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# IMS Version 7



*The world depends on it*

*Rich Lewis and Suzie Wendler  
IBM Dallas Systems Center*



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# Abstract

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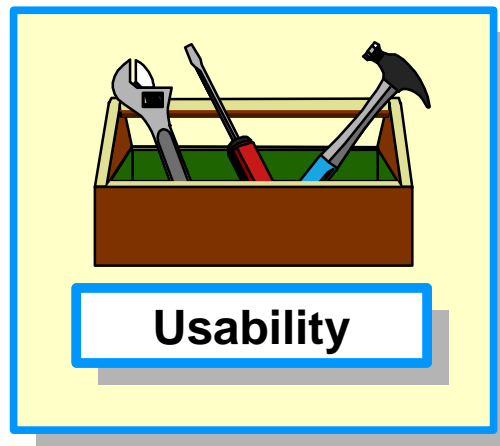
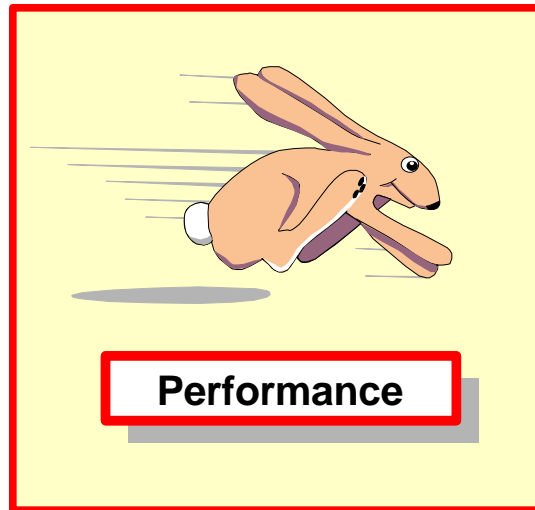
IMS, the recognized leader in database and transaction management, continues to evolve. IMS may be used to power e-business environments while preserving customers' investments in mission-critical applications and data.

IMS Version 7 introduces many enhancements to help its users provide increased availability, improved performance, and a more usable system. This presentation highlights the new system, database, and transaction manager capabilities. IMS V7 includes High Availability Large Database (HALDB) which supports databases with up to 1001 independently managed partitions, Online Recovery Service (ORS) which allows users to recover databases with online facilities, Rapid Network Restart which implements VTAM persistent sessions, Open Database Access (ODBA) which provides for IMS database access from DB2 stored procedures, DBRC usability and performance enhancements, improved DEDB availability, and many performance, usability, and availability enhancements.

This presentation will be of interest to both IMS TM and DBCTL users.



# IMS Version 7





# IMS Version 7

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## ▲ System Enhancements

- ▶ Install/IVP process
- ▶ System Parameters display
- ▶ CPLOG specification
- ▶ Concurrent upgrade of RECONs
- ▶ Online RECON access preference
- ▶ RECON loss notification
- ▶ ACBGEN processing and limits
- ▶ IMS Monitor and IMS PA enhancements

## ▲ Database Enhancements

- ▶ High Availability Large DB (HALDB)
- ▶ Online Recovery Service (ORS)
- ▶ Change Accum enhancements
- ▶ Image Copy 2 compression
- ▶ DBRC GENMAX and RECOVPD
- ▶ DBRC PROCOPT=L|LS support
- ▶ I/O error handling for DEDBs
- ▶ DEDB Scan segment expansion
- ▶ Open DB Access (ODBA)



# IMS Version 7

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## ▲ Transaction Manager Enhancements

- ▶ CQS Enhancements for Shared Queues
- ▶ Asynchronous OTMA/APPC
- ▶ TM and MSC Message Routing and Control User Exit
- ▶ Deferred VTAM ACB open
- ▶ RACF PassTicket support
- ▶ USERID clarification
- ▶ SLUP/Finance Session Cold Termination
- ▶ Spool enhancement
- ▶ Queue Space Notification Exit enhancement
- ▶ SLU2 enhancement
- ▶ ETO Enhancements
- ▶ Callable Interface to OTMA
- ▶ VTAM Generic Resources enhancements
- ▶ Rapid Network Reconnect (RNR)
- ▶ IMS Connect



# System Enhancements

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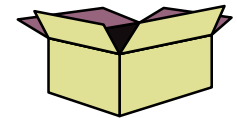
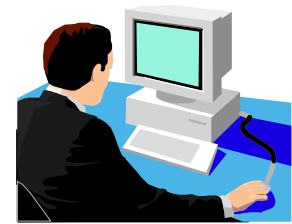
## IMS V7 System Enhancements



# Install/IVP Enhancements

## ▲ Style and format of Install/IVP panels standardized

- Same look and feel as other IBM products
  - ▶ Action Bar Pull-Downs
  - ▶ Pop-up windows
  - ▶ Standard command and message areas



## ▲ Sample IVP jobs support DFSMS allocation parameters

- ▶ STORCLAS
- ▶ MGMTCLAS

Usability

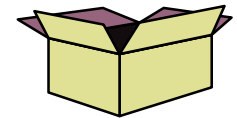




# Install/IVP Enhancements

## ▲ OS/390 Standards

- Data set names
  - ▶ Distribution libraries: ADFS prefix
  - ▶ Target libraries: SDFS prefix
- Macro libraries
  - ▶ One distribution library: ADFS MAC
  - ▶ One target library: SDFS MAC



**Usability**

## ▲ SYSGEN reduction

- More than 1000 modules moved from SYSGEN to DFSJCLIN



# System Parameters Enhancements

## ▲ System parameters display

- Written to system console and job log at initialization

## ▲ IMS V6 CPLOG

- CPLOG (system checkpoint frequency) set by system definition
  - Change requires a new system definition
- Default is 1000

**Usability**

## ▲ IMS V7 CPLOG

- CPLOG default is 500,000
  - Reasonable default
- CPLOG is execution parameter in DFSPBxxx
- CPLOG may be displayed with /DIS CPLOG command
- CPLOG may be altered by /CHANGE CPLOG command
  - Easily changed

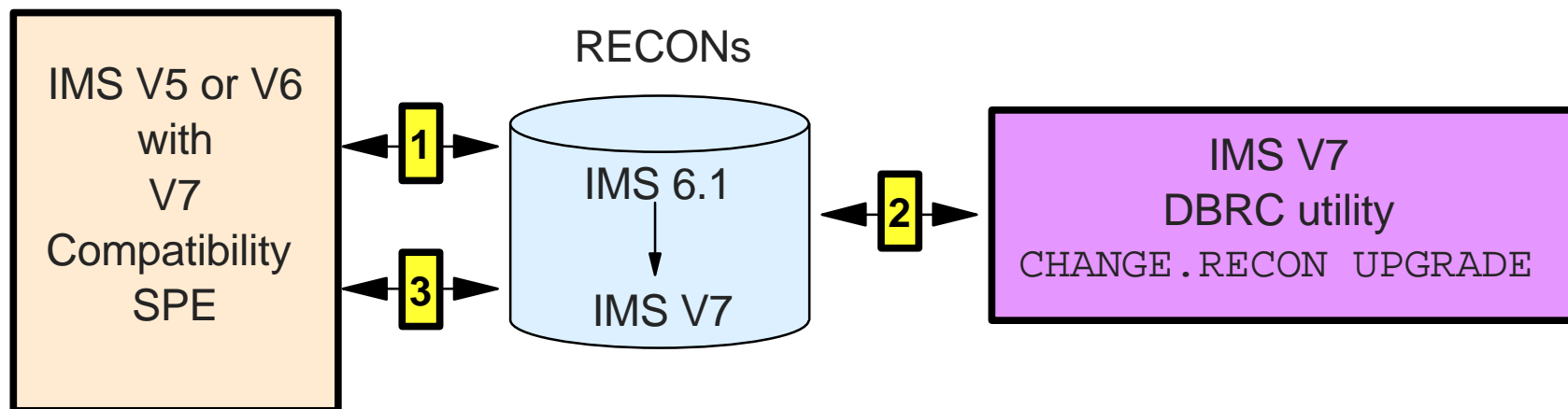


# Concurrent Upgrade of RECONs

## ▲ IMS 6.1 RECONs are upgraded to V7 without terminating IMS

- Upgraded by DBRC command
  - ▶ CHANGE.RECON UPGRADE

**Availability**





# Online RECON Access Preference

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## ▲ Reserves of RECONs by batch jobs will be serialized

- Only one batch job per MVS will request a RESERVE at any time
  - ▶ Batch jobs will request exclusive enqueue before issuing RESERVE
  - ▶ Utilities are included in "batch" jobs

## ▲ Avoids batch jobs locking out online systems from RECONs

**Performance**



# RECON Loss Notification

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## ▲ Loss of RECON requires all IMS subsystems to reconfigure

- Switch to "spare" RECON
- Required to delete and redefine bad RECON

Availability

## ▲ Reconfiguration occurs on next RECON access

- RECONs may be infrequently accessed

## ▲ IMS V7 adds MVS console message on RECON loss

- Message identifies all subsystems using RECONs

## ▲ Allows automation to force reconfiguration



# ACBGEN Enhancements

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## ▲ New PSB Limits

- Maximum SENSEGs increased to 30,000
- Maximum PCBs increased to 2500
- Maximum PSB size increased to 4 Meg

**Usability**

▲ **Generally, available ACBGEN buffer storage will be exceeded before limits are reached**



# Reduction of ACBGEN PSB Rebuilds

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## ▲ IMS V7 does not rebuild PSBs for many DBD changes

### ■ Examples:

- ▶ Change of exit routine names
- ▶ Change of exit routine parameters
- ▶ Change in field names

**Performance**

**Availability**

## ▲ Shortens ACBGEN times

## ▲ PSB rebuilds still required for some DBD changes

### ■ Examples:

- ▶ Addition of exit routines
- ▶ Changes in segment descriptions



# IMS Monitor and IMS Performance Analyzer

## ▲ Tracing of Fast Path added by IMS Monitor

- DEDBs, MSDBs, EMH, and IFP regions

## ▲ IMS monitor subsetting added

- Limit tracing to a set of databases or regions
- Limit tracing to a time interval

Usability

Performance

## ▲ IMS Performance Analyzer reports Fast Path activity

- IMS Monitor report program does not report Fast Path activity
  - ▶ IMS Monitor report program is not being enhanced

## ▲ Benefits

- More complete performance information
- More manageable reports
- Less impact by monitor tracing





# Database Enhancements

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*The world depends on it*

## IMS V7 Database Enhancements



# HALDB (High Availability Large Database)

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## ▲ Large Database

Up to 10,010 data sets per database!

Greater than 40 terabytes

- Databases are partitioned
  - ▶ Up to 1001 partitions per database
  - ▶ Partitions have up to 10 data set groups

## ▲ High Availability Database

- Partition independence
  - ▶ Allocation, authorization, reorganization, and recovery are by partition
- Self healing pointers
  - ▶ Reorganization of partition does not require changes to secondary indexes or logically related databases which point to it



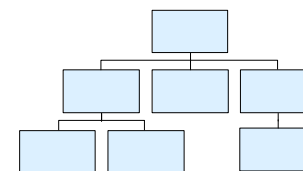
# Highlights

## ▲ New database types

- PHDAM - partitioned HDAM
- PHIDAM - partitioned HIDAM
  - ▶ Index is also partitioned
- PSINDEX - partitioned secondary index

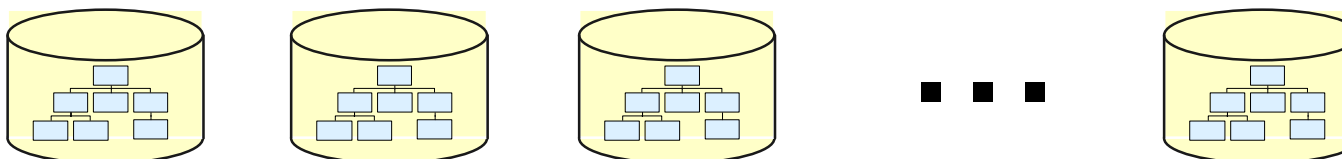
## ▲ Hierarchic structure is maintained

- A database record resides in one partition



## ▲ Partition selection

- By key or by user exit routine





# Highlights

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## ▲ Logical relationships and secondary indexes are supported

- Secondary indexes may be partitioned

## ▲ OSAM and VSAM (ESDS and KSDS) are used

## ▲ DBRC is required

- Databases must be registered
- Dynamic allocation from DBRC information, not DFSMDA

## ▲ Minimal (or no) application changes required

- Initial load cannot insert logical children (must be added by update)
  - ▶ New status code for load programs
- 'Data unavailable' conditions apply to partitions
  - ▶ Database may be available, but partition unavailable



# Direct and Indirect Pointers

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## ▲ HALDB uses both direct and indirect pointers

- Combination of pointers are used for logical relationships and secondary indexes
- Direct pointers point to segments
- Indirect pointers "point" to Indirect List Entries (ILEs) in Indirect List Data Set (ILDS)
- ILEs have token (indirect pointer) for key
  - ▶ ILEs contain direct pointer to segment
- ILDS is a KSDS associated with a Partition



# Extended Pointer Set

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## ▲ Extended Pointer Set (EPS) is used for logical relationships and secondary indexes

- Replaces direct or symbolic pointer used in Non-HALDB databases
- Contains identification of partition
- EPS contains direct pointer, indirect pointer, and reorganization number
  - ▶ If reorg number is current, direct pointer is used
  - ▶ If reorg number is not current, indirect pointer is used
  - ▶ Indirect pointer points to Indirect List DS containing pointers from last reorg
- EPS is not updated by reorganizations!
- Direct pointer in EPS is updated when indirect pointer is used

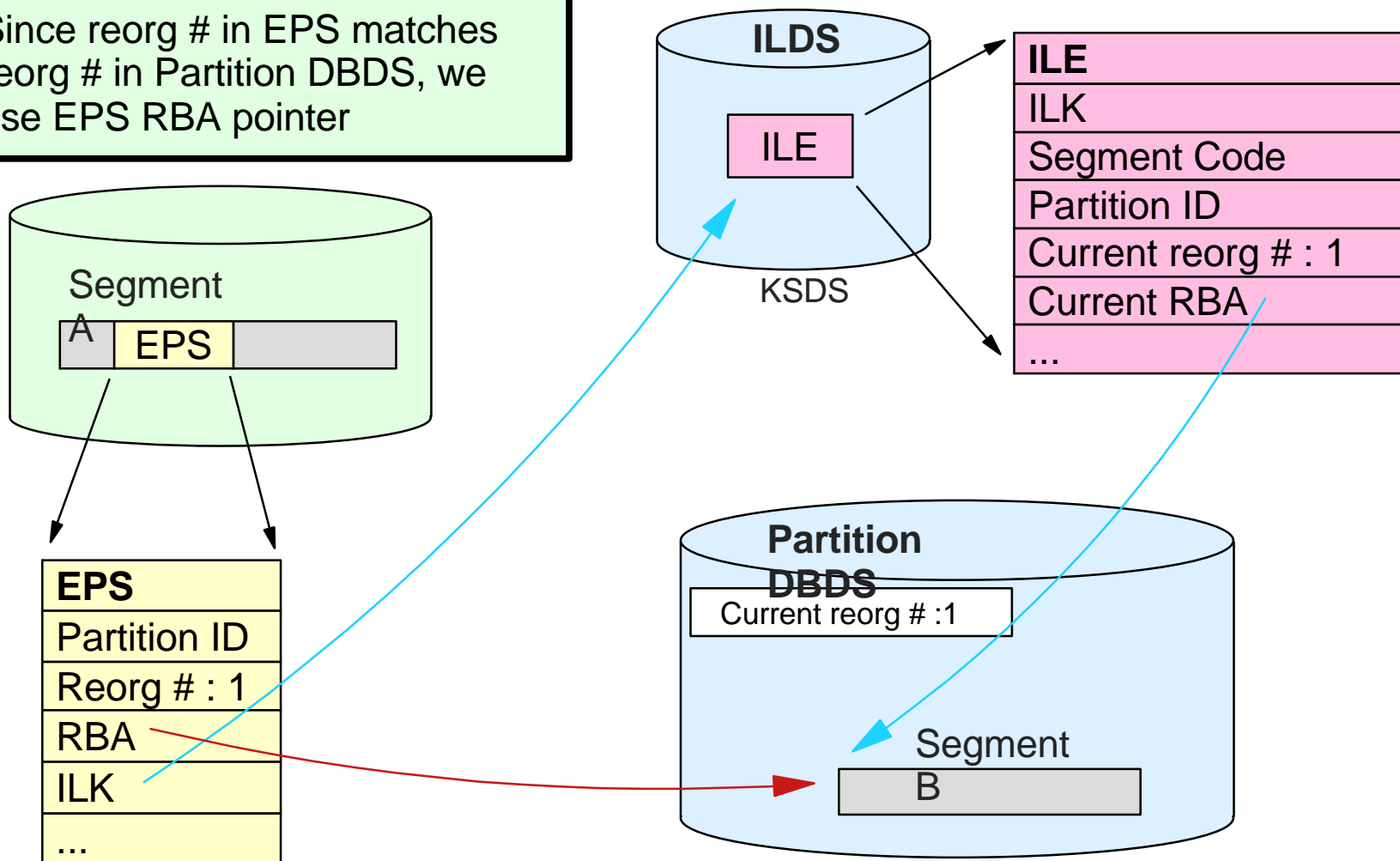
## ▲ Self healing pointers!



# Self-Healing Pointers

## Using an Extended Pointer Set (EPS)

Since reorg # in EPS matches reorg # in Partition DBDS, we use EPS RBA pointer

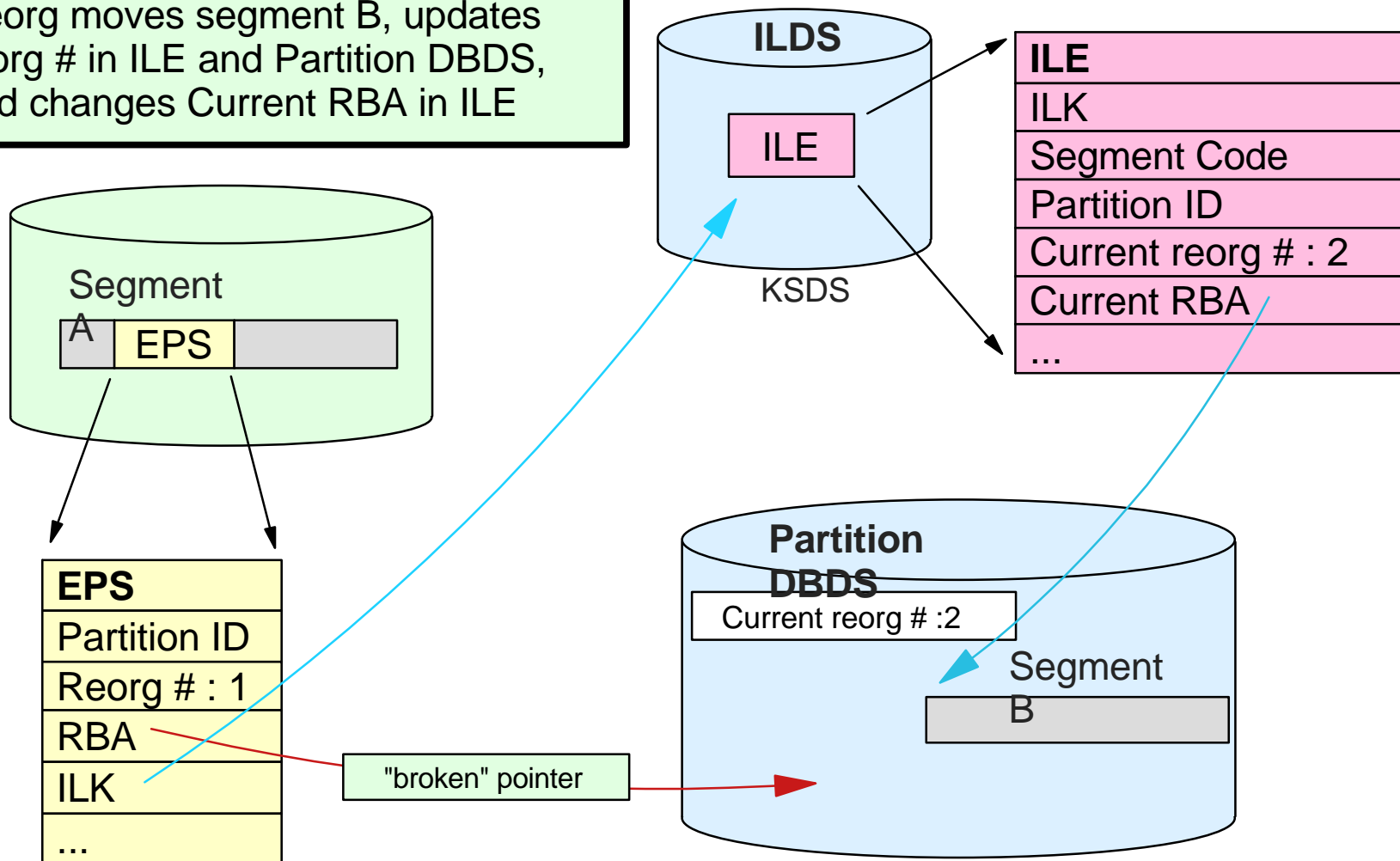




# Self-Healing Pointers

## After reorganization of Partition

Reorg moves segment B, updates reorg # in ILE and Partition DBDS, and changes Current RBA in ILE



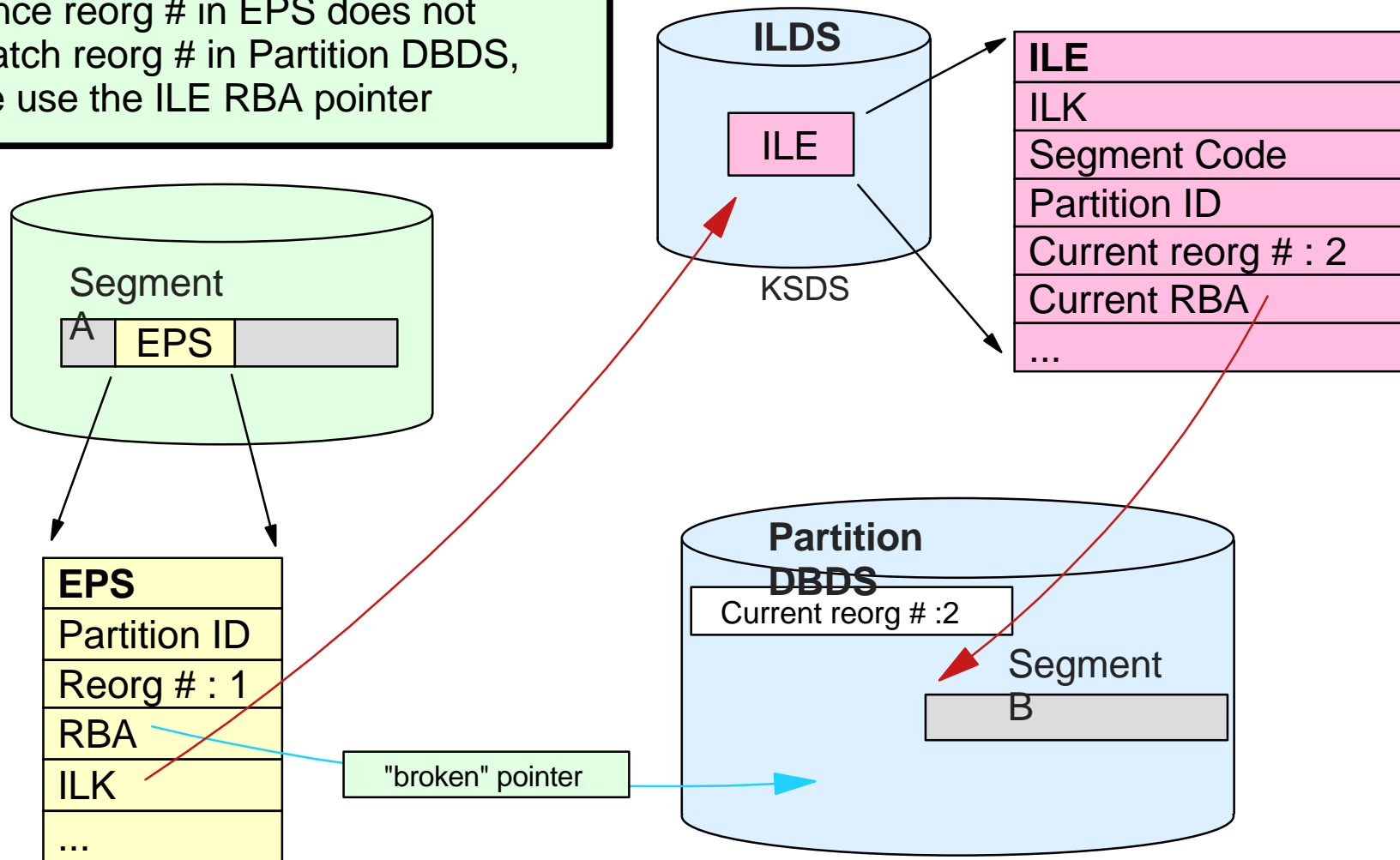




# Self-Healing Pointers

## Using the EPS after the reorganization

Since reorg # in EPS does not match reorg # in Partition DBDS, we use the ILE RBA pointer

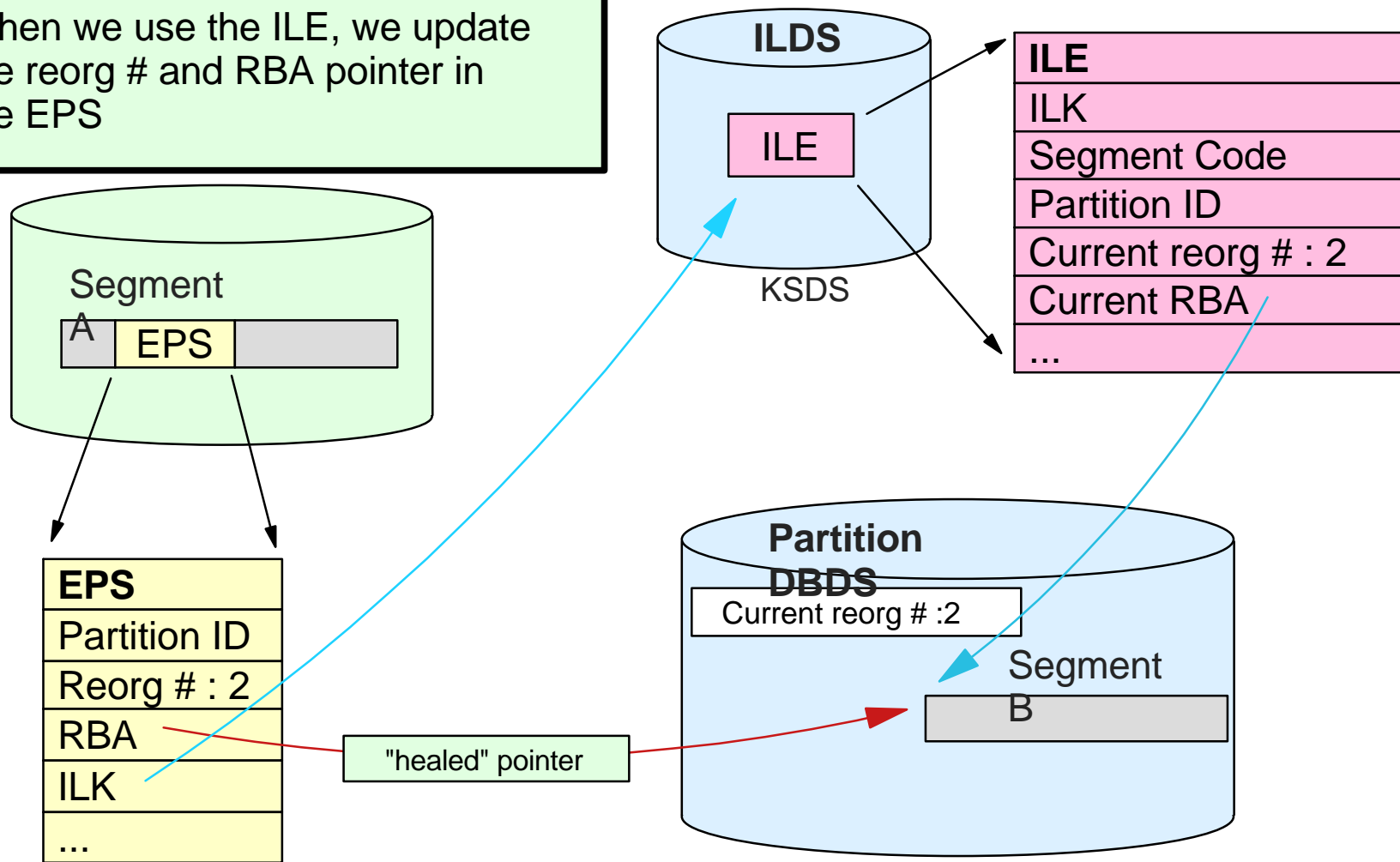




# Self-Healing Pointers

## "Healing" the EPS

When we use the ILE, we update the reorg # and RBA pointer in the EPS





# HALDB Support

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## ▲ HALDB is supported with:

- Data sharing
- Remote Site Recovery (RSR)
- Extended Recovery Facility (XRF)
- Online Change
- OSAM Sequential Buffering
- IMS Monitor and IMS Performance Analyzer
- ...



# HALDB

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## ▲ Benefits

- Greater database capacity
  - ▶ Without application changes
- Increased database availability
  - ▶ Partitions, not databases, are removed from system
  - ▶ Shortened reorganization process
  - ▶ Batch window is shortened with concurrent processing
- Improved manageability
  - ▶ Data sets may be smaller

**Usability**

**Availability**

**Performance**



# HALDB

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## ▲ Database candidates for HALDB

- Very large databases
  - ▶ Approaching 4G (VSAM) or 8G (OSAM) limitations
  - ▶ Theoretical limit is now over 40 terabytes
  
- Medium and large databases
  - ▶ Parallel processing to meet time deadlines
  
- Any size database
  - ▶ More frequent reorganizations
  - ▶ Making only parts of the data unavailable for database maintenance



# Online Recovery Service (ORS)

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## ▲ Online recovery of databases

- Logs are read once for all database data sets
- Parallel reads of inputs
  - ▶ Image copies, change accumulations, and logs
- Parallel writes of outputs
  - ▶ Databases recovered in parallel
- Change accumulation not required for data sharing
- Time stamp recovery to any time

## ▲ A separate IMS feature



# Online Recovery Service

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## ▲ A control region function

- Invoked by IMS commands
- Executes in parallel with other online activity
- Uses Remote Site Recovery (RSR) techniques
  - Merges updates without requiring Change Accumulation

## ▲ Supports

- HDAM, HIDAM, HISAM, SHISAM, Index
- PHDAM, PHIDAM, PSINDEX
- DEDB



# Online Recovery Service

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## ▲ Recovers a list of database data sets

- List is built by /RECOVER ADD xxx commands
  - ▶ Command may add a data set, a database, or a group

## ▲ Recovery of list is started by command

- /RECOVER START command
- Database, partition, or area must be deallocated (/DBR) before recovery

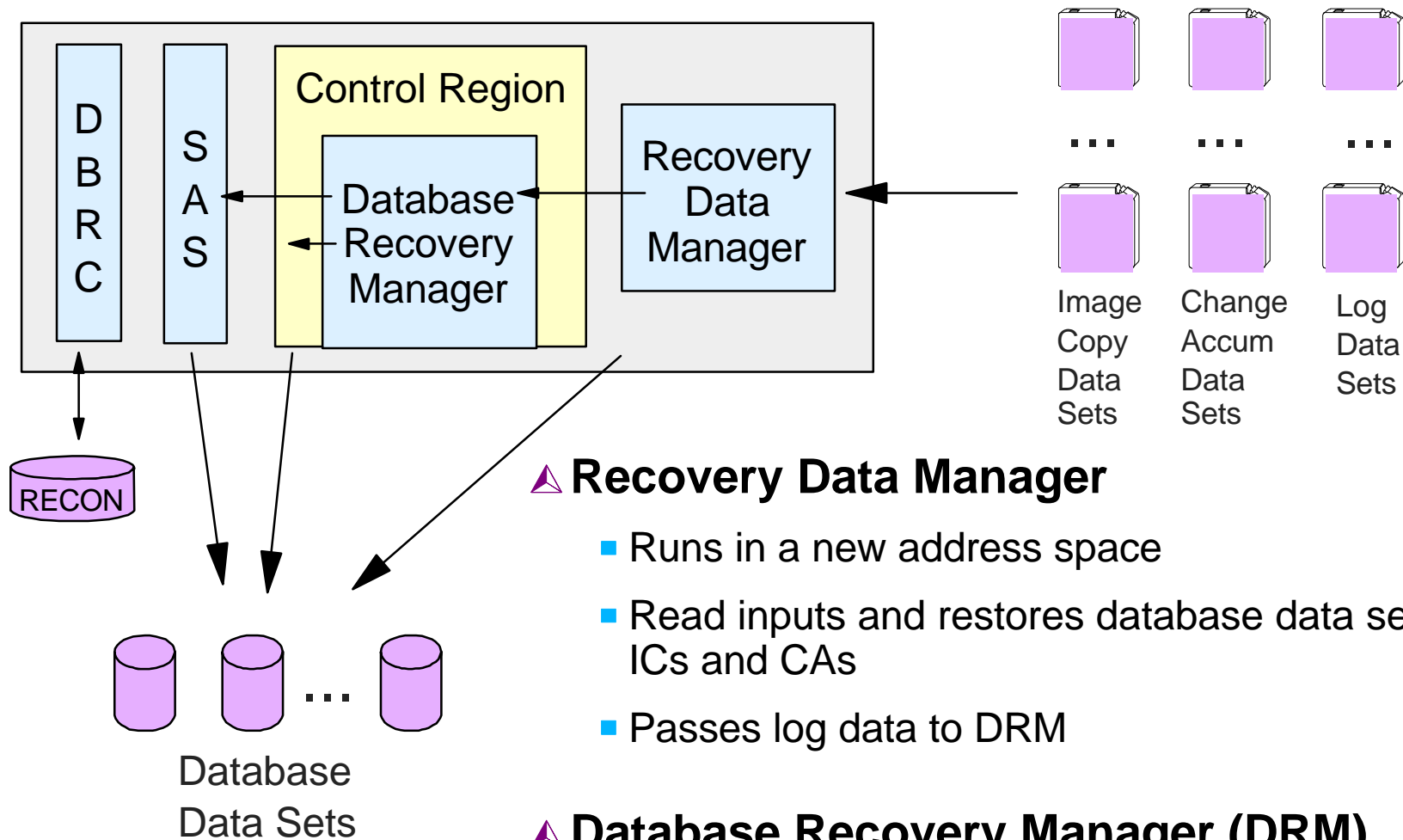
## ▲ Option to /START database, partition, or area after recovery

- /START GLOBAL may be specified for data sharing





# ORS Components and Flow



## ▲ Recovery Data Manager

- Runs in a new address space
- Read inputs and restores database data sets from ICs and CAs
- Passes log data to DRM

## ▲ Database Recovery Manager (DRM)

- Manages recovery in the control region and SAS address spaces



# Online Recovery Service

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## ▲ Benefits

- Faster recoveries
  - ▶ Inputs read once for all database data sets
- Change Accumulation requirement eliminated
  - ▶ Especially beneficial for data sharing users
  - ▶ Change Accum may be used, but is not required
- Time stamp recoveries to any time
  - ▶ Creation of "recovery points" no longer required

**Performance**

**Usability**

**Availability**



# Change Accumulation Enhancements

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## ▲ Data sharing limits merging of logs in IMS V6

- Cannot merge incomplete log set
  - ▶ Merging requires /DBRs or termination of all IMS systems
  - ▶ "Spills" unmergable logs

## ▲ IMS V7 eliminates this restriction

- Merges all records up to end of oldest log
- "Spills" only later timed records

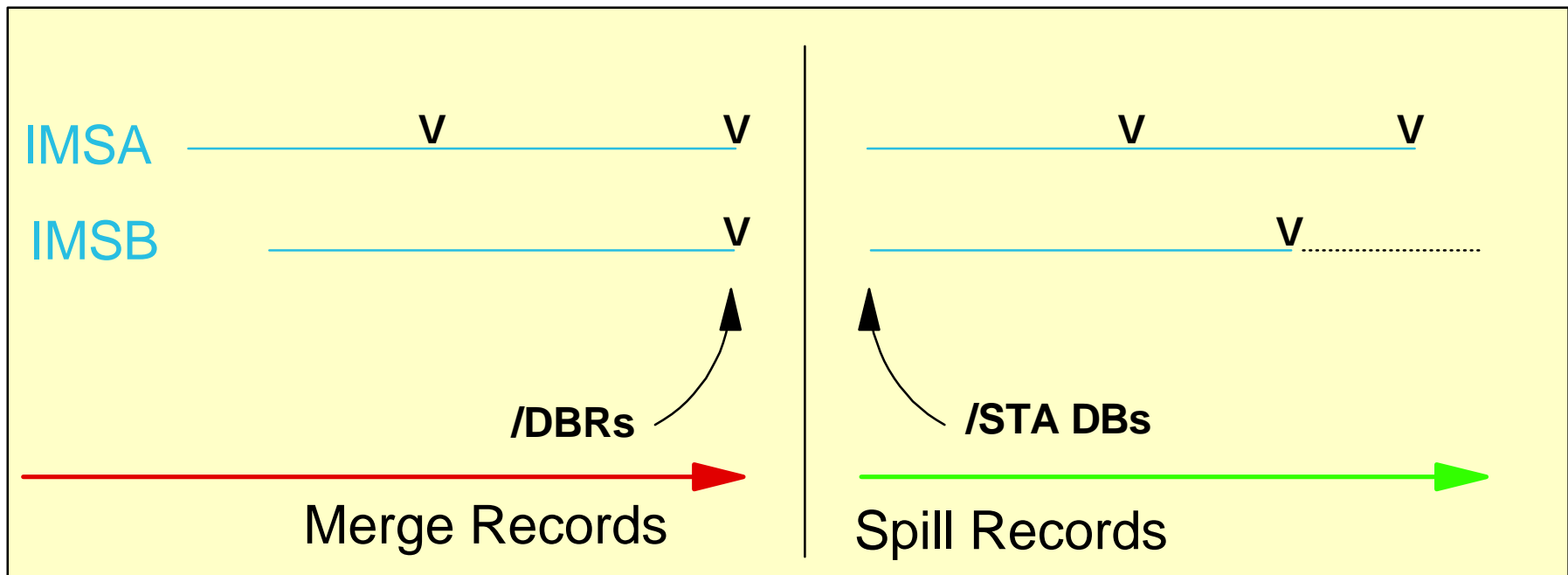
**Usability**

**Availability**



# IMS V6 Change Accum Illustration

▲/DBRs are used so that CA may merge records



**V:** end of volume

— : log is input to Change Accumulation

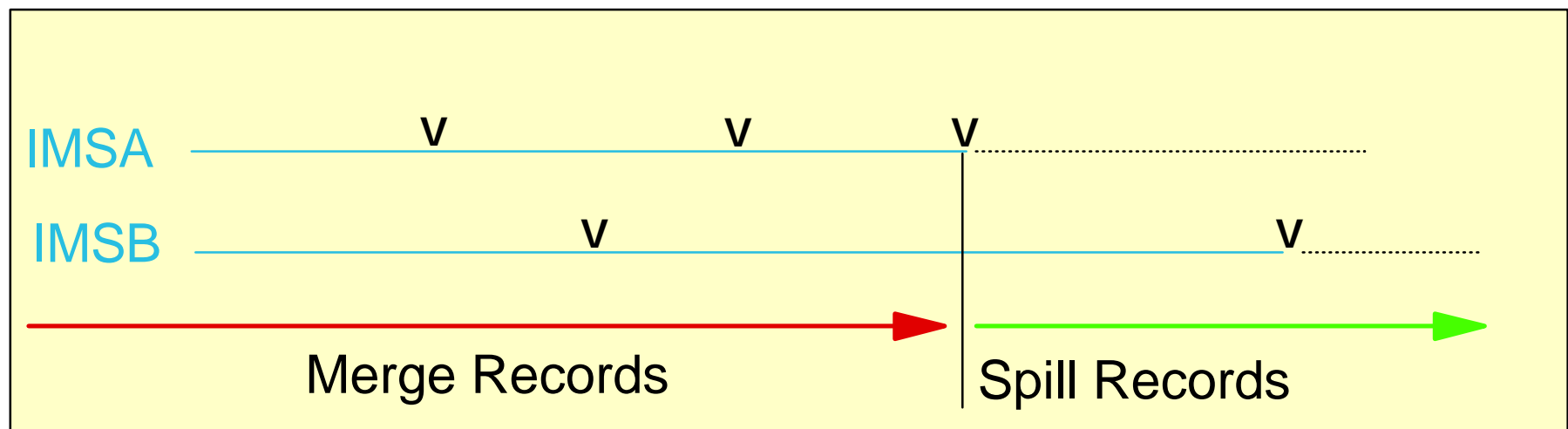
..... : log is not input to Change Accumulation



# IMS V7 Change Accum Illustration

## ▲/DBRs are not needed

- Fewer spill records are created



**V:** end of volume

— : log is input to Change Accumulation

..... : log is not input to Change Accumulation



# Change Accumulation Enhancements

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## ▲ Sort efficiency automation

- Automatically calculates sort key length
- Simplifies user interface
  - ▶ User does not specify size
  - ▶ Value in "ID" statement is ignored
- Avoids unnecessarily large sizes
  - ▶ Large sizes have negative performance effect

**Usability**

**Performance**



# Image Copy 2 Enhancement

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## ▲ Compression may be used for Image Copy 2 copies

- Invoked by control statement or GENJCL.IC keyword
- Invokes COMPRESS for DFSMSdss DUMP
- DFSMSdss RESTORE automatically expands data
  - ▶ RESTORE is invoked by IMS Database Recovery and ORS

## ▲ Benefits

- Smaller space requirements

**Performance**

**Availability**



# DBRC GENMAX and RECOVPD Enhancement

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## ▲ RECOVPD will not cause changes in GENMAX value

- RECOVPD and GENMAX will operate independently
  - ▶ GENMAX is max. number of ICs that DBRC tracks
  - ▶ DBRC keeps all ICs that are not older than RECOVPD
- Previous releases increased GENMAX when RECOVPD required more ICs

## ▲ Benefit

Usability

- Users will not have to manually reset GENMAX





# DBRC PROCOPT=L and LS Support

## ▲ DBRC will require Image Copy after initial load

- 'Image Copy Needed' flag set
  - ▶ Prevents updates which cannot be recovered
- REORG record written for each database data set
  - ▶ Prevents recovery using IC taken before initial load

## ▲ Benefits

- Improved data integrity
- Elimination of user actions
  - ▶ CHANGE.DBDS ICON
  - ▶ NOTIFY.REORG

Usability

Availability



# DEDDB I/O Error Handling

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## ▲ New way of handling write errors for DEDBs

- Write error CIs kept in memory
- Write error CIs may be read from memory
- Area not stopped after write errors for 10 CIs

## ▲ Benefits

- Increased CI availability
- Increased area availability
- Processing similar to full function

**Availability**



# DEDDB I/O Error Handling

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## ▲ IMS 6.1 handling of write errors

- Write EQE created in CI1 and kept in memory
- Data sharing partners notified
- CI is no longer available
  - ▶ Requests for CI result in 'AO' status code
- If more than 10 write errors for ADS
  - ▶ ADS is stopped
  - ▶ Area stopped if no remaining ADS



# DEDDB I/O Error Handling

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- ▲ **IMS V7 uses processes similar to full function**
  
- ▲ **Write error causes creation of EEQE and creation of I/O Toleration (IOT) buffer in memory**
  - CI stored in IOT buffer for subsequent reads and writes
  
  - CI written to log at system checkpoint
    - ▶ Buffer restored on subsequent restarts of IMS system
  
  - EEQE written in RECONs
  
  - EEQE notification sent to data sharing systems



# SDEP SCAN Expansion of Compressed Data

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## ▲ SDEPs may be compressed with segment edit/compression exit

- Previous releases did not include SCAN utility support for segment edit/compression exit
- Users could expand during scan process by using Scan exit routine
  - ▶ Different exit routine or different coding required for each compression routine

## ▲ IMS V7 eliminates need for Scan exit for expansion

- Scan utility option to invoke exit
  - ▶ Users may continue to use old techniques for compatibility

**Usability**



# Open Database Access (ODBA)

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## ▲ Available in IMS 6.1 with PQ15784

## ▲ Callable interface to IMS DBCTL or IMS TM/DB

- Similar to CICS connection to DBCTL (DRA)
- Caller is in MVS address space outside of IMS TM or CICS
  - ▶ Such as DB2 Stored Procedure

## ▲ Caller connects to IMS, schedules PSB, issues DL/I calls, commits work, ...

- Uses AIB interface
- Supports two-phase commits

## ▲ Prerequisites

- OS/390 Release 3 or later
- Resource Recovery Services (RRS/MVS)

**Usability**



# Transaction Manager Enhancements

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## IMS V7 Transaction Manager Enhancements



# CQS Enhancements

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## ▲ IMS V7 Enhancements

- Support for multiple clients
  - ▶ Achieves better utilization of the CQS address space
    - Storage
    - Problem determination
    - Operations
  
- Security checking during CQS registration
  
- Interface enhancements
  - ▶ Diagnostics
  - ▶ CQS requests

**Usability**

**Availability**





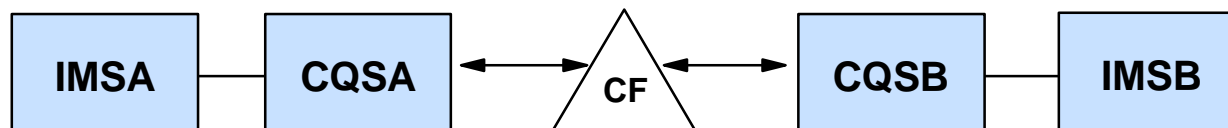
# CQS Background

## ▲ Shared Queues were introduced in IMS/ESA V6

- A set of input and output message queues (*Shared Queue Structures in a Coupling Facility*) that can be shared by multiple IMSs in a Parallel Sysplex.
  - ▶ Replace individual IMS message queues
  - ▶ Allow messages in the Shared Queue Structures to be **available to all IMSs**

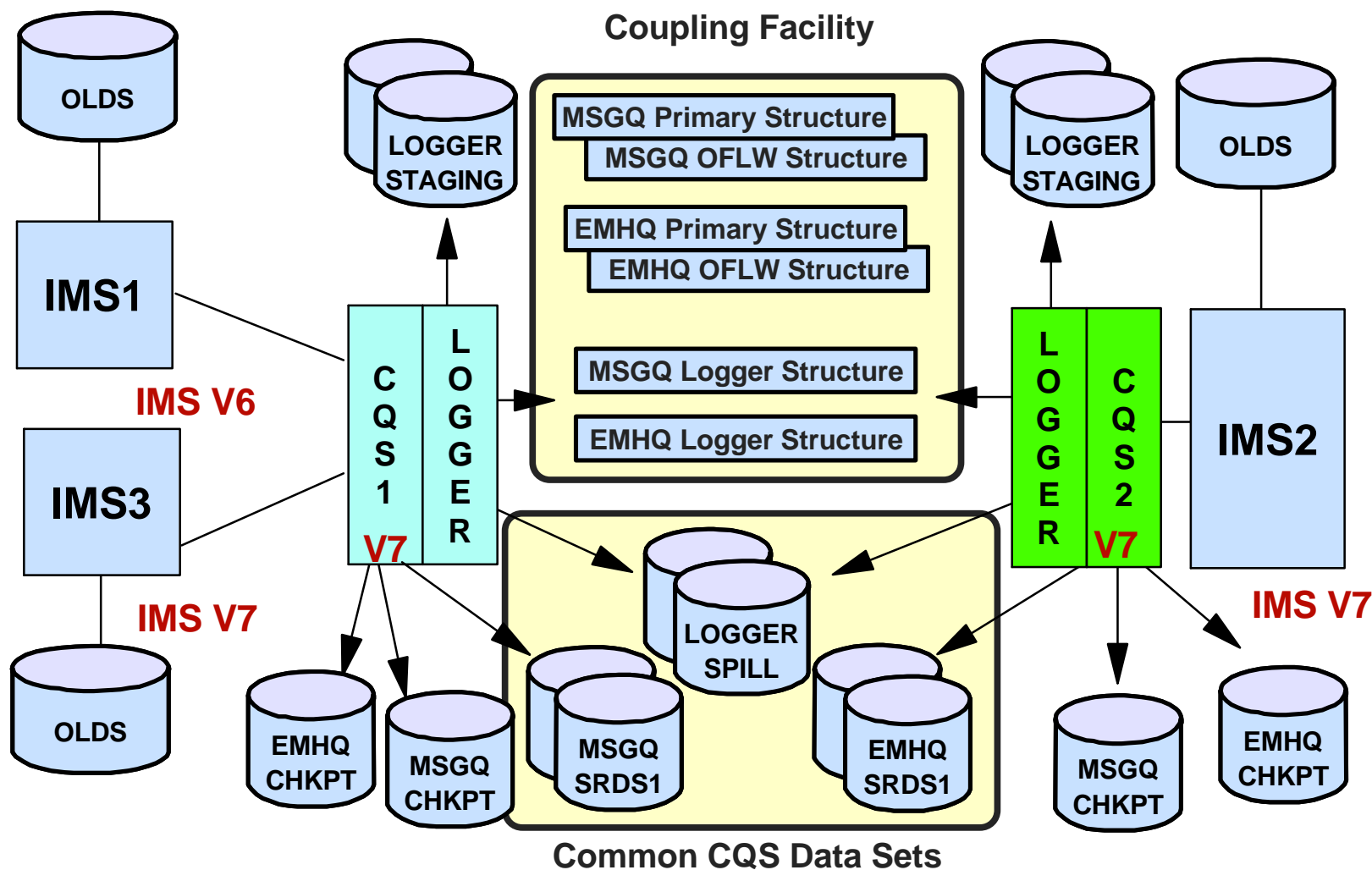
## ▲ Common Queue Server (CQS)

- Component that manages the shared queue structures on the CF
  - ▶ Connects to the shared queue structures
- Runs in separate address space connected to IMS
- Acts as server for IMS control region
  - ▶ V6 - One client (IMS) per CQS





# V7 CQS - Multiple Client Support





# Asynchronous APPC/OTMA

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## ▲ Support for Asynchronous input message processing on a Shared Queues back-end system

- APPC Asynchronous inbound requests (Allocate-Send-Deallocate)
- OTMA Commit-then-Send (commit mode 0)
- Note:
  - ▶ IMS/ESA V6 required all APPC/OTMA input messages to process on the Shared Queues front-end IMS system
  - ▶ Synchronous messages still process on the system in which they are received

**Performance**

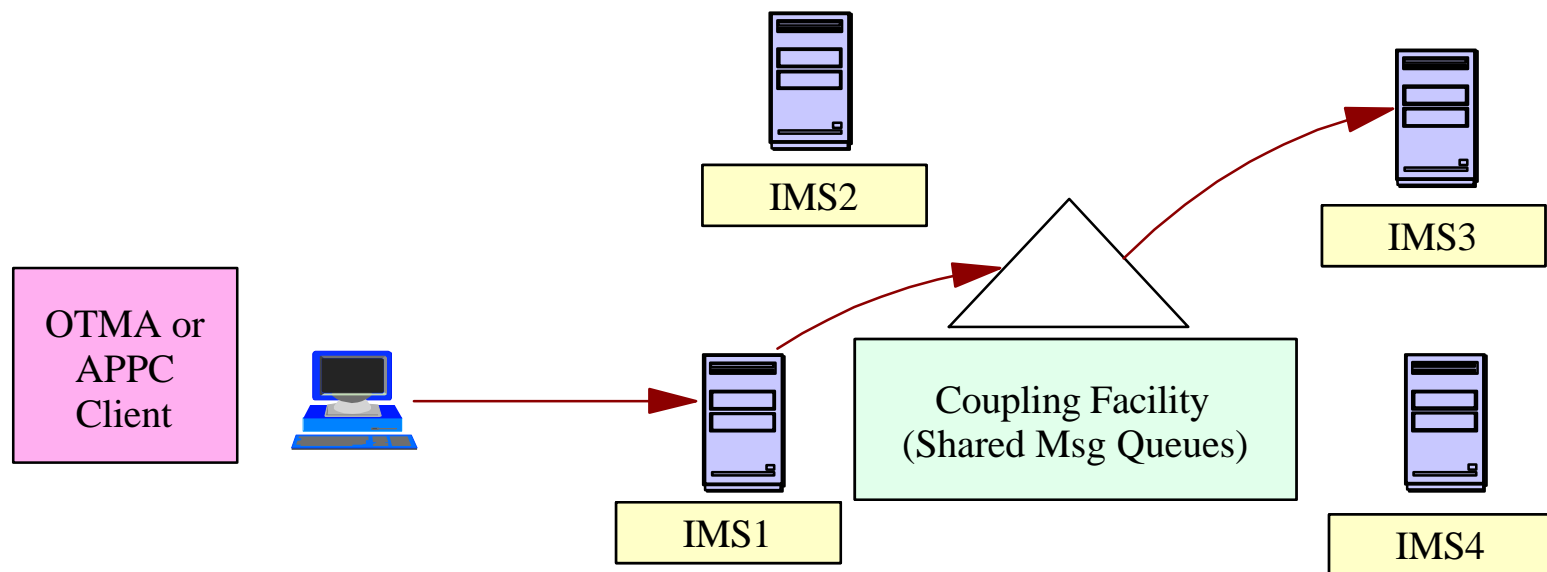
**Usability**



# IMS V7 Enhancement

▲ **Asynchronous** OTMA/APPC input messages are allowed to process on any IMS system in the shared queues group

- ▶ **Assumes** APPC/OTMA are enabled on all back-end systems



- ▶ IOPCB messages are delivered by the system which receives the input message
- ▶ ALTPCB messages are delivered by the system that processes the transaction



# DFSMSCE0

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## ▲ TM and MSC Message Routing and Control User Exit (DFSMSCE0)

- New exit that combines and replaces:

**Usability**

Terminal Routing Exit (DFSCMTR0)

Input Message Routing Exit (DFSNPRT0)

Link Receive Routing Exit routines (DFSCMLR0/DFSCMLR1)

Program Routing Exit (DFSCMPR0)

- ▶ Eases coding and maintenance by reducing the number of exit routines
  - ▶ Supports a consistent set of routing capabilities for all types of messages
- Provides the ability to attach a user prefix that follows the message and is passed to each exit interface
    - ▶ Allows the message to be customized for accounting, statistics, security, etc.



# Deferred ACB Open

## ▲ New system option to delay the opening of the VTAM ACB until IMS is ready to accept logons during /STA DC processing

- **VACBOPN = INIT | DELAY**
  - ▶ Specified in the DFSDCxxx member of PROCLIB
  - ▶ INIT - Open ACB is issued during initialization (as before)
  - ▶ DELAY - Open ACB is delayed until /STA DC
  
- Prevents potential queuing of logon requests
  - ▶ Impacts devices (e.g., ATMs during ERE) that immediately send in logon requests when IMS begins initialization

**Performance**

**Availability**



# Security Enhancements

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## ▲ Enhanced PassTicket Support (uses RACF or equivalent)

- New keyword parameter on the /SIGN ON command  
*/SIGN ON userid PassTicket APPL applname*
- Provides greater flexibility for the end-user/program
  - ▶ PassTicket creation can use IMSID (same as before)
  - ▶ PassTicket creation can use the IMS application name
- Allows the creator of PassTickets to specify the value by which it knows IMS

## ▲ New system-wide default **SAPPLID=applid** in DFSDCxxx

- ▶ Enables the use of PassTickets for VGR connections to IMS

Usability



# Security Enhancements

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## ▲ USERID Clarification

- An indicator associated with the **userid** field that defines its content
  - ▶ USERID, PSB name, LTERM name, or other
  - ▶ Added to IOPCB, INQY ENVIRON call, and exit parameter lists
    - For example, DFSBSEX0 (Build Security Environment) exit
- Provides a method that allows IMS application programs and exits to determine whether a user was signed on at the time a transaction was entered

Usability





# SLUP/Finance Session Cold Termination

## ▲ Extension to the /CHANGE NODE command for SLUP/Finance

***/CHANGE NODE*** *nodename* / *nodename\** / ***ALL COLDSESS***

- New keyword COLDSESS
  - ▶ Resets status to 'COLD'
  - ▶ Impacts devices that are **not** in session and **are** idle
  - ▶ Applicable to ETO and static terminals
  
- Allows a forced reset of terminals via command if an unrecoverable STSN sequence number mismatch occurs during system warm start
  
- Allows applicable ETO control blocks to be cleaned up at next system checkpoint

**Availability**



# Spool Enhancements

## ▲ Internal change to the way EOF markers are written to spool data sets

- Improves spool performance by reducing EOF writes from one per record to one per track

**Performance**

## ▲ A new **IMSWT = yyyyy** parameter in **DFSDCxxx**

- Identifies the first 5 characters to use when auto scheduling the spool print utility
- Example:
  - ▶ **IMSWT=IMSA** causes IMS to issue: `/STA REGION IMSA000` command to print the first spool line data
  - ▶ If **IMSWT=** is not coded, **IMSWT** is used as a default

- Facilitates the use of cloned IMS SYSGENs and PROCLIBs in a Parallel Sysplex environment
  - ▶ Each IMS generates correct spool print JCL

**Usability**



# Queue Space Notification Exit (DFSQSPC0)

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## ▲ Enhancement to the existing exit interface

- Allows IMS to pass a stopped status to DFSQSPC0 for conversational transaction destinations

## ▲ Benefit

- Prevent looping applications from impacting the message queue for stopped conversational transaction destinations



# SLU2 Enhancement

---

## ▲ New DFSDCxxx option: **SLU2=EXR/NOEXR**

- Specifies whether or not to suppress the SNA exception response prior to sending a DFS error message during error recovery processing
- Addresses Program check/keyboard lock for SLU2 devices that implement DFT (Distributed Function Terminal) architecture
  - ▶ Applies to static and ETO terminals

**Usability**



# ETO Enhancements

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▲ **Descriptor Limitation (50 records per descriptor) has been removed**

▲ **Associated Print Support enhancements**

- Allows more timely delivery of output messages for Associated Printers regardless of where the transaction is processed in a Shared Queues environment

▲ **Autologon**

- Enhancements for Associated Printers
- Dynamic terminals activated via /OPNDST
- New keywords in the /CHANGE command
  - ▶ Update autologon information, e.g., Mode
  - ▶ SAVE|NOSAVE across restarts

**Usability**



# ETO Enhancements...

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## ▲ LTERM Assignment

- Allows users and LTERMs to be moved between printers more easily
  - ▶ Assignments can persist across session and system restarts

**Usability**



# OTMA Callable Interface

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## ▲ Introduced in IMS/ESA V6 via APAR PQ17203

- Part of Base IMS V7

## ▲ A high-level C/C++ API interface for OS/390 applications and subsystems

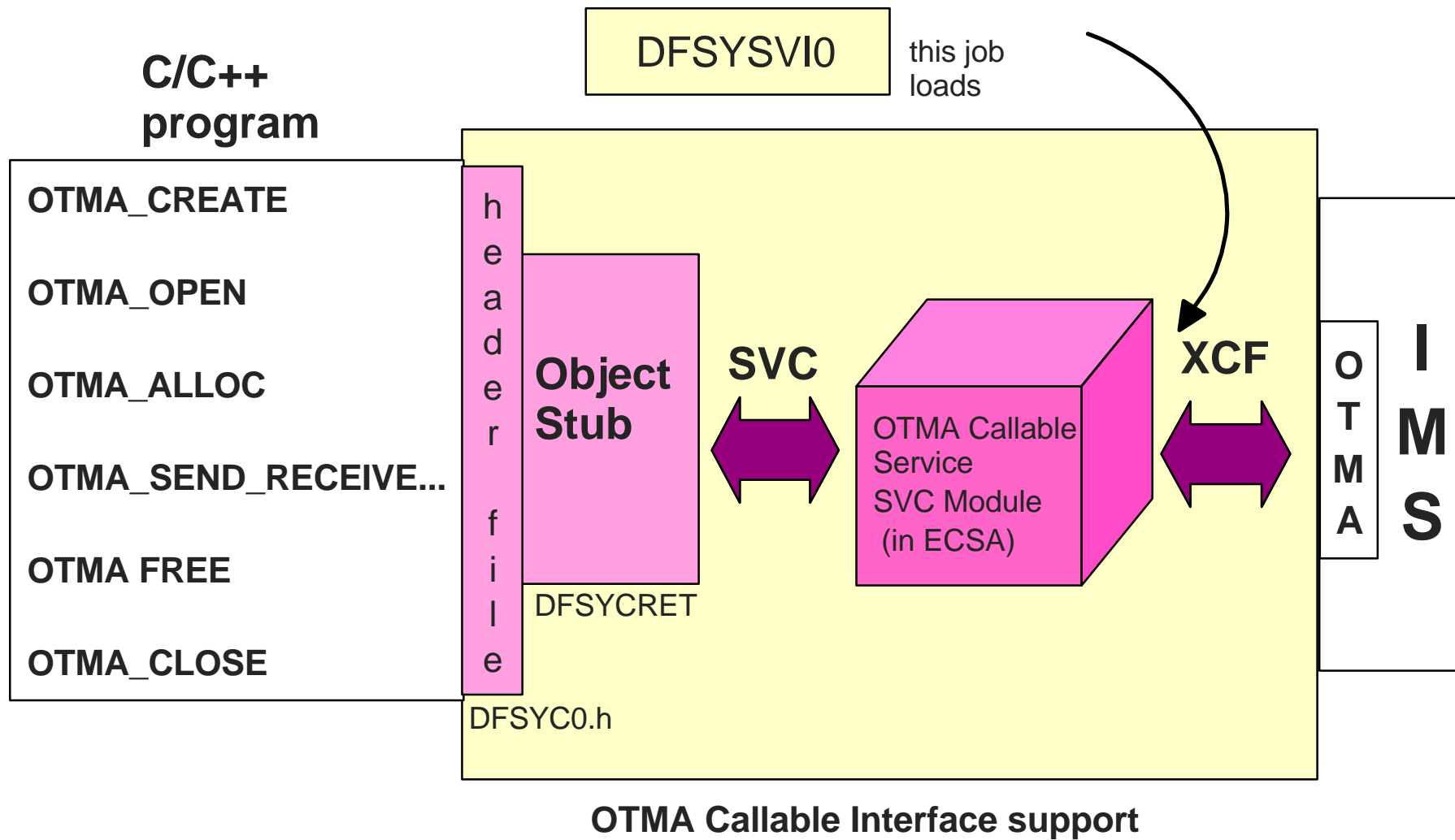
- Provides access to IMS transactions and commands
  - ▶ Through the Open Transaction Manager Access (OTMA) interface
- Provides a high-level interface for non-authorized and authorized programs to invoke OTMA facilities
  - ▶ Facilitates the coding of an OTMA client
  - ▶ Hides the complexity of XCF and OTMA

Usability

Availability



# OTMA CI Control Flow







# VTAM Generic Resources Enhancements

## ▲ IMS DFSDCxxx options: GRAFFIN and GRESTAE

Availability

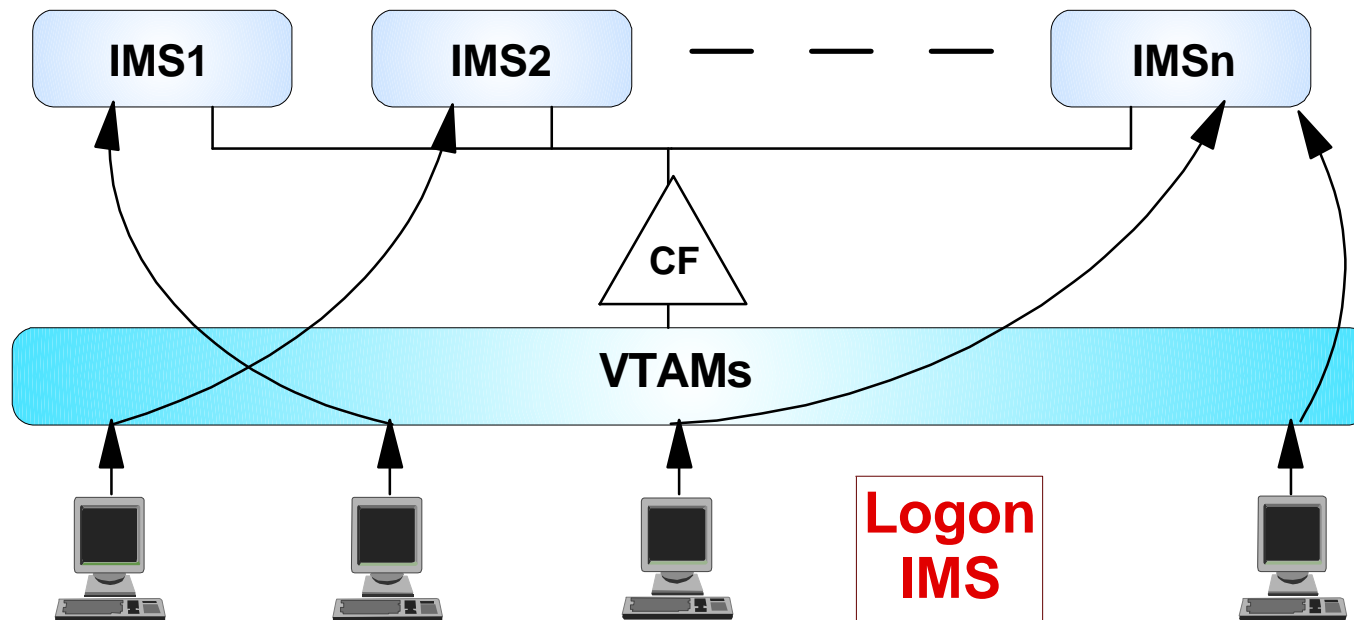
- Delivered via APAR PQ18590 in IMS/ESA V6
- Part of Base IMS V7
- Greater control over access availability to any IMS when failures occur
- **GRAFFIN = IMS | VTAM**
  - ▶ System option that specifies which component is to manage the Generic Resource affinities
- **GRESTAE = Y | N**
  - ▶ System option that defines whether or not IMS should reset affinities (CLSDSTs) during ESTAE processing
  - ▶ Applies to GRAFFIN=IMS

Usability

Note: MSC does not use VGR (sessions specify APPLID)



## Background - VGR ...



- All IMSs in the Sysplex join a **Generic Resource Group**
- IMS user logs on to a **Generic Resource Name** for the IMS Sysplex
- VTAM connects the user to one of 'n' IMS **Members** of the Group



## Background - VGR ...

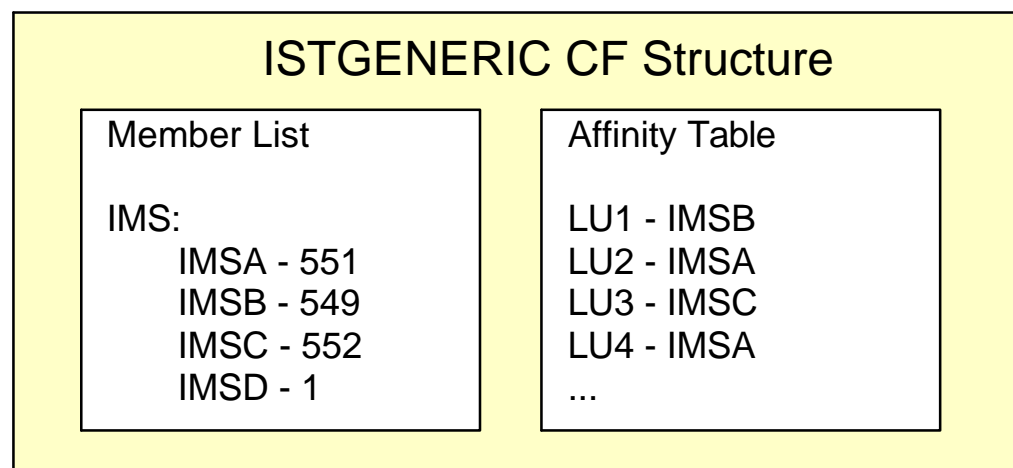
### AFFINITY: A mapping of an LU to a specific member (IMS)

#### ▲ Affinity is set when a session is first established

- VTAM maintains the **affinity table** in ISTGENERIC

#### ▲ When an LU requests a session using the GRSNAME

- VTAM checks to see if an affinity exists
  - ▶ If one exists, the session request is routed to that member
  - ▶ Otherwise, VTAM chooses one of the members
    - Special considerations for ISC





# GRAFFIN=IMS

---

## ▲ Affinity deletion may occur at session termination

- Special treatment for ISC, SLUP/Finance, ETO
- Special treatment for LUs that have a VGR-related status
  - ▶ Conversation mode, full function response mode, FP response mode, exclusive mode, test or MFS mode, preset mode
  - ▶ User-written exits (DFSSGFX0 and DFSLGFX0) can reset status

## ▲ Affinities are not (cannot be) deleted for MVS/CEC/VTAM failures

- IMS ESTAE not driven and affinities still exist when IMS is restarted

## ▲ If affinity is not deleted at session termination

- Next logon to generic name establishes session with existing affinity
- May need to wait for an IMS restart



# GRAFFIN=VTAM

---

## ▲ **Non-ISC affinities are reset at failure:**

- CEC, MVS, IMS/ESA, VTAM, and Network/Session terminations
- VGR-related status conditions are automatically reset by IMS
- Terminal sessions can be reestablished immediately with any surviving IMS in group

## ▲ **ISC affinities continue to be managed by IMS regardless of GRAFFIN**



# Rapid Network Reconnect (RNR)

Availability

## ▲ RNR implements VTAM persistent session support

- Higher availability and reduced overhead
  - ▶ Quickly reestablishes VTAM sessions following system outages (IMS, MVS, CEC or VTAM)
- Eliminates session cleanup/restart following an outage

## ▲ New IMS option PSTIMER

- Specifies time VTAM waits for recovery of the persistent session before terminating sessions

## ▲ New IMS option RNR = NRNR | ARNR

- ▶ ARNR - automatic session reconnect
- ▶ NRNR - no reconnect

## ▲ Prerequisite - OS/390 V2R5, ACF/VTAM V4R4.1 (HVT4411)



# Background

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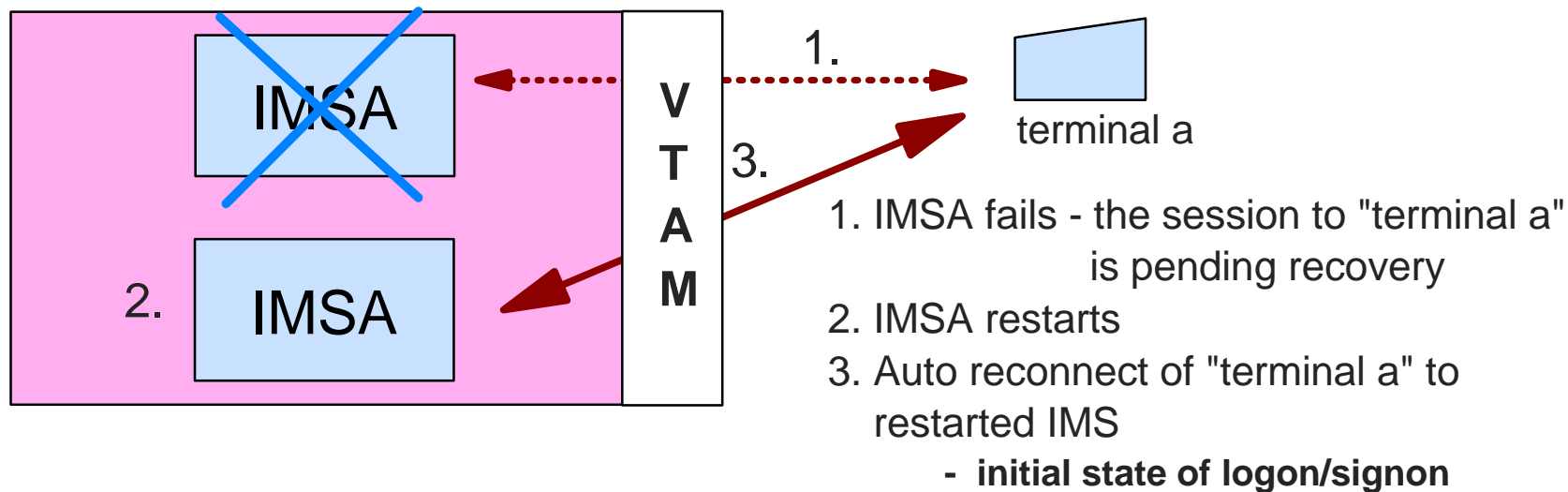
## ▲ Persistent Sessions

- VTAM Single-Node Persistent Session (SNPS)
  - ▶ Reconnect must be on same CEC as original IMS
  - ▶ Supports only application (IMS) failure/reconnect
  
- VTAM Multinode Persistent Session (MNPS)
  - ▶ Reconnect may be on another CEC in a sysplex
  - ▶ Supports failures/reconnects, including IMS, VTAM, MVS, and CEC failures
  
- Applies to VTAM nodes supported except MSC
  - ▶ Persistent session support for APPC is provided by APPC/MVS



# Background ...

## Single Node Persistent Session Scenario



Signon required after reconnect for:  
 SLU0 - 3270 non-SNA  
 SLU1 - non-printer only  
 SLU2  
 NTO

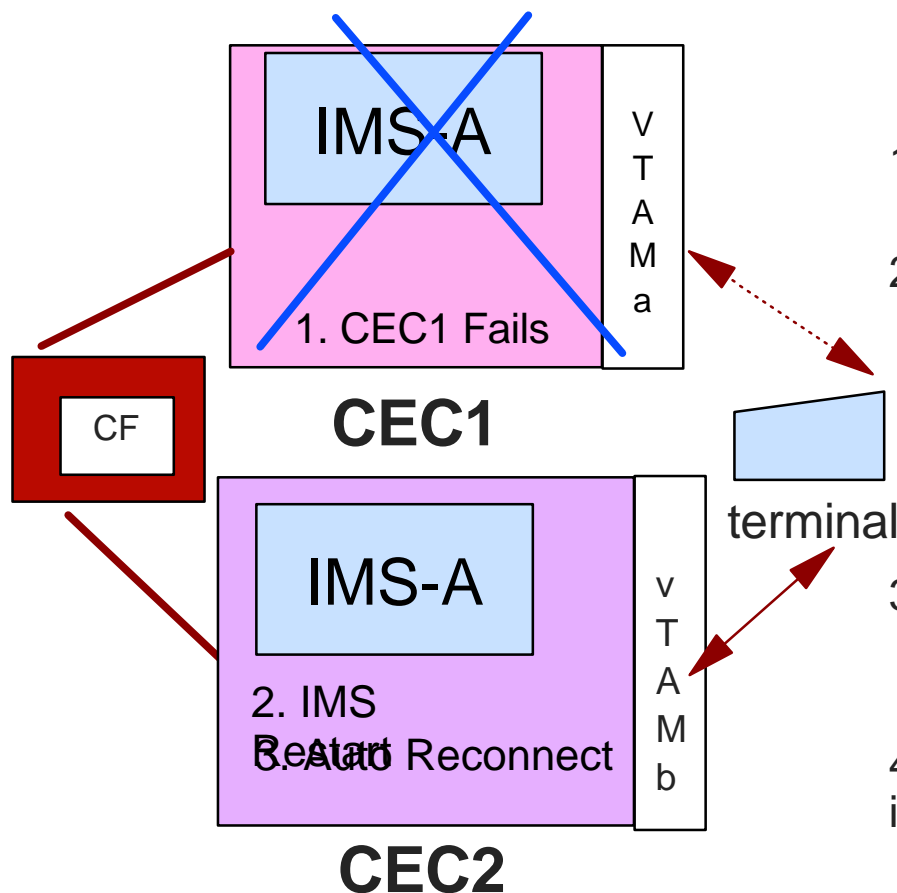
Signon automatically reestablished for:  
 SLU0 - FINANCE/3600, SLUP  
 LU6.1 - ISC  
 SLU1 - Printer only





# Background ...

## Multinode Persistent Session Scenario



1. VTAM stores session data in the CF
2. CEC1 fails
  - Another VTAM in the Parallel sysplex detects the error
  - Each VTAM connected to the CF structure starts a PSTIMER
3. Through operator intervention or ARM IMS is restarted on CEC2
4. The sessions are restarted using information saved in the CF structure
  - Terminal is reset to initial state of logon/signon**



# Background - Requirements

## ▲ VTAM V4R4

- VTAM APPL definition

```
IMSPROD  APPL  ACBNAME=IMSPROD
...
          PERSIST= SINGLE | MULTI
...
```

## ▲ If VTAM MNPS is used:

- VTAM end nodes must be running with APPN/HPR
  - ▶ HPR (High Performance Routing) network environment
- All VTAMs must be connected to a coupling facility
  - ▶ Parallel Sysplex environment
  - ▶ Coupling Facility structure - ISTMNPS



# RNR - Highlights...

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## ▲ IMS Rapid Network Reconnect (RNR=)

- If specified, **always** establishes persistent sessions
- **/START DC** following IMS restart initiates RNR action

Two IMS levels of RNR support on a terminal level:

### **RNR=ARNR**

Automated session reconnect

### **RNR=NRNR**

CLSDST scheduled

Forced for MSC/VTAM



# PSTIMER

---

## ▲ DFSDCxxx execution option: PSTIMER= 0/86400

- Specifies time VTAM waits for recovery of the persistent session before terminating sessions
  - ▶ 0 = no timer used (24 hours)
  - ▶ 1-84600 seconds (up to 24 hours)
  - ▶ IMS default = 3600 seconds (1 hour)
  - ▶ Null or invalid value = IMS default

VTAM start option (HPRPST) for MNPS will override PSTIMER if HPRPST is less than PSTIMER



# Terminal User / Remote Program

---

## ▲ At IMS, VTAM, CEC, or MVS failure, session persistence takes effect

- ARNR
  - ▶ Session is suspended until /STA DC
  - ▶ Session is reconnected
    - DFS3649 (signon) or DFS3650 (terminal connected) as appropriate
  - ▶ If session cannot be reconnected, an error message is sent to the MTO
  
- NRNR
  - ▶ Session is suspended until /STA DC
  - ▶ Session is terminated
  - ▶ Affinities are reset as appropriate
  - ▶ Terminal user can log back on



# APPC Persistent Sessions

## ▲ Persistent session support is provided by APPC/MVS

- Sessions are persistent, conversations are not
- SYS1.Parmlib (APPCPMxx)

```
LUADD
  ACBNAME (IMSLUA)
  SCHED (IMSA)
  BASE
  TPDATA (SYS1.APPCTP)
  PSTIMER (3600)
```

PSTIMER indicates the length of time that the sessions persist.  
The VTAM definition for IMSLUA has PERSIST=SINGLE | MULTI.



# IMS Connect

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## ▲ New feature in IMS V7

## ▲ Includes the IMS TCP/IP OTMA Connection (ITOC) capability

### ■ Enhancements:

- ▶ SMP Installability
- ▶ Persistent Sockets
- ▶ Asynchronous Support
- ▶ Initialization Exit
- ▶ Dump Formatting capability

**Usability**

**Performance**

**Availability**



# IMS Version 7

---

## ▲ System Enhancements

- ▶ Install/IVP process
- ▶ System Parameters display
- ▶ CPLOG specification
- ▶ Concurrent upgrade of RECONs
- ▶ Online RECON access preference
- ▶ RECON loss notification
- ▶ IMS Monitor and IMS PA enhancements
- ▶ ACBGEN processing and limits

## ▲ Database Enhancements

- ▶ High Availability Large DB (HALDB)
- ▶ Online Recovery Service (ORS)
- ▶ Change Accum enhancements
- ▶ Image Copy 2 compression
- ▶ DBRC GENMAX and RECOVPD
- ▶ DBRC PROCOPT=L|LS support
- ▶ I/O error handling for DEDBs
- ▶ DEDB Scan segment expansion
- ▶ Open DB Access (ODBA)





# IMS Version 7

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## ▲ Transaction Manager Enhancements

- ▶ CQS Enhancements for Shared Queues
- ▶ Asynchronous OTMA/APPC
- ▶ TM and MSC Message Routing and Control User Exit
- ▶ Deferred VTAM ACB open
- ▶ RACF PassTicket support
- ▶ USERID clarification
- ▶ SLUP/Finance Session Cold Termination
- ▶ Spool enhancement
- ▶ Queue Space Notification Exit enhancement
- ▶ SLU2 enhancement
- ▶ ETO Enhancements
- ▶ Callable Interface to OTMA
- ▶ VTAM Generic Resources enhancements
- ▶ Rapid Network Reconnect (RNR)
- ▶ IMS Connect

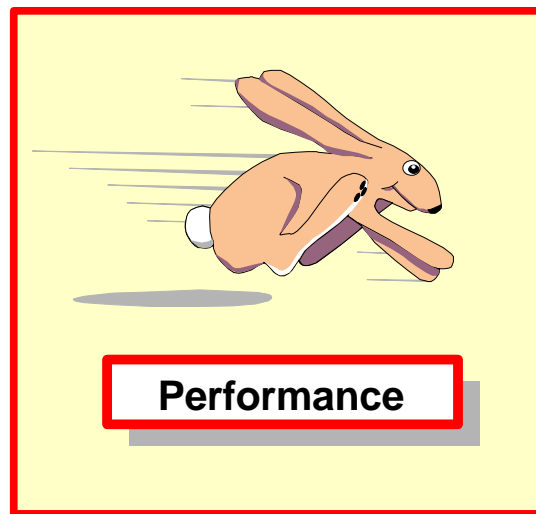


# IMS Version 7



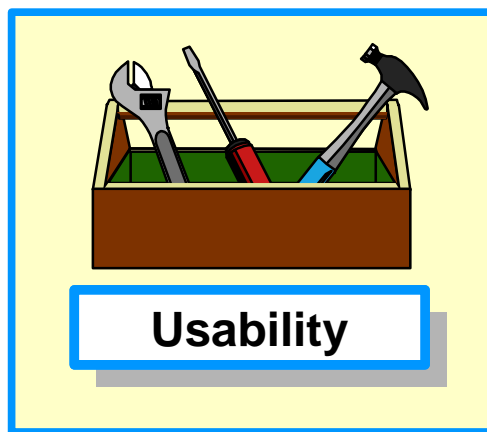
**Availability**

- HALDB
- ORS
- RNR
- VTAM Gen. Resources
- DBRC
- Change Accum
- IC2
- DEDB I/O error handling
- SLUP/Finance Session Cold Termination
- ...



**Performance**

- HALDB
- ORS
- DBRC
- Change Accum
- ACBGEN
- Async OTMA/APPC
- Deferred ACB Open
- ...



**Usability**

- HALDB
- ORS
- ODBA
- Install/IVP
- IMS Connect
- DBRC
- ACBGEN
- Change Accum
- RACF PassTicket
- ...