victims in a deadlock. The log stream name is IGWTVnnn.IGWLOG.SYSLOB where "nnn" is the TVSNAME assigned in the IGDSMSxx member of SYS1.PROCLIB.

Typically, backout records do not need to be maintained for a long time. When the unit of recovery is committed, these log records may be deleted. On the other hand, there are occasions when the log records need to be kept for a long time. This would occur if a backout failed due to the inability to do the backout updates to the data set or if a unit of recovery was not committed for a long time. In these cases, log records may be moved to a shunt log stream. Each instance of DFSMStvs has a shunt log stream with the name IGWTVnnn.IGWSHUNT.SHUNTLOG where "nnn" is the TVSNAME.

Log records are moved from the undo log to the shunt log by activity keypoint processing. The frequency of this processing is determined by the AKP parameter in the IGDSMSxx member. If a unit of recovery has not logged for two AKPs, its log records are moved to the shunt log.

The use of the shunt log allows TVS to trim the undo log. TVS tracks the oldest log entry for any running unit of recovery. It can trim records that are older than this. This limits the size of the undo log and tends to keep all of its records in the log structure.



## Log Streams

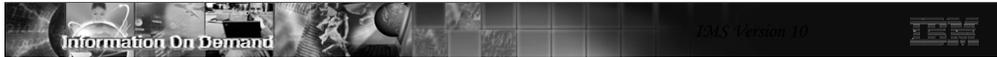
- RRS log streams
  - ◆ RRS has five log streams which are shared by all systems in the sharing group
    - Resource Manager data log
      - Contains information about resource managers using RRS services
    - Restart log
      - Contains information about incomplete units of recovery
    - Main UR state log
      - Contains state of active units of recovery
    - Delayed UR state log
      - Contains state of delayed active units of recovery
    - Archive log (optional)
      - Contains information about completed units of recovery

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Each request to DBRC is a unit of recovery which is tracked and logged by RRS.

RRS has multiple log streams. These log streams are used for various purposes. DFSMStvs is only one of several components which use RRS. Other IMS users of RRS include APPC, ODBA, and OTMA. Most installations will already have RRS log streams defined.

Many installations have already implemented RRS. For example, IMS requires RRS for ODBA and APPC protected conversations which use SYNCLVL=SYNPT.



## Log Stream Definitions

- Log streams are defined in the LOGR Policy
  - ◆ Specifies
    - CF log structure for the log stream
    - Offload percentages
    - Duplexing
  - ◆ Sample for backout or "undo" log:

```

DEFINE LOGSTREAM
  NAME(IGWTV001.IGWLOG.SYSLOG)
  STRUCTNAME(TVSLOG_TV001_SYSLOG)
  LS_SIZE(1180)
  STG_DUPLEX(YES)
  DUPLEXMODE(COND)
  HIGHOFFLOAD(85)
  LOWOFFLOAD(15)

```

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Log streams must be defined in the LOGR policy for a sysplex. Each log stream is defined with a DEFINE LOGSTREAM statement. The policy assigns the log stream to a structure. The CFRM policy defines the size of the structure.

The sample definition shows some of the other parameters that you may define. The LS\_SIZE parameter defines size of the data used for offloading the log stream from the structure. The size is specified in 4k blocks. STG\_DUPLEX(YES) specifies that the log stream is duplexed in staging data sets when the condition defined in the DUPLEXMODE parameter is satisfied. DUPLEXMODE(COND) specifies that duplexing occurs when the CF structure is in a volatile CF or when the CF and the SMSVSAM address space reside in the same machine (CPC). The HIGHOFFLOAD parameter specifies the percentage of the structure that must be full before an offload process occurs. Offload moves log records from the structure to an offload data set. LOWOFFLOAD specifies the percentage of the log stream that may remain in the structure when an offload process completes. All parameters that you may specify in a LOGR policy are documented in the *z/OS MVS Setting Up a Sysplex* manual.

Since DBRC "transactions" that update the RECONS should be short-lived, undo logs for DBRC should be small. They are deleted by activity keypoint processing (AKP). In addition, the log records for long-lived transactions will be moved to the shunt log by activity keypoint processing (AKP).



## SMSVSAM Lock Structure

- One structure for all SMSVSAM RLS and TVS users
  - ◆ Must be sized for all users
- Structure is required even with sharing in only one system
- Name must be: IGWLOCK00
- Size:
  - ◆ Lock table is half of space (or less)
  - ◆ Record list is half of space (or more)
- Recovery characteristics
  - ◆ Rebuild is automatic after failure of CF or loss of connectivity
    - Locks are repopulated in rebuilt structure
    - DBRC survives the rebuild
  - ◆ System-managed duplexing is supported

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SMSVSAM uses a lock structure. It is always required, even when there is only one system using RLS or TVS. The lock structure holds locks for all of the data sets using RLS and TVS. This may include data sets other than RECONS. It must be sized to hold all of these locks.

The lock structure name is always IGWLOCK00. If the size of the lock structure is a power of 2, it is equally divided between the lock table and the record list. If it is not a power of two, the size of the lock table is the largest power of 2 that is smaller than half the structure size. The remaining space is used for the record list. Most DBRC actions do not hold many locks. These actions also typically hold locks for a short time. There is one exception. A LIST of the RECONS with the STATIC option gets a lock on every record. These locks are held until the LIST completes. A LIST with the STATIC option is generally not recommended for this reason.

The lock structure is automatically rebuilt after a failure of the lock structure, a failure of its CF, or loss of connectivity to its CF. If the SMSVSAM address spaces survive, the locks are repopulated in the rebuilt structure. DBRC will survive this recovery. This applies to all instances of DBRC including online systems, IMS batch jobs, and IMS utilities using DBRC.

System-managed duplexing may be used for the lock structure. Duplexing is not recommended when the structure is placed on a machine that does not contain an SMSVSAM address space connected to the structure. The overhead of duplexing is unlikely to be justified in this case since recovery is done without the loss of any users.



## SMSVSAM Cache Structures

- Multiple structures may be used
  - ◆ Data sets are assigned to a storage class
  - ◆ Cache set name is defined for a storage class
  - ◆ Structure(s) are defined for each cache set
  - ◆ RECONS can have their own structure
    - Start with size equal to sum of the DSPBUFFS
- Store-through structure
  - ◆ All CIs are written to DASD when they are written to structure
- Recovery characteristics
  - ◆ Rebuild is automatic after failure of CF or loss of connectivity
    - Structure is empty after rebuild, buffers are invalidated in SMSVSAM
    - DBRC survives the rebuild
  - ◆ System-managed duplexing is not supported

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SMSVSAM uses one or multiple cache structures. Data sets are assigned to structures through their storage classes. A set of structures may be assigned to a storage class. The data sets in the storage class use the structures defined for the storage class. This allows you to set aside a structure for the exclusive use of the RECONS. By doing this you may size a structure to meet the needs of the RECONS. As a starting point you could make the structure large enough to hold all of the data that was previously in the DBRC buffers. These are defined with DSPBUFFS.

When storage class has multiple cache structures, data sets are assigned to a structure when they are opened. SMSVSAM attempts to balance the use of structures in a storage class.

The SMSVSAM cache structures are store-through structures. This means that all of the CIs that are written to the structure are also written to the RECON data sets. All committed updates are in the data sets.

If a Coupling Facility containing an SMSVSAM cache structure fails, the structure is automatically rebuilt on another CF. When the structure is rebuilt, it is not repopulated. All of the buffers containing CIs assigned to the structure are invalidated. This is similar to the actions that IMS takes when a full function cache structure is lost. If a structure cannot be rebuilt but the storage class has one or more other structures, the data sets using the failed structure are reassigned to another structure. DBRC survives the rebuilding of structures and the reassignment of data sets to other structures. These failures and recoveries are masked from DBRC by SMSVSAM.

System-managed duplexing is not supported for SMSVSAM cache structures. It is not needed since the loss of a structure is easily handled by the rebuild done by SMSVSAM.



## Logger Structures

- TVS
  - ◆ Undo and shunt log streams for each TVS system
- RRS
  - ◆ RRS log streams
- Sizes
  - ◆ Sizes will depend on RECON activity and any other users of TVS and RRS
    - RECON activity should typically be small

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Log structures are required for the DFSMStvs undo and shunt logs and for the RRS log stream.

PRA will typically not require much space in these structures. PRA "transactions" typically make few updates to the RECONS and do not wait for non-DBRC work. This tends to make its space requirements small. If a structure is not large enough, records are offloaded to logger data sets. This offloading depends on the size of the structure, the sizes of the log streams using the structure, and the HIGHOFFLOAD and LOWOFFLOAD parameters in the log stream definition in the LOGR policy.



## Security (RACF) Considerations

- UPDATE authority recommended for online DBRC address space
  - ◆ RECON data sets
    - and
  - ◆ STGADMIN.IGWSHCDS.REPAIR
  - ◆ Update authority is required for DBRC internal use of SHCDS commands
    - Lack of update authority could cause failures after RECON I/O errors
  - ◆ Read authority is required for all users
    - DBRC users without update authority could fail after a RECON I/O error
- ALTER authority required for RECONS to maintain LOG() parameter
  - ◆ ALTER authority required for job that does
    - CHANGE.RECON ACCESS(PARALLEL|SERIAL)

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DBRC issues some DFSMS commands for recovery situations. These commands require update authority to the RECONS and the STGADMIN.IGWSHCDS.REPAIR resource. Read authority is required for all users for the RECONS and the "REPAIR" resource. Update authority is required in some recovery situations. If a RECON I/O error occurs, it is likely that update authority will be required for the recovery to the spare RECON. A lack of update authority would result in the user failing. Obviously, it would be good for no users to fail, however, it is probably essential that online systems not fail.

DBRC ALTERs the RECONS when switching from serial to parallel access or from parallel to serial access. This should not be a typical operation. The ALTER is used to change from LOG(NONE) to LOG(UNDO) or from LOG(UNDO) to LOG(NONE). ALTER authority is required for the DBRC jobs that issue the command. DBRC also issues an ALTER when reconfiguring the RECONS if the spare has the wrong setting for the LOG parameter. If the spare has been defined with the correct LOG value, the ALTER is not required.



## Parallel RECON Access Implementation

- PRA is turned on with a RECON setting
  - CHANGE .RECON ACCESS ( SERIAL | PARALLEL )
  - INIT .RECON ACCESS ( SERIAL | PARALLEL )
    - PARALLEL turns on PRA
      - Requires DFSMStvs environment
      - Requires "pair and spare" RECONS
    - SERIAL turns off PRA
  - ◆ IMS does not have to be shut down to change access

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Parallel RECON Access is turned on by specifying ACCESS(PARALLEL) on the CHANGE.RECON or INIT.RECON command. It may be turned off with ACCESS(SERIAL). SERIAL is the default for the INIT.RECON command.

Since PRA requires DFSMStvs a complete DFSMStvs environment must be active when the command is issued. For example, the command must be issued on a z/OS system with an SMSVSAM address space and the lock and cache structures must be defined.

A good pair of active RECONS and a spare RECON must be available when the CHANGE.RECON ACCESS(PARALLEL) command is issued.

There cannot be an active RSR tracking subsystem when a change to parallel access is made.



## LIST.xxx Command Options

- LIST.xxx CONCURR|STATIC [QUIESCE]
  - ◆ CONCURR - updates may occur during list process
    - Output may not be consistent
  - ◆ STATIC - produces output that is consistent as of a point in time
    - Locks held until list processing completes
  - ◆ STATIC QUIESCE - RECONs quiesced during list processing
    - No concurrent activity to the RECONs is allowed
      - Batch and utility jobs wait (even if not doing RECON activity)
    - Locking is not used in most cases
    - Consider using this option when static is required and many records will be listed (e.g. LIST.RECON)
- CHANGE.RECON LIST(STATIC|CONCURR)
  - ◆ Sets default for LIST commands

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The LIST commands have new options with PRA. They are implemented with the CONCURR, STATIC, and QUIESCE keywords. These keywords are ignored when PRA is not being used.

If the CONCURR keyword is used, updates may occur to the RECONs while the list is being produced. This could make the output inconsistent since some of the records could be listed before a change and some after the change. For example, a database record might include an authorization to a subsystem but the subsystem record might not show the database as authorized to the subsystem. When CONCURR is used, a lock for a record is held only to read the record.

If the STATIC keyword is used, the listing is consistent. For example, if a database record listing includes an authorization to a subsystem, the subsystem record will show the database as authorized to the subsystem. When STATIC is used without the QUIESCE keyword, PRA locks each record when it reads it and holds the lock for the duration of the list processing.

The QUIESCE keyword may be used with STATIC. It quiesces all other activity to the RECONs during list processing. Other DBRC instances cannot access the RECONs during this time. Since all other activity is quiesced, locking is not needed to provide integrity or consistency unless there are retained locks. If there are retained locks from a failed DBRC for which recovery has not been done, a lock is held while DBRC is positioned on a record. QUIESCE reduces the overhead of the LIST command since it eliminates locking. You should consider using QUIESCE when a LIST command will read many RECON records. During the quiesce process batch jobs and utilities which use DBRC wait even if they are not attempting to access the RECONs. For example, batch jobs do no DL/I calls during the QUIESCE process.

The default of CONCURR or STATIC for the LIST command is set by the CHANGE.RECON LIST command. When RECONs are upgraded to V10, the default is set to STATIC. The QUIESCE keyword cannot be set by default.

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## LIST.RECON output

```

LIST.RECON CONCURR
06.286 10:43:55.891200          LISTING OF RECON (CONCURRENT)          PAGE 0002
-----
RECON
RECOVERY CONTROL DATA SET, IMS V10R1
DMB#=357                      INIT TOKEN=05306F1839312F
NOFORCER LOG DSN CHECK=CHECK44  STARTNEW=NO
TAPE UNIT=3490          DASD UNIT=SYSDA          TRACEOFF  SSID=**NULL**
LIST DLOG=NO            CA/IC/LOG DATA SETS CATALOGED=NO
MINIMUM VERSION = 10.1          CROSS DBRC SERVICE LEVEL ID= 00001
LOG RETENTION PERIOD=00.001 00:00:00.0
COMMAND AUTH=NONE  HLQ=**NULL**

ACCESS=PARALLEL  LIST=STATIC
SIZALERT DSNUM=15          VOLNUM=16          PERCENT= 95
LOGALERT DSNUM=3          VOLNUM=16

TIME STAMP INFORMATION:

TIMEZIN = %SYS

OUTPUT FORMAT:  DEFAULT = LOCORG NONE          PUNC YY
                CURRENT = LOCORG NONE          PUNC YY

IMSPLEX = PLEX1          GROUP ID = GPB
  
```

This listing was produced with the CONCURR option.

ACCESS(PARALLEL) has been specified for these RECONS

List default for the RECONS is STATIC

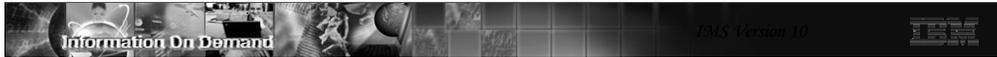
The DBRC Group ID is GPB

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This is an example of some of the output of a LIST.RECON command. The line which includes, "LISTING OF RECON (CONCURRENT)" indicates that this listing was produced with the CONCURR option. In this case, the LIST command included the CONCURR keyword.

Near the middle of the example there is a line of "ACCESS=PARALLEL LIST=STATIC". This indicates that PRA is active for this RECON and that the default of LIST commands is STATIC.

At the bottom of the example is "GROUP ID = GPB". GPB is the DBRC group ID used for this set of RECONS.



## Locking of VSAM Records with PRA

- Locks are either shared or exclusive
  - ◆ Shared for get requests
  - ◆ Exclusive for 'get for update' requests
- Locks held during access or until a commit point
  - ◆ Locks for updates held until commit
  - ◆ Locks for read depends on options
    - LIST command with CONCURR
      - Lock released after record is read
    - LIST command with STATIC
      - Locks held until commit
    - Other reads hold locks until commit
      - Except reads used to browse multiple records looking for a specific record

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PRA locks RECON records when they are read. The locks are either at a share level or an exclusive level. As the names suggest, multiple DBRC instances may hold the lock for a record at the same time if they are all at the share level. There can be only one holder of a lock for a record at the exclusive level.

VSAM get requests use share level locks. VSAM get for update requests use exclusive level locks.

Commit occurs when the DBRC request from IMS or the DBRC command has completed. Exclusive level locks are held until commit. Share level locks may be released before commit. Typically, share level locks are held until commit. When the CONCURR option is used for a LIST command, the locks are released as part of the read process. When the STATIC is used for a LIST command, the locks are held until commit. Sometimes DBRC browses RECON records of a type looking for a specific record. When this occurs, locks are obtained and released as each record is read. When the specific record is found, the lock is obtained again and held until commit.



## Deadlocks

- Deadlock detection is done on a timer basis
  - ◆ Times determined by DEADLOCK\_DETECTION parameters in IGDSMSxx
    - Similar to IRLM deadlock detection
  - ◆ There is no "worth value"
    - Deadlock victim does not depend on the type of DBRC (online vs. batch)
  
- Request from "victim" in deadlock is backed out and reprocessed
  - ◆ IGW10072I and IGW10073I messages are issued, otherwise user is unaware of deadlock
    - Messages identify requestors and holders of the locks
  - ◆ Retry may be done multiple times
    - No limit on the number of retries

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The deadlock detection process of SMSVSAM is similar to that done by IRLM. There is a local cycle and a global cycle. During the local cycle deadlocks within a SMSVSAM are detected. During the global cycle deadlocks between units of recovery using different SMSVSAMs are detected. The local cycle uses a waiters list in the detection process. At each cycle a list is built of those units of recovery which are waiting. If the same wait exists in two successive cycles, the locks are examined to see if a deadlock exists. When a deadlock is found, a victim is chosen. Unlike the IRLM implementation, there is no "worth" value associated with units of recovery. A victim is chosen without regard to the type of DBRC instance in which it is executing.

The UOR which is the victim in a deadlock is backed out and its request is reprocessed.

If a deadlock occurs an IGW10072I message is sent to the console. It is followed by IGW10073I messages. An IGW10073I message is issued once for each DBRC in the deadlock chain and includes the record that that DBRC holds and which record it is waiting for. The messages are:

```
IGW10072I jobname stepname urid VSAM RLS DETECTED A DEADLOCK. THERE ARE nn UNITS OF RECOVERY IN THE DEADLOCK CHAIN
```

```
IGW10073I {UNIT OF RECOVERY urid | SUBSYSTEM NAME subsys TRANSACTION ID tranid}  
RUNNING IN JOB jobname HOLDS {ADD TO END LOCK | EXCLUSIVE LOCK ON KEY | SHARED LOCK ON KEY}  
ON BASE CLUSTER NAME cluster [ALTERNATE INDEX NAME altindex] AND IS WAITING FOR  
{ADD TO END LOCK | EXCLUSIVE LOCK ON KEY | SHARED LOCK ON KEY} ON BASE CLUSTER  
NAME cluster2 [ALTERNATE INDEX NAME altindex2] [HOLDING KEY VALUE = key1 WAITING KEY  
VALUE = key2]
```

Deadlocks are retried indefinitely. This is no limit to the number of retries for them.

**Lock Timeouts**

- Lock requests may time out
  - ◆ Timeout value for DBRC is always 2 seconds
  - ◆ Deadlocks may be handled by lock timeout before deadlock is detected
- Request which times out is backed out and reprocessed
  - ◆ IGW10070I and IGW10071I messages are issued, otherwise user is unaware of timeout
    - Messages identify requestor and holders of the lock
- If a retry fails after 5 retry attempts
  - ◆ Message DSP1184W is issued
    - Retries continue
- If a retry after a timeout fails after 15 retry attempts
  - ◆ WTOR message DSP1185A is issued
    - Operator must reply 'retry' or 'cancel'

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If a time out occurs an IGW10070I message is sent to the console. It is followed by an IGW10071I message for each holder of the lock. The messages are:

IGW10070I *jobname stepname urid* A REQUEST TIMED OUT WAITING FOR A LOCK. THERE ARE *nn* UNITS OF RECOVERY HOLDING THIS LOCK.

IGW10071I {UNIT OF RECOVERY *urid* | SUBSYSTEM NAME *subsys* TRANSACTION ID *tranid*} RUNNING IN JOB *jobname* HOLDS {ADD TO END LOCK | EXCLUSIVE LOCK ON KEY | SHARED LOCK ON KEY} IN BASE CLUSTER NAME *cluster* [PATH NAME *path*] CAUSING {TRUE | FALSE} CONTENTION. [KEY VALUE = *key*]

A random delay is done before a retry after a timeout. This is done to resolve situations where two requestors wait on each other multiple times

Message DSP1184W is sent to indicate that five retries have been attempted. Retries continue. No action is required by the operator. The text of the message is: DSP1184W VSAM ACCESS ERROR ENCOUNTERED 5 TIMES RC=0008 RSN=0022

If a timeout for the same lock request occurs 15 times for a unit of recovery, the DSP1185A message is sent. It is sent after the backout of the UOR. The message is a WTOR. The operator must reply to the message. The operator may be able to determine which DBRC instance is holding the lock. If so, the RETRY reply may be issued after the holder of the lock has completed its work. The text of the message is DSP1185A VSAM ACCESS ERROR ENCOUNTERED 15 TIMES RC=0008 RSN=0022 - REPLY 'RETRY' OR 'CANCEL'

The RSN=0022 in the DSP1184W and DSP1185A messages indicate the reason for the error is a timeout for a lock request.



## Retries After Lock Timeouts and Deadlocks

- Timeout or Deadlock results in backout and retry of the unit of recovery
  - ◆ Backout only applies to RECON updates
    - Does not apply to other data sets
  - ◆ This could produce duplicate output for GENJCL, LIST, and other commands
    - Output may have already been written to SYSPRINT and/or JCLOUT
  - ◆ Message issued to inform user
    - DSP1186I DBRC COMMAND RETRY DRIVEN
    - Output produced before this message should be ignored or discarded

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As explained before, a lock timeout or a deadlock results in the backout of the unit of recovery and the reprocessing of the DBRC request. The backout applies to the updates to the RECONS. It does not apply to any other output data sets, such as SYSPRINT or the JCLOUT data set used for GENJCL commands. Timeouts and deadlocks may produce duplicate outputs to these data sets. DBRC recognizes the possibility of these occurrences. It issues the DSP1186I message when a command is retried. This warns the user that there may be duplicate output from the command. Duplicate output tends to be a problem with GENJCL and LIST commands. It could occur for other commands, but the consequences are less serious. For example, the SYSPRINT output of a CHANGE.DB command could contain repeated lines.

The explanation of the DSP1186I message is:

An error that could be retried was detected. DBRC is attempting to reprocess a command that might have produced external output. DBRC retries the processing, which encountered errors, that it considers capable of being retried (for example, deadlock or timeout). In this instance, data might have been written to a data set (for example, SYSPRINT) or the JCLOUT data sets. Since command processing is redriven, output produced prior to this message should be ignored. Output to a JCLOUT data set that is submitted directly to an internal reader may produce duplicate JCL or JCL that does not run.

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## Monitoring of Locks

- The D SMS,CFLS command provides locking information

```

-D SMS,CFLS
IEE932I 236
IGW320I 14:52:52 Display SMS,CFLS
PRIMARY STRUCTURE:IGWLOCK00 VERSION:B8FC73F0F2A13441 SIZE:16384K
RECORD TABLE ENTRIES:48525 USED:4
System Interval LockRate ContRate FContRate WaitQLen
14:52:52 Display SMS,CFLS
SC64 1 Minute 3.3 25.969 0.000 0.33
SC64 1 Hour 84.0 4.797 0.416 0.10
SC64 8 Hour 17.8 1.004 0.092 0.00
SC64 1 Day 7.7 0.354 0.044 0.00
(03) 1 Minute 2.2 17.714 0.000 0.19
(03) 1 Hour 56.0 3.220 0.282 0.05
(03) 8 Hour 11.4 0.671 0.059 0.00
(03) 1 Day 4.5 0.236 0.024 0.00
***** LEGEND *****
LockRate = number of lock requests per second
CONTRATE = % of lock requests globally managed
FCONTRATE = % of lock requests falsely globally managed
WaitQLen = Average number of requests waiting for locks

```

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The D SMS,CFLS command displays locking information from SMSVSAM. In this example the lock structure size is 16384K or 16M. This implies that the lock table size is 8M which is half of 16M. There are 48252 record table (or record list) entries. Only 4 of these record table entries are being used at the time of the display.

The following lines show the locking rate, the contention rate, the false contention rate, and the average number of requests waiting for locks during the last minute, the last hour, the last 8 hours, and the last day. The data returned by the command is for the system where the command is issued and an average of all of the systems. The response shows the lock and contention rates for system SC64. The lines beginning with "(03)" are averages for all of the systems. The "(03)" indicates that there are three systems.



## SMSVSAM Messages About Excessive Locks

**IGW326W \*\*\* Warning \*\*\* DFSMS SMSVSAM RECORD TABLE IN IGWLOCK00 IS *percent* % FULL.**

- ◆ The record table in lock structure IGWLOCK00 is *percent* % full. This message will appear when the record table is more than 80% full.

**IGW859I JOB *jobname* UNIT OF RECOVERY *urid* HAS REQUESTED *nnn* LOCKS**

- ◆ This message is based on the first MAXLOCKS parameter in IGDSMSxx

**IGW10074I JOB *jobname* UNIT OF RECOVERY *urid* HAS REQUESTED *nnn* LOCKS. SYSTEM MAXIMUM IS *mmm***

- ◆ This message is based on the increment value in the MAXLOCKS parameter in the IGDSMSxx

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The IGW326W message is issued when the record table (record list) in the lock structure is 80% full. If the record table becomes full, new locks for updates cannot be granted.

The IGW859I message is issued when a unit of recovery first exceeds the first MAXLOCKS subparameter in the IGDSMSxx member.

The IGW10074I message is issued after the IGW859I message when the unit of recovery requests more locks. Its issuance is controlled by the second MAXLOCKS subparameter. This subparameter specifies an incremental number of locks. The message is issued each time the incremental number of additional locks is requested.



## RMF Information

- Structure Activity Reports
  - ◆ Cache structure
    - Reports size, service times, reads from cache, cross invalidations
  - ◆ Lock structure
    - Reports size, service times, contention, false contention
- RMF III
  - ◆ VSAM RLS Activity report
    - Reports by storage class or by data set
      - Read rate
      - % reads from SMSVSAM pool, cache structure, and DASD
      - % reads for which SMSVSAM buffer was invalid
  - ◆ VSAM LRU Overview report
    - May be used to get sizing information for the SMSVSAM buffer pools

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Lock and cache structure usage information is also available from the RMF Structure Activity Report. IMS data sharing users are familiar with these reports for the IRLM lock structure and OSAM and VSAM cache structures. The same type of report is available for the SMSVSAM structures.

RMF III has a VSAM RLS Activity report. An example of this report is shown on the next page.

The RMF III VSAM LRU Overview report provides information about the size of the SMSVSAM buffer pool. The size of this pool is dynamically adjusted by SMSVSAM. The `RLS_MAX_POOL_SIZE` parameter sets the limit for the pool size, although it might be temporarily exceeded. During each LRU cycle, SMSVSAM determines whether the system is over the goal. If it is, adjustments are made. The report shows the percentage of time when the buffer pool exceeded the desired limit. It also reports on percentages of requests which were satisfied from the buffer pool, the cache structures, and DASD.

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## RMF III - VSAM RLS Activity report

```

RMF V1R2  VSAM RLS Activity - SYSPLEX           Line 1 of 12
Command ==>                               Scroll == => HALF
Samples: 59   Systems: 2   Date: 11/29/02   Time: 13.16.00   Range: 60   sec
LRU Status   : Good
Contention % : 0.0
False Cont % : 0.0
Stor Class  Access  Resp  ----- Read -----  BMF -----  Write
              Time   Rate  BMF%  CF%  DASD%  Valid%  False Inv%  Rate
RLS1
      DIR   0.004  665.6  88.2   0.5   11.3   100     0.01   0.00
      SEQ   0.000   0.00   0.0   0.0   0.0   0.0     0.00   0.00
RLS2
      DIR   0.005  200.0  90.5   0.0    9.5   100     0.00   0.00
      SEQ   0.000   0.00   0.0   0.0   0.0   0.0     0.00   0.00
RLS3
      DIR   0.003  213.3  90.5   0.0    9.5   100     0.00   0.00
      SEQ   0.000   0.00   0.0   0.0   0.0   0.0     0.00   0.00

```

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This is an example of the RMF III VSAM RLS Activity report. It reports on three storage classes used by RLS. These storage classes are RLS1, RLS2, and RLS3. For each class it reports direct and sequential access activities. Under the "Read" columns it reports the percentage of requests that are satisfied from the SMSVSAM buffers (BMF%), from the coupling facility structures (CF%), and from DASD (DASD%). Under "BMF" is shows the percentage of reads which found the CI in the SMSVSAM buffer pool but the buffer had been invalidated by an update to the CI in another system.

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## Recovery

- DFSMStvs backs out and releases locks of failed users
  - ◆ Each DFSMStvs instance has its own undo log
    - Used for backouts after failures
  - ◆ Backouts are invoked by DFSMStvs for failures including:
    - Lock time outs
    - Deadlocks
    - DBRC abends
- SMSVSAM address space started automatically at IPL
  - ◆ Restarted automatically if it fails
    - Backs out in-flight work and releases retained locks
    - Accepts new work
  - ◆ DBRC survives SMSVSAM failures
    - Reissues VSAM request when SMSVSAM recovers

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Each DFSMStvs instance has its own undo log and associated shunt log. The logs are shared by all users of the DFSMStvs instance, but they are not shared by DFSMStvs instances on different z/OS systems. The undo and shunt logs are used for backouts when there is a failure or deadlock by a user of DFSMStvs services, such as a DBRC instance.

When you IPL a z/OS system the SMSVSAM address space is automatically started if it has been defined for the system. If the address space fails, it is automatically restarted by z/OS. When it is restarted, it backs out any work that was in-flight at the time of the failure. It also releases the locks held for the work. After this recovery, it accepts new work.



## Recovery

- Peer recovery for z/OS system failures
  - ◆ In case of system failures, peer instance of DFSMSStvs may be started on another z/OS
    - This z/OS must have a primary instance of DFSMSStvs on it
    - ARM is highly recommended
  - ◆ Peer uses log to backout in-flight work and release retained locks
  - ◆ Peer does not accept new work

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Peer recovery is the process of completing the work that was left in an incomplete state due to the failure of an instance of DFSMSStvs. Peer recovery is done by another instance of DFSMSStvs. Peer recovery occurs only in cases of system failure, not merely when DFSMSStvs fails. When a z/OS system fails, a peer recovery instance of DFSMSStvs is used to back out in-flight work and release locks. The z/OS system where peer recovery is run must have a primary instance of DFSMSStvs running on it.

Peer recovery is not automatically invoked unless Automatic Restart Management (ARM) is used to invoke it. Without ARM, an operator command is required to start peer recovery. ARM information is available in the *z/OS DFSMSStvs Planning and Operating Guide* and in *z/OS MVS Setting Up a Sysplex*.

Peer recovery backs out the in-flight work of the failed system and releases the locks for this work. The peer does not accept new work.

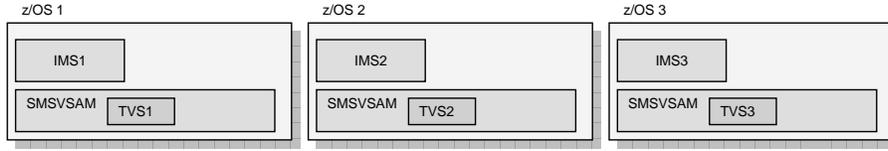
The peer recovery instance of DFSMSStvs does the following:

- It registers with VSAM RLS and RRS as the failed instance of DFSMSStvs and indicates to RRS that it is beginning restart processing as the failed instance.
- It reads the failed instance's undo log to retrieve information about in-progress units of recovery.
- It invokes RRS to retrieve information about unit of recovery status.
- It processes the log data and the information returned by RRS to determine whether to commit or back out units of recovery. It backs out in-flight work and releases locks for this work.
- When all outstanding units of recovery have been processed, it unregisters with RRS and VSAM RLS.

The peer recovery instance of DFSMSStvs registers as the failed instance in order to gain access to the failed instance's resources. This registration persists until peer recovery is complete. As a result, should the failed instance restart, it will be unable to initialize because its attempt to register will fail. It may be necessary to restart DFSMSStvs manually once peer recovery is complete.

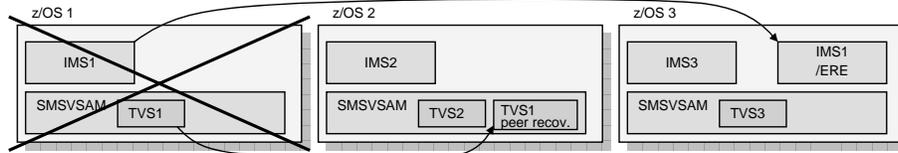
## Peer Recovery Example

- Before failure:



- After failure:

- ◆ TVS1 peer recovery may be done on z/OS2 or z/OS3
  - It does not require that IMS1 be restarted
- ◆ IMS1 may be restarted on a different z/OS



This example illustrates that peer recovery may be done on any z/OS system which has a SMSVSAM address space with a current primary instance of DFSMSStvs. Peer recovery does not require that the IMSs using it be restarted. Of course, you would probably want to restart any failed IMS online system. The emergency restart of IMS1 could be done on any z/OS which has a DFSMSStvs instance. It does not have to be done on the same z/OS system where peer recovery is being done for the failed instance of DFSMSStvs.

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## Changing Execution Parameters

- The SETSMS command may be used to change execution parameters
  - ◆ Changes values set in the IGDSMSxx member
  - ◆ Examples:
    - SETSMS AKP (nnn, nnn, nnn, ...)
      - Changes activity keypoint values
    - SETSMS DEADLOCK (localsecs, globalcycles)
      - Changes deadlock detection cycle parameters
    - SETSMS MAXLOCKS (max, incr)
      - Changes the thresholds for the IGW859I and IGW10074I messages

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The SETSMS command may be used to change parameters that were specified in the IGDSMSxx member. Examples of the kinds of parameters that may be changed are shown here.



## RECON Header/Header Extension Processing

- Serial access
  - ◆ RECON header contains DBRC options and "multiple update" (MUP) records
    - Options include:
      - Trace options, time format options, ...
    - MUP record is used by DBRC requests which update multiple RECON records
      - It's a backout log
    - Every DBRC request reads the header
      - Options may have changed or backout may need to be done
  - ◆ RECON header extension has information about COPY1, COPY2, and spare
    - Every DBRC request reads the header extension
      - Reconfigures if the pair and spare have changed

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This explains how the RECON header and header extension records are used when Parallel RECON Access is NOT used.

With serial access, the RECON header and header extension are read by each DBRC request.

The header is read for two reasons. It is read to determine the current RECON options. These include things such as trace options and time format options. Second, the header is read to determine if there is a multiple update (MUP) record. A MUP record is written before DBRC makes updates to multiple RECON records as part of one DBRC request. This is used to ensure that all of the updates are made, or if they are not made, that they may be backed out. MUP records contain information sufficient for backing out updates to the RECONS. After the MUP record is written, DBRC makes the updates to the indicated RECON records. When these are completed, the MUP record is deleted. Each DBRC request first checks for a MUP record. If one exists, it indicates that another DBRC instance has failed in the middle of making multiple updates. The DBRC instance which reads the MUP record, backs out the partial updates and deletes the MUP record. This mechanism provides integrity with serial access to the RECONS.

The header extension is read to determine the current RECON configuration. This is the current COPY1, COPY2 and spare data sets. They could have been changed by another DBRC instance since this DBRC last accessed the RECONS.

This processing differs with Parallel RECON Access.



## RECON Header/Header Extension Processing

- Parallel RECON Access
  - ◆ RECON header contains DBRC options
    - RECON Header is locked with share (CR) lock
      - Only waits for updaters of the header
      - Avoids almost all possible contentions
    - MUP records are not used
      - Incomplete units of recovery are backed out by DFSMStvs
  - ◆ RECON header extension has information about COPY1, COPY2, and spare
    - Each DBRC request does not read the header ext.
      - Changes in the configuration are propagated by SCI
      - Reduces RECON I/Os
    - Configuration information is read from the header ext. when a DBRC instance is initialized

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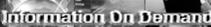
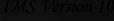
The header record is read by DBRC "logical open" but is locked with a shared lock except when updates are done. It is read to check on the current RECON options. Updates are rare. They are typically done by a DBRC CHANGE.RECON command.

Parallel RECON Access eliminates the need to read the RECON header extension for every DBRC request.

The RECON header extension still contains the current RECON configuration information, but DBRC does not need to read the header for every DBRC request. If a DBRC instance reconfigures the RECONS, it uses SCI to communicate the new configuration to the other instances. The configuration information is obtained from the header extension when a new DBRC instance is initialized. The header extension does not have to be read for every subsequent request of the DBRC instance.

MUP records are not used with Parallel RECON Access. Backouts of incomplete updates are done by DFSMStvs using its undo log stream. This does not eliminate the need to read the header for each DBRC request. The continues to be read to find any changes to RECON options. (e.g. if a CHANGE.RECON TRACEON has been issued).

These changes in processing of the header extension record with Parallel RECON Access eliminate a reason for possible contention on the header extension record. It also reduces the number of I/Os to the RECONS required for most DBRC requests.

## Serial vs. Parallel RECON Access Comparison

Serial	PRA
<ul style="list-style-type: none"> <li>• Hardware reserves (or global serialization) serialize access to the entire RECONS</li> </ul>	<ul style="list-style-type: none"> <li>• Individual RECON records are locked for serialization</li> <li>• Deadlocks and lock timeouts may occur</li> </ul>
<ul style="list-style-type: none"> <li>• RECON header ext. read during "logical open" to determine configuration</li> </ul>	<ul style="list-style-type: none"> <li>• SCI used to communicate RECON configuration changes</li> </ul>
<ul style="list-style-type: none"> <li>• "Multiple update" processing used for recoveries from failures</li> </ul>	<ul style="list-style-type: none"> <li>• TVS log used for recoveries from failures</li> </ul>
<ul style="list-style-type: none"> <li>• Uses VSAM LSR pools</li> </ul>	<ul style="list-style-type: none"> <li>• Uses VSAM RLS pools and cache structures</li> </ul>
<ul style="list-style-type: none"> <li>• SCI registration and ARLN are optional</li> </ul>	<ul style="list-style-type: none"> <li>• SCI registration and ARLN are required</li> </ul>

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Serial processing uses hardware reserves or global data set serialization to serialize access to the RECONS. Only one DBRC instance may be accessing the RECONS at any time. PRA allows multiple DBRC instances to access the RECONS at the same time. It locks individual RECON records to provide integrity. Since it uses locking, there is the possibility of deadlocks or timeouts for lock requests.

Serial processing maintains the status of the RECONS in the header/header extension records. Every access to the RECONS first has to check the header/header extension for the current status. PRA uses SCI communication to notify other DBRC instances of any change in the RECON configuration. PRA does not access the header/header extension with every access to the RECONS.

Serial processing has special handling for requests that require updates to multiple RECON records. This is needed to maintain integrity for multiple updates. It writes a MUP record to the header/header extension before doing its intended multiple updates and then deletes the MUP information after the intended multiple updates are done. PRA does not have this processing. It uses TVS to maintain integrity for multiple updates. If one or more RECON records are updated, but the other records in the request cannot be updated, the TVS log is used to back out the updates that were made.

Serial processing uses VSAM LSR (local shared resources) pools. Each DBRC instance has its own pools. These pools are invalidated at the beginning of each request to DBRC. This is necessary because another DBRC instance may have modified the CIs that are in the pool. PRA does not use LSR pools. It uses the SMSVSAM RLS pool in its LPAR. Parallel Sysplex buffer invalidations are used to invalidate only the buffers that have been updated by DBRC instances running in other LPARs. Cache structures are used in the invalidation process. These cache structures also maintain copies of RECON CIs so that some reads to the RECON data sets may be eliminated.

SCI registration and Automatic RECON Loss Notification are optional with serial access. They are required with PRA.

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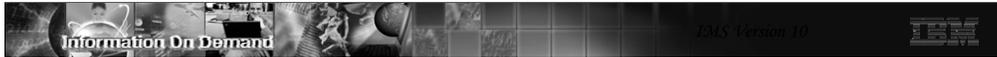
## PRA Migration and Coexistence

- Parallel RECON Access cannot coexist with serial access
- PRA requires MINVERS('10.1')
- Vendor or user code which accesses the RECONs directly must be modified
  - ◆ DBRC API highly recommended
    - Supports PRA
  - ◆ Otherwise,
    - Must use RRS commit/backout
    - Invoke read integrity options on RPLs
    - Must handle new RPL error codes
    - ...
    - However, there is no "quiesce" interface for vendor or user code
- RECON I/O exit routine (DSPCEXT0) must be modified

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This is a summary of the migration and coexistence considerations. Most of these have been covered previously.

Products and application programs which access the RECONs natively must be adapted for DFSMSStvs. The recommended way of handling this is the use of the DBRC API. The DBRC API supports both Parallel RECON Access and serial access. If the DBRC API is not used, the programs must support the DFSMSStvs interfaces. These include the use of RRS for commit and backout, opening the RECONs for DFSMSStvs access, and the use of RPLs which invoke DFSMSStvs access. Even if they successfully implement these interfaces, full support cannot be done. For example, there is no interface to quiesce user code for the LIST command with the STATIC QUIESCE option.

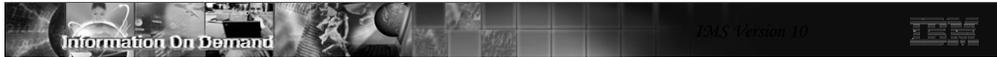


## PRA Migration and Coexistence

- PRA is invoked by CHANGE.RECON ACCESS(PARALLEL)
  - ◆ ALTERs RECON definition
    - LOG(UNDO)
- PRA Requires DFSMStvs environment
  - ◆ IGDSMSxx parameters
  - ◆ Structure and log stream definitions
  - ◆ SHCDS data sets
  - ◆ RACF authority
  - ◆ RRS
  - ◆ SMSVSAM address space
  - ◆ Updated operation and recovery procedures

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Parallel RECON Access is invoked with the CHANGE.RECON ACCESS(PARALLEL) command. The command internally issues an ALTER for the RECON data sets changing the LOG parameter to LOG(UNDO). This requires that the DFSMStvs environment be present. Of course, operations procedures and recovery procedures should be updated for DFSMStvs.

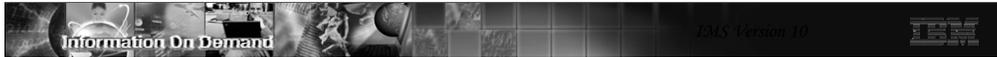


## PRA Summary and Benefits

- Parallel RECON Access
  - ◆ Exploitation of Transactional VSAM
  - ◆ Concurrent RECON activity by multiple DBRC instances
- Benefits
  - ◆ Reduction of RECON contention
  - ◆ Increased throughput
  - ◆ Reduction of interference with online systems from batch jobs and utilities
  - ◆ Removal of growth constraint

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PRA exploits Transactional VSAM for the RECON data sets. This allows multiple DBRC instances, which are online systems, IMS batch jobs, and IMS utilities, to access the RECON data sets concurrently. Volume or global data set serialization is not required. This reduces RECON contention. The reduced contention provides for greater growth potential and increased throughput possibilities. The primary recipient of the benefits for most installations will be online systems since they will suffer less interference from batch jobs and utilities which are accessing the RECONS.



## Additional Information on DFSMStvs

- z/OS publications
  - ◆ *z/OS DFSMStvs Administration Guide*, GC26-7483
  - ◆ *z/OS DFSMStvs Planning and Operating Guide*, SC26-7348
- *Redbooks*
  - ◆ *DFSMStvs Overview and Planning Guide*, SG24-6971
  - ◆ *DFSMStvs Presentation Guide*, SG24-6973
  - ◆ *VSAM Demystified*, SG24-6105-01
    - Chapters 5 and 6
  - ◆ *ABCs of z/OS System Programming Volume 3*, SG24-6983-01
    - Chapter 7

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These books provide information on DFSMStvs. Much of the information assumes that DFSMStvs is being used to support concurrent access to VSAM files from CICS and batch programs. When reading these publications keep in mind that DBRC use of DFSMStvs has the following characteristics:

- Forward recovery logs are not used for the RECONs.
- Each DBRC request is a "transaction". Requests include:
  - DBRC commands or subsets of them. Some commands are processed as multiple requests.
  - Subsystem signons and signoffs
  - Database authorizations or unauthorizations
  - Recordings of log
  - Recordings of image copies
  - Recordings of reorganizations
  - Recordings of database recoveries
  - Creation of allocation records (first update to a data set by a subsystem)
  - and many others

Information On Demand IMS Version 10

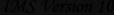
## DBRC Enhancements

- Timestamp precision
  - ◆ Avoids timestamp duplications with extremely fast systems
- SCI DBRC Registration
  - ◆ Support for multiple sets of RECONS
- RECON READONLY support
  - ◆ RECON readers require only READ authority
  - ◆ RECON updaters require only UPDATE (not ALTER) authority
- DBRC API Enhancements
  - ◆ Update commands may be issued
  - ◆ Enhanced queries
  - ◆ Alternate RECON and IMS DD name support
  - ◆ Database authorization capability for utility functions
- Parallel RECON Access
  - ◆ Improved throughput with many IMS instances

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This summarizes the DBRC enhancements in IMS V10.

# RECON Migration and Coexistence



## Supported Migrations and Coexistence

- IMS V8 to IMS V10
  - ◆ Apply DBRC coexistence SPE APAR PK06145 to IMS V8
  - ◆ Upgrade RECONs from IMS V8 to IMS V10
- IMS V9 to IMS V10
  - ◆ Apply DBRC coexistence SPE APAR PK06147 to IMS V9
  - ◆ Upgrade RECONs from IMS V9 to IMS V10

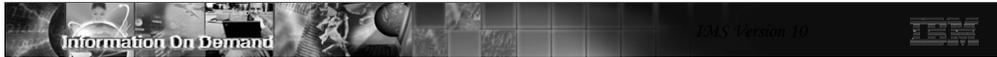
90

IMS V8 RECONs may be upgraded directly to IMS V10. Similarly, IMS V9 RECONs may be upgraded to IMS V10. There is no support to upgrade RECONs from previous releases directly to IMS V10.

PK06145 is an IMS V8 SPE (Small Programming Enhancement) APAR. It allows IMS V8 to use RECONs which have been upgraded to IMS V10.

PK06147 is an IMS V9 SPE APAR. It allows IMS V9 to use RECONs which have been upgraded to IMS V10.

These APARs should be applied to IMS V8 or IMS V9 before its RECONs are upgraded to IMS V10.



## RECON Upgrade

- CHANGE.RECON UPGRADE
  - ◆ Using IMS V10 DBRC Utility (DSPURX00)
  - ◆ May be executed while subsystems are running
    - Upgrade fails if there is subsystem record for an IMS V8 or V9 subsystem without the DBRC coexistence DBRC SPE
      - Some utilities do not create subsystem records
        - They are not protected by the check for subsystem records
        - If they are running without the SPE, unpredictable results may occur
        - Examples: Change Accumulation, Log Archive, DSPURX00, HALDB Partition Definition Utility, V9 DBRC API applications

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RECONs are upgraded to IMS V10 by using the DBRC CHANGE.RECON UPGRADE command with the IMS V10 DBRC utility (DSPURX00).

The upgrade may be run while the RECONs are allocated to and being used by IMS V8 or IMS V9. Of course, these systems must be able to use IMS V10 RECONs. The upgrade checks the RECONs to ensure that any subsystems using the RECONs are capable of using IMS V10 RECONs. It does this by examining the SUBSYS records in the RECONs. Some IMS utilities do not create SUBSYS records. Thus, the upgrade cannot determine if they are running. Users must ensure that any IMS utility which is running at the time of the upgrade has the appropriate maintenance (PK06145 or PK06147) which allows it to read IMS V10 RECONs.

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## RECON Listings

- "COEXISTENCE LEVEL" added to subsystem record listing
  - ◆ Added by V10 and V10 coexistence SPE for V9 and V8
  - ◆ May be used to determine if subsystems would cause an upgrade failure

```

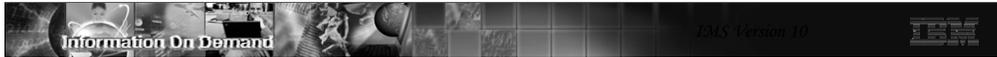
SSYS
SSID=IMS1      LOG START=06.137 17:25:44.2
SSTYPE=ONLINE  ABNORMAL TERM=OFF  RECOVERY STARTED=NO  BACKUP=N
TRACKED=NO     TRACKER TERM=OFF    SHARING COVERED DBS=NO
IRLMID=**NULL**  IRLM STATUS=NORMAL      GSGNAME=**NULL**
COEXISTENCE LEVEL=10.1

AUTHORIZED DATA BASES/AREAS=4      VERSION=9.1      XRF CAPABLE=NO
                                     ENCODED
  -DBD-          -AREA-    -LEVEL-  -ACCESS INTENT-  -STATE-
PDHDOKA         **NULL**    0        UPDATE          6
PDHDOKB         **NULL**    0        UPDATE          6
PDHDOKC         **NULL**    0        UPDATE          6
PDHDOKD         **NULL**    0        UPDATE          6
      
```

- In this example the subsystem is at 9.1 but has the 10.1 coexistence maintenance applied

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IMS V10 has added the coexistence level to the RECON listing of subsystem records. This has also been added to IMS V8 and V9 by the IMS V10 coexistence SPEs for these releases. The VERSION= field has existed in previous releases. It indicates the IMS release level of the subsystem. The COEXISTENCE LEVEL= field indicates if the coexistence maintenance for a later release has been applied. In this example, the IMS V10 DBRC coexistence maintenance has been applied to the IMS V9 system used by this subsystem. This listing could have been produced by an IMS V9 DBRC utility with the IMS V10 coexistence SPE applied or it could have been produced by the IMS V10 DBRC utility.



## RECON Upgrade

- Upgrade from IMS V8 or V9 to IMS V10
  - ◆ Reads SSYS records to check for DBRC SPE
  - ◆ Updates RECON header record
    - Sets version indicator, sets MINVERS value, resets CDSLID value, sets ACCESS to SERIAL, and sets LIST to STATIC
  - ◆ Updates RECON header extension record
    - Sets version indicator, moves PLEXNAME, and adds GROUPID
  - ◆ Updates Image Copy records
    - IC type field expanded and moved
  - ◆ Updates Subsystem records
    - API flag added
  - ◆ Quick!

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The upgrade of the RECONS includes the reading of the subsystem (SSYS) records to ensure that these subsystems are running with the DBRC coexistence SPE. If not, the subsystem could not use the RECONS and the upgrade fails.

The upgrade changes a few records in the RECONS. The header and header extension records are changed to include the correct version indicator and to values for the parameters shown. The Cross DBRC Service Level ID (CDSLID) is set to the higher of the value in the RECONS before the upgrade and "1". The Image Copy records are rewritten to accommodate the larger IC type field. This field was expanded to include new image copy types for FlashCopy and fuzzy user image copies. The subsystem records are rewritten to accommodate the DBRC API flag for subsystems using the DBRC API.

Since only a few records are updated, a typical upgrade will be quick.

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## MINVERS

- IMS V10 MINVERS valid values
  - ◆ '8.1', '9.1', and '10.1'
  
- Upgrade of RECONS
  - ◆ MINVERS('7.1') changed to MINVERS('8.1')
  - ◆ MINVERS('8.1') remains MINVERS('8.1')
  - ◆ MINVERS('9.1') remains MINVERS('9.1')

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MINVERS is the parameter on the INIT.RECON and CHANGE.RECON commands which controls the minimum level of IMS which may use the RECONS. The minimum level of IMS which can use V10 RECONS is V8. If the previous MINVERS value was for '7.1', it is changed to '8.1' by the upgrade. Otherwise, upgrades do not change the MINVERS value.

MINVERS values of 81 and 91 (specified without the decimal point or the single quotes) are accepted by IMS V10 for compatibility, however, using the single quotes and the decimal point are required for specifying V10 ('10.1') and recommended for specifying V8 ('8.1') and V9 ('9.1').



## IMSplex Name and DBRC Group ID

- IMSplex name is specified with 5 characters (xxxxx)
  - ◆ IMS V8 and V9 store 'CSLxxxx' in the RECON header extension record
  - ◆ IMS V10 stores 'xxxxyyy' in the RECON header extension record
    - 'yyy' is the DBRC Group ID
      - DBRC Group ID defaults to '001'
      - Upgrade uses the default
- Example
  - ◆ IMS V9: IMSplex name is MYPLX
    - Contents in RECON Header Extension record: 'CSLMYPLX'
    - RECON Listing: IMSPLEX=MYPLX
  - ◆ IMS V10 after upgrade of RECONS with IMSplex name of MYPLX
    - Contents in RECON Header Extension record: 'MYPLX001'
    - RECON Listing: IMSPLEX=MYPLX          GROUP ID=001

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The IMSplex name is optional. It is required for Automatic RECON Loss Notification and Parallel RECON Access. The IMSplex name is specified with up to 5 characters. It is specified either in the IMSPLEX= execution parameter or by the DBRC SCI Registration exit routine. When first specified, it is stored in the RECONS. IMS V8 and V9 store the IMSplex name as 'CSLxxxx' where 'xxxxx' is the value specified in the IMSPLEX= parameter or in the exit routine. When the RECONS are upgraded to V10, the value stored is 'xxxxyyy' where 'yyy' is the DBRC Group ID. The upgrade sets the DBRC Group ID to '001' which is the default value.

IMS V8, V9, and V10 list only the 5 characters of the IMSplex name in listings of the RECON header. These listing include a line with IMSPLEX=xxxxx when an IMSplex name has been stored in the RECONS. If there is no value stored, the line includes IMSPLEX=\*\*NONE\*\*. IMS V10 listings also include the DBRC Group ID on this line. If there is no IMSplex name the Group ID is listed as GROUP=\*\*NONE\*\*. If there is an IMSplex name, the Group ID is listed as GROUP=yyy where yyy is the Group ID.



## IMSplex and DBRC Sharing Group ID Specification

- IMSplex users considerations
  - ◆ DBRC SCI Registration Exit routine (DSPSCIX0) can set the DBRC Sharing Group ID
    - Recommended
    - If DBRCGRP is specified in EXEC, it is passed to the exit routine
- Migration and coexistence considerations
  - ◆ DBRC Sharing Group ID in RECONs is tolerated by IMS V8 and V9 systems
    - Exit routine is not passed the Group ID
    - Exit routine does not specify the Group ID
    - V8 and V9 systems will process all ARLN notifications from its IMSplex group
    - ARLN notifications from V8 and V9 systems will be sent to all members of the IMSplex, without regard to V10 DBRC Group IDs
      - Do not use multiple DBRC Sharing Group IDs in an IMSplex while V8 and V9 systems are used

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The DBRC SCI Registration exit routine (DSPSCIX0) may be used to specify the IMSplex name, as in previous releases, and the new DBRC Group ID. The use of the exit routine is recommended for users of IMSplex. It removes the requirement to specify IMSPLEX= for the execution of all IMS jobs which use DBRC. This includes batch jobs and utilities. With IMS V10 the exit also may specify the DBRC Sharing Group ID. This removes the requirement to specify DBRCGRP= for IMS executions.

IMS V8 and V9 systems can tolerate the specification of the DBRC Group ID in the RECONs. DBRCGRP= is not a valid parameter on the EXEC statement for V8 and V9. When the exit routine is invoked in a V8 or V9 environment, the DBRC Group ID is not passed to it. The exit routine cannot specify the DBRC Group ID. Even though a V8 or V9 instance cannot specify the DBRC Group ID, it can join an IMSplex where V10 instances are using DBRC Group IDs. The V8 or V9 instance will be passed all ARLN notifications from the IMSplex group. If a V8 or V9 system reconfigures its RECONs, its ARLN notification will be processed by all members of the IMSplex. This will include all V10 systems. If there are multiple DBRC Groups, all members of all groups will process the notification. For these reasons, you should not use multiple DBRC Group IDs in an IMSplex while you are still using IMS V8 or V9 systems.

Information On Demand IMS Version 10

## RECON Listings

- Version 10 adds information to RECON status listing

```

RECON
RECOVERY CONTROL DATA SET, IMS V10R1
DMB#=231                INIT TOKEN=06082F0536577F
NOFORCER LOG DSN CHECK=CHECK44  STARTNEW=NO
TAPE UNIT=3480          DASD UNIT=SYSDA  TRACEOFF  SSID=**NULL**
LIST DLOG=NO            CA/IC/LOG DATA SETS CATALOGED=NO
MINIMUM VERSION = 8.1    CROSS DBRC SERVICE LEVEL ID= 00001
REORG NUMBER VERIFICATION=NO
LOG RETENTION PERIOD=00.001 00:00:00.0
COMMAND AUTH=NONE HEQ=**NULL**
ACCESS=SERIAL           LIST=STATIC
SIZALERT DSNUM=15       VOLNUM=16      PERCENT= 95
LOGALERT DSNUM=3        VOLNUM=16

TIME STAMP INFORMATION:

TIMEZIN = %SYS

OUTPUT FORMAT:  DEFAULT = LOCAL  NONE  PUNC YY
                CURRENT = LOCAL  NONE  PUNC YY

IMSPLEX = ** NONE **   GROUP ID = ** NONE **

-DDNAME-      -STATUS-      -DATA SET NAME-
RECON1        COPY1         IMSTESTS.DSHR.RECON1
RECON2        COPY2         IMSTESTS.DSHR.RECON2
RECON3        SPARE         IMSTESTS.DSHR.RECON3
  
```

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The RECON status or header listing has some added and changed information.

Of course, the IMS version is listed as "V10R1". This means that the RECONS have been upgraded to IMS V10.

There is a new line which lists the type of RECON access, either SERIAL or PARALLEL. On the same line the default for the DBRC LIST command, either STATIC or CONCURR, is shown.

On the line where the IMSPLEX value is shown, the DBRC Group ID value is also shown. In this example, these parameters have no values so "\*\*\* NONE \*\*\*" is listed.

The sample listing shown here includes the "CROSS DBRC SERVICE LEVEL ID". This also appears on IMS V9 RECON listings when the maintenance for APARs PQ98655 and PK01097 is applied and on IMS V8 RECON listings when the maintenance for APARs PQ98654 and PK01096 is applied. The service level ID is used to invoke functions which require a consistent level of maintenance on all IMS systems using the RECONS.

**DBRC Migration Steps**

1. Install IMS V8 or V9 DBRC Migration/Coexistence SPEs
2. Install IMS V10 DBRC Type 4 SVC
  - ◆ The V10 Type 4 SVC may be used with V8 and V9
3. Upgrade RECONs using the IMS V10 SDFSRESL library
4. Begin using IMS V10
  
5. Discontinue all use of IMS V8 and V9
6. CHANGE.RECON MINVERS('10.1')
  - ◆ Full precision will be used in timestamps

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This shows the DBRC steps for migration to IMS V10.

The first set of steps allows you to begin using IMS V10. The migration/coexistence SPE must be installed on the old release before you upgrade the RECONs to V10. The V10 DBRC Type 4 SVC must be installed before you may use IMS V10. The upgrade of the RECONs to IMS V10 requires that you use the SDFSRESL library created by the installation of IMS V10. The upgrade using this library will be to the IMS V10 format. Once the RECONs have been upgraded, you may begin using IMS V10. You may also continue to use IMS V8 or V9.

Once you have discontinued all use of IMS V8 and V9, you can change the MINVERS value to '10.1'. This causes IMS to begin using the increased precision timestamp. Before changing MINVERS to '10.1', you must ensure that the IMS utility control statements that you use specify full precision in their timestamps. The control statements generated by GENJCL statements will always generate control statements with the correct timestamps. Remember that the position of the timestamp in the control statements for the IMS V10 Change Accumulation and Database Recovery utilities does not depend on the MINVERS value, however, if MINVERS is not '10.1' the low order part of the timestamp does not matter since these positions in timestamps are not recorded in the RECONs unless MINVERS('10.1') is specified.

# Installation and Migration

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## Installation and Migration

- Packaging, Prerequisites, and Coexistence
- IMS Library Changes
- IVP Enhancements
- Syntax Checker Enhancements
- KBLA Coexistence
- Installation and Migration Tasks
- Review of Migration Considerations



## Packaging, Prerequisites, and Coexistence

## Packaging

- IMS V10 product number: 5635-A01

FMID	Feature Description
HMK1010	System Services
JMK1011	Database Manager
JMK1012	Transaction Manager
JMK1013	Extended Terminal Option (ETO)
JMK1014	Recovery Level Tracking (RSR)
JMK1015	Database Level Tracking (RSR)
JMK1016	IMS Java
HIR2220	IRLM 2.2

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IMS V10 packaging is the same as that for IMS V9. Transaction Manager is a prerequisite for ETO. Recovery Level Tracking RSR is a prerequisite for Database Level Tracking RSR.

IRLM 2.2 is the only IRLM shipped and supported with IMS V10.

## Software Prerequisites

- Minimum software level prerequisites
  - ◆ z/OS V1R7 (5694-A01)
    - RACF, or equivalent, if security is used
    - High Level Assembler Toolkit (5696-234)
  - ◆ IRLM 2.2, if IRLM is used
- Minimum software levels for optional functions:
  - ◆ IMS V10 Image Copy 2 and Database Recovery fast replication
    - z/OS V1R8
  - ◆ DBRC Parallel RECON Access
    - z/OS DFSMStvs, a separately orderable feature of z/OS
  - ◆ See the IMS V10 Release Planning Guide for additional requirements with IMS V10 functions

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The minimum level of z/OS for IMS V10 is z/OS V1R7. In addition to z/OS the user must install RACF, or an equivalent security product, in order to use security with IMS V10. As with previous IMS releases, the High Level Assembler Toolkit is required to provide assembler macros that IMS uses. If the IRLM is used, IRLM 2.2 is required. Program Isolation (PI) is also supported with IMS V10. IRLM is required for block level data sharing.

z/OS V1.7 runs on the following IBM System z9 and zSeries servers or equivalents: z9-109, z900, z990, z800, and z890.

z/OS V1R8 is required if the fast replication function of Image Copy 2 and the Database Recovery utility are used.

DBRC Parallel RECON Access requires z/OS DFSMStvs which is a separately orderable feature of z/OS V1R7 or z/OS V1R8. Special bids will be considered for IMS customers using the Parallel RECON Access function, who do not already have DFSMStvs, to acquire DFSMStvs for use restricted to IMS.

DFSMS APAR OA11468/PTF UA18949 is a prerequisite for Fast Path customers running at z/OS 1.7 or above.

EWLM support is available in z/OS 1.8 or via APAR OA12935 for z/OS 1.7. For both releases of z/OS the EWLM, Virtualization Engine, and Java SDK FMIDs must be installed in the z/OS system.

The IMS V10 Release Planning Guide has additional information about requirements when using particular functions in IMS V10.



## Supported Connections

- ISC is supported with
  - ◆ IMS V10, V9, and V8
  - ◆ CICS Transaction Server V3.2, V3.1, V2.3, and V2.2
  - ◆ User-written software
- MSC is supported with
  - ◆ IMS V10
  - ◆ IMS V9
  - ◆ IMS V8
- Shared Queues is supported with
  - ◆ IMS V10
  - ◆ IMS V9
  - ◆ IMS V8

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All currently supported releases of IMS and CICS are supported for ISC connectivity to IMS V10.

All currently supported releases of IMS are supported for MSC connectivity to IMS V10.

All currently supported releases of IMS are supported for shared queues with IMS V10 Transaction Manager.

## Supported Connections

- DB2 connections are supported with
  - ◆ DB2 V9, V8, and V7
  
- DBCTL connections are supported with
  - ◆ CICS Transaction Server V3.2, V3.1, V2.3, and V2.2
  
- IRLM 2.2 connections to IRLM 2.1 are supported
  - ◆ IRLM 2.1 is supported with IMS V8 and V9
  - ◆ IRLM 2.1 is not supported with IMS V10
  - ◆ IRLM 2.2 with IMS V10 may connect to IRLM 2.1 with IMS V9 or V8

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All currently supported releases of DB2 on z/OS are supported for connections from IMS V10.

All currently supported releases of CICS are supported for DBCTL connectivity to IMS V10.

## Supported Migrations and Coexistence - DBRC

- IMS V9 to IMS V10
  - ◆ Upgrade RECONs from IMS V9 to V10
    - IMS V9 SPE PK06147 allows IMS V9 to use IMS V10 RECONs
  
- IMS V8 to IMS V10
  - ◆ Upgrade RECONs from IMS V8 to V10
    - IMS V8 SPE PK06145 allows IMS V8 to use IMS V10 RECONs
      - Also provides compatibility for IMS V10 using HALDB Online Reorganization

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IMS V8 and V9 RECONs may be upgraded to IMS V10 by executing the DBRC utility (DSPURX00) and using the CHANGE.RECON UPGRADE command with an IMS V10 SDFSRESL library. Before doing the upgrade you should apply the Small Programming Enhancement to your IMS V8 or V9 system. This allows the V8 or V9 systems to use the RECONs after they have been upgraded to V10.

SPE PK06145 for IMS V8 also supplies compatibility support that allows IMS V10 to invoke HALDB Online Reorganizations (OLR) for partitions that are accessed by IMS V8. IMS V8 cannot invoke HALDB OLR, but when this maintenance is applied it may access partitions for which OLR is used.



## Other Coexistence Maintenance

- Global Online Change Coexistence APARs
  - ◆ V8 - PK23401; V9 - PK23402
- System Management Enhancement Coexistence SPEs
  - ◆ V8 - PK30188; V9 - PK30189
- Resource Consistency Checking Coexistence SPEs
  - ◆ V8 - PK32969; V9 - PK32970
  - ◆ Resource Consistency Checking is not done in IMS V10
- Operations Management Coexistence SPEs
  - ◆ V8 - PK27279; V9 - PK27280

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This chart shows the coexistence maintenance required on earlier releases when they coexist with IMS V10.

The Global Online Change coexistence SPEs allow lower level IMS systems to share an OLCSTAT data set with IMS V10. IMS V10 makes changes to the header record. The SPEs allow IMS V8 and V9 to implement and tolerate these changes.

The System Management Enhancement coexistence SPEs allow lower level IMS systems to coexist with IMS V10. Lower level IMS systems which process transaction submitted from the OM API will receive an AD status code if they reply to the IOPCB.

IMS V10 does not support the resource consistency checking function of the Resource Manager. The Resource Consistency Checking SPEs allow lower level IMS systems to use this function among themselves while in an IMSplex with IMS V10 systems. The elimination of resource consistency checking is explained later in this section of the class.

The Operations Management coexistence SPEs allow OM address spaces and IMSs at lower level of IMS to coexist in a CSL environment with IMS V10 OM.

## Coexistence - IMS Utilities

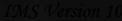
- Batch Backout, Log Archive, and Log Recovery
  - ◆ Use the utility from the IMS release that created the log
  
- IMS V10 Database Recovery utility
  - ◆ Accepts Image Copies produced by IMS V10, V9, and V8
  - ◆ Accepts HISAM Unloads produced by IMS V10, V9, and V8
  - ◆ Accepts Change Accum data sets produced by IMS V10, V9, and V8
  - ◆ Accepts logs produced by IMS V10, V9, and V8
  
- IMS V10 Change Accumulation utility
  - ◆ Accepts logs produced by IMS V10, V9, and V8
  - ◆ Accepts Change Accum data sets produced by IMS V10, V9, and V8

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The Batch Backout, Log Archive, and Log Recovery utilities access one log. The release level of the utility must match the IMS release that was used to create the log.

The IMS V10 Database Recovery utility (DFSURDB0) accepts Image Copies, HISAM Unload data sets, Change Accumulation data sets, and IMS logs as inputs. These inputs may be created by any currently supported release of IMS.

The Change Accumulation utility accepts IMS logs and Change Accumulation data sets as inputs. These inputs may be created by any currently supported release of IMS.


## Resource Consistency Checking Eliminated

- Resource consistency checking is optional with IMS V8 and V9
  - ◆ Ensures that all IMS systems in the IMSplex are using the same data sets for:
    - ACBLIBx, FORMATx, MODBLKSx, and MATRIXx data sets
    - Only applies to systems using global online change with an RM structure
      - Requires: CSL including RM address space(s), RM structure, and OLC=GLOBAL specified in DFSCGxxx member
      - Disabled with NORSCCC= in DFSCGxxx member
- Resource consistency checking is not done in IMS V10
  - ◆ Even with global online change and RM structure
- Coexistence
  - ◆ If IMS V8 and/or V9 systems request resource consistency checking it will be done between the V8 and V9 systems, but not for the V10 system

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Resource consistency checking for global online change is not done by IMS V10. This function was available in IMS V8 and V9. It checks to ensure that the data set names used for the active ACBLIB, FORMAT, MODBLKS, and MATRIX data sets are the same for all of the IMS systems. It is only done when global online change is used (OLC=GLOBAL is specified in the DFSCGxxx member) and an RM structure is used. It can be disabled in V8 and V9 by specifying values for the NORSCCC= parameter in the DFSCGxxx member. Users were likely to disable resource consistency checking since the use of resource consistency checking created a single point of failure. For example, the loss of the ACBLIB data set would effect all systems since all would be using the same data set.

IMS V10 does not do resource consistency checking. The NORSCCC= parameter in the DFSCGxxx member may be specified for compatibility, but it is ignored by V10.

If your IMSplex has a mixture of IMS V10 and V9 or V8 systems, resource consistency checking will apply only to the V8 and V9 systems. When resource consistency checking is used, only the V8 and V9 systems must use the same data set(s). The Resource Consistency Checking SPEs, PK32969 for V8 and PK32970 for V9, must be applied for the IMS V8 or V9 systems to use resource consistency checking when an IMS V10 system is part of the IMSplex.

## Remote Site Recovery (RSR) Migration/Coexistence

- V10 RSR tracking system can process logs created by V10, V9, or V8
- V10 RSR Isolated Log Sender can send logs created by V10, V9, or V8
- Logs created by V10 cannot be processed by V8 or V9 tracking system or Isolated Log Sender
  
- Migration steps
  - ◆ Upgrade the RSR tracking system RECONs to V10
  - ◆ Migrate RSR tracking system to V10
  - ◆ Upgrade the active system RECONs to V10
  - ◆ Migrate active system Transport Manager Subsystem (TMS) running Isolated Log Sender to V10
  - ◆ Migrate active IMS to V10

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The migration of systems using RSR is similar to migrations for previous releases. IMS V10 tracking systems can process logs produced by lower releases. The IMS V10 Isolated Log Sender (ILS) function of the Transport Manager System (TMS) can process logs created by lower releases. On the other hand, IMS V8 and V9 tracking systems cannot accept logs produced by IMS V10 and the IMS V8 and V9 ILSs cannot accept logs produced by IMS V10. Of course, you could migrate all of the RSR components at the same time. You would more likely prefer to migrate them in stages. The restrictions mentioned above imply that the order of migration of the components is as shown on the slide. The tracking system must be migrated before or at the same time as the ILS at the active site. The ILS at the active site must be migrated before or at the same time as the active IMS system. The RECONs must be upgraded to IMS V10 before the systems that use them are migrated to IMS V10.

Information On Demand *IMS Version 10*

## Log Records

- Some log records have changed
- New log records have been added
- DSECTS for IMS log records may be generated by assembling:
  - ◆ ILOGREC RECID=ALL

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Among the log records which have been changed for IMS V10 are the following types:

07, 08, 22, 4001, 4004, 4006, 4007, 4012, 4083, 45, 56FA, 5950, 5951, 5953, 5954, 5955, 5956, 5957, 5958, 56FA, and 7205.

This is NOT an exhaustive list of changed log records.

If you have application programs which process IMS log records, you should examine to see if they are affected by the changes to the log records. You can assemble DSECTS for IMS log records by using the ILOGREC macro.

# IMS Tools Migration/Coexistence

- Some products may require updates
  - ◆ Contact your vendor for information on requirements
  - ◆ IBM has a web site with consolidated information about requirements for IBM IMS tools with IMS V10
    - Navigate:
      - [www.ibm.com/software/data/db2imstools/](http://www.ibm.com/software/data/db2imstools/)
      - Click on "Support"
      - Click on "IMS Tools and IMS Compatibility"
      - Click on "IMS Version 10"



<http://www-1.ibm.com/support/docview.wss?rs=688&uid=swg21249278>  
 or  
<http://tinyurl.com/3852cs>

There are APARs for IMS V9 and V8 to support fallback from IMS V10 to these releases. The fixes for these APARs are needed if messages created under IMS V10 need to be queued to an IMS V9 or V8 system after a fallback to these releases. These fixes are not required to take messages from an IMS V8 or V9 system and queue them on an IMS V10 system.

QCF 2.1 requires the fix for APAR P28050 for IMS V10 support.



## IMS Tools Migration/Coexistence

- IMS APARs for fallback from IMS V10 to IMS V8 or V9 using QCF
  - ◆ Required so that IMS V9 and V8 can recognize V10 messages
    - PK29667 (V9) and PK29666 (V8)
      - Not required for migration from V8 or V9 to V10

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There are APARs for IMS V9 and V8 to support fallback from IMS V10 using the IMS Queue Control Facility (QCF). The fixes for these APARs are needed if messages created under IMS V10 need to be requeued to an IMS V9 or V8 system after a fallback to these releases. These fixes are not required to take messages from an IMS V8 or V9 system and requeue them on an IMS V10 system.



# IMS Library Reorganization

Information On Demand IMS Version 10

# IMS Library

- Information Center contains information on IMS V10

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The Information Center has been updated to include information on IMS V10. The topics on the left side of the screen map to the titles of the IMS V10 manuals.

## IMS Library Reorganization

- IMS V9 licensed manuals will be unlicensed in IMS V10
- Information moved between manuals
  - ◆ Chapter 5 of Release Planning Guide explains the reorganization

IMS Version 10 Titles	IMS Version 9 Titles
<ul style="list-style-type: none"> <li>• <i>Release Planning Guide</i></li> <li>• <i>Installation Verification Guide</i></li> <li>• <i>System Definition Guide</i></li> <li>• <i>System Definition Reference</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Release Planning Guide</i></li> <li>• <i>Installation Volume 1: Installation Verification</i></li> <li>• <i>Installation Volume 2: System Definition and Tailoring</i></li> </ul>
<ul style="list-style-type: none"> <li>• <i>Exit Routine Reference</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Customization Guide</i></li> </ul>
<ul style="list-style-type: none"> <li>• <i>Database Administration Guide</i></li> <li>• <i>System Administration Guide</i></li> <li>• <i>Communications and Connections Guide</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Administration: Database</i></li> <li>• <i>Administration: System</i></li> <li>• <i>Administration: Transaction Manager</i></li> </ul>
<ul style="list-style-type: none"> <li>• <i>Operations and Automation Guide</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Operations Guide</i></li> </ul>

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The following table summarizes the source of the content of these IMS V10 manuals.

IMS V10 book title	Summary of source of the V10 book's information
Release Planning Guide	Same as RPG plus a chapter from OG.
Installation Verification Guide	Includes info from the IIV.
System Definition Guide	Includes info from ISDT, plus CQS, CSL, CT, and JGR.
System Definition Reference	Includes info from ISDT, plus BPE, CQS, CT, and URS.
Exit Routine Reference	Includes reordered info from the CG, plus info from BPE, CQS, CSL, and CT.
Database Administration Guide	Includes much of the ADB, plus some info from JGR, OG, and ISDT.
System Administration Guide	Includes info from AS, plus OG, DBRC, ATM, IIV, ISDT, URDBTM, and URS.
Communications and Connections Guide	Includes the functions that facilitate communicating with IMS and connecting to IMS: APPC, ESAF, ETO, Connect, ISC, MSC, OTMA, and SLU P.
Operations and Automation Guide	Includes info from OG and CG

## IMS Library Reorganization

- Information moved between manuals

IMS Version 10 Titles	IMS Version 9 Titles
<ul style="list-style-type: none"> <li>• <i>Application Programming Planning Guide</i></li> <li>• <i>Application Programming Guide</i></li> <li>• <i>Application Programming API Reference</i></li> <li>• <i>System Programming API Reference</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Application Programming: Design Guide</i></li> <li>• <i>Application Programming: EXEC DLI Commands for CICS and IMS</i></li> <li>• <i>Application Programming: Database Manager</i></li> <li>• <i>Application Programming: Transaction Manager</i></li> <li>• <i>IMS Java Guide and Reference</i></li> </ul>

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The following table summarizes the source of the content of these IMS V10 manuals.

IMS V10 book title	Summary of source of the V10 book's information
Application Programming Planning Guide	Includes info from APDG, plus intro chapters from APDB, APTM, APCICS, and JGR.
Application Programming Guide	Includes the guidance info from the APDB, APTM, and APCICS.
Application Programming API Reference	Includes the reference info from the APDB, APTM, APCICS and JGR.
System Programming API Reference	Includes info from CQS, CSL, CG, APDB, CG, DBRC, CT, OTMA, and ATM.

## IMS Library Reorganization

- Information moved between manuals

IMS Version 10 Titles	IMS Version 9 Titles
<ul style="list-style-type: none"> <li>• <i>Command Reference, Volume 1</i></li> <li>• <i>Command Reference, Volume 2</i></li> <li>• <i>Command Reference, Volume 3</i></li> <li>• <i>Database Utilities Reference</i></li> <li>• <i>System Utilities Reference</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Command Reference Volume 1</i></li> <li>• <i>Command Reference Volume 2</i></li> <li>• <i>Utilities: Database and Transaction Manager</i></li> <li>• <i>Utilities: System</i></li> </ul>

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The following table summarizes the source of the content of these IMS V10 manuals.

IMS V10 book title	Summary of source of the V10 book's information
Command Reference, Volumes 1 and 2	Includes part 1 + part 2 of CR (the type-1 and type-2 commands).
Command Reference, Volume 3	Includes CSL, DBRC, TMS, Connect, and z/OS commands.
Database Utilities Reference	Includes reordered info from URDBTM.
System Utilities Reference	Includes reordered info from URS, plus ISDT, URBDTM, and DBRC.

## IMS Library Reorganization

- Information moved between manuals

IMS Version 10 Titles	IMS Version 9 Titles
<ul style="list-style-type: none"> <li>• <i>Diagnosis Guide</i></li> <li>• <i>Diagnosis Reference</i></li> <li>• <i>Messages and Codes Reference, Volume 1: DFS Messages</i></li> <li>• <i>Messages and Codes Reference, Volume 2: Non-DFS Messages</i></li> <li>• <i>Messages and Codes Reference, Volume 3: IMS Abend Codes</i></li> <li>• <i>Messages and Codes Reference, Volume 4: IMS Component Codes</i></li> </ul>	<ul style="list-style-type: none"> <li>• <i>Diagnosis Guide and Reference (licensed)</i></li> <li>• <i>Failure Analysis Structure Tables (licensed)</i></li> <li>• <i>Messages and Codes Volume 1: Non-DFS Messages</i></li> <li>• <i>Messages and Codes Volume 2: DFS Messages</i></li> </ul>

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The following table summarizes the source of the content of these IMS V10 manuals.

IMS V10 book title	Summary of source of the V10 book's information
Diagnosis Guide	Includes part 1 of the DGR plus a chapter from CQS.
Diagnosis Reference	Includes parts 2 and 3 of the DGR.
Messages and Codes Reference, Volume 1	DFS Messages
Messages and Codes Reference, Volume 2	Non-DFS Messages
Messages and Codes Reference, Volume 3	IMS Abend Codes
Messages and Codes Reference, Volume 4	IMS Component Codes

## IMS Library Reorganization

- New and discontinued manuals

### IMS Version 10 Titles

Two new titles include:

- *IMSplex Administration Guide*
- *System Programming API Reference*

### IMS Version 9 Titles

The content of the single-topic books listed here were distributed throughout the Version 10 library.

- *Base Primitive Environment Guide and Reference*
- *Common Queue Server Guide and Reference*
- *Common Service Layer Guide and Reference*
- *Database Recovery Control*
- *Open Transaction Manager Access*
- *IMS Connect*

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The following table summarizes the source of the content of these IMS V10 manuals.

IMS V10 book title	Summary of source of the V10 book's information
IMSplex Administration Guide	Includes IMSplex info from BPE, CSL, CQS, AS, OG, and ATM.
System Programming API Reference	Includes info from CQS, CSL, CG, APDB, CG, DBRC, CT, OTMA, and ATM.



# IVP Enhancements

## Highlights

- IVP enhancements for existing functions
  - ◆ Support of RACF implementation and SMU removal
  - ◆ IMS Java sample application
  - ◆ IMS Connect sample application
- IVP support for new functions
  - ◆ Operations Manager (OM) Subscribe/Unsubscribe sample
  - ◆ Dynamic Resource Definition User Interface (DRD UI)
- Continues to be invoked as in previous releases
  - ◆ ISPF Option 6
    - EXEC '*hlq.SDFSCLST(DFSIXC01)*' '*HLQ(imshlq)*'  
Where *imshlq* is the High Level Qualifier of the IMS data sets
  - ◆ IMS Application Menu

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The IMS V10 Installation Verification Program provides new sample applications and examples to clarify existing functionality in IMS. Additionally, the IVP includes support for new functions that are introduced in IMS V10.

Information On Demand IMS Version 10 

## RACF Implementation Support

- New RACF Security options on Sub-Options panel
  - ◆ Whether or not to use RACF

```

Help
-----
IVP                Sub-Option/Security Selection - DBT      IMS 10.1
Command =====>

Select the desired Sub-Options and press ENTER

/  IRLM - Use IRLM in IVP Applications
/  FP   - Use Fast Path in IVP Applications
/  ETO  - Feature Installed
/  CQS  - Add CQS to CSL Application
/  RACF - Use RACF Transaction Security
      
```

- A “/” in front of RACF requests generation of the necessary jobs and tasks to set up the security environment

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A new RACF Security section is added to the Sub-options panel which requires the user to specify whether or not RACF Security is to be used.

The default is not to use this sub-option (no slash).

If the sub-option is selected, the IVP builds the necessary jobs and tasks to define resources to RACF and to set up the use of several IMS security user exit routines. The user can modify the sample RACF resource definition task. The sample user exit routines always authorize the user to the resources. This sub-option is not available for DB batch.

New IVP steps that implement RACF security:

- IV\_D218T which includes actions that replace the IV\_E316J actions in previous releases. The new step establishes IMS Security and provides an example of defining the IVP security definitions to RACF.
- IV\_C105J which provides a new step to replace the IV\_E315J actions in previous releases. The new step assembles and binds the RACF security exits in IMS.SDFSISRC into IMS.SDFSRESL and replaces the uses of DFSISIS0 with DFSRAS00.

Modified IVP steps for RACF security:

- IV\_C210T which browses the Stage1 source deck. Depending on the user security choice of using RACF or not, the SECURITY definition macro is also changed to specify whether or not the application resource access security authorization using RACF and exit routines are to be performed by IMS at execution time.
- If the RACF Security option was checked on the Sub-option panel, then the definition using RACF and exit routines is created as follows: SECURITY TYPE=(RAS,SIGNEXIT,TRANEXIT,RACFCOM), SECLVL=(SIGNON,TRANAUTH)
- If the security definition is to be done without using RACF then the definition is: SECURITY TYPE=(NORAS), SECLVL=(NOSIGN,NOTRAN)

Information On Demand IMS Version 10 

## IMS Java Sample

- New Java Application options on Sub-Options panel

```

Help _____
IVP              Sub-Option/Security Selection - DBT      IMS 10.1
Command =====>

Select the desired Sub-Options and press ENTER

/  IRLM - Use IRLM in IVP Applications
/  FP   - Use Fast Path in IVP Applications
/  ETO  - Feature Installed
/  CQS  - Add CQS to CSL Application
/  RACF - User RACF Transaction Security
/  JAVA - Use Java Applications

```

- ◆ Adds necessary jobs and tasks for the IMS JDBC application sample
- ◆ The Java sub-option is not available for DB batch or DCCTL environments

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A new Java section is added to the Sub-options panel. If the sub-option is selected, the IVP adds the necessary jobs and tasks for the IMS JDBC application execution.

The Java Sample verifies that a Java workload can be run in an IMS Java Dependent Region environment. The changes in the IVP that support this capability are included in the "C", "E", "G", and "H" steps.

The IVP provides the steps that:

- Add new database, application, and transaction definition statements to the IVP stage 1 source input.
- Add control statement members to the IMS.PROCLIB for Java virtual machine (JVM) initialization.
- Allocate the data set for the auto dealership database.
- Start an IMS control region.
- Start a JMP dependent region.
- Run a transaction in the JMP dependent region.
- Run a batch job in the JBP region to access databases.

## IMS Java Sample ...

- New IVP variables
  - ◆ IXUJPATH - specifies the path name of the absolute Java libraries
  - ◆ IXUSPATH - specifies the path name of the sample Java libraries
  - ◆ IXUJHOME - specifies the path name of the Java installation libraries
  - ◆ IXUJOUT - specifies the path name of the HFS file for the output data
  - ◆ IXUJERR - specifies the path name of the HFS file for the error data
- New members in IMS.SDFSISRC
  - ◆ DBD sources for the Dealership application
    - DFSAUTDB, DFSLAUTO, DFSEMPDB, DFSEMLDB, DFSIND11, DFSIND22
  - ◆ PSB sources for the Dealership application
    - DFSAUTAL, DFSAUTEL, DFSAUT11,

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Several new IVP variables have also been added to support the Java sample:

- IXUJPATH - specifies the path name of the absolute Java libraries. The default value is /usr/lpp/ims/imsjava10. This substitutes a value for string "ImsjavaPath" in the IMS DFSJVMMS and DFSJVMEV proclib members.
- IXUSPATH - specifies the path name of the sample Java libraries. The default value is /usr/lpp/ims/imsjava10. This substitutes a value for string "SamplesPath" in the IMS DFSJVMMS and DFSJVMEV proclib members.
- IXUJHOME - specifies the path name of the Java installation libraries. The default value is /usr/lpp/java150/J1.5/bin. This substitutes a value for string "JavaHome" in the IMS DFSJVMMS and DFSJVMEV proclib members.
- IXUJOUT - specifies the path name of the HFS file for the output data. The default value is /tmp
- IXUJERR - specifies the path name of the HFS file for the error data. The default value is /tmp

To support the IVP, new DBD and PSB sources have been added into the IMS.SDFSISRC library.

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## IMS Connect Sample Application

- New IMS Connect sample application option

```

Help _____
IVP          Sub-Option/Security Selection - DBT      IMS 10.1
Command =====>

Select the desired Sub-Options and press ENTER

/ IRLM - Use IRLM in IVP Applications
/ FP   - Use Fast Path in IVP Applications
/ ETO  - Feature Installed
CQS   - Add CQS to CSL Application
RACF  - User RACF Transaction Security
JAVA  - Use Java Applications
/ CNCT - IMS Connect Applications

```

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A new IMS Connect section is added to the Sub-options panel. The default is not to use this sub-option (no slash). It is available for DB/DC and XRF environments. If this sub-option is selected, the IVP adds the necessary jobs and tasks for IMS Connect application execution

DFSIHWS1 is an assembler language IMS Connect application program that sends the PART transaction to IMS Connect and receives a response.

The IVP provides the steps that:

- Assemble and bind the sample application program and user exits.
- Add a configuration member in the PROCLIB data set to define the IMS Connect environment.
- Allocate the Recorder data set HWSRCRDR for output data capture.
- Start an IMS control region with OTMA enabled.
- Start the IMS Connect address space.
- Send a transaction message to IMS via IMS Connect and receive a response.



## IMS Connect Sample Application ...

- New IVP variable
  - ◆ IXUTCPIP - fully qualified DSNAME for the TCPIP Library
- New member in IMS.SDFSISRC
  - ◆ DFSIHWS1 - sample IMS Connect client written in assembler

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To support the IMS Connect IVP, a new IVP variable and a new member in IMS.SDFSISRC have been added.

## Operations Manager Sample

- TSO SPOC sample
  - ◆ View all messages
  - ◆ Shows the input/output audit trail of commands
- Modified IVP steps:
  - ◆ Add new parameter AUDITLOG= Audit Trail log data set name in the OM PROCLIB member CSLOI000 - step E303J
  - ◆ Add CFRM and LOGR policy definitions for the new Audit Trail log data set - step E307T

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IMS V10 provides a TSO SPOC sample to view all messages and displays information from the audit trail.

The changes are delivered as enhancements to the CSL "E" steps of the IVP jobs and tasks.

## Manage Resources

- Dynamic Resource Definition is a new capability in IMS 10
  - ◆ Manage Resources is a general purpose interface that can be used to issue various resource definition and operational commands
  
- The IVP for Manage Resources provides
  - ◆ A set of ISPF panels that provide support for DRD commands
  - ◆ An IVP example of updating a program.
  - ◆ An IVP example of updating a transaction.

Manage Resources is a new capability in IMS 10. The IVP provides samples, using Manage Resources, that update both a program and a transaction.

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## DRD Example

```
Help _____
IMS Managed Resources
Command =====>
Select an action and press ENTER
*. . . . ._4 1. Create a new resource
              2. Delete a resource
              3. Query a resource
              4. Update a resource
              5. Import resources
              6. Export resources
```

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A new panel provides the user with options on actions that can be performed against resources. In this example a request is made to update a resource by entering option 4.

Information On Demand IMS Version 10

## DRD Example ...

```

File  Action  Manage Resources  SPOC  View  Options  Help
-----
Plex1                IMS Update a Resource
Command =====>_____
_____
-----Plex. ._____ Route. ._____ Wait. ._____

Select a resource type. To base the resource on a model, specify model info
Press enter to continue.

* Resource. . . . . 4__ 1. Database
                        2. Program
                        3. Routing Code
                        4. Transaction

Resource Name. . . . . APOL12, APOL13, SHUTTLE_____
Resource Type. . . . . ____ 1. Resource
                        2. Descriptor

```

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The next panel that displays is the panel that allows a user to select which resource is to be updated. The example on this visual shows a request to update a transaction.

## DRD Example ...

```

File Action Manage Resources SPOC View Options Help
-----
Plex1          IMS Update a Transaction
Command =====>_____
-----Plex. ._____ Route. ._____ Wait. ._____

Press enter to continue.
More: +

*NAME Transaction Name. . . . . : APOL12, APOL13, SHUTTLE
Filter APOL12,
CLASS Current Class. . . . . _____ 1-999

START
Enter "/" to select option          STOP
  _ Q      Start queuing             _ Q      Stop queuing
  _ SCHD   Start scheduling          _ SCHD   Stop scheduling
  _ SUSPEND Transfer to ready queue  _ TRACE  Stop trace
  _ TRACE  Start trace

SET
AOCMD AOI command option. . . . . _____ Yes, No, Tran
CLASS Set to class. . . . . _____ 1-999
CMTMODE Commit mode . . . . . _____ Single, Multiple
CONV Conversational. . . . . _____ Yes, No
DCLWA Log Write-Ahead option. . . . . _____ Yes, No
DEFAULT Default - descriptor only . . . . _____ Yes, No
    
```

The previous request results in the panel that defines the parameter values applicable to a transaction. The user can now provide the desired changes.

## Miscellaneous

- Support for IXUUPROC variable as optional rather than required
  - ◆ User JES2 PROCLIB ddname or JES3 DDNAME suffix
    - If not specified, /\*JOBPARM or /\*MAIN statement not generated
    - JCLLIB ORDER statement can be used to specify PROCLIB
- New option to access the IVP Variable Export Utility from IVP panel

```

Help _____
IVP           IVP Phase Selection - DBT           IMS 10.1
Command =====>

Select the desired Phase and position option and press ENTER

Variable Gathering - (Define user values for variables)
1. Start/Restart from the beginning of the phase
2. Start/Restart from the last known position within the phase
3. Variable Export Utility
  
```

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The IVP variable IXUUPROC (User JES2 PROCLIB DDNAME or JES3 DDNAME suffix) was a required value in prior releases of IMS. In the IMS V10 IVP, it is made optional. If the variable is not specified, the JES2 “/\*JOBPARM PROCLIB=xxxxxxx” JCL statement or the JES3 “/\*MAIN PROC=xx” is not generated in the JCL. This allows the user to specify the JES PROCLIBs using the JCLLIB ORDER statement in one of the JESx variables IXUJESC1 to IXUJESC5.

The Variable Export Utility can be directly accessed as an option from the IVP Phase Selection panel.

Information On Demand IMS Version 10

## Miscellaneous ...

- More useful MFS device definition
  - ◆ Default of DEV TYPE=(3270,2),FEAT=IGNORE
    - Rather than DEV TYPE=3270-A02,FEAT=IGNORE
  
- ALL IVP JCL has been changed for UNIT type
  - ◆ SYSALLDA
    - From SYSDA

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The IMS IVP job IV\_E204J has been changed to provide a DEV statement default of 'DEV TYPE=(3270,2),FEAT=IGNORE' rather than 'DEV TYPE=3270-A02,FEAT=IGNORE'. This is used for all terminals defined to IMS with 'DEV TYPE=3270-An' and SIZE=(x,80) where x is greater than or equal to 24 (in addition to using it for terminals specifically defined as 'DEV TYPE=(3270,2)'). The change makes the IVP easier to use for many customers because it eliminates the need to have to edit the MFS source to match their systems.

The hard coded unit type SYSDA is changed to SYSALLDA in all the IVP JCL. SYSDA is not a required unit type. SYSALLDA is a required unit type.

## Benefits

- The IVP tasks
  - ◆ Provide useful sample applications
    - Easy to use step-by-step and menu-driven jobs and tasks
  - ◆ Show how the new functions work
  - ◆ Provide a working model for future reference and testing.



# Syntax Checker Enhancements



## Highlights

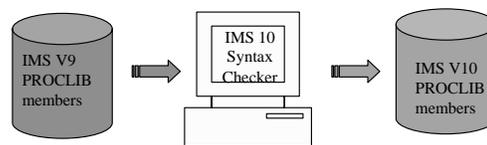
- Support for members of IMS.PROCLIB
  - ◆ Existing
  - ◆ New
- New display formats
- New keyword "Sel" Options
  - ◆ Expand, Contract, Insert
- New selections in View menu
- New member selection panel

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The Syntax Checker is an IMS capability that can define, verify and validate the parameters and their values in the members of IMS.PROCLIB. IMS V10 provides several enhancements to the Syntax Checker as listed on this visual.

## Invocation

- IMS 10 Syntax Checker
  - ◆ Continues to be invoked as in previous releases
    - ISPF Option 6
    - EXEC '*hlq.SDFSEXEC(DFSSCSRT)*' '*HLQ(hlq)*'  
Where *hlq* is the High Level Qualifier of the IMS data sets
  - ◆ Coexists on the same z/OS along with previous releases of IMS
    - Can be used to check parameters in IMS 10 and previous IMS releases



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The invocation of the Syntax Checker in IMS V10 is no different than in previous releases. It is a stand alone, offline product that can coexist on the same z/OS environment as previous releases of IMS. When used to check parameters of previous releases, make sure that the release number shown is correct.

## Support for Members of PROCLIB

- V10 Syntax Checker
  - ◆ Supports the 3 IMS.PROCLIB members as in previous releases:
    - DFSPBxxx, DFSDCxxx, DFSSQxxx
  - ◆ Adds support for 10 additional members:
    - DFSDFxxx, DFSCGxxx, CSLOIxxx, CSLRIxxx, CSLSIxxx, CQSIPxxx, CQSSLxxx, CQSSGxxx, IMS Connect configuration member, BPE User exit list member
- To facilitate migration to IMS V10, the Syntax Checker adds support for many of the same members in IMS V8 and IMS V9
- Syntax Checker support for IMS V7 is dropped

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In IMS V10, the Syntax Checker continues to support the following members: DFSPBxxx, DFSDCxxx and the DFSSQxxx. In addition, support for 10 other members of IMS.PROCLIB has been added:

DFSDFxxx - Dynamic Resource Definition, Common Service Layer, Shared Queues, and Diagnostics and Statistics parameters. (Support for V10 only)

DFSCGxxx - Common Service Layer Parameters

CSLOIxxx - OM Initialization Parameters

CSLRIxxx - RM Initialization Parameters

CSLSIxxx - SCI Initialization Parameters

CQSIPxxx - CQS Initialization Parameters

CQSSLxxx - CQS Local Structure Definition Proclib Member

CQSSGxxx - CQS Global Structure Definition Proclib Member

IMS Connect Configuration Member. (Note: These members do not have a specific member name prefix. The user can select any name. Support for V9 and V10 only).

BPE User Exit List member (Note: These members do not have a specific member name prefix. The user can select any name).

To facilitate migration to IMS V10, the Syntax Checker's support for the currently processed members, DFSPBxxx, DFSDCxxx and the DFSSQxxx includes any new parameters in V8 and V9 that have been added since GA of those releases. Support of IMS V7 PROCLIB members is dropped. Syntax Checker only supports the three latest releases of IMS.

## Support for Members of PROCLIB ...

- DFSDFxxx member
  - ◆ New in IMS V10
    - Supports Dynamic Resource Definition, Common Service Layer and Shared Queues parameters
      - Special section tag
        - <SECTION=DYNAMIC\_RESOURCES>
        - <SECTION=SHARED\_QUEUES>
        - <SECTION=COMMON\_SERVICE\_LAYER>
        - <SECTION=DIAGNOSTICS\_STATISTICS>
- Member names that have no pre-defined prefix
  - ◆ Set by the System Programmer
    - IMS Connect configuration member
    - BPE user exit list member

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IMS V10 introduces a new member in IMS.PROCLIB. DFSDFxxx supports the parameters for Dynamic Resource Definition, Common Service Layer, Shared Queues, and Diagnostics and Statistics . The Syntax Checker recognizes these parameters and provides validation support.

Note that the DFSDFxxx member is new to IMS V10. Additionally, the IMS Connect configuration member and BPE user exit list member all have names that can be tailored to the user environment. As a result, the names are not specifically listed here but can be defined to the Syntax Checker during execution.

## Support for Comments

- V10 Syntax Checker recognizes comments for several members
  - ◆ “\*” in column 1 for multiple lines
  - ◆ “/\* .....\*/” in the same line as the parameter

### Example

```
*-----*  
* IMS COMMON SERVICE LAYER PROCLIB MEMBER *  
*  
*-----*  
CMDSEC=N, /* NO CMD AUTHORIZATION CHECKING */
```

43

The IMS V10 Syntax Checker recognizes comments in several of the members of Proclib. Comments can be in two forms:

- When an “\*” is encountered in column 1, the entire line is considered a comment. A member can have multiple consecutive comment lines.
- On the same line as a parameter, the text between a paired “/\*” and “\*/” is considered a comment.

## Support for Members of PROCLIB ...

- Changed DFSSQxxx member
  - ◆ IMS 10 supports comments

```

File Edit View Help
-----
                    IMS 10.1 Parameters for ANY
Command ==>

Press enter (without other input) to check for errors.

Data Set Name . . . : IMSV10.PROCLIB(DFSSQXXX)
IMS Release . . . : 10.1

Sel Codes: C = Comment D = Delete I = Insert P = Process

Sel Keyword      Value      Description
- CQS            = _____ CQS Start Proclib
- CQSSN         = _____ CQS Subsystem Name
- * EMHQ comment
- EMHQ          = _____ EMHQ same line comment
- MSGQ          = _____ Shared Message Queues Structure Name
- SQGROUP       = _____ XCF IMS Shared Queues Group Name Suffix
- WAITRBLD      = _____ EMHQ Structure Rebuild Wait

```

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The panel for the Shared Queues member, DFSSQxxx, now supports the addition of comments. Note that this is added only for IMS V10 and does not affect IMS V8 or IMS V9.

## New DISPLAY Formats

- Keywords can be displayed in one of two modes
  - ◆ Contract or Expand
    - Provides a choice when keywords have multiple levels of parameters
  - Contract mode
    - Displays keyword values on one line followed by “...”

```
IMSPLEX ( NAME = PLEX1, RSRCSTRUCTURE ( STRNAME = ...
```

- Expand mode
  - Displays keyword values on multiple lines for easier viewing

```
IMSPLEX (  
  NAME = PLEX1,  
  RSRCSTRUCTURE (  
    STRNAME = RSRC1 ) )
```

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To facilitate viewing keyword values when sub-keywords and sub-keyword lists are available, two modes are provided.

The Contract mode displays the keyword values on one line. If the values associated with the keyword extend beyond the line, they are not shown but a “...” is displayed to give the viewer an indication that there is more to the keyword that is not displayed.

The Expand mode uses multiple lines, and as many as are needed, to display all the keywords, sub-keywords and sub-keyword lists that are part of the definition.

Information On Demand IMS Version 10

## New “Sel” Field Options

- Expand and Contract modes:
  - + (Expand ) - Expands the selected keyword in the display
  - (Contract) - Contracts the selected keyword in the display
- ◆ Not available for all members or keywords
- Insert
  - I - Adds a new keyword to the display
- ◆ Displays a pop-up window of available keywords
  - Allows user to choose the keyword

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The “Sel” field in the Parameters panel provides new options to invoke the Expand and Contract modes:

- The “Expand” “Sel” option, “+” (plus), displays the keyword on multiple lines. As described on previous visuals, when a keyword is expanded, the sub-parameters are displayed in a predefined order.
- The “Contract” “Sel” option, “-” (minus sign), displays the keywords on one line. As much of the keyword as will fit on one line is displayed followed by “...”.

The options are not available for all members or keywords.

The “Sel” field also provides the option to Insert a new keyword. When selected, a pop-up window of available keywords is displayed to allow the user to choose the desired keyword.

- I (Insert) adds a new keyword to the display. Note that insertion of a comment requires the use of Sel code “C”.

## New "Pull Down" Options

- The "Pull Down" options that are displayed when a View is requested have been enhanced to include
  - ◆ Expand All - expands all the keywords in the display
  - ◆ Contract All - contracts all the keywords in the display
  - ◆ Not available for all members

```

File Edit View Help
-----
Command === |      *. Display All | for ANY
              |      2. Display Selected |
              |      3. Display New      |
Press enter  |      4. Expand All      | eck for errors.
              |      5. Contract all    |
Data Set Na  ----- IB(CSLRIDKE)
IMS Release  . . . : 10.1

Sel Codes: C = Comment D = Delete I = Insert
           P = Process + = Expand - = Contract
  
```

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New "Pull Down" options are displayed when View is selected from the top of the screen. The Expand All and Contract ALL options are new.



## New Member Selection Panel

- Some new members names have no fixed prefix
  - ◆ Defined for an environment and loaded when required
    - BPE Exit List Member
    - IMS Connect Configuration Member
  
- Once Syntax Checker detects unknown member name
  - ◆ Member Selection list is displayed.

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Two of the new PROCLIB member names that can be processed by the Syntax Checker do not have required names or prefixes. They are defined by the user requesting the function and then specified as part of the startup procedure. These members include the BPE Exit List Member and the IMS Connect Configuration Member.

When the Syntax Checker detects an unknown member name, a new Member Selection list is displayed to assist in the identification of the member.

## New Member Selection Panel ...

- Example

```
File  Help

                                IMS Parameter Syntax Checker

Command ==>

Enter the following information and press enter.

Select member type . . . . . 1. BPE Exit List Member
                               2. IMS Connect Configuration Member
```

This visual shows the panel that is displayed to assist the user in identifying the member type.



## Benefits

- IMS V10 Syntax Checker
  - ◆ Assists with IMS release to release migrations when converting PROCLIB members
    - Provides the ability to define, verify and validate parameters
    - Supports new parameters
    - Supports 13 members of IMS.PROCLIB



# KBLA Coexistence



## Knowledge-Base Log Analysis Highlights

- KBLA Enhancements
  - ◆ Support for IMS 10 log record changes
  
  - ◆ Support for concurrent KBLA-supported levels of IMS (V9 and V10)
    - Ensures correct log record DSECTs are used for the corresponding IMS version of the log records
    - Generates JCL appropriate to the IMS release
  
  - ◆ Ease of migration to IMS 10
    - Ensures that prior release parameters are not invalidated or superseded by the installation of IMS 10
      - New panel to facilitate migration
      - No reconfiguration required for setup

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IMS V9 introduced the ISPF menu-based utility, KBLA (Knowledge-Based Log Analysis), for processing log records.

IMS V10 enhances this capability to support the log record changes introduced in this release. Additionally, enhancements to support multiple concurrent releases of IMS ensure that the correct log record DSECTs associated with an IMS release are used and that the parameters which were defined for the prior release are not invalidated or superseded by the installation of a new release.



## Concurrent Levels of IMS with KBLA

- SDFSRESL contains the KBLA utility modules
- Support for selection of IMS level-related SDFSRESL data set
  - ◆ Default Parameter Maintenance Panel (0.1) allows entry of four data sets
    - Entries specifying version 9 or version 10 can be selected for processing
      - Every KBLA processing panel has a parameter where the user can specify the desired IMS level

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Users specify the appropriate SDFSRESL library for an IMS version in the “Default Parameter Maintenance” panel (Option 0.1). An audit in KBLA restricts the specifiable version number to either 9 or 10. Different SDFSRESL libraries for a version can be specified such as 9, 91, 10, 101, etc. KBLA attempts to find the best match of the IMS version specified on a processing panel to the SDFSRESL data set supplied on the Option 0.1 panel.



## Concurrent Levels of IMS with KBLA ...

- Change to the JOBLIB data set concatenation specification
  - ◆ V9 KBLA automatically concatenated the data set specified in the ISPF Environment
    - Data set specified as “KBLA Loadlib”, or if blank
      - Data set specified as “IMS Version 9 Reslib”
    - Along with the SDFSRESL data set specified for the IMS version associated with the log data sets
  - ◆ IMS 10 KBLA provides optional inclusion of “KBLA Test Loadlib” value
    - Data set specified as “KBLA Test Loadlib” - only if specified
      - “KBLA Loadlib” has been changed to “KBLA Test Loadlib”
    - Along with the SDFSRESL data set specified for the IMS version associated with the log data sets

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With IMS V9, if a value was not specified for the 'KBLA Loadlib' parameter in the KBLA ISPF Option 0.1 panel ("IMS K.B.L.A - Define KBLA Environment), KBLA defaulted to the specification associated with IMS V9 resource library. KBLA always included this data set as the first DSN in the JOBLIB DD concatenation sequence.

V10 renames the variable from “KBLA Loadlib” which previously implied that a value was required, to “KBLA Test Loadlib” which is intended to imply that a value is optional and perhaps only used for testing purposes. If specified, the associated data set will be included as the first DSN in the JOBLIB concatenation sequence.



## Migration to V10 with KBLA

- Migration Panel
  - ◆ Useful when migrating from IMS V9 KBLA
  - ◆ Automatically invoked only on initial entry to the IMS V10 Level KBLA ISPF environment after migration
  - ◆ Purpose
    - Ensures that the IMS V10 SDFSRESL data set is defined as a variable for the KBLA ISPF environment
    - Establishes the environment

55

In order to facilitate migration from prior IMS releases, a migration panel is provided. This panel will automatically be invoked if the user has not explicitly supplied a V10 SDFSRESL, which is identified as such on the Option 0.1 panel.

Existing IMS V9 KBLA users should note that their previous user-set parameter values are retained during the migration and any new parameters that have been added to the IMS V10 KBLA environment are implemented as 'optional' parameters.



## Migration to V10 with KBLA ...

- Migration Panel Function
  - ◆ Sets the SDFSRESL data set name to *hlq.SDFSRESL*
    - Provides ability to specify actual name to be used
  - ◆ Performs maintenance on the “KBLA Test Loadlib” variable:
    - Automatically nullifies the value if it matches the V9 SDFSRESL data set name
    - By default, retains the parameter value if different from the V9 SDFSRESL data set name
    - Allows the user to manually
      - Nullify the parameter, or
      - Change it to any desired value

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If not specified, the V10 SDFSRESL name is set to *hlq.SDFSRESL* where *hlq* is the high level qualifier for the environment.

Additionally, the panel automatically propagates the IMS V9 level “KBLA Loadlib” value into “KBLA Test Loadlib”. The user can nullify or set the value to a different name. If the panel determines that the ‘KBLA Loadlib’ data set is the same data set as the existing IMS V9 data set, this value will be removed. The panel will provide an opportunity to enter another data set name as the ‘KBLA Loadlib’, or this variable may be left blank. When the JCL for KBLA utilities is generated, the JOBLIB will contain only the SDFSRESL data set name for the selected IMS version if the ‘KBLA Loadlib’ variable contains blanks.

## An Example - Migration ...

- Migration Panel

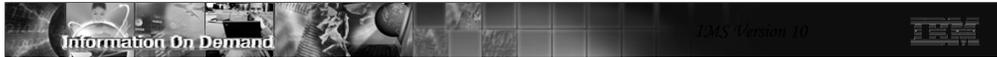
```
          IMS K.B.L.A. - Migration Panel
Command ==>

                                     TIME...15:17:05
                                     DATE...2005/01/20
Supply the indicated values and press ENTER .    JULIAN..2005.020

          IMS Version 10 SDFSRESL DSN IMSBLD.IMS10A.SDFSRESL

          KBLA Loadlib . . . . .
          (If the KBLA Loadlib DSN is the same as the SDFSRESL for IMS Version 9
           it will be set to a null value)

          To Perform Migration, press ENTER .
          To Exit panel, press END .
```



## Migration and Coexistence with KBLA

- The KBLA ISPF environment generates JCL for any KBLA-supported level of IMS
  - ◆ Version 9 or Version 10
- Every KBLA processing panel has a parameter where the user can specify the desired IMS level
- Benefits
  - ◆ Simplified migration of KBLA to IMS 10, and implementation of multiple system support
  - ◆ Allows concurrent KBLA access for multiple IMS levels without any setup reconfiguration

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KBLA uses the IMS version information on the processing panel to create the JCL appropriate to the log data sets that are being processed.



# Installation and Migration Tasks

## Installation and Migration Tasks

- Migration Tasks
  - ◆ Eliminate BTAM and SMU use
    - They are not supported with IMS V10
  - ◆ Check PSP bucket
  - ◆ Review the Program Directory
  - ◆ Review the installation information in Chapters 1, 2, and 3 of the *Installation Verification Guide*
  - ◆ Review the z/OS interface information in Appendix G of the *Installation Verification Guide*
  - ◆ Install prerequisite software and maintenance
    - Check your IMS tools and related products

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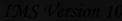
This is an overview of the tasks for migration to IMS V10.

Remember that IMS V10 is the first release of IMS not to support BTAM or the Security Management Utility (SMU). Their use should be discontinued before migrating to IMS V10.

As for all installations of new products the Preventive Service Planning (PSP) bucket and the Program Directory for the product should be reviewed before beginning the migration.

The IMS V10 *Installation Verification Guide* has content similar to the *Installation Volume 1: Installation Verification* manual for IMS V9. You should read this Guide before beginning the migration process. Chapters 1, 2, and 3 and Appendix G should be reviewed for installation information.

Other products may need to be upgraded for use with IMS V10. They could require maintenance or new releases.



## Installation and Migration Tasks

- Migration Tasks (continued)
  - ◆ Apply coexistence maintenance to other IMS systems
    - DBRC coexistence SPEs
    - System Management Enhancements coexistence SPEs
    - Global Online Change coexistence SPEs
    - Operations Management coexistence SPEs
  - ◆ Evaluate and update IMS exit routines
    - RECON I/O Exit Routine (DSPCEXT0)
  - ◆ Install IMS V10 using SMP/E installation process
    - CBPDO or ServerPac may be used

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You should apply DBRC coexistence SPEs to your IMS V8 or V9 systems before upgrading your RECONs to IMS V10. This is required for the IMS V8 or V9 systems to be able to use the RECONs after the upgrade.

Similarly, you should apply the other coexistence SPEs to your lower level IMS systems.

The only user exit routine that must be updated for use with IMS V10 is the RECON I/O Exit Routine (DSPCEXT0). If you use this routine, you should examine it for required changes due to the change in RECON records.

CBPDO is Custom-Built Product Delivery Offering. The CBPDO product package consists of one logical tape (multiple volumes). A CBPDO package that includes IMS can also include other products in the same System Release (SREL). CBPDO also provides service for the products included with the product order. The service includes all PTFs available within one week of order fulfillment. All PTFs are identified by one or more SOURCEIDs, including PUTyymm, RSUyymm, SMCREC, and SMCCOR.

ServerPac is an entitled software delivery package. It consists of products and service for which IBM has performed the SMP/E installation steps and some of the post-SMP/E installation steps. To install the package on your system and complete the installation of the software it includes, use the CustomPac Installation Dialog, which is the same dialog used for all CustomPac offerings, including SystemPac® (dump-by-data-set format), ProductPac®, and RefreshPac. For IMS, ServerPac allocates, catalogs, and loads all the data sets; sets up the SMP/E environment; supplies a job to update PARMLIB (IEFSSNxx, PROGxx, IEASVCxx, and SCHEDxx); and directs you to start the IVP

Running the IVP is optional, but recommended. All required installations tasks are done outside of the IVP. The IVP verifies that the installation is correct.

## Installation and Migration Tasks

- Migration Tasks (continued)
  - ◆ Install the Type 2 and Type 4 SVCs
  - ◆ Review IMS Resource Cleanup Module considerations
    - IMS V10 uses dynamic resource cleanup module
    - Do not delete the IMS V8 module until IMS V8 use is discontinued
  - ◆ Upgrade RECONs
  - ◆ System definition
  - ◆ ACBGEN
  - ◆ Run the IVP

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System definition is required as with previous IMS releases. Most system definition statements from previous IMS releases are compatible with IMS V10. BTAM definitions are no longer allowed.

System definition creates the Type 2 and Type 4 SVC modules which must be installed in the z/OS system. A z/OS IPL is not required. They may be installed by running DFSUSVC0 and specifying SVCTYPE=(2,4).

In IMS Versions 9 and 10 use a dynamic resource cleanup module (DFSMRC20). No user setup is required; you do not need to install the static resource cleanup module (DFSMRCL0) on the host z/OS system for IMS V9 or V10. IMS V8 uses the static resource cleanup module (DFSMRCL0). Do not delete it from your z/OS system while there is still a possibility that you will need to run IMS V8.

Upgrade the RECONs by using the CHANGE.RECON UPGRADE command using the IMS V10 release of the DBRC utility.

An ACBGEN is required for use with the online system or any batch DBB jobs.



# Review of Migration Considerations

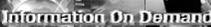
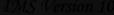


## Migration Considerations

- This section repeats information previously covered in the class
  - ◆ These are changes that might affect your migration
    - Changed messages
    - Changed responses
    - Changed parameters
    - Changed control statements
    - ...

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The following pages repeat information that appears elsewhere in this class. This is a collection of information about migration that was previously presented in the class. The information concerns changes in IMS V10 that might require adjustments when you migrate without taking advantage of new optional capabilities.

## BTAM Support Removal

- IBM BTAM products were withdrawn from service several years ago
  - ◆ IMS continued to support BTAM through IMS V9
  
- IMS V10 removes BTAM support
  - ◆ Ignores all macro statements associated with the unsupported BTAM terminals during IMS system definition
    - Issues warning message
 

```
G411 MACRO STATEMENT ASSOCIATED WITH AN UNSUPPORTED BTAM
              TERMINAL
```

      - A severity code of 2 is issued to allow system definition to continue
  
  - ◆ Devices such as Spool, Reader, Printer, Punch, Tape and Disk are not affected.

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Although IBM withdrew marketing and service of BTAM products several years ago, IMS continued to support the BTAM macros through IMS V9. IMS V10 removes this support. The following list shows the device types affected:

BTAM Device Type	Comments or Other Specifications
1050	Switched Terminal
2740	Non-Station-Control
2740	Non-switched, model 1
2740	Non-switched, model 2
2740	Switched Terminal, model 1
2741	Non-switched
2741	Switched Terminal
2260	Local
2780	
3270	Remote, Non-switched
3270	Local
3270	Switched Terminal
3275	Switched Terminal
3741	Switched Terminal
SYSTEM/3	
SYSTEM/7	BSC, BSC and Contention
SYSTEM/7	Start/Stop, Start/Stop and Contention

Warning message G411 will be issued if the macro statement operand has an unsupported BTAM terminal specification during the IMS STAGE 1 system definition process. In addition, a severity code of 2 will be issued to allow system definition to continue. This warning message and severity code will be documented in the IMS V10 Messages and Codes manual.



## SMU Support Removed

- IMS V10 removes SMU and SMU components
  - ◆ IMS-provided security
  - ◆ The Security Maintenance Utility
  - ◆ Application Group Name Exit Routine (DFSISIS0)
  - ◆ IMS.MATRIXx data sets
- Primary consideration
  - ◆ If migration from SMU to SAF/RACF has not already been done, migration to IMS V10 will also need to include migration from SMU to SAF/RACF

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IMS V10 no longer supports the Security Maintenance Utility (SMU) capability. As a result, SMU components have been removed including the SMU Utility, the AGN Exit Routine (DFSISIS0) and the MATRIX data sets. Note that the IMS.MATRIXx data sets have been deleted and removed from all IMS procedures and logic.

A primary consideration in this area includes migration. IMS systems that use SMU must migrate to the SAF interface at the time that the upgrade to IMS V10 occurs.

## SMU to SAF/RACF Migration

- Migration to SAF (RACF or equivalent) can begin in IMS V8 or IMS V9
  - ◆ V9 includes RACF enhancements for SMU functions which previously had no alternatives
    - Enhancements include areas of AGN, AOI, TCO, MSC link receive, signon verification, and /LOCK and /UNLOCK
    - V9 is a transition release where SMU is still available
  - ◆ Migration from SMU to SAF and from IMS V8 to IMVS V10 is a valid option
    - Begin SMU to SAF migration in IMS V8
    - Migration using V9 enhancements will have to occur during the V10 migration
- Migration references
  - ◆ Chapter 6, IMS V9 Implementation Guide redbook (SG24-6398)
  - ◆ Chapter 4, IMS V9 Administration Guide: System (SC18-7807)
  - ◆ Chapter 3 and 4, IMS V9 Release Planning Guide (GC17-7831)

Both IMS V8 and V9 provide migration paths to the use of SAF/RACF security. IMS V9 provides migration capabilities that are not available with IMS V8.



## SMU Support Removed – Migration Considerations

- Ensure that any dependency on SMU has been migrated to SAF/RACF
- Review automated operations and operations procedures
- Review changes to messages, start up parameters, commands and documentation

## Transaction Scheduling

- SCHD= parameter on system definition TRANSACT macro is ignored
- Only one scheduling option is used in IMS V10
  - ◆ SCHD=3 option is always used
    - When the transaction defined on the TRANSACT macro cannot be scheduled for "internal reasons", any transaction in the selected class may be scheduled. If no more transactions for this class exist, IMS schedules transaction in next eligible class.
      - "Internal reasons" are database intent or no more space in PSB pool or DMB pool to bring in needed blocks
  - ◆ SCHD=1 was the default in previous releases
    - When the transaction defined on the TRANSACT macro cannot be scheduled for internal reasons, only transaction of equal or higher priority in the selected class may be scheduled. If five intent failures occur within a class, transactions in the next class are attempted

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In previous release of IMS, the SCHD= parameter on the system definition TRANSACT macro specified the scheduling option used when the transaction defined on the TRANSACT macro could not be scheduled for internal reasons (database intent or no more space in PSB pool or DMB pool to bring in needed blocks). IMS V10 always uses the SCHD=3 option. The default in previous releases was SCHD=1.

SCHD=1 specified that only transactions of equal or higher priority in the selected class would be scheduled. Five consecutive intent conflicts are allowed within a class before IMS starts scheduling the next eligible class.

SCHD=3 specified that any transaction in the selected class could be scheduled. IMS starts scheduling the next eligible class after attempting to schedule all the transactions in the current class

Two other options were available in previous releases.

SCHD=2 specified that only higher-priority transactions in the selected class could be scheduled.

SCHD=4 specified that IMS should skip to the next class and attempt to schedule the highest-priority transaction in that class.

Scheduling failures for the "internal reasons" should be rare. Intent conflicts only occur when PROCOPTs with the E (exclusive) option are used. The PSB and DMB pools should always be large enough to hold the currently required PSBs and DMBs.

## FPCTRL System Definition Macro Eliminated

- The system definition FPCTRL macro is ignored
  - ◆ Previous releases:
    - Macro was required to enable Fast Path capability
    - Set defaults for Fast Path parameters
- Execution parameters for IMS and DBC procedures
  - ◆ FP=Y|N used to enable Fast Path
    - Default is FP=N
  - ◆ DBBF=, DBFX=, BSIZ=, and OTHR= used to specify Fast Path parameters
- Benefit
  - ◆ Simplifies implementation of Fast Path
- Migration
  - ◆ Fast Path users must specify FP=Y and values for DBBF=, DBFX=, BSIZ=, and OTHR= for execution

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IMS V10 has simplified the implementation of Fast Path. It does not have to be specified at system definition time. The FPCTRL system definition macro is ignored. In previous releases it was required to enable Fast Path capabilities. It also was used to specify the default values for some Fast Path parameters. Fast Path capabilities are always generated for DB/DC and DBCTL systems. They are enabled by a parameter at execution time.

You must specify FP=Y at execution time for an online system to enable Fast Path capabilities in IMS V10. The default for the parameter is FP=N. Since defaults for Fast Path parameters cannot be specified at system definition time, they should be specified at execution time. These parameters are DBBF=, DBFX=, BSIZ=, and OTHR=. The default values for these parameters are the same as the default values for the FPCTRL macro in previous releases. These are:

```
DBBF=10
DBFX=4
BSIZ=2048
OTHR=2
```

These values are highly unlikely to be appropriate for most Fast Path users.

## DSP1929I System Startup Message

- Changes in DFS1929I IMS system startup message
  - ◆ New header information
    - IMS version and Control Region type
  - ◆ Parameters which do not apply to the system are eliminated
  - ◆ Sent two times
    - First: specified parameters
    - Second: used parameters
      - After reading the log for restart

When migrating to IMS V10, user-written routines or procedures that look for the DFS1929I message should recognize the header format change to include the IMS version and Control Region type. Additionally, these routines should be modified to recognize that there are two versions of the message.

## IMS Application Menu

- Two options have been added to the IMS Application Menu
  - ◆ 2 Manage resources
  - ◆ 9 Abend Search and Notification
- Some options have moved in the list

```
                                IMS Application Menu
Command =====>
Select the desired Sub-Options and press ENTER

      1  Single Point of Control (SPOC)
      2  Manage resources
      3  Knowledge-Based Log Analysis (KBLA)
      4  HALDB Partition Definition Utility (PDU)
      5  Syntax Checker for IMS parameters (SC)
      6  Installation Verification Program (IVP)
      7  IVP Export Utility (IVPEX)
      8  IPCS with IMS Dump Formatter (IPCS)
      9  Abend Search and Notification (ASN)
```

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The IMS Application Menu has been modified to accommodate two new options. "Manage Resources" is option 2. This changed the option numbers for the items that follow it. "Abend Search and Notification" has been added as option 9.



## PSB Sizes Increase

- PSB PCB sizes increase by 16 bytes in IMS V10
  - ◆ May require larger PSB pools
    - CSAPSB and DLIPSB pools
  - ◆ Resident PSBs will require more space
  - ◆ Estimated size increase: about 5% for CSA, about 1% for SAS

## ACBGEN Default Change for BUILD DBD=

- Previous IMS versions
  - ◆ ACBGEN with BUILD DBD= did not always rebuild PSBs referencing the DBD
    - Only rebuilt PSBs if DBD physical structure changed
- IMS Version 10
  - ◆ ACBGEN with BUILD DBD= rebuilds PSBs referencing the DBD by default
    - Done for support of ACBLIB member online change
    - May elongate ACBGEN execution time
  - ◆ BLDPSB=NO overrides default
    - PSBs are not rebuilt unless DBD structure is changed
    - May be used for ACBGENs not used for ACBLIB member online change

```
BUILD DBD=( CUSTOMER , ORDER ) , BLDPSB=NO
```

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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.

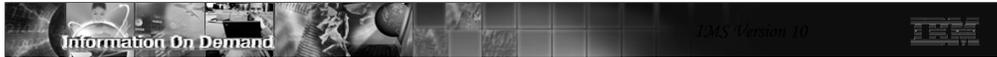
## Sysplex Serial Program Management

- SSPM is invoked for all users with CSL and resource structure
  - ◆ Applies to all programs with SCHDTYP=SERIAL specified
  - ◆ No program or definition changes
- SSPM enforces serial program management across the IMSplex
  - ◆ Only one copy of programs (PSBs) with SCHDTYP=SERIAL is scheduled at any time
    - Applies to MPRs, JMPs, and message-driven BMPs
- Migration
  - ◆ If you currently have CSL and a resource structure
    - You will get SSPM
    - You may want to eliminate operational procedures, definitions, etc. that were used to enforce serialization across the sysplex

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If you have an IMSplex with the common service layer (SCI, OM, and RM address spaces) with a resource structure, serial program management will automatically be enforced across the IMSplex with IMS V10. There are no program or definitions changes required for this. Only one copy of a program with SCHDTYP=SERIAL will be scheduled in the IMSplex at any time. This applies to MPRs, JMPs, and message-driven BMPs. It does not apply to non-message driven BMPs, JBPs, CCTL (CICS), or ODBA applications such as DB2 Stored Procedures.

If you have implemented the Common Service Layer and defined a resource structure with previous releases of IMS, you will automatically get the SSPM function when you migrate your IMS systems to V10. You probably created some operational procedures and/or definitions to enforce serialization in your previous release. For example, you may have started a dependent region with the class for the transaction on only one IMS system. This is OK with V10, but it is not required for the enforcement of serialization.



## MSC Migration Considerations

- DFMSCE0
  - ◆ Ensure migration from the older routing exit routines DFSCMTR0, DFSNPRT0, DFSCMLR0, DFSCMPR0
- Bandwidth
  - ◆ Migrate using the default of non-Bandwidth mode in IMS V10
    - Compatible with previous releases
  - ◆ After migration, bandwidth Mode can be enabled using the UPD command
    - Requires both partners of the link to be IMS V10 systems
  - ◆ Adjust buffer sizes
    - Minimum of 4096
    - To be effective, the buffers should be large enough to accommodate multiple messages

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When migrating to IMS V10, ensure that the older routing exit routines, if any, have been converted to DFMSCE0. This migration can be accomplished in any of the supported previous releases (V7, V8, V9) prior to the actual IMS V10 migration. If the exit routines still exist while the V10 migration is in progress then the V10 migration tasks need to include the upgrade of the previous releases to DFMSCE0.

A like-for-like migration from a previous release to IMS V10 allows MSC to be initialized in non-bandwidth mode. This mode is compatible with MSC operations in previous releases.

The ability to turn on bandwidth mode is provided via the UPD command and requires both partners of the link to be at an IMS V10 level. In this mode, the minimum size of the buffers should be 4096. To be more effective, the buffer sizes should be defined to accommodate multiple messages.

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## MSC Migration Considerations ...

- Buffer size
  - ◆ MSPLINK buffer size ranges have changed
    - Minimum is 1024, maximum is 65,536
      - Increase over IMS V8/V9 definitions
      - VTAM sizes for IMS V10 can be any size and no longer follow an algorithm
    - Validate that partner IMS systems have matching buffer specifications
      - If the IMS V8/V9 systems have link buffer sizes less than 1024, they must be modified to a minimum of 1024

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Note that the buffer size minimum and maximum ranges have changed in IMS V10. If the link is a VTAM link, the buffer size can now be any size defined in the range and no longer requires a size that fits into the previous formula of  $X \text{ times } 2 \text{ to the power of } Y$ , where  $X$  had to be a value from 8 to 15, and  $Y$  has to be a value from 3 to 13. . The MSPLINK macro description in the System Definition Guide still documents a table but only for compatibility purposes.

If the partner of the MSC link is a V8 or V9 IMS system then those definitions must be at a minimum of 1024.

## OTMA Migration Considerations

- Message flood control
  - ◆ Default limit of 5000 is set at initialization
    - To deactivate the function, define the INPUT parameter in the DFSYDTx descriptor or issue the /STA TMEMBER INPUT command
- Time-out
  - ◆ Default is set to 5 seconds
    - To deactivate the function, define the T/O parameter in the DFSYDTx descriptor or issue the /STA TMEMBER TIMEOUT command
- /DIS OTMA and /DIS TMEMBER command enhancements
  - ◆ Single line output has been expanded to two-line output in order to include DRU exit name info and time-out info.
  - ◆ The first column info of /DISPLAY TMEMBER TPIPE is now the input message count instead of output enqueue count.

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The considerations listed on this visual address issues that should be considered when migrating from a previous release of IMS. The assumption is that migration to IMS V10 is based on existing functionality without adding any new capabilities during the migration process.

The message flood control enhancement in IMS V10 is automatically enabled with a default limit of 5000 messages. To provide compatibility with previous releases and deactivate the support, either specify an INPUT value of 0 in a descriptor or issue the /STA TMEMBER INPUT command.

Likewise, the timeout support for synchronous CM1 message is automatically enabled with a default value of 5 minutes. To provide compatibility with previous releases and deactivate the support, specify T/O value of 0 in a descriptor or issuing the /STA TMEMBER TIMEOUT command.

Note that the /DISPLAY command output associated with OTMA and TMEMBER requests has been expanded to two output lines and includes new information. As a migration consideration, this is a key issue for automated operations.

## Log Transaction Analysis, Log Merge, and Statistical Analysis utilities

- Migration
  - ◆ Old Log Transaction Analysis utility JCL continues to work
    - Specification of `NOLOG` or `NOREPORT` on `EXEC` statement ignored
      - These actions are now controlled by the presence or absence of `DD` statements
  - ◆ Log Merge utility continues to work but is not required
    - Multiple logs may be specified as input to the other utilities
  - ◆ Old Statistical Analysis utility JCL must be modified
    - Move `SYSIN` from step 6 to the first step
    - Delete the `LOGOUT` `DD` statement from first step
    - Delete the last five steps
  - ◆ Logs from previous releases are not valid input to these V10 utilities

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The JCL used in previous releases for the Log Transaction Utility can be used with IMS V10. There is one slight incompatibility. Previously you could specify an `OUT=` parameter on the `EXEC` statement. `OUT=NOLOG` specified that an output report should not be written to the `LOGOUT` `DD` data set. `OUT=NOREPORT` specified that an output report should not be written to the `PRINTER` `DD` data set. In IMS V10 if you do not want either of these data sets do not include the `DD` statement for it. IMS V10 ignores the `OUT=` parameter on the `EXEC` statement.

The Log Merge utility was used in previous releases to merge logs from different systems. The output of Log Merge was used as input to the Log Transaction Analysis or Statistical Analysis utilities. The Log Merge utility can be used with IMS V10, but it is not required. Both analysis utilities can merge multiple logs as part of their processing.

The JCL used for the Statistical Analysis utilities in previous releases must be changed for IMS V10. The actions needed to change the JCL are listed on the slide. The control statements were specified in the `SYSIN` data set of the sixth step. The `SYSIN` data set is now part of the first (and only) step. The `LOGOUT` `DD` in the old first step was used to pass data to the following steps. Since only one step is used in IMS V10, the `LOGOUT` `DD` is no longer used. The last five steps are no longer used, so their JCL should be eliminated.

Logs produced by IMS V8 and IMS V9 are not valid input to the IMS V10 Log Transaction Analysis utility and the IMS V10 Statistical Analysis utility.



## Change Accum and Prefix Resolution Sort

- Default sort size changed from 200K to MAX
  - ◆ CORE= parameter in JCL for Change Accumulation and Database Prefix Resolution
    - CORE= specifies the storage used by sort
      - MAX allows the installation default value for sort to be used
    - CORE limits the number of sort work data sets used by OEM sort programs
      - UCBs for these data sets are below 16M line for some OEM sort programs
- Migration
  - ◆ If an installation wants to limit the sort space to less than the system default, it should code the CORE= parameter for the desired value.

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The default for the CORE= parameter on the Database Change Accumulation and Database Prefix Resolution utilities is changed in IMS V10 from 200K to MAX. When MAX is used, the IMS utility does not limit the amount of space used by sort. It is limited by the default value specified for the sort product. The sort space is particularly important for some non-IBM sort programs which create UCBs for sort work data sets below the 16M line. The sort space may limit the number of these data sets that may be used. By increasing the default space, the number of sort work data sets may be increased. This may shorten the elapsed execution time for these utilities.

A new message has been added to the Database Change Accumulation and Database Prefix Resolution utilities. It is issued when the CORE= parameter is not specified. The message is:

```
DFS3007I SORT CORE SIZE WILL DEFAULT TO CORE=MAX
```

If an installation wants to limit the sort space to less than the system default, it should code the CORE= parameter for the desired value.

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## Keeping Randomizer Resident when Stopping DB

- New status STOACC
  - ◆ Response to QUERY DB Command
    - Indicates that the database is not accessible
      - It has been /DBRed or an UPD DB STOP(ACCESS) command has been issued
- New implication for Status RNL
  - ◆ Response to QUERY DB Command
    - Indicates that the randomizer for the database is not loaded
    - This status previously also indicated that the database was not accessible
- Benefit
  - ◆ STOACC and RNL separately indicate that the database is not accessible or the randomizer is not loaded

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In conjunction with the OPTION(NORAND) parameter on the UPDATE DB STOP(ACCESS) command, a new status is available with the QUERY DB command. In previous releases one could tell that a database was inaccessible because the RNL status was associated with the database. RNL indicated that the randomizer module was not loaded. The absence of the RNL status no longer indicates that the database is accessible. A new status is available for this. The STOACC status in the response to a QUERY DB command indicates that the database is inaccessible. That is, the database has been /DBRed or an equivalent UPDATE DB STOP(ACCESS) command has been processed for the database.

The RNL status is now used only to indicate that the randomizer module is not loaded. The STOACC status is used to indicate that the database is inaccessible. The STOACC status is not returned by the /DISPLAY DB command. It is only returned by QUERY DB commands.

After you issued the UPDATE DB NAME(DEBJN) STOP(ACCESS) command, you would expect that the response to a QRY DB NAME(DEBJN) SHOW(STATUS) command would include:

DBName	AreaName	MbrName	CC	TYPE	LclStat
DEDBJN		IMS1	0	DEDB	NOTOPEN, STOACC, RNL

After you issued the UPDATE DB NAME(DEBJN) STOP(ACCESS) OPTION(NORAND) command, you would expect that the response to a QRY DB NAME(DEBJN) SHOW(STATUS) command would include:

DBName	AreaName	MbrName	CC	TYPE	LclStat
DEDBJN		IMS1	0	DEDB	NOTOPEN, STOACC

RNL is not included in the second response.



## DBRC Timestamp Precision

- Migration Considerations
  - ◆ Full precision used after MINVERS('10.1') specified
    - Fallback to MINVERS < 10.1 requires deletion of RECON log records
  - ◆ Utility control statement changes are unlikely to affect users
    - GENJCL.CA and GENJCL.RECOV create correct statements
      - Used by almost all users
  - ◆ RECON listings and message outputs include full precision timestamps when MINVERS('10.1')
  - ◆ Abbreviated timestamps supported for most uses
  - ◆ No changes for DBRC API
    - Timestamps continue to be 12 byte internal timestamp format
  - ◆ Timestamp precision of GENJCL.USER output could change
    - Default changes when MINVERS('10.1') is set unless overridden in skeletal JCL

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Full precision timestamps are not implemented unless the RECONs have MINVERS('10.1') specified. Even when MINVERS is set to a lower value, the IMS V10 Change Accumulation and Database Recovery utility control statements require new formats which accommodate full precision timestamps. Nevertheless, this is unlikely to be a concern to users since GENJCL.CA and GENJCL.RECOV in IMS V10 always produce control statements with the V10 formats.

When MINVERS('10.1') is set log records are created with the full precision timestamps. If you fallback to MINVERS('9.1') or MINVERS('8.1'), the log records created with full precision timestamps must be deleted before the CHANGE.RECON MINVERS(...) command is issued. The records that must be deleted include PRILOG, PRISLD, PRIOLD, etc. and the ALLOC records associated with these log records.

If you wish, you may specify abbreviated timestamps for most uses. DBRC will interpret the time correctly. Full precision timestamps are required in CHANGE and DELETE commands when a full precision timestamp is part of the RECON record key.

The timestamp precision value may be coded on the TIMEFMT parameter of the %SET statement in skeletal JCL. It is a value from 1 to 6. The default in previous releases was 1. In IMS V10 the default depends on the MINVERS value. MINVERS('10.1') sets the default to 6. MINVERS values less than '10.1' sets the default to 1. This could affect the output of GENJCL.USER. If you have specifically coded the TIMEFMT parameter, timestamp precision in the output will not change. If you have not coded TIMEFMT, the output may change when the MINVERS value is set to '10.1'.

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## Database Change Accumulation Utility

- DB0 and DB1 control statements
  - ◆ Purge time is expanded
  - ◆ Number of DD names allowed reduced from 4 to 3
    - Position on control statement moved

**Version 8 or 9 example:**

```

-----1-----2-----3-----4-----5-----6-----7---
//SYSIN      DD *
DB0DI32DB012006.175 12:00:00.1 -08:00DI320101 DI320102 DI320103 DI320104
DB0AB77DB012006.175 12:00:00.1 -08:00AB770101 AB770102
/*
  
```

**Version 10 example:**

```

-----1-----2-----3-----4-----5-----6-----7---
//SYSIN      DD *
DB0DI32DB012006.175 12:00:00.123456 -08:00DI320101 DI320102 DI320103
DB0DI32DB012006.175 12:00:00.123456 -08:00DI320104
DB0AB77DB012006.175 12:00:00.1 -08:00      AB770101 AB770102
/*
  
```

- ◆ GENJCL.CA has been updated to create V10 control statements

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The Database Change Accumulation utility DB0 and DB1 control statements have been modified to support timestamps with greater precision. The new expanded timestamp format may be used in V10 but it is not required. DB0 control statements are used to specify the database data sets that are accumulated to the new change accumulation data set. DB1 control statements are used to specify the database data sets that are written to the new output log data set. Since the timestamps now may occupy more columns in the control statements, the position of the database data set DDNAMEs have moved and only three may be specified on one control statement. In previous versions the timestamp was specified in columns 12-37 and DDNAMEs were in columns 38-45, 47-54, 56-63, and 65-72. In V10 the timestamp uses columns 12-42 and DDNAMEs are in columns 43-50, 52-59, and 61-68. If a database has more than three data sets that are in the same Change Accum group, multiple control statements are required in V10. The V10 example shows two control statements to replace the first control statement in the V9 example. Two control statements are required because four DDNAMEs are specified. The V10 example shows the greater precision timestamp. The last control statement in the V10 example does not specify the greater precision timestamp.

GENJCL.CA has been updated to create the new format of the control statements. These changes to the control statements will have no effects on users who create Change Accumulation JCL and control statements with GENJCL.CA. This is the vast majority of IMS installations.

Information On Demand IMS Version 10

## Database Recovery Utility

- S control statement
  - ◆ Timestamp recovery time is expanded
  - ◆ Specification of "no image copy input" has been moved to column 63
  - ◆ Specification of time zone offset changed - space added before offset

**Version 8 or 9 example:**

```

-----1-----2-----3-----4-----5-----6-----7---
//SYSIN      DD *
S  DI32DB01  DI320101          2006.175 12:00:00.1-08:00 C
/*
  
```

**Version 10 examples:**

```

-----1-----2-----3-----4-----5-----6-----7---
//SYSIN      DD *
S  DI32DB01  DI320101          2006.175 12:00:00.123456 -08:00 C
/*
  
```

```

//SYSIN      DD *
S  DI32DB01  DI320101          2006.175 12:00:00.1 -08:00   C
/*
  
```

- ◆ GENJCL.RECOV has been updated to create V10 control statements

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The S control statement is used to specify the database and DDNAME for the database data set that is to be recovered. If the recovery is a timestamp recovery, the timestamp is also specified. The new expanded timestamp format may be used in V10 but it is not required. In previous releases column 57 was used for an indicator. The indicator could specify that a user image copy had been restored or that an RSR receive was done. Since the timestamp may use column 57, the indicator is now coded in column 63 when needed. The first example for V10 shows the use of the expanded timestamp. The second shows the use of the shorter timestamp. Both examples have the 'C' which indicates that there is no image copy input.

There is another small change in the coding of the timestamp. In previous releases there was not a space between the time and the sign for the time zone offset. In the V8 or V9 example on this page the sign is in column 50. In V10 there is a blank between the time and the sign for the offset. In the two examples on this page the blank is in column 55 for the first V10 example and column 50 for the second example.

GENJCL.RECOV has been updated to create the new format of the control statement for timestamp recovery. The change in the control statement will have no effects on users who create Database Recovery JCL and control statements with GENJCL.RECOV. This is the vast majority of IMS installations.

Information On Demand IMS Version 10

## RECON Listings

- Version 10 adds information to RECON status listing

```

RECON
RECOVERY CONTROL DATA SET, IMS V10R1
DMB#=231 INIT TOKEN=06082F0536577F
NOFORCER LOG DSN CHECK=CHECK44 STARTNEW=NO
TAPE UNIT=3480 DASD UNIT=SYSDA TRACEOFF SSID=**NULL**
LIST DLOG=NO CA/IC/LOG DATA SETS CATALOGED=NO
MINIMUM VERSION = 8.1 CROSS DBRC SERVICE LEVEL ID= 00001
REORG NUMBER VERIFICATION=NO
LOG RETENTION PERIOD=00.001 00:00:00.0
COMMAND AUTH=NONE HELQ=**NULL**
ACCESS=SERIAL LIST=STATIC
SIZALERT DSNUM=15 VOLNUM=16 PERCENT= 95
LOGALERT DSNUM=3 VOLNUM=16

TIME STAMP INFORMATION:

TIMEZIN = %SYS

OUTPUT FORMAT:  DEFAULT = LOCAL NONE PUNC YY
                  CURRENT = LOCAL NONE PUNC YY

IMSPLEX = ** NONE ** GROUP ID = ** NONE **

-DDNAME- -STATUS- -DATA SET NAME-
RECON1 COPY1 IMSTESTS.DSHR.RECON1
RECON2 COPY2 IMSTESTS.DSHR.RECON2
RECON3 SPARE IMSTESTS.DSHR.RECON3

```

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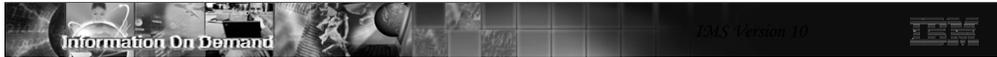
The RECON status or header listing has some added and changed information.

Of course, the IMS version is listed as "V10R1". This means that the RECONS have been upgraded to IMS V10.

There is a new line which lists the type of RECON access, either SERIAL or PARALLEL. On the same line the default for the DBRC LIST command, either STATIC or CONCURR, is shown.

On the line where the IMSPLEX value is shown, the DBRC Group ID value is also shown. In this example, these parameters have no values so "\*\*\* NONE \*\*\*" is listed.

The sample listing shown here includes the "CROSS DBRC SERVICE LEVEL ID". This also appears on IMS V9 RECON listings when the maintenance for APARs PQ98655 and PK01097 is applied and on IMS V8 RECON listings when the maintenance for APARs PQ98654 and PK01096 is applied. The service level ID is used to invoke functions which require a consistent level of maintenance on all IMS systems using the RECONS.



## DBRC API Security Authorization

- DBRC command authorization security is extended to include DBRC API requests
  - ◆ Requests are treated like commands for security checking
- Migration
  - ◆ Security was not checked in V9
    - Security checking in V10 might cause application which ran successfully in V9 to fail in V10

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DBRC command security was introduced in IMS V8. It may be used to invoke authorization checking for DBRC commands. RACF, or any SAF security product, may be used. Alternatively, an exit routine may be invoked or both the security product and the exit routine may be invoked. Commands are authorized by defining a resource representing the command. In RACF this is done with an RDEFINE statement.

This authorization is extended to the DBRC API in IMS V10. API requests invoke command authorization checking. Command authorization checking uses resources which are defined to secure specific commands or API requests.



## VERSION parameter in DSPAPI macros

- IMS V10 macros default to VERSION=2.0
  - ◆ New functions and options require VERSION=2.0
- Reassembly is not required
  - ◆ Applications assembled with V9 macros default to VERSION=1.0
- Applications can be reassembled with IMS V10 macros
  - ◆ Will run unchanged if VERSION=1.0 is specified
  - ◆ May require changes if VERSION= is allowed to default
- Recommendation
  - ◆ Always specify VERSION= parameter
    - Allows reassembly in future releases without changes

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Each DBRC API macro includes the VERSION= parameter. New functions, such as AUTH, and new options, such as READONLY=YES, require VERSION=2.0. In IMS V9 the only valid value for VERSION was 1.0. It was also the default. In IMS V10 VERSION= defaults to 2.0.

Applications written in IMS V9 will continue to run in V10 without change. Reassembly is not required. In fact, reassembly could cause the program to change due to the change in the default for VERSION=. In some cases, the default of VERSION=2.0 may cause different results from the previous default of VERSION=1.0. This is not always the case. Some of the changes are only the use of previously reserved bytes in the control blocks that are produced. In any case, if you wrote a program for IMS V9 and reassemble it using an IMS V10 macro library, it is safest to specify VERSION=1.0 on the DFSAPI macros before the reassembly.

Since the VERSION= parameter defaults to the latest level of the macros and later levels may produce different results, it is safest to specify the VERSION= parameter value explicitly. This will ensure that future assemblies of DBRC API programs will produce the same results.



## IMSplex Name and DBRC Group ID

- IMSplex name is specified with 5 characters (xxxxx)
  - ◆ IMS V8 and V9 store 'CSLxxxxx' in the RECON header extension record
  - ◆ IMS V10 stores 'xxxxxyyy' in the RECON header extension record
    - 'yyy' is the DBRC Group ID
      - DBRC Group ID defaults to '001'
      - Upgrade uses the default
- Example
  - ◆ IMS V8 or V9: IMSplex name is MYPLX
    - Contents in RECON Header Extension record: 'CSLMYPLX'
    - RECON Listing: `IMSPLEX=MYPLX`
  - ◆ IMS V10 after upgrade of RECONS with IMSplex name of MYPLX
    - Contents in RECON Header Extension record: 'MYPLX001'
    - RECON Listing: `IMSPLEX=MYPLX           GROUP ID=001`

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The IMSplex name is optional. It is required for Automatic RECON Loss Notification and Parallel RECON Access. The IMSplex name is specified with up to 5 characters. If it was set under IMS V8 or V9, it will be maintained when the RECONS are upgraded to IMS V10. If it was not set under IMS V8 and V9 it may be set in IMS V10 by a CHANGE.RECON command. It is stored in the RECONS. IMS V8 and V9 store the IMSplex name as 'CSLxxxxx' where 'xxxxx'. When the RECONS are upgraded to V10, the value stored is 'xxxxxyyy' where 'yyy' is the DBRC Group ID. The upgrade sets the DBRC Group ID to '001'. It may be changed with a CHANGE.RECON IMSPLEX(plexname,groupid) command.

IMS V8, V9, and V10 list only the 5 characters of the IMSplex name in listings of the RECON header. These listing include a line with `IMSPLEX=xxxxx` when an IMSplex name has been stored in the RECONS. If there is no value stored, the line includes `IMSPLEX=**NONE**`. IMS V10 listings also include the DBRC Group ID on this line. If there is no IMSplex name the Group ID is listed as `GROUP=**NONE**`. If there is an IMSplex name, the Group ID is listed as `GROUP=yyy` where yyy is the Group ID.



## IMSplex and DBRC Sharing Group ID Specification

- IMSplex users considerations
  - ◆ DBRC SCI Registration Exit routine can set the DBRC Sharing Group ID
    - Recommended
    - If DBRCGRP is specified in EXEC, it is passed to the exit routine
- Migration and coexistence considerations
  - ◆ DBRC Sharing Group ID in RECONs is tolerated by IMS V8 and V9 systems
    - V8 or V9 exit routine is not passed the Group ID
    - V8 or V9 exit routine does not specify the Group ID
    - V8 or V9 system processes all ARLN notifications from its IMSplex group
    - ARLN notifications from V8 and V9 systems will be sent to all members of the IMSplex, without regard to V10 DBRC Group IDs
      - Do not use multiple DBRC Sharing Group IDs in an IMSplex while V8 and V9 systems are used

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The DBRC SCI Registration exit routine (DSPSCIX0) may be used to specify the IMSplex name, as in previous releases, and the new DBRC Group ID. The use of the exit routine is recommended for users of IMSplex. It removes the requirement to specify IMSPLEX= for the execution of all IMS jobs which use DBRC. This includes batch jobs and utilities. With IMS V10 the exit also may specify the DBRC Sharing Group ID. This removes the requirement to specify DBRCGRP= for IMS executions.

IMS V8 and V9 systems can tolerate the specification of the DBRC Group ID in the RECONs. DBRCGRP= is not a valid parameter on the EXEC statement for V8 and V9. When the exit routine is invoked in a V8 or V9 environment, the DBRC Group ID is not passed to it. The exit routine cannot specify the DBRC Group ID. Even though a V8 or V9 instance cannot specify the DBRC Group ID, it can join an IMSplex where V10 instances are using DBRC Group IDs. The V8 or V9 instance will be passed all ARLN notifications from the IMSplex group. If a V8 or V9 system reconfigures its RECONs, its ARLN notification will be processed by all members of the IMSplex. This will include all V10 systems. If there are multiple DBRC Groups, all members of all groups will process the notification. For these reasons, you should not use multiple DBRC Group IDs in an IMSplex while you are still using IMS V8 or V9 systems.