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Technical Introduction to IMS Version 8

Bill Stillwell

IBM Dallas Systems Center



Introduction to IMS Version 8

This is the first of three presentations intended to provide an overview of the enhancements made available with IMS Version 8.

Enhancements addressed in these presentations fall generally into one or more of the following categories

- ▶ Availability and recovery
- ▶ Performance and capacity
- ▶ Application development
- ▶ Parallel sysplex exploitation
- ▶ Systems management

IMS V8 Contents

Availability and Recovery

- ▶ DBRC enhancements
 - 16MB RECON record size
 - PRILOG compression
 - RECON command authorization support
 - Automatic RECON loss notification

- ▶ Database Image Copy 2 enhancements

- ▶ ORS enhancements

- ▶ IMS/DB2 coordinated disaster recovery support

- ▶ Dynamic allocation of SLDS after IMS restart

- ▶ Batch Resource Recovery Services (RRS) support

IMS V8 Contents ...

Performance and Capacity

- ▶ Parallel database open processing at restart
- ▶ Fast path DEDB enhancements
 - Support for 2048 areas
 - Support for Non-recoverable DEDBs
- ▶ VSCR for common areas (CSA and PVT)

IMS V8 Contents ...

Applications

- ▶ Java
 - JVM Dependent Regions
 - Java Classes
 - IMS Connector for Java

- ▶ Dynamic LE runtime parameters

IMS V8 Contents ...

Systems

- ▶ APPC
 - Dynamic descriptors
 - Outbound LU support
 - CPU time limit for CPI-C transactions

- ▶ Syntax checker

- ▶ Dynamically allocate and read SLDS when needed after IMS restart
 - Available in V7 via SPE PQ50657

- ▶ Transaction trace

IMS V8 Contents ...

Parallel sysplex enhancements to existing function

- ▶ Coupling facility structure management
 - System managed duplexing
 - Systems managed rebuild
 - Automatic alter of structure size and entry-to-element ratio
 - Applies to
 - Fast path shared VSO structures
 - Shared queue structures
 - New CSL resource structure

- ▶ Synchronous APPC and OTMA shared queue support
 - IMS V7 provided support for asynchronous APPC/OTMA SQ support

IMS V8 Contents ...

New and Improved IMS Architecture

- ▶ Common Service Layer (CSL)

- ▶ New address spaces
 - Structured Call Interface (SCI)
 - IMSplex member registration
 - Communications between IMSplex members
 - Operations Manager (OM)
 - IMSplex-wide command entry
 - Resource Manager (RM)
 - Global resource management

- ▶ New function supported in IMSplex
 - Sysplex Terminal Management (STM)
 - Single Point of Control (SPOC)
 - Coordinated Global Online Change (G-OLC)

Agenda

There are three parts to these presentations

▶ **Part I a - Base Enhancements**

- These are enhancements which may be applicable to all IMS V8 users, including those not using parallel sysplex functions in IMS

▶ **Part I b - Parallel Sysplex Enhancements**

- These are enhancements to IMS's current use of parallel sysplex functions

▶ **Part II - Common Service Layer**

- This is new function in IMS V8 and represents an extension to the IMSplex architecture for systems management

▶ **Part III - Installation and Migration Considerations**

- This part is for reference purposes only; it is not presented



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Part 1a - IMS Version 8 Base Enhancements Highlights



IMS V8 Highlights

Enhancements to ...

- ★ Base IMS product without parallel sysplex
 - Database Manager
 - Transaction Manager
 - Systems
 - Applications


Enhancements to ...

- ★ Parallel Sysplex
- ★ Common Service Layer



Large RECON Record Size

IMS outages could be required because RECON records would exceed VSAM maximum record size

- ▶ PRILOG (family of) records 
 - Entries for all archived logs
 - PRILOG compression not always effective
- ▶ DBDS record
 - DASD/CU problems may result in many I/O errors and EEQEs
- ▶ SUBSYS record
 - Large number of authorized databases
- ▶ LOGALL record
 - Large number of data sets with updates on log

Warning message DSP0278W - then U0071 if not corrected

- ▶ LOGALERT and SIZALERT provide warnings

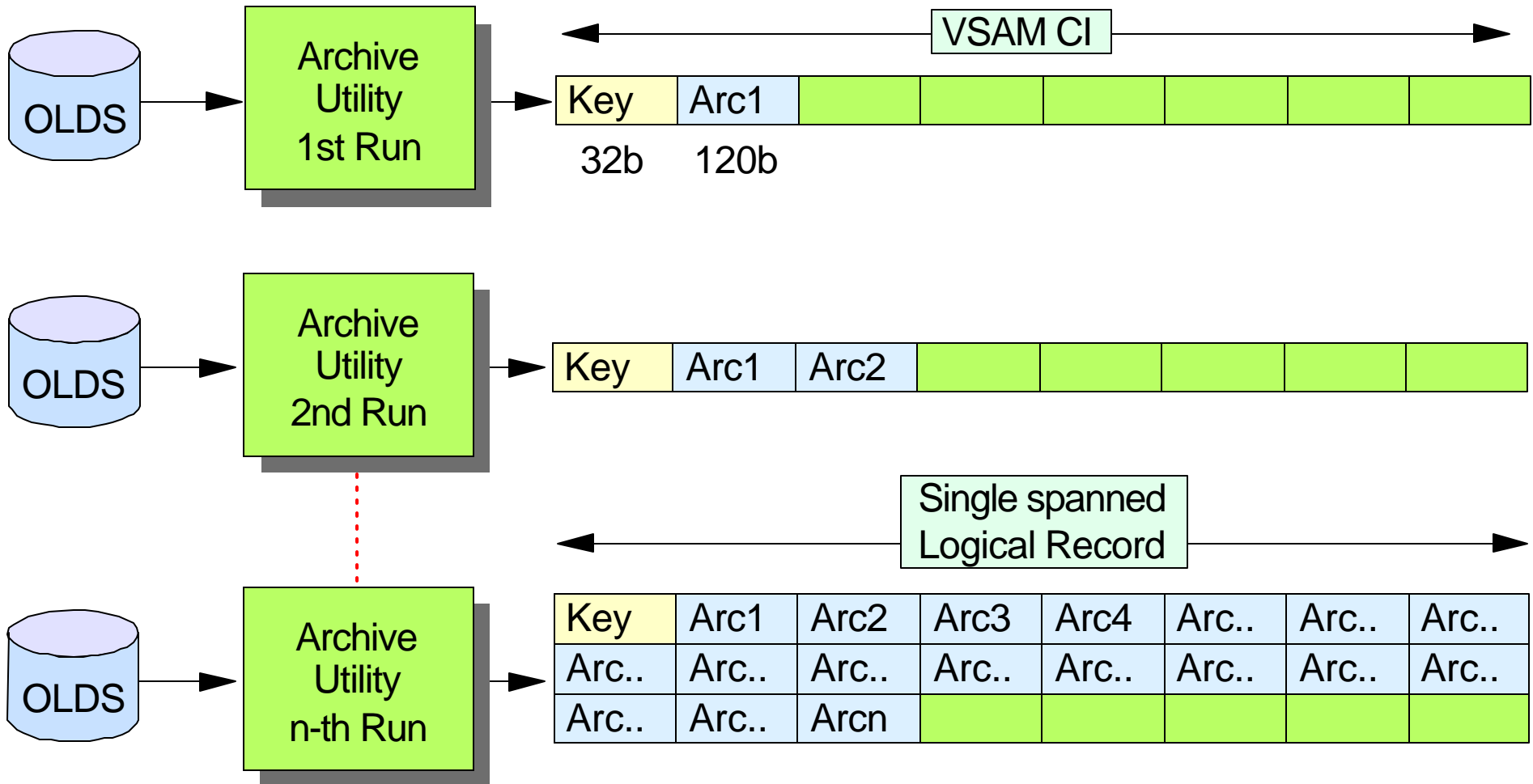
16MB RECON Record Size

Large maximum record sizes are needed to extend IMS continuous availability

- ▶ Pre-V8 used VSAM spanned records
- ▶ Maximum record size limited to Control Area size
 - Typically one DASD cylinder (about .75 MB)
- ▶ Prevented RECON backup to tape if >32K
 - Had to back up to another KSDS

RECON PRILOG Record Size

RECONs defined to VSAM with SPANNED records and large maximum RECORDSIZE (up to CA size)



etc.

As one CI is filled, VSAM "spans" logical record across CI s up to maximum record size. If PRI LOG record fills up, must shut IMS down (or U0071).

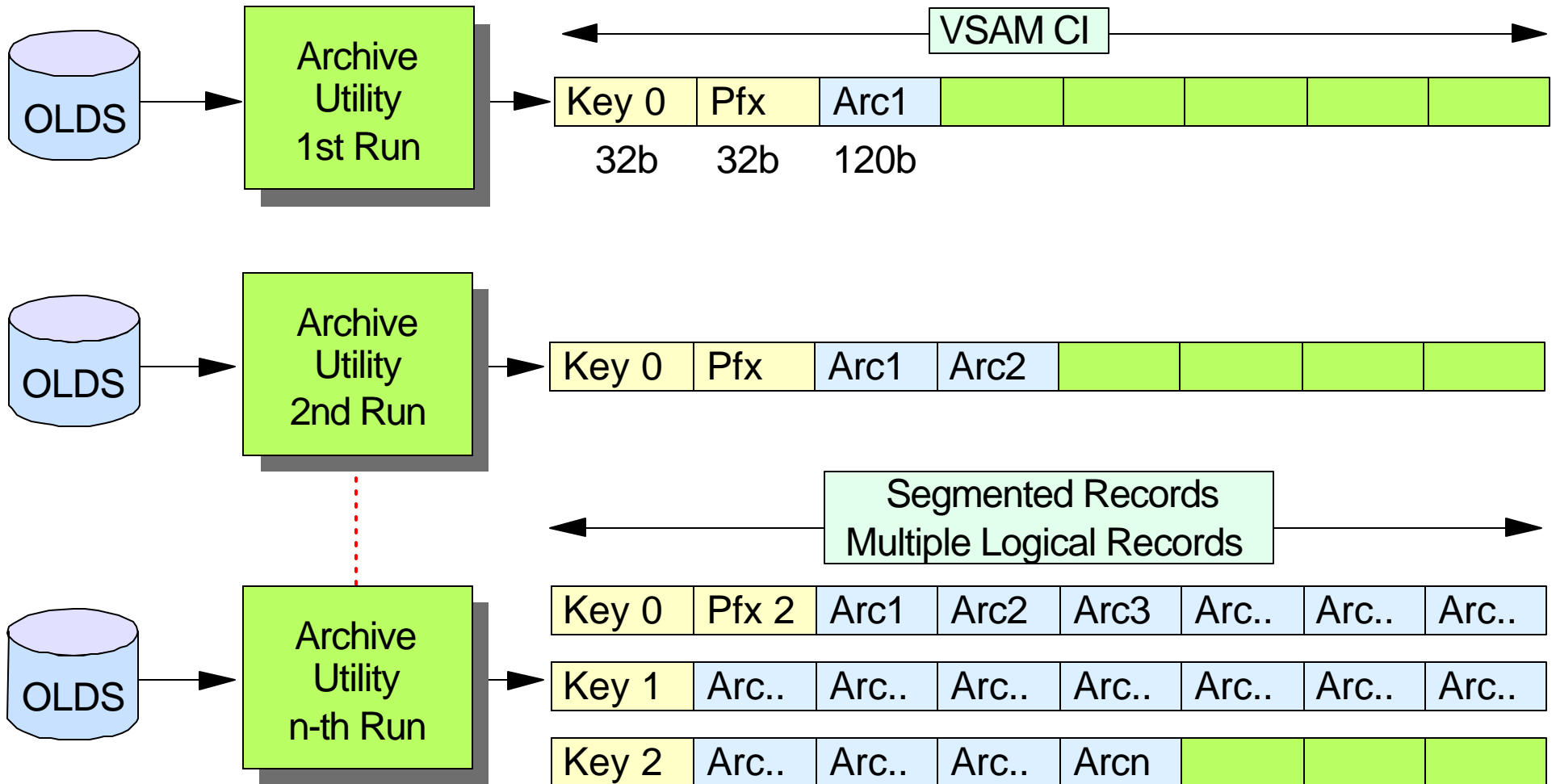
16MB RECON Record Size

IMS V8 uses "segmented" records instead of VSAM spanned records

- ▶ Controlled by IMS
 - Not limited by VSAM maximum record size or control area size
- ▶ Records are divided into multiple segments - 1/CI
 - Last two bytes of KEY is Segment #
 - First segment contains DATA PREFIX with last Segment #
- ▶ Maximum total size of all segments - 16MB
 - More than 100,000 single volume archived data sets

16MB RECON Record Size ...

RECONs may be defined to VSAM
without spanned records



As one CI is filled, DBRC creates another "segment"
and writes it to VSAM as another logical record.
Data prefix in 1st segment identifies last segment.

16MB RECON Record Size ...

Migration considerations

- ▶ IMS V8 supports RECONs with differing CI/record sizes
 - Can change one RECON at a time
 - Not recommended to be permanent
 - Requires additional overhead for segmenting
- ▶ RECON I/O Exit (DSPCEXT0)
 - Complete unsegmented record passed to exit
 - May be much larger than before (up to 16MB)
 - Length passed in standard parameter list
- ▶ May want to adjust LOGALERT and SIZALERT
 - Based on 16MB size - not VSAM maximum record size
- ▶ LIST.RECON displays current PRILOG record size
- ▶ SPEs available for V6 and V7
 - Will read and write segmented records, but ...
 - Still limited to maximum record size specified to VSAM
 - CI and logical record sizes must still be the same for all RECONs

PRILOG Compression

In previous releases

- ▶ PRILOG compression is attempted
 - When record reaches 50% of maximum record size
 - When record reaches 75% of maximum record size
 - When DELETE.LOG INACTIVE is issued

In IMS V8

- ▶ PRILOG compression is attempted on every archive, and when DELETE.LOG INACTIVE command entered

- ▶ If compression attempt removes no data set entries

DSP1150I LOG RECORD(S) COULD NOT BE COMPRESSED,

RECORD TIME = timestamp

reason type = timestamp

- ▶ Reason types: EARLIEST ALLOC TIME, LOG RETENTION TIME, or EARLIEST CHECKPOINT

New

New

PRI LOG Compression ...

Periodically, DBRC will attempt to remove unneeded logs from the PRI LOG record, freeing up space.

Key 0	Pfx 2	Arc1	Arc2	Arc3	Arc..	Arc..	Arc..
Key 1	Arc..	Arc..	Arc..	Arc..	Arc..	Arc..	Arc..
Key 2	Arc..	Arc..	Arc..	Arcn			

DELETE.LOG INACTIVE

Key 0	Pfx 1	Arc7	Arc8	Arc9	Arc..	Arc..	Arc..
Key 1	Arc..	Arc..	Arc..	Arc..	Arcn		

Three conditions will prevent PRI LOG compression

1. Log still needed for potential database recovery (oldest image copy older than log start time)
2. DBRC log retention time not expired
3. Log needed for /NRE BUILDQ (last SNAPQ or cold start on this log)

DBRC Command Authorization

Security support for DBRC commands

- ▶ Commands can be authorized
 - At the command verb level
 - For example, the **CHANGE** command
 - At the verb + resource type level
 - For example, the **CHANGE.DB** command
 - At the verb + resource type + resource name level
 - For example, the **CHANGE.DB DBD(ACCTDB)** command
- ▶ Security profiles may differ for different RECONs
- ▶ Security is invoked only for commands issued from DBRC Utility (DSPURX00) or HALDB Partition Definition Utility
 - Use IMS command security for /RMx commands

DBRC Command Authorization ...

Invoking Command Authorization

- ▶ Activate using DBRC command

```
CHANGE.RECON CMDAUTH(SAF|EXIT|BOTH|NONE,safhlq)
```

- **SAF** - invoke security product (e.g. RACF)
 - **EXIT** - invoke DBRC Command Authorization exit routine (DSPDCAX0)
 - **BOTH** - invoke both security product and exit routine
 - **NONE** - do not invoke command authorization

 - **safhlq** - RECON high level qualifier (e.g. IMSP)
 - To distinguish between different RECONs in RACF
 - 1 to 8 characters
 - Must be specified with SAF, EXIT, or BOTH
 - Cannot be specified with NONE
-
- ▶ **LIST.RECON** displays current settings

DBRC Command Authorization ...

RACF Definitions

- ▶ Uses FACILITY resource class
 - RDEFINE FACILITY resource UACC(NONE)
 - resource is safhlq.command-verb.resource-type.resource-name
- ▶ Users must be given READ access to command resource
 - PERMIT resource CLASS(FACILITY) ID(user_id) ACCESS(READ)

Example

```
REDEFINE FACILITY IMSP.GENJCL.RECOV.ACCTDB UACC(NONE)  
  
PERMIT IMSP.GENJCL.RECOV.ACCTDB CLASS(FACILITY)  
ID(LONNIE) ACCESS(READ)
```

DBRC Command Authorization ...

DBRC Command Authorization Exit (DSPDCAX0)

- ▶ Optional
- ▶ May deny authorization

```
DSP1154I    DBRC COMMAND AUTHORIZATION DENIED BY  
DSPDCAX0 FOR USER userid  
RESOURCE NAME = hlq.verb.type.name    RC = rc
```

- ▶ May be used with security product (RACF, etc.)
 - Security product is invoked first
 - SAF return code and RACF return code/reason code are passed to exit routine
 - Exit may override security product

Automatic RECON Loss Notification

RECON reconfiguration

- ▶ When a RECON fails, the first DBRC to recognize failure copies good RECON to SPARE
- ▶ Other DBRCs (e.g. batch or utility running with DBRC) switch the next time they access RECONS
 - Cannot delete and redefine new SPARE until all DBRCs deallocate bad RECON
 - May be a long time if in use by batch job
 - No way to force DBRC to access RECONS (except for online DBRC)

Version 8

- ▶ When DBRC registers with Structured Call Interface
 - All DBRCs notified as soon as error detected
 - All DBRCs switch to good RECON and deallocate bad RECON
 - Lets user reestablish SPARE quickly
- ▶ Structured Call Interface is part of Common Service Layer (discussed later)

DEDDB Enhancements

DEDDB size

- ▶ Support for more than 240 Areas
 - DEDBs can now be defined with up to 2048 Areas
 - 2048 * 4GB = 8TB
 - Just add additional SEGM statements to DBD
- ▶ No change to DEDDB application interface
- ▶ Some migration considerations
 - DEDB randomizer "may" have to be updated to handle larger number of areas passed to randomizer
 - DBFHDC40/44 continue to work without change
 - Log record DSECTs have changed to support 2-byte area number
 - May require changes to user (or vendor) written code
- ▶ Fallback
 - Be careful. Cannot fall back to earlier version with more than 240 areas

DEDB Enhancements ...

Non-recoverable DEDBs

INIT.DB or CHANGE.DB DBD(dbdname) NONRECOV ...

- Applies to entire database
 - Not area-specific
- Database changes (x'5950') not logged
 - Reduces log volumes
- If area updated during sync interval
 - IMS writes x'5951' log record
 - Used by emergency restart to warn against possible corruption
 - **DFS3711W Norecoverable DEDB integrity warning**
DEDB=dbdname AREA=areaname
- Especially useful for work databases, scratch pad databases, temporary databases
- Supported for VSO and Non-VSO, shared and non-shared
- Not supported for DEDBs with SDEPs
 - **DFS3711A Nonrecoverable DEDB authorization error**
DEDB=dbdname AREA=areaname

DEDB Enhancements ...

Shared VSO

- ▶ Shared VSO requires coupling facility cache structures
 - User-managed duplexing supported
- ▶ V8 now takes advantage of new XES functionality to support
 - System-managed rebuild
 - Move a structure from one CF to another
 - Requires CF Level 9
 - System-managed duplexing
 - Can be used to replace user-managed duplexing now supported for shared VSO areas
 - Requires z/OS 1.2 or later
 - Requires CF Level 11 if CF is 9672
 - Requires CF Level 12 if CF is zSeries
 - Autoalter
 - System may automatically alter structure size; be careful of this one when using non-preloaded areas
 - More discussion on these later

Image Copy 2

I C2 introduced in IMS V6

- ▶ Dynamically invokes DFSMSdss to perform "concurrent copy"
 - CC must be supported by control unit (e.g. 3990 or Shark)
- ▶ Minimizes down-time for databases to perform "clean" image copy
 - /DBR DATABASE
 - Not required if fuzzy image copy wanted
 - Perform logical copy (a matter of seconds)
 - Creates "bit map" of data set tracks in control unit
 - Returns "logical copy complete" message
 - /START DATABASE
 - When track updated, turn on bit, copy before image to cache
 - Perform physical copy
 - Copy tracks to output data set
 - If track bit turned on, copy before image

Image Copy 2 ...

Enhanced in V8

- ▶ Can copy multiple database data sets in one execution of IC2
 - Logical and physical copies performed in parallel
- ▶ Can copy groups of DBDSs (e.g. DBDSGRP)
 - All DBDSs in group are copied in parallel
 - Single message reports when all logical copies are complete
 - OK to /START databases
- ▶ Supports additional DFSMSdss options
 - OPTIMIZE 1 | 2 | 3 | 4 (selectable by user)
 - SAMEDS (multiple image copies to same output data set)
- ▶ DBRC support
 - GENJCL.IC GROUP(FNCLGRP) SMSNOCIC(C,2) ONEJOB
- ▶ ORS support

Image Copy 2 ...

Example Logical Copy complete notification

- ▶ /DBR DATAGROUP FNCLGRP
- ▶ GENJCL.IC GROUP(FNCLGRP) COPIES(2) SMSNOCIC(C,2)
ONEJOB

```
DFS3121A LOGICAL COPY COMPLETE FOR GROUP FNCLGRP; 0 OF 5 DATA SETS FAILED
DFS3121I COPIED DB/AREA EMPL DDN ACCT1 DSN IMSPRD.DB.ACCT.ACCT1
DFS3121I COPIED DB/AREA EMPL DDN ACCT2 DSN IMSPRD.DB.ACCT.ACCT2
DFS3121I COPIED DB/AREA CUST DDN CUSTA DSN IMSPRD.DB.CUST.CUSTA
DFS3121I COPIED DB/AREA CUST DDN CUSTB DSN IMSPRD.DB.CUST.CUSTB
DFS3121I COPIED DB/AREA CUST DDN CUSTC DSN IMSPRD.DB.CUST.CUSTC
```

- ▶ /START DATAGROUP FNCLGRP
 - Resume updating databases

Image Copy 2 ...

Stacked versus SAMEDS

▶ Stacked

- Multiple output data sets on single volume
- Logical copy for 2nd DBDS not done until physical copy for 1st DBDS complete
 - Even if output volume is DASD
 - DFSMS restriction
- Logical and physical copy serial
 - Logical copy complete message delayed

▶ SAMEDS

- Single output data set
- Logical copy for all DBDSs in parallel
- Physical copy for all DBDSs serial

Online Recovery Service (ORS)

ORS is an IBM IMS Tool (5655-E50)

- ▶ Recovers IMS databases quickly and easily
- ▶ Fast processing
 - Parallel reads of inputs
 - Image copies, change accumulations, and logs
 - Logs and Change Accums are read once for all database data sets
 - Saved in data space until needed
 - Parallel writes of outputs
 - Databases recovered in parallel
- ▶ Change accumulation not required for data sharing
- ▶ Point-in-time recovery to any time

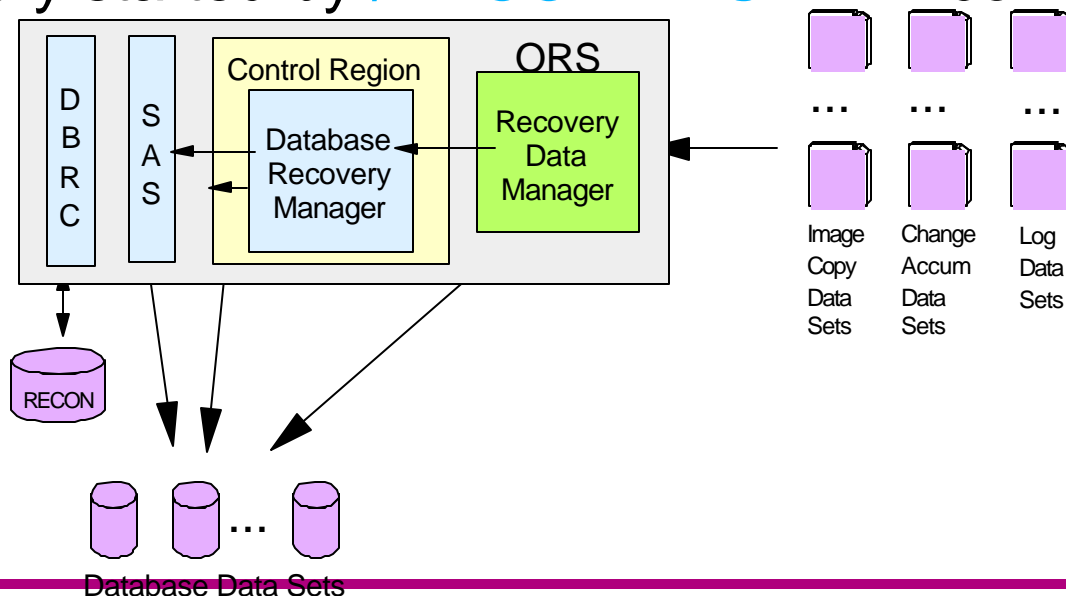
Online Recovery Service ...

A control region function

- ▶ Invoked by IMS commands
- ▶ Executes in parallel with other online activity
- ▶ May run on any control region where the DBs are defined

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 started by **/RECOVER START** command



ORS Enhanced Capabilities

Most ORS enhancements do not require IMS V8

- ▶ Applicable to IMS V7 and IMS V8

Enhanced functionality supports ...

- ▶ Stacked image copies
 - Suppresses rewind between files
- ▶ IC2 SAMEDS image copies
 - Single restore request for all image copies
- ▶ "Image Copy Extensions" compressed image copies
 - Decompresses image copy records
- ▶ Virtual tape caching
 - Takes advantage of Tape Management System caching
 - Can explicitly exploit two TMSs concurrently (caching primary/secondary or RLDS/SLDS logs)
- ▶ Messages to IMS MTO (requires IMS V8)
 - ORS message embedded in DFS4299I message

IMS/DB2 Coordinated DR

Synchronization of IMS and DB2 logs at remote site

▶ Environment

- IMS with RSR

- IMS logs are sent to remote site using RSR
- Optionally, IMS databases may be "shadowed" at remote site

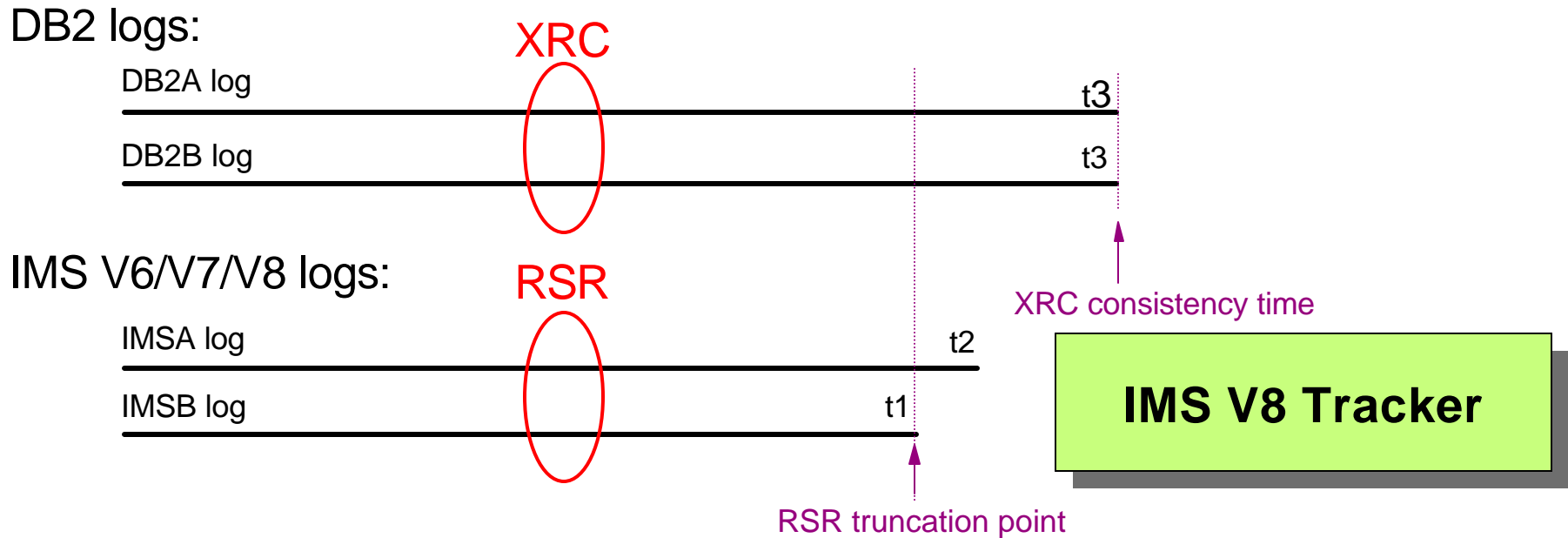
- DB2 data sharing systems using XRC (eXtended Remote Copy)

- DB2 logs and boot strap data sets (BSDSs) sent to remote site using XRC
- Databases not included

▶ Allows IMS and DB2 databases to be recovered to same time

- Especially applicable to environments with limited bandwidth
 - DB2 updated CIs not sent to remote site - just the logged changes

IMS/DB2 Log Synchronization



- ✦ IMS RSR tracking subsystem truncates IMSA's log at time **t1**
 - ✓ The truncation point timestamp is displayed in DFS2933I message
- ✦ IMS log truncation timestamp is supplied as the "to timestamp" for conditional restart of DB2A and DB2B
 - ✓ DB2 restart truncates the logs for DB2A and DB2B at time **t1**
- ✦ Result : DB2 and IMS logs end at same time; allowing consistent timestamp recoveries

Systems and Transaction Manager

TM Enhancements

- ★ APPC
- ★ Transaction Trace
- ★ MSC

Systems Enhancements

- ★ Syntax Checker
- ★ Parallel DB Open
- ★ Dynamic SLDS allocation
- ★ VSCR



Dynamic APPC Descriptors

Ability to Add/Delete LU 6.2 descriptors without an IMS restart

- ▶ To **ADD** a new LU 6.2 Descriptor:
 - Create new descriptor member in IMS Proclib
 - DFS62DTy where y is a user-defined suffix
 - Include new descriptors in new member
 - Issue **/START L62DESC y**
 - Where **y** is the suffix associated with the new member in Proclib
 - Proclib members are "additive"

- ▶ To **DELETE** an LU 6.2 Descriptor:
 - Issue **/DELETE L62DESC descriptor**
 - Where **descriptor** is the name of the one to be deleted

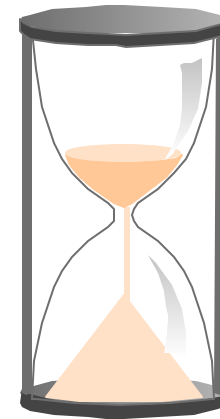
- ▶ Changes are not saved across a restart
 - Update **DFS62DTx** member used during IMS initialization

CPU Time Limit for CPI C Transactions

CPU Time Limit for CPI -C driven transaction

▶ CPUTIME = 0 - 1440

- Specifies the number of CPU seconds before a timeout occurs
 - 0 = no timeout (default)
 - 1440 = maximum value



- If time is exceeded
 - Abend U0240
 - Message DFS554x

- TP_Profile can be dynamically updated

▶ Protects against program loops

- Does not protect against calls waiting for an APPC response

Outbound LU Support

Outbound conversations require active APPC/IMS LU

- ▶ Default is the LU defined to APPC/MVS as BASE
 - If "disabled", outbound conversations cannot be established
 - Even if there are multiple APPC/IMS LUs

IMS Outbound LU support enhancement

- ▶ Ability to specify which = LU is to be used for outbound conversations
 - Assumes IMS has multiple APPC/IMS LUs defined in APPCPMxxx
 - Default continues to be the BASE
 - **DFSDCxxx** parameter **OUTBND=luname**
 - **/CHANGE APPC OUTBND luname**
- ▶ Restart reverts to OUTBND value in DFSDCxxx or BASE LU

/DISPLAY APPC

- ▶ Shows: TYPE=OUTB | BASE

Transaction Trace (TT) - Basics

A facility provided by OS/390 and z/OS

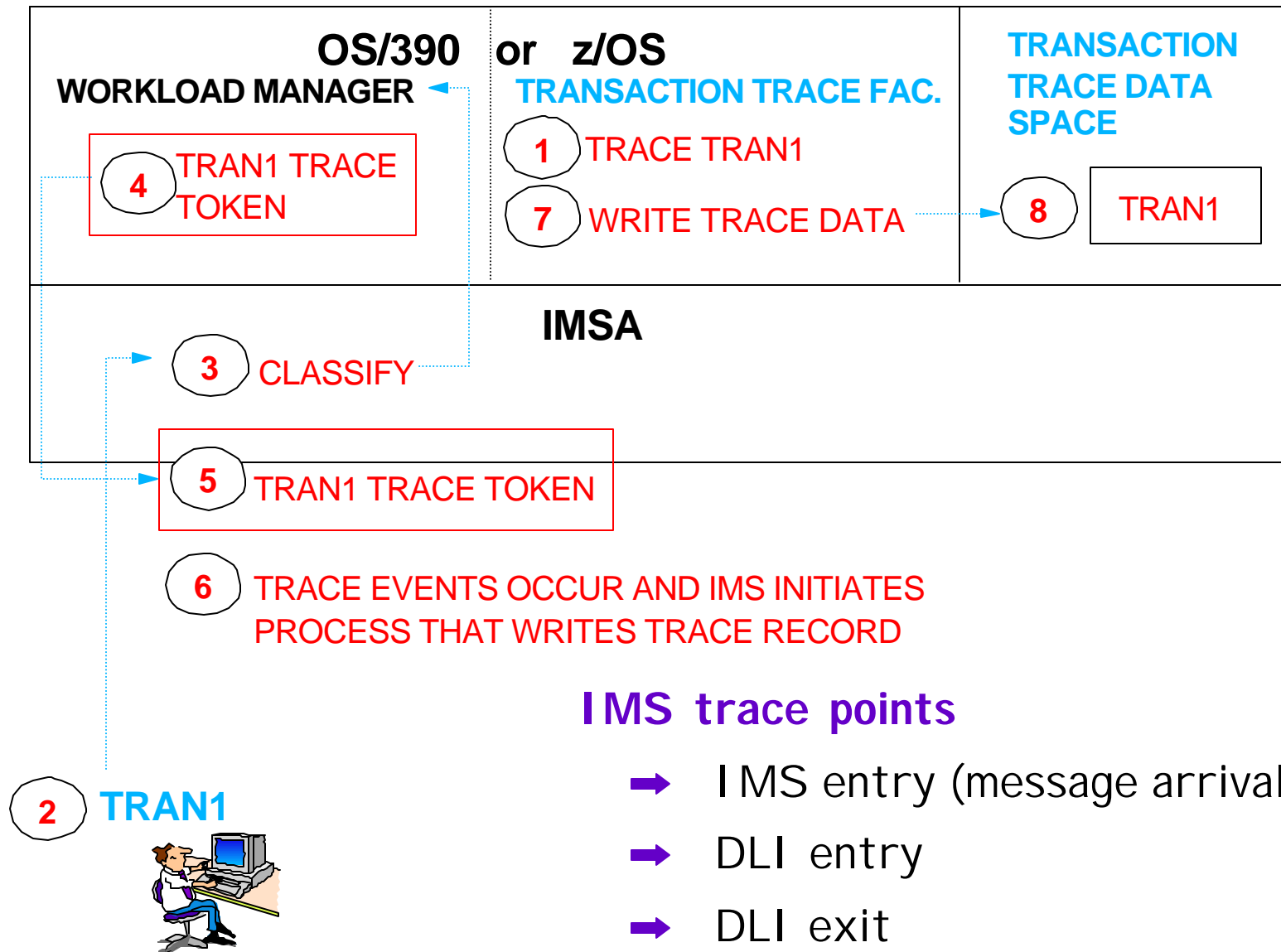
Shows the flow of work between subsystems that combine to service a transaction

- ▶ Provides ability to track a work unit across multiple subsystems in the same sysplex
- ▶ Facilitates debugging problems in multi-system application environments
- ▶ Ties work unit together using transaction trace token

IMS V8 may exploit

- ▶ Transaction trace facility of OS/390 or z/OS
 - Continues to have the standard IMS transaction trace support
- ▶ Is the first (and so far, the only) subsystem that supports TT

Transaction Trace Overview



IMS trace points

- ➔ IMS entry (message arrival)
- ➔ DLI entry
- ➔ DLI exit
- ➔ IMS exit (response delivered)

MSC FICON CTC Support

Enhances MSC to take advantage of FICON CTC support

- ▶ Greater bandwidth
 - Increases volume of messages between IMS systems
 - Increases the distance between IMS systems

- ▶ Activated by changing the IMS online procedure
 - DD cards specifying the CTC address for the link should be changed to specify the CTC FICON address
 - IMS detects a FICON CTC and invokes the support
 - Note: No required IMS system definition changes or sysgen
 - Assumes the existing link is already defined as CTC

Syntax Checker

Syntax Checker is a new IMS I SPF application

Its primary functions are to

- ▶ Define, verify, and validate PROCLIB member **DFSPBxxx** parameters and value specifications prior to (re)starting IMS
 - For example, Syntax Checker ...
 - Reads and displays a Proclib member's parameters and values
 - Verifies that parameters and values are valid
 - Allows user to add/delete parameters and/or modify values
 - Allows user to save to same or different Proclib member
- ▶ Identify new and obsolete parameters
 - Useful when migrating to new version of IMS
- ▶ Provide detailed online help text at the parameter level

Invalid Parameter

File Edit View Help

IMS 7.1 Parameters for DB/DC

Command ==>

DFSI920 Parameter value invalid

Press enter to check the syntax.

Data Set Name . . : IMS71.IMS1.PROCLIB(DFSPBIMS)

IMS Release . . . : 7.1

Sel Codes: C = Comment D = Delete / = Select

Sel Keyword	Value	Description
— _____	= _____	
— ALOT	= 9	ETO Auto Logon Off Time
— AOIS	= A	ICMD Security Option
— APPC	= Y	Activate APPC/IMS (Y N)
— APPLID1	= IMS1	VTAM Applid of Active IMS System
— APPLID2	= IMS2	VTAM Applid of XRF Alternate System
— CHTS	= 1000	Number of CCB Hash Table Slots
— CMDMCS	= N	MCS/EMCS Command Option: N Y R C B
— DBBF	= 1000	Number of Database Buffers

Keyword ALOT Help

File Edit View Help

ALOT Autologoff Time

More: +

KEYWORD: ALOT

Specifies the autologoff time in minutes. Valid values are 0 and from 10 to 1440. If the ALOT value is not specified, the value from the JCL member is used except for FINANCE, SLU P, and ISC. If ALOT is not specified on the logon descriptor or overridden by the logon exit (DFSLGNX0) for FINANCE, SLU P, and ISC, a value of 1440 is used (the value from the JCL member is ignored).

Not Valid in Release

File Edit View Help

IMS 8.1 Parameters for DB/DC

Command ==>

DFSI926 Keyword CHTS not valid in Release 8.1

Press enter to check the syntax.

Data Set Name . . : IMS71.IMS1.PROCLIB(DFSPBIMS)

IMS Release . . . : 8.1

Sel Codes: C = Comment D = Delete / = Select

Sel Keyword	Value	Description	More: -
_ CHTS	= 1000	Number of CCB Hash Table Slots	
_ CMDMCS	= N	MCS/EMCS Command Option: N Y R C B	
_ DBBF	= 1000	Number of Database Buffers	
_ DBFX	= 10	Num. DB Buffs available at FP Reg Start	
_ DBRCNM	= DBCPROC	DBRC Proplib Member Name	

Database Allocation/Open/Close

Full function database authorization, allocation, and open processing prior to V8

- ▶ Database authorization and DBDS allocation
 - Occurs during program specification block (PSB) schedule
 - Incurs 1 DBRC authorization call per database
- ▶ Database data set open
 - Occurs at first DL/I call requiring the data set

Impact

- ▶ Large number of concurrent allocation requests
 - Potential increase in RECON contention
 - Potential increase in length of time needed to achieve steady state
- ▶ May affect response times for early end-users

DB Authorization/Allocation/Open

.....
DATABASE DBX
DATABASE DBY
DATABASE DBZ
.....

PSBXYZ
PCB DBX
PCB DBY
PCB DBZ

IMS V6/V7

/NRE
/STA REGION
SCHEDULE PSBXYZ
AUTH DBX
ALLOCATE DBDSX
AUTH DBY
ALLOC DBDSY
AUTH DBZ
ALLOC DBDSZ
DLI CALL TO DBX
OPEN DBDSX
DLI CALL TO DBY
OPEN DBDSY
DLI CALL TO DBZ
OPEN DBDSZ

Items in red and indented contribute to the response time of that first transaction.

This occurs for every database until all are authorized, allocated, and opened.

Parallel Auth/Alloc/Open

For full function IMS databases

- ▶ During warm or emergency restart
 - Perform database authorization, allocation, and open processing for all databases with data sets allocated at time of last shutdown
 - Not part of PSB schedule or DL/I call processing

Ten parallel TCBs for database processing during IMS warm or emergency restart, and during IMS shutdown

- ▶ Each databases assigned to one of 10 TCBs for authorization and open/close/eov processing
 - Assignment based on local DMB number
- ▶ During warm or emergency restart
 - Each TCB, in parallel, ...
 - Issues single DBRC authorization request for all DBs assigned to that TCB
 - Performs DBDS ALLOCATION and OPEN processing

Parallel Auth/Alloc/Open ...

.....
DATABASE DBX (TCB1)
DATABASE DBY (TCB2)
DATABASE DBZ (TCB3)
.....

PSBXYZ
PCB DBX
PCB DBY
PCB DBZ

/NRE

TCB1
AUTH DBX ...
ALLOCATE DBDSX
OPEN DBDSX

TCB2
AUTH DBY ...
ALLOCATE DBDSY
OPEN DBDSY

TCB3
AUTH DBZ ...
ALLOCATE DBDSZ
OPEN DBDSZ

/START REGION
SCHEDULE PSBXYZ

DLI CALL TO DBX
DLI CALL TO DBY
DLI CALL TO DBZ

Application response time
not impacted by authorization,
allocation, or open processing.

Parallel Close/Dealloc/Unauth

During shutdown

- ▶ New TCBs process shutdown for assigned databases
 - Single DBRC request (per TCB) to unauthorize databases
 - Parallel close and deallocation of database data sets

/CHE FREEZE



Online Reading SLDS After Restart

Online may need to read SLDS after restart

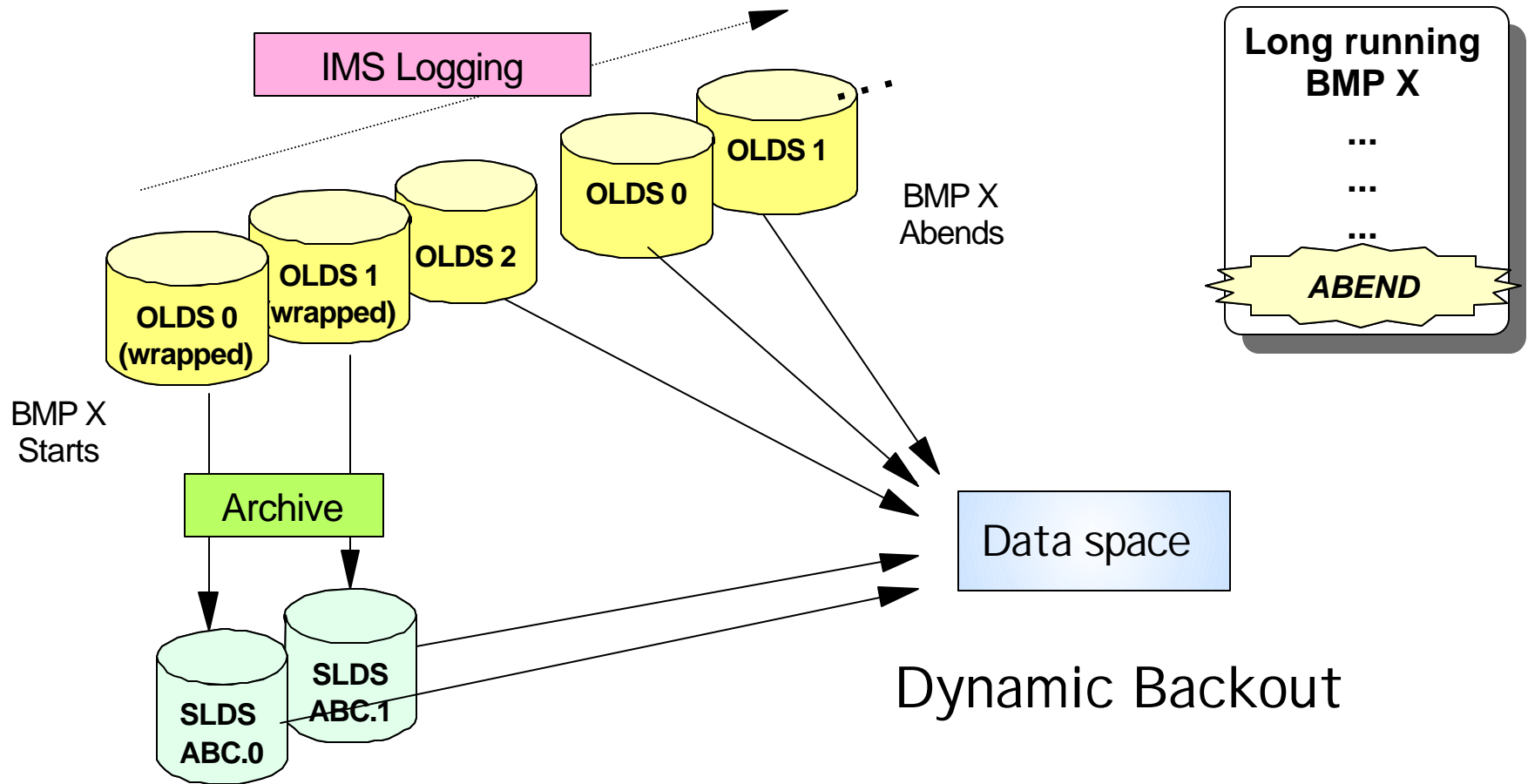
- ▶ Previous releases could read SLDS only during emergency restart
 - Needed if backout records or shared queues records no longer available from OLDS

- ▶ IMS V8 also reads SLDS if needed for dynamic backout or shared queues
 - SLDSs dynamically allocated as needed
 - Even if required after restart completes
 - SLDS log records are stored in data space(s)

- ▶ Enhancement also available for IMS V7
 - APAR PQ50657

- ▶ New commands
 - /STOP (/START) SLDSREAD disables (enables) function

Dynamic Backout Reading SLDS



RRS Support for IMS Batch

In a Stand-alone IMS Batch environment

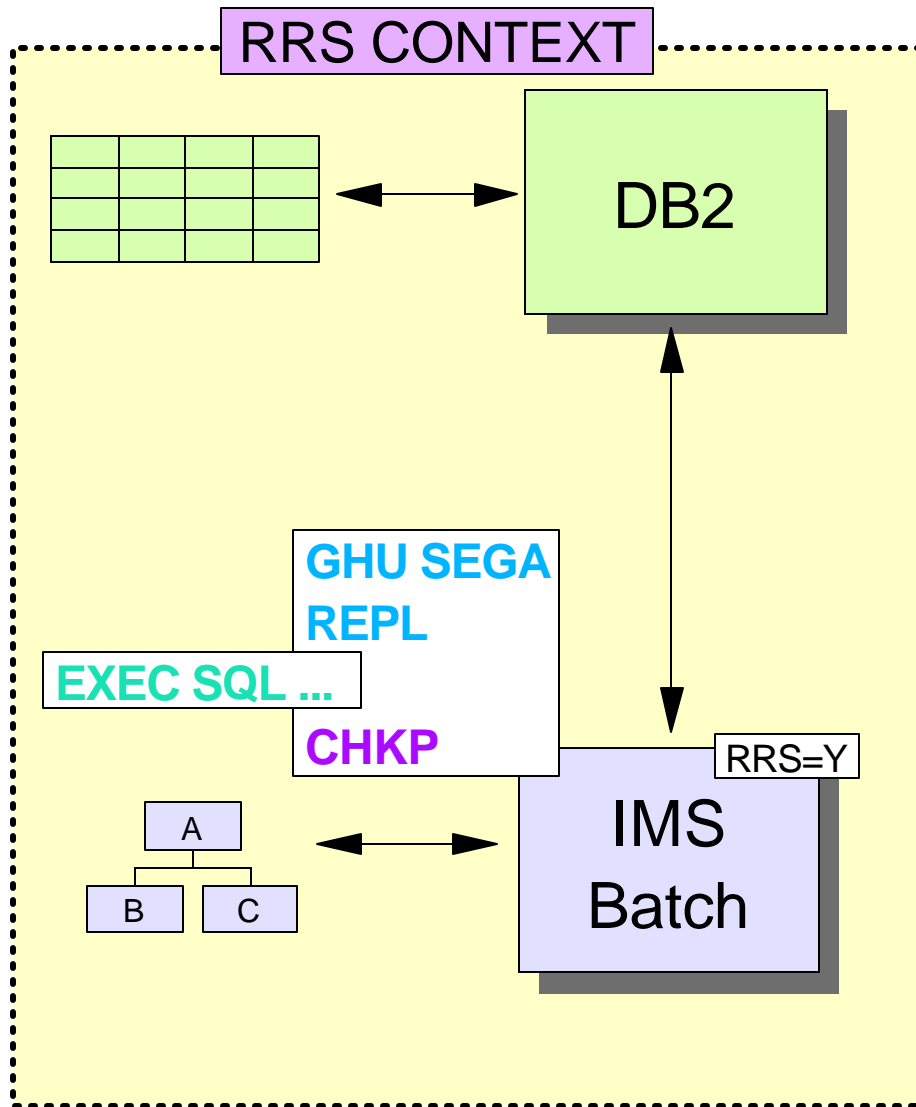
- ▶ IMS V8 now provides full coordinated two phase commit with attached subsystems
 - DB2 V6 or MQ V5.2
- ▶ Batch program requires connection to RRS
 - New JCL PROC parameter “RRS=Y”
 - RRS uses System Logger for saving coordination data
- ▶ Batch program requires DASD logging and BKO=Y

Utilized by IMS DataPropagator V3R1

- ▶ Uses MQ to give “asynchronous near real time” data propagation for Batch DL/1

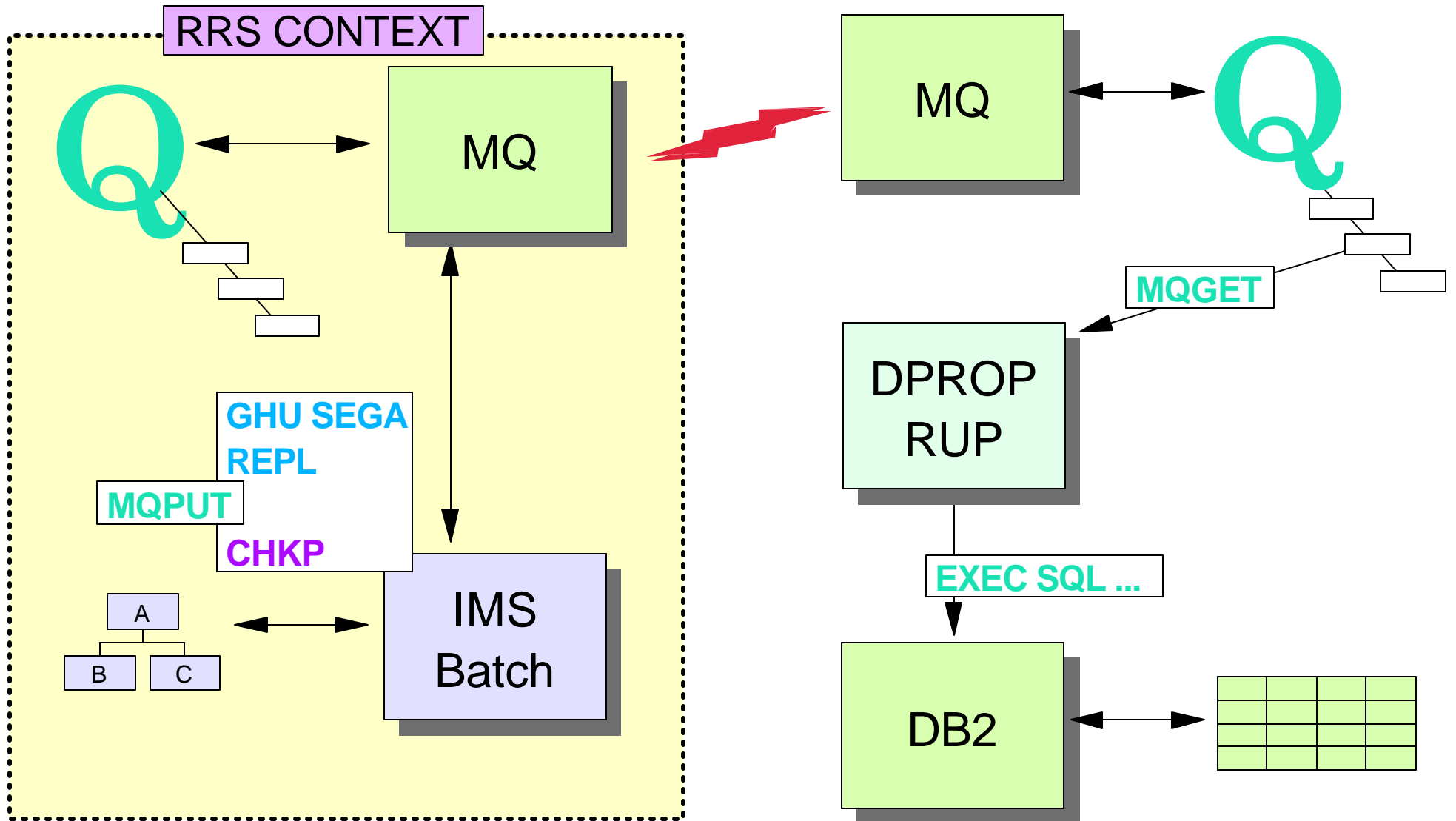
IMS V7 support with APAR PQ51895

RRS Support for IMS Batch ...



- ⚡ IMS and DB2 register with RRS
- ⚡ IMS updates IMS DB
- ⚡ IMS expresses interest in UR
- ⚡ Data capture exit updates DB2 (may be DPROP)
- ⚡ DB2 expresses interest in UR
- ⚡ CHKP - initiate 2-phase commit for UR
- ⚡ RRS manages 2-phase commit

RRS Support for IMS Batch ...



IMS Java

Write, compile, and run IMS programs written in Java

- ▶ Development environment
 - IMS Java Class Library
 - Set of packages that contain groups of classes
 - Java classes are pre-written reusable code that can be invoked by Java program to ...
 - Access IMS message queues and databases
 - Support APIs familiar to Java programmers
- ▶ Runtime environment supports new dependent region types
 - JMP and JBP (V7 APAR PQ53944)
 - Persistent reusable Java Virtual Machine

Benefit

- ▶ Incorporates Java programming model into IMS environment
- ▶ Allows Java programmers to code IMS applications
 - Requires only basic IMS knowledge
 - Supports all major IMS capabilities

Development - Java Class Library

Java programs use the APIs that are provided:

- **Application Package classes** to
 - initialize and begin the program
 - access messages on the message queue
 - commit
- Database interfaces
 - **JDBC** which maps segments to tables and fields to columns (use of "*" not supported)
 - or **db Package classes** that provide greater control for IMS db access

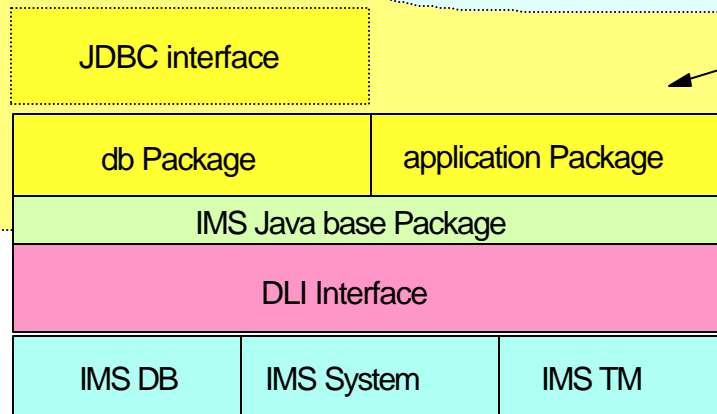
Ex. "SELECT __ FROM __ WHERE __"

OR

Ex. "connection.getUniqueSegment (mySegment , ssalist)"

Ex. "messageQueue.getUniqueMessage (inputMessage)"

.....
Ex. "trans.commit()"



JavaToDLI

provided as a low-level interface

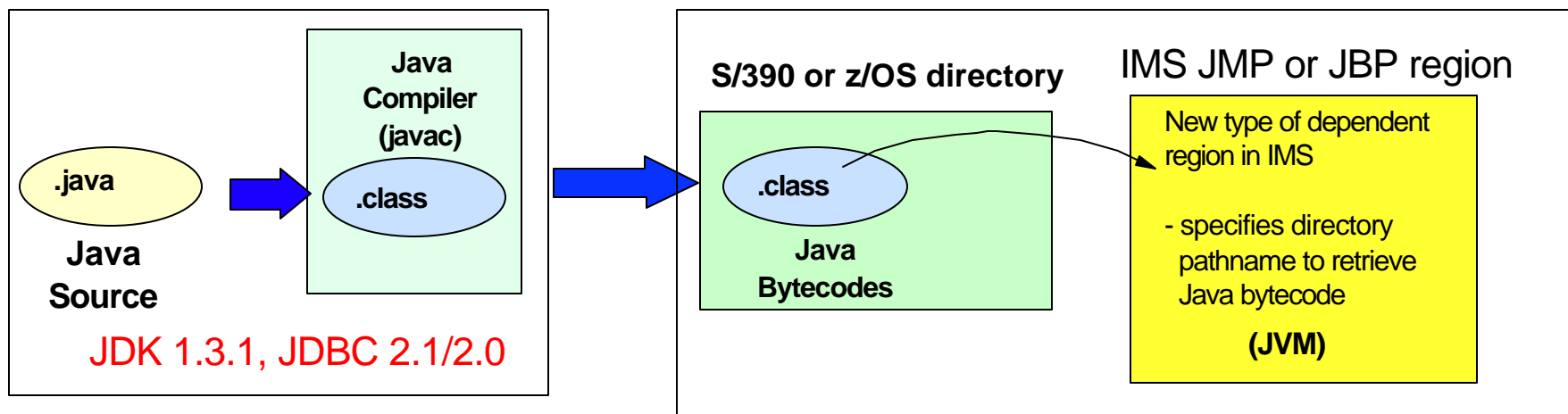
Runtime - New JVM support

Persistent Reusable JVM

- ▶ Supports a Java Virtual Machine (JVM) in an IMS environment
 - Two new dependent region types in IMS
 - **JMP** for message-driven programs
 - **JBP** for non-message driven programs

Value

- ▶ Supports the traditional Java execution model
 - Write the Java program and compile in development environment
 - Send the byte code (.class) to the execution environment



IMS V8 Part 1a Review

Availability and Recovery

- ▶ DBRC Enhancements
 - Automatic RECON loss notification
 - RECON command authorization support
 - 16MB RECON record size
 - PRILOG compression
 - Miscellaneous

- ▶ Database Image Copy 2 enhancements

- ▶ ORS (Online Recovery Service) enhancements

- ▶ IMS/DB2 coordinated disaster recovery support

- ▶ Dynamic allocation of SLDS after IMS restart

- ▶ Batch Resource Recovery Services (RRS) support

IMS V8 Part Ia Review ...

Performance and Capacity

- ▶ Parallel database open processing at restart
- ▶ Fast path DEDB enhancements
 - Support for 2048 areas
 - Support for Non-recoverable DEDBs

Systems

- ▶ Syntax checker
- ▶ Transaction trace

IMS V8 Part 1a Review ...

Applications

- ▶ Java
 - JVM Dependent Regions
 - Java Classes
 - IMS Connector for Java

- ▶ APPC
 - Dynamic descriptors
 - Outbound LU support
 - CPU time limit for CPI-C transactions

Topics Still To Be Discussed

Parallel Sysplex Enhancements (Part I b)

- ▶ IMS exploitation of enhanced XES functionality for structures
 - Autoalter
 - System can alter structure size and entry-to-element ratio
 - System managed rebuild
 - Can move structure without connector being active
 - System managed duplexing
 - System maintains copy of structure
- ▶ Shared queues support for synchronous APPC and OTMA transactions
 - Completes the shared queues support for all standard IMS transaction types

Common Service Layer (Part I I)

- ▶ Improved systems management of an IMSplex

Common Service Layer (CSL)

The next step in IMS architectural evolution

- ▶ New address spaces built on Base Primitive Environment
 - *Structured Call Interface (SCI)*
 - IMSplex member registration
 - Communications between IMSplex members
 - *Operations Manager (OM)*
 - IMSplex-wide command entry and response
 - *Resource Manager (RM)*
 - Global resource and process management
 - VTAM terminal/user status recovery
- ▶ Enables new systems management functions in IMSplex
 - *Sysplex Terminal Management (STM)*
 - Uses SCI and RM
 - *Single point of control (SPOC) and user-provided automation (AOP)*
 - Uses SCI and OM
 - *Coordinated Online Change (Global Online Change)*
 - Uses SCI, OM, and RM



e-business

Part 1 b - IMS Version 8 Parallel Sysplex Highlights



IMS Version 8 Highlights

Enhancement highlights

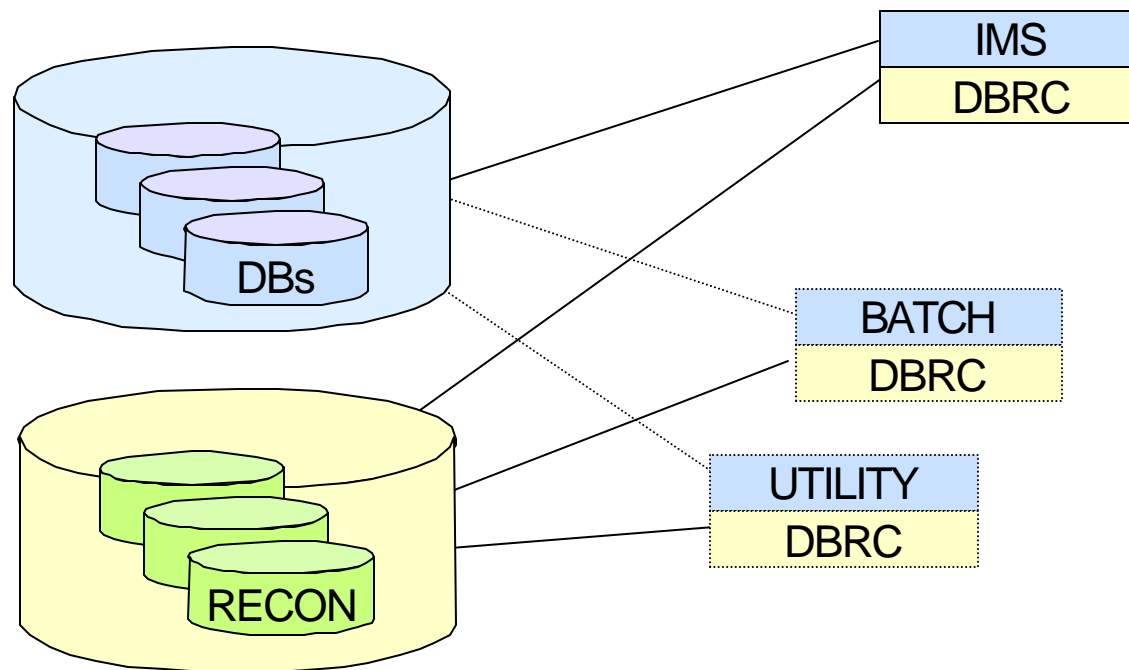
- ★ Base environment
- ★ Parallel sysplex environment
 - Review of resource sharing by IMS through V7
 - Structure management enhancements
 - SQ support for synchronous APPC/OTMA transactions
- ★ Common Service Layer



In the Beginning

Before IMS/VS V1 R2

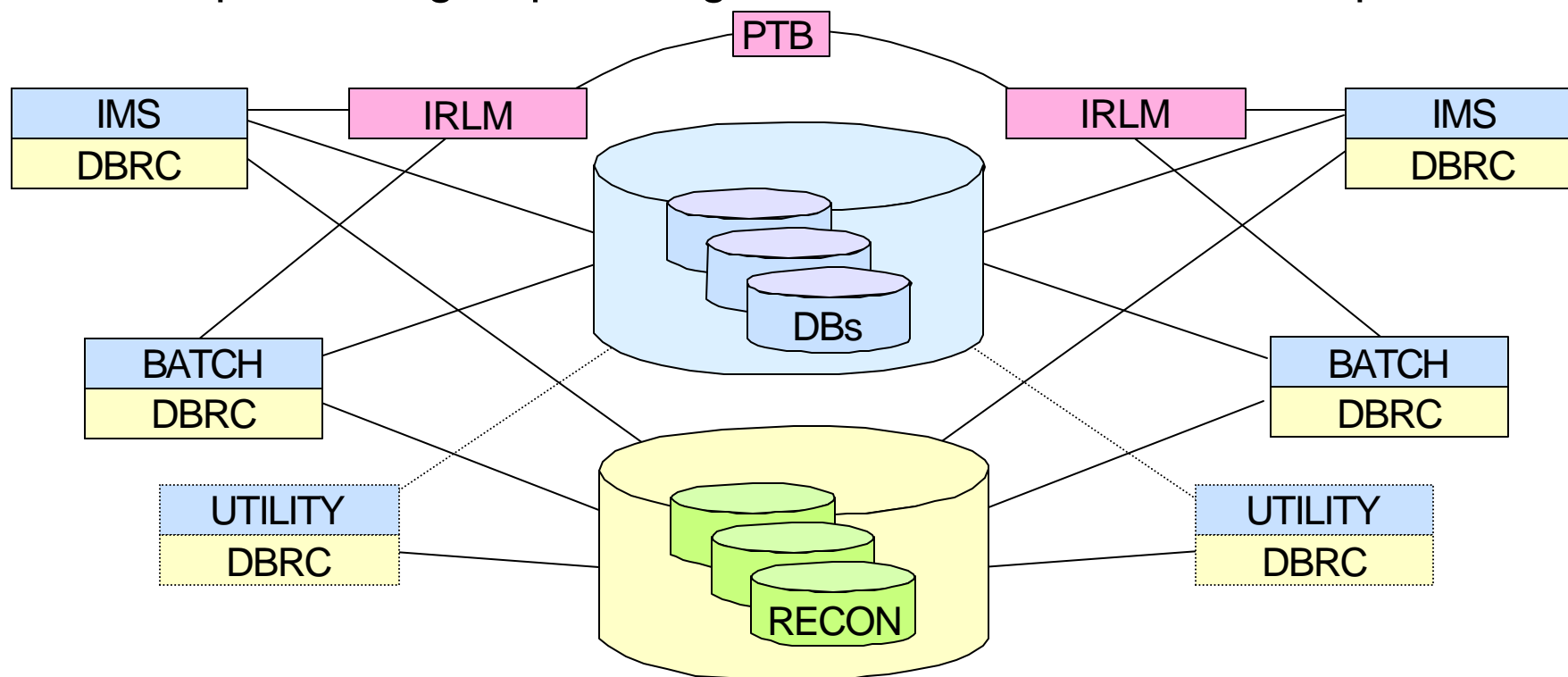
- ▶ No data sharing
 - Only one IMS at a time could access the data
 - Databases protected by user (DISP=OLD)
- ▶ To process database in batch or utility region
 - /DBR database - PROCESS - /START database online
- ▶ DBRC used for recovery only
 - No authorization processing



Then in IMS/V8 V1 R2

Block level data sharing introduced

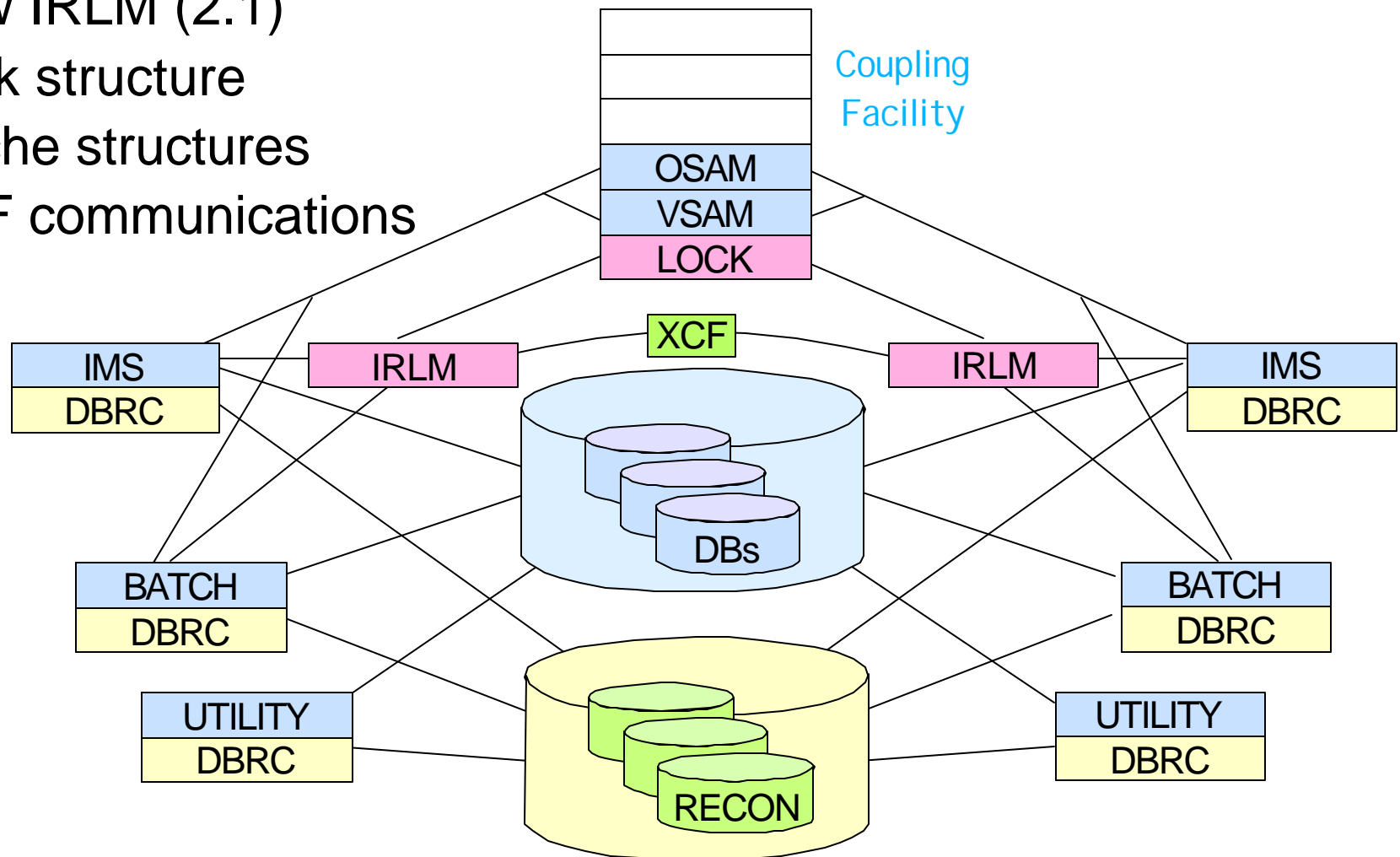
- ▶ DBRC added database authorization processing
- ▶ IRLM added as global lock manager (maximum of two IRLMs)
- ▶ IMS used IRLM for lock management and buffer invalidation
- ▶ IRLMs communicated using Pass-the-Buck processing
 - PTB processing required significant overhead for lock requests



After a Long Wait

IMS/ESA V5 started to exploit XCF, the Parallel Sysplex, and coupling facility structures

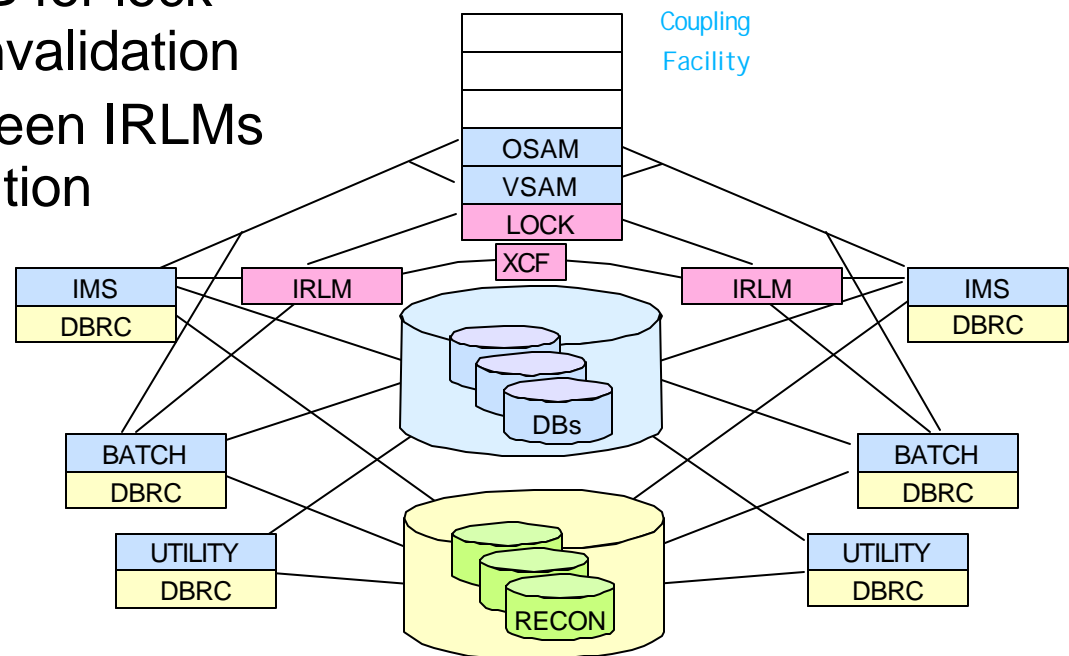
- ▶ New IRLM (2.1)
- ▶ Lock structure
- ▶ Cache structures
- ▶ XCF communications



After a Long Wait ...

Issues addressed in IMS/ESA V5

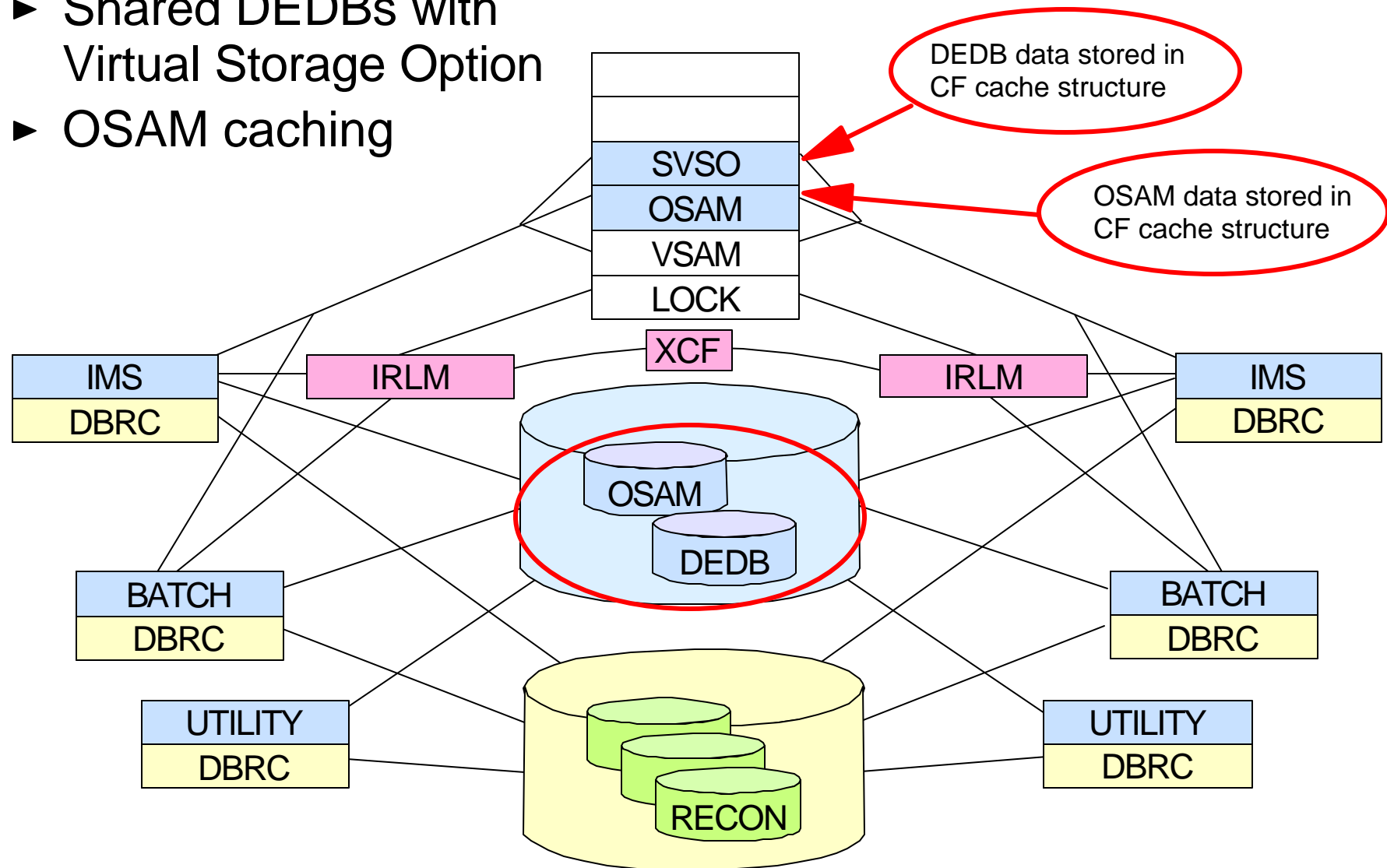
- ▶ Increased **capacity**
 - More IMSs could participate in data sharing
 - Up to 32 IRLMs
 - Up to 256 IMSs
- ▶ Improved **performance**
 - CF access faster than PTB for lock management and buffer invalidation
 - XCF communication between IRLMs faster than PTB for contention resolution, etc.



Now We're on a Roll

IMS/ESA V6 added additional data sharing support

- ▶ Shared DEDBs with Virtual Storage Option
- ▶ OSAM caching

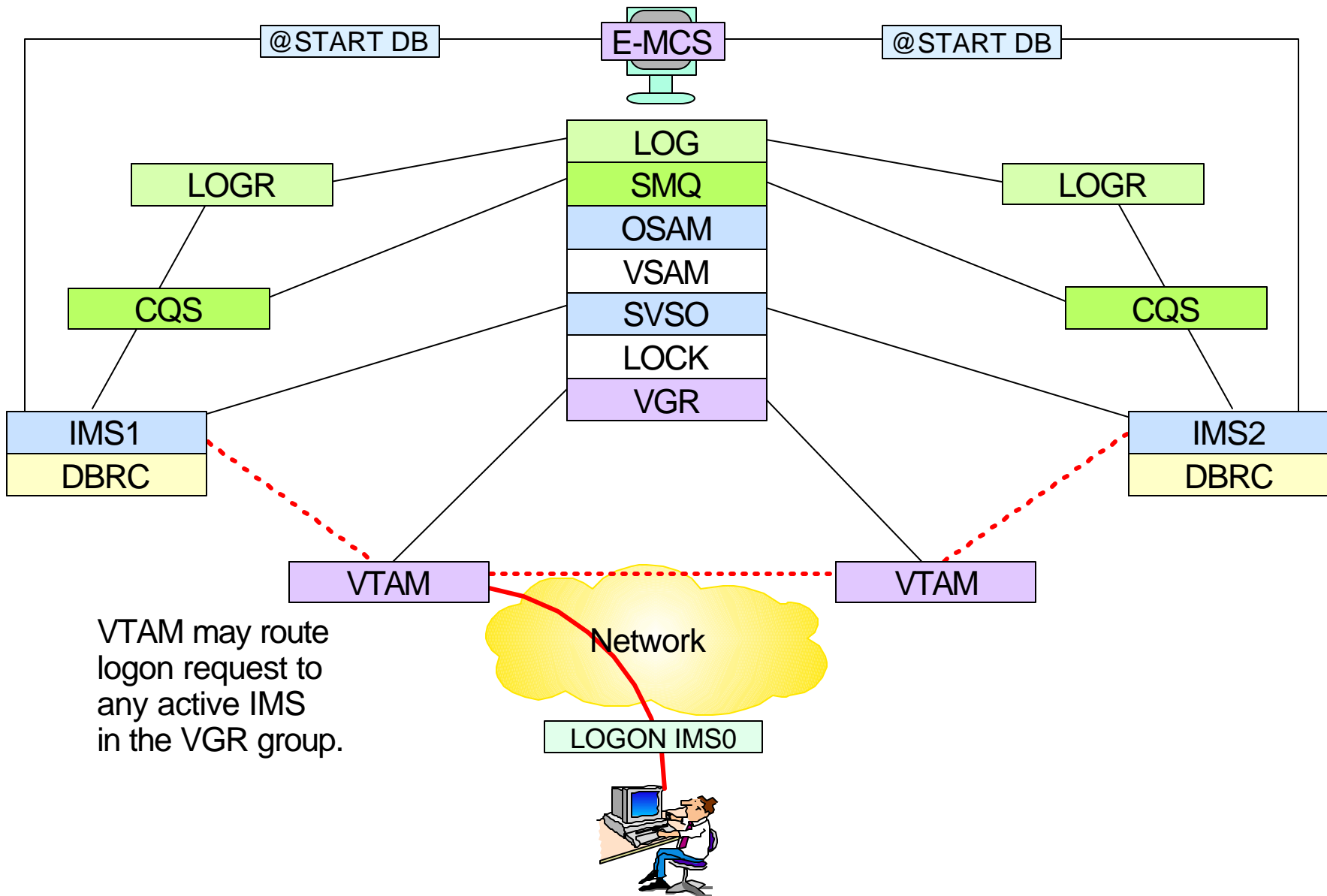


Now We're on a Roll ...

IMS/ESA V6 added additional transaction manager and operations support ...

- ▶ Shared message queues for full function and fast path EMH
 - Single set of message queues for all IMSs
 - Queues stored in CF list structures
 - New Common Queue Server (CQS) address space to manage the queue structure
 - CQS uses system logger to log updates to queue structure
- ▶ VTAM Generic Resource support
 - Single system image to end user (LOGON IMS)
- ▶ Sysplex communications
 - Use of CRC from E-MCS console to send commands to all IMSs in Sysplex and receive responses
- ▶ Automatic Restart Manager support
 - Restart IMS following IMS or MVS failure
 - Provided to IMS V5 via PTF

Now We're on a Roll ...

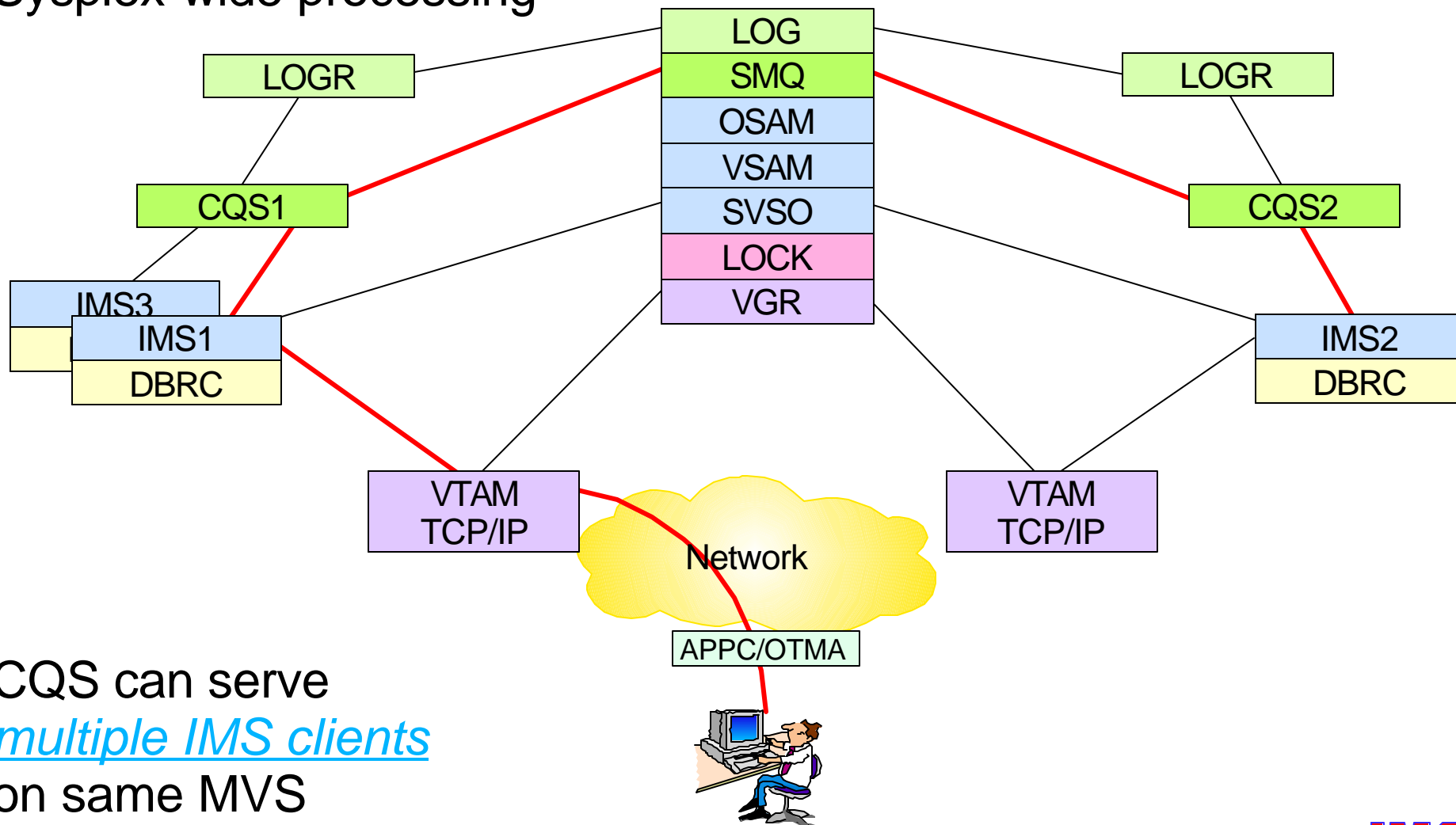


VTAM may route logon request to any active IMS in the VGR group.

IMS V7 Added Still More

Enhanced shared queues support

- ▶ Asynchronous APPC and OTMA transactions eligible for Sysplex-wide processing

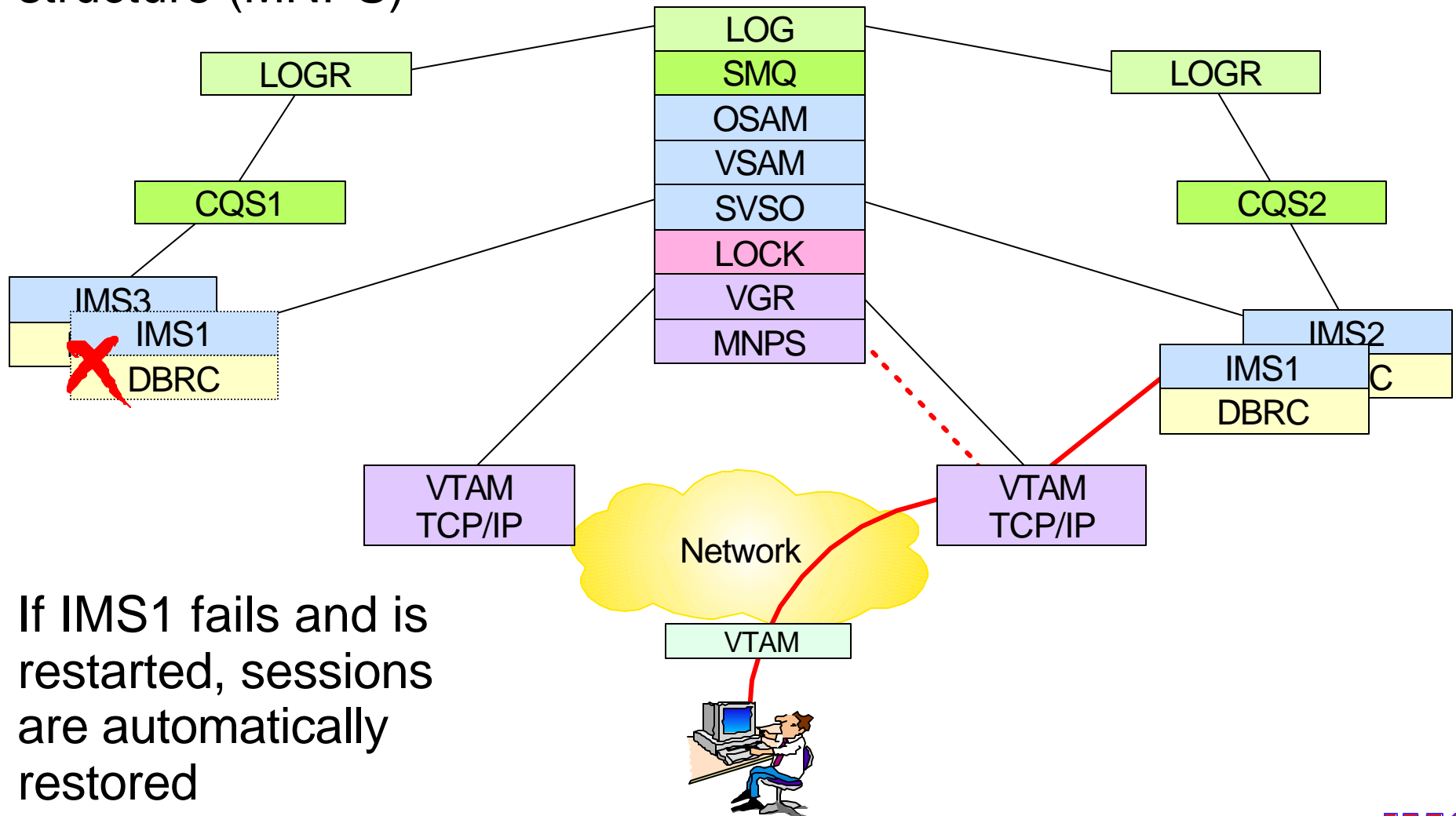


- ▶ CQS can serve multiple IMS clients on same MVS

IMS V7 Added Still More ...

Rapid network reconnect

- ▶ VTAM session information saved in data space (SNPS) or CF structure (MNPS)



- ▶ If IMS1 fails and is restarted, sessions are automatically restored

IMS Version 8 Highlights

Parallel sysplex enhancements

- ★ CF structure management
 - Autoalter
 - System managed rebuild
 - System managed duplexing
- ★ SQ support for synchronous APPC and OTMA transactions



Alter and Auto Alter Support

Alter changes a structure without rebuilding it

- ▶ Change is made to the existing structure
- ▶ Size may be changed by operator command or by connector
- ▶ Entry-to-element ratio may be changed only by connector
 - IMS (or CQS) does not change this ratio
- ▶ Initiated with operator command:

```
SETXCF START,ALTER,STRNM=<NAME>,SIZE=<new-size>
```

Autoalter allows an alter to be done by the system

- ▶ Dynamic adjustment
- ▶ Size and/or entry-to-element ratio may be changed by system
 - Reacts to needs of the structure
 - Reaching [fullthreshold](#) causes Auto Alter to increase size
 - Reacts to needs of the system
 - Unused space in structure makes it available for contraction

Alter and Autoalter ...

Autoalter hardware and software requirements

- ▶ OS/390 V2R10; CF Level 9

Autoalter enabling requirements

- ▶ Update and activate CFRM policy
 - Administrative Data Utility: IXCMIAPU

ALLOWAUTOALT(YES) - default is NO
FULLTHRESHOLD(percentage) - default is 80%
MINSIZE(nnnn) - default is 75% of INITSIZE

Supported for

- ▶ Shared VSO, Shared Queues, IRLM, OSAM, and VSAM
- ▶ Resource structure in V8

System-Managed Rebuild

System-managed rebuild

- ▶ Allows operator to move structure to another CF
 - Does not require an active connector to rebuild (copy) a structure
 - Operator initiates rebuild with a command
 - If connector active, connector will rebuild,
 - If no connector active, system will rebuild

```
SETXCF START,REBUILD,STRNM=<name>,LOC=OTHER
```

- Moves one structure to another candidate CF

```
SETXCF START,REBUILD,CFNAME=<name>
```

- Moves all structures on named CF to other candidate CFs

- ▶ Does not provide automatic rebuild of structure for failures
 - This function is provided by system-managed duplexing

System-Managed Rebuild ...

Hardware and software requirements

- ▶ OS/390 V2R8; CF Level 9

Enabling requirements

- ▶ CFRM CDS must be formatted to support SMREBLD
 - CDS Format Utility: IXCL1DSU

```
DATA TYPE(CFRM)  
ITEM NAME(SMREBLD) NUMBER(1)
```

- ▶ Update and activate CFRM policy
 - Administrative Data Utility: IXCMIAPU

```
PREFLIST(CF01 CF02)
```

Supported for

- ▶ Shared VSO, Shared Queues, IRLM
- ▶ Resource structure in V8

System-Managed Duplexing

System-managed duplexing

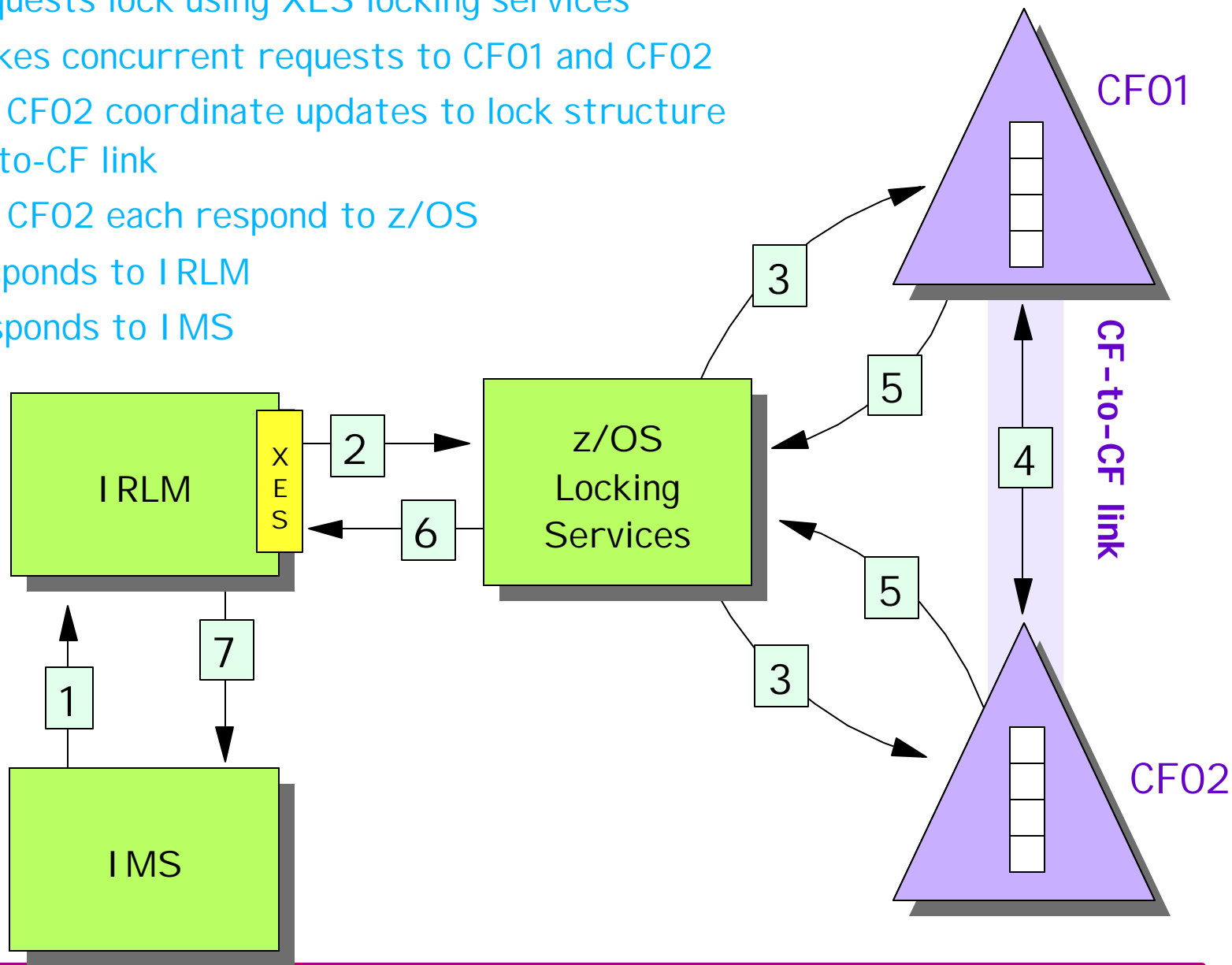
- ▶ Objective is to provide
 - Robust failure recovery of a structure with ...
 - Minimal participation by connectors
 - Compare to CQS recovery of shared queues structures

- ▶ Provides protection against
 - Structure failure
 - CF failure
 - Loss of CF connectivity

- ▶ System creates and maintains two copies of the structure
 - On two different Coupling Facilities
 - One structure name is used for the two structures

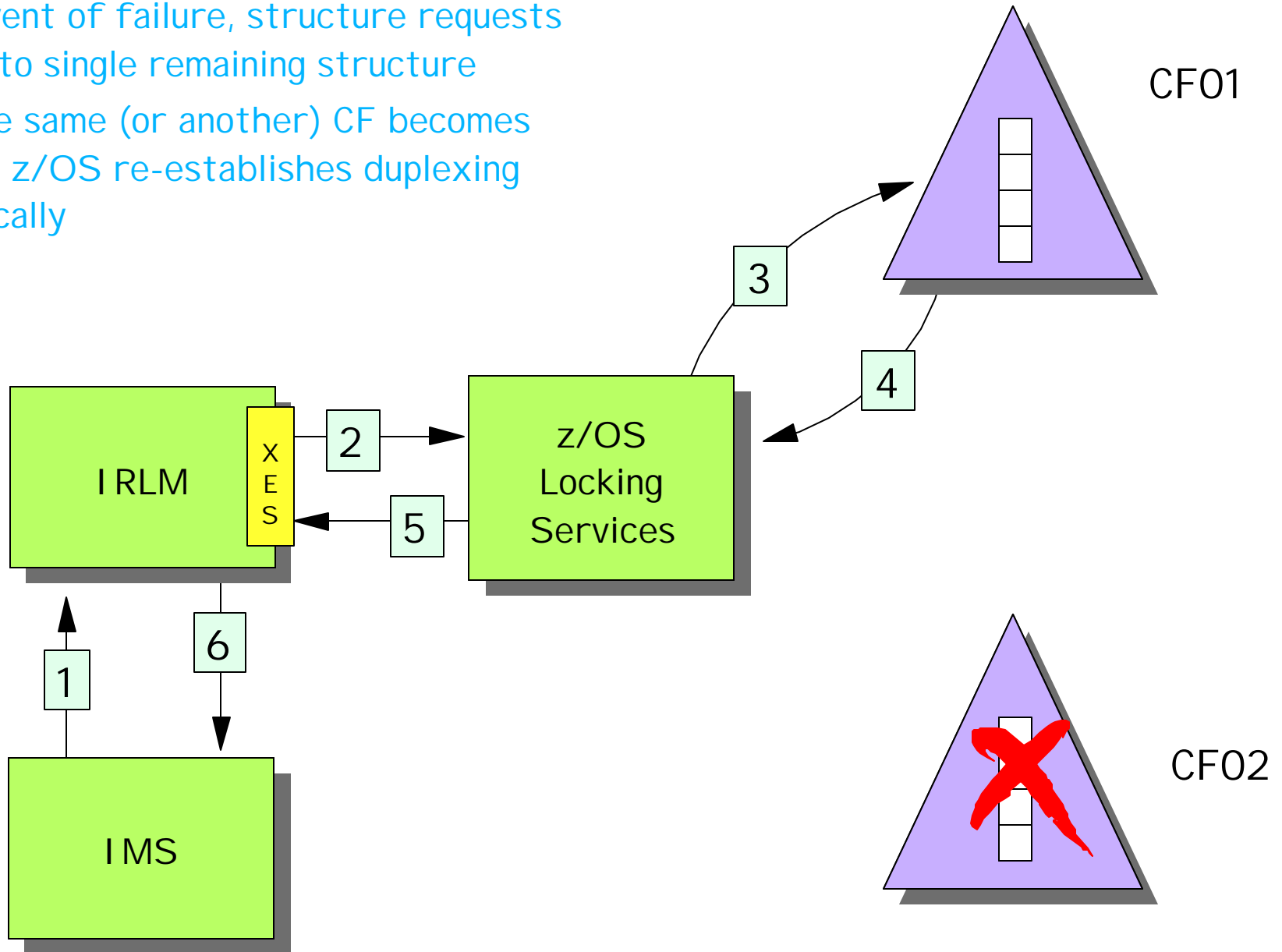
System-Managed Duplexing ...

1. IMS requests lock from IRLM
2. IRLM requests lock using XES locking services
3. z/OS makes concurrent requests to CF01 and CF02
4. CF01 and CF02 coordinate updates to lock structure using CF-to-CF link
5. CF01 and CF02 each respond to z/OS
6. z/OS responds to IRLM
7. IRLM responds to IMS



System-Managed Duplexing ...

- ⚡ In the event of failure, structure requests continue to single remaining structure
- ⚡ When the same (or another) CF becomes available, z/OS re-establishes duplexing automatically



System-Managed Duplexing ...

Enabling requirements:

- ▶ CFRM CDS must be initialized with SMDUPLEX specified
 - CDS Format Utility: IXCL1DSU

DATA TYPE(CFRM)

ITEM NAME(SMDUPLEX) NUMBER(1)

- ▶ CFRM policy definition for structure:
 - DUPLEX(ENABLED) - automatically activated
 - or -
 - DUPLEX(ALLOWED) - activated by command

SETXCF START,DUPLEX,STRNM=name

Duplexing supported for

- ▶ Shared VSO, Shared Queues, IRLM
- ▶ Resource structure in V8

System-Managed Duplexing ...

Hardware and software requirements:

- ▶ z/OS V1.2 with APARs OW41617 and OW45976
- ▶ CF Level 11 (9672 CF) or CF Level 12 (zSeries CF)
- ▶ CF-to-CF links
- ▶ IMS V8
- ▶ IMS V7 with APAR
 - Call the support center to get the most current list of APARs

IMS Version 8 Highlights

Parallel sysplex enhancements

- ★ CF structure management
 - Autoalter
 - System managed rebuild
 - System managed duplexing
- ★ SQ support for synchronous APPC and OTMA transactions



Sync APPC/OTMA SQ Support

Description

- ▶ Allows synchronous APPC/OTMA transactions to execute on any IMS in the shared queues group
 - APPC Synchronous inbound requests (Allocate - Send - Receive)
 - OTMA Send-then-Commit (Commit Mode 1)

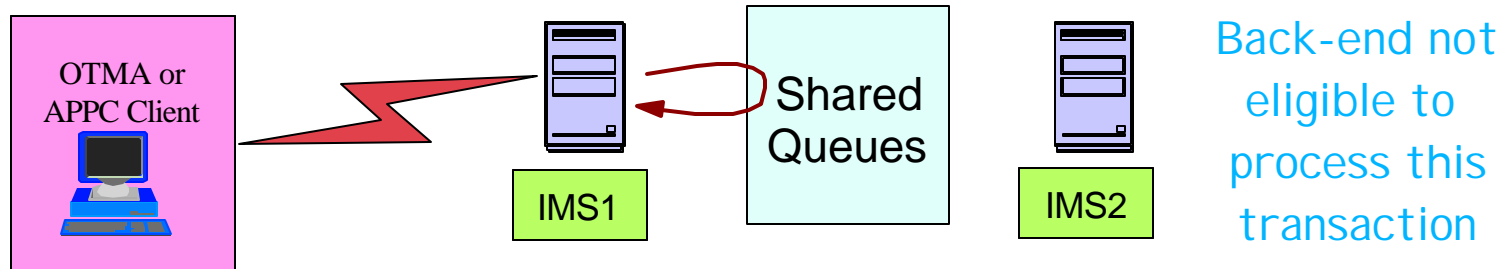
- ▶ Automatically enabled if all of the following are true
 - All environments are z/OS V1.2 with RRS enabled
 - Shared queues is enabled
 - All IMS systems in the SQ group are IMS V8
 - Update RECONS to reject V6/V7 signons

CHANGE.RECON MINVERS(81)

Background

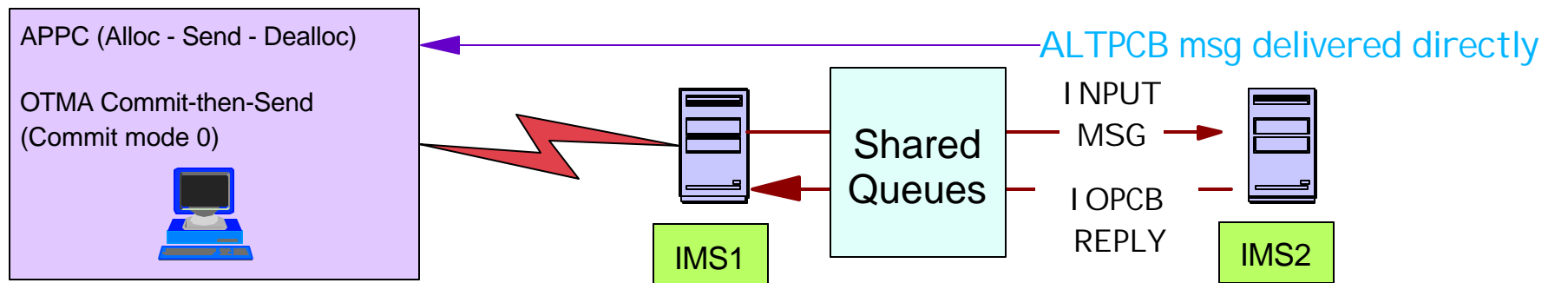
IMS V6 - Introduced Shared Queues support

- ▶ All APPC and OTMA messages processed on SQ "front-end"



IMS V7 - Enhanced Shared Queues support

- ▶ Asynchronous APPC/OTMA messages could process on any system in the Shared Queues group ("front- or back-end")



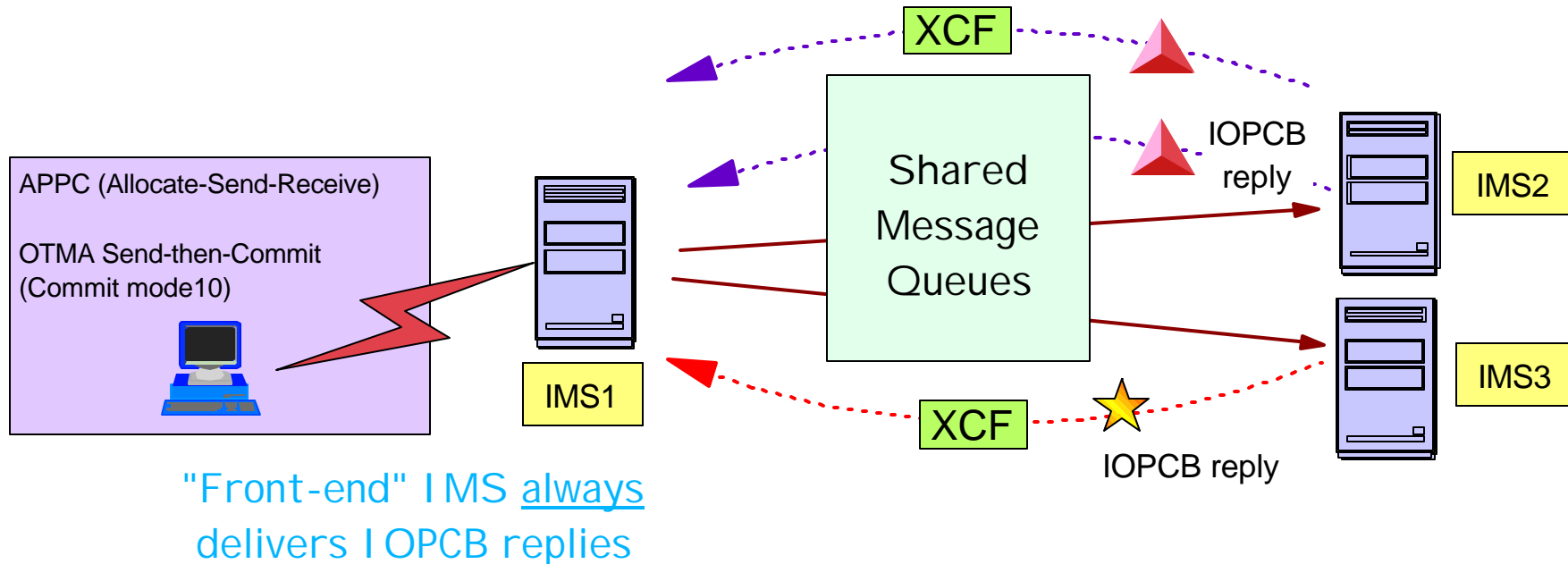
"Front-end" IMS always delivers IOPCB replies

Any system may pull message from queue and process it

Synchronous SQ Support ...

IMS V8 - Completes Shared Queues support

- ▶ Synchronous APPC/OTMA message support



- ★ Non-conversational IOPCB reply messages (less than 61K) are sent to the front-end using XCF services.
- ▲ Conversational IOPCB reply messages or any messages greater than 61K are sent to the front-end using Shared Queues along with a special NOTIFY message that is sent using XCF.

Synchronous SQ Support ...

Support for ...

- ▶ Sync_levels: None, Confirm, Syncpoint
- ▶ All transaction types except APPC CPIC-Driven

Uses RRS (Resource Recovery Services) - z/OS V1.2

- ▶ Allows synchronization of message-processing and the associated commit across IMS systems

Support is automatically enabled/disabled

- ▶ Disabled if RRS not available or not all shared queue members are IMS V8

IMS V8 Part 1b Review

Alter and Autoalter support

- ▶ Provides improved manageability for VSO and CQS structures

System-Managed rebuild support

- ▶ Provides rebuild support for VSO structures
- ▶ Provides improved rebuild support of CQS structures

System-Managed duplexing support

- ▶ Provides improved availability
 - Eliminates need for /VUNLOAD to reestablish duplexing when a shared VSO structure fails
 - May eliminate need to recover CQS structure
 - May eliminate need to repopulate Resource Structure (new in V8)

IMS V8 Part 1b Review ...

Shared queue support for synchronous APPC and OTMA transactions

- ▶ Makes the benefits of shared queues available to all types of IMS transactions, regardless of origin
- ▶ Requires all IMS systems to be at Version 8 level
 - MINVERS(81) specified in RECONS