



IMS/ESA Version 6

Overview





IMS/ESA Version 6 Enhancements

■ **Parallel Sysplex**

- ▶ VTAM Generic Resources
- ▶ Shared Queues
- ▶ Data Sharing
- ▶ Communications

■ **Continuous availability**

■ **Performance and capacity**

■ **DBRC function**

■ **Systems management**

■ **APPC**



IMS/ESA V6 Highlights

■ Parallel Sysplex Related Function

- ▶ Shared DC
 - VTAM generic resources
 - Common Queue Server (CQS)
 - Shared message queues and EMH
- ▶ Data sharing enhancements
 - Shared DEDB VSO
 - Shared DEDB SDEPs
 - OSAM coupling facility caching
 - Fast Database Recovery
 - CI reclaim



Highlights ...

■ Continuous availability enhancements

- ▶ Support for Daylight Savings Time and Year 2000
- ▶ Support for DFSMS Concurrent Copy
- ▶ Fast path online change



Highlights ...

■ Performance/capacity enhancements

- ▶ 8 gigabyte OSAM support
- ▶ UCB VSCR and 10,000 DD-names
- ▶ DBRC performance/parallelism
- ▶ Increased number of MSC links and SYSIDs
- ▶ DBCTL single cycle commit
- ▶ RACF signon performance



Highlights ...

■ DBRC functional enhancements

- ▶ Dropped support for RECOVCTL
- ▶ Shared DEDBs with VSO areas
- ▶ CA/DBDS/DB groups
- ▶ NOTIFY.RECOV timestamp
- ▶ Identify batch backout logs
- ▶ Log retention period



Highlights ...

■ DBRC functional enhancements ...

- ▶ List deleted log data sets
- ▶ CHANGE.DB UNAUTH
- ▶ LIST.RECON output
- ▶ Support for DST/2000
- ▶ Support for DFSMS CC



Highlights ...

■ Systems management/operations

- ▶ System definition
 - Macros
 - Process
 - Discontinued support

- ▶ IMS execution time
 - Security defaults, exits
 - Non-discardable message exit (DFSNDMX0)
 - Dynamic SAPs



Highlights ...

■ Systems management/operations ...

- ▶ System operations
 - Sysplex Communications
 - Generic /START REGION
 - Commands



Highlights ...

■ **APPC support**

- ▶ APSP security
- ▶ APPC distributed sync point

■ **Miscellaneous small enhancements**



VTAM Generic Resources

■ What is it?

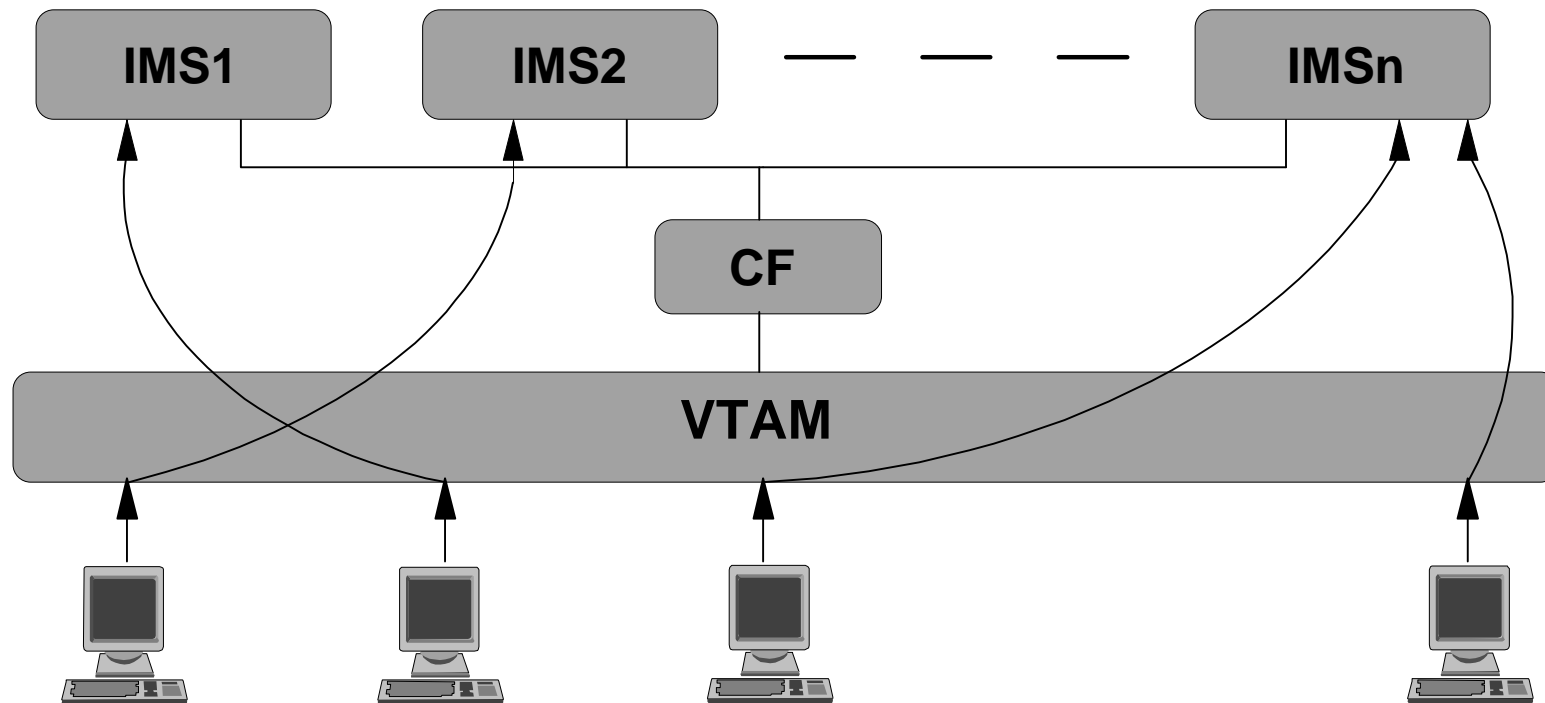
- ▶ A feature of VTAM that allows a collection of IMS systems in a Sysplex to be a member of a **Generic Resource Group** and to be known to terminal users by a single **Generic Resource Name**
- ▶ When users log on to the generic resource name, VTAM may route the logon request to any of the IMSs in the GRG

■ Software requirements

- ▶ MVS/ESA 5.2
 - OS/390 Release 3 for APPC generic resource support
- ▶ VTAM 4.2



VTAM Generic Resources ...



- ▶ 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 **any one of 'n' IMSs** in the Group



Joining the GRG

- Each IMS has its own IMS APPLID which is the name by which it is known to VTAM

```
COMM    APPLID=IMSA
EXEC    APPLID1=IMSA
```

```
COMM    APPLID=IMSB
EXEC    APPLID1=IMSB
```

- To join a Generic Resource Group, the Generic Resource Group Name (GRSNAME) is specified in the execution JCL of each IMS

```
EXEC    APPLID1=IMSA,GRSNAME=IMS
EXEC    APPLID1=IMSB,GRSNAME=IMS
```



IMSA and IMSB
are members
of the same
GRG (IMS)



Session Establishment

■ If user logs on with specific APPLID (IMSA)

- ▶ VTAM connects user to specific IMS (IMSA)

■ If user logs on with generic resource name (IMS)

- ▶ VTAM connects user to any member (IMSA or IMSB), based on VTAM session balancing methods
 - Existing mapping (affinity)
 - VTAM Generic Resource Resolution Exit
 - MVS Workload Manager information
 - Session counts

Affinities



■ When a terminal logs on to any IMS

- ▶ It acquires an affinity for that IMS

■ Affinities are maintained by VTAM and will be deleted at logoff time unless

- ▶ A significant status exists
 - Terminal is in **response mode**
 - Terminal is in **conversational mode**
 - Terminal is in exclusive, test, preset, or MFS test mode
- ▶ Terminal is a **SLUTYPEP** or **FINANCE** or (sometimes) **ISC** device

■ If an affinity still exists at the next logon

- ▶ VTAM will route the request to that IMS



Operations

■ IMS can join or leave a Generic Resource Group

▶ /STOP VGRS

- Prevents any new logons to this IMS

▶ /START VGRS GRSNAME name

- Causes IMS to join the VTAM GRG
- Used if IMS did not join when starting, or /STOP VGRS command had been issued

▶ /CHE FREEZE LEAVEGR

- Deletes all affinities when IMS shuts down



Compatibilities

■ XRF

- ▶ Cannot coexist with VTAM Generic Resources

■ RSR

- ▶ Cannot coexist with VTAM Generic Resources

■ ETO

- ▶ Can exist in a VTAM Generic Resource Group

■ MSC

- ▶ Can exist within a VTAM Generic Resource Group



Why Generic Resource Support?

■ Provides session workload balancing

- ▶ Replaces manual partitioning of the network

■ Enhances resource availability

- ▶ If an IMS system fails, the end users reinitiate their sessions with one of the surviving IMS's (some exceptions due to affinities)

■ Simplifies the end user interface to IMS in the Sysplex

- ▶ A single generic resource name provides access to any of a number of IMS's

■ Allows for non-disruptive growth

- ▶ IMS systems may be added without disrupting active IMS's in the Sysplex



Shared Queues

■ Shared Message Queues

- ▶ IMS full function messages available to multiple IMS subsystems
- ▶ Multiple queue types
 - Transaction, Suspend, Serial
 - Remote (MSC), LTERM, APPC, OTMA

■ Shared Fast Path EMH Queues

- ▶ Fast path EMH messages available to multiple IMS subsystems
- ▶ Multiple queue types
 - EMH Transaction (Balancing Group)
 - LTERM, APPC, OTMA



Shared Queues ...

- **Queues are maintained in List Structures in the Coupling Facility**
 - ▶ Defined in CFRM Policy
 - ▶ One primary structure for FF messages
 - Optional overflow structure
 - ▶ One primary structure for EMH messages
 - Optional overflow structure



Implementation

■ **IMS registers interest in specific queues**

- ▶ Indicates that IMS is capable of processing a message on that queue
- ▶ Input queues (e.g. TRANX)
 - TRANX is defined and not stopped in IMS
 - It can be scheduled and processed
 - Multiple IMSs in the shared queues group may register interest in a transaction
- ▶ Output queues (e.g. LTERMY)
 - LTERMY is defined and in session with IMS
 - Only one IMS in the shared queues group will (should) register interest in an output queue



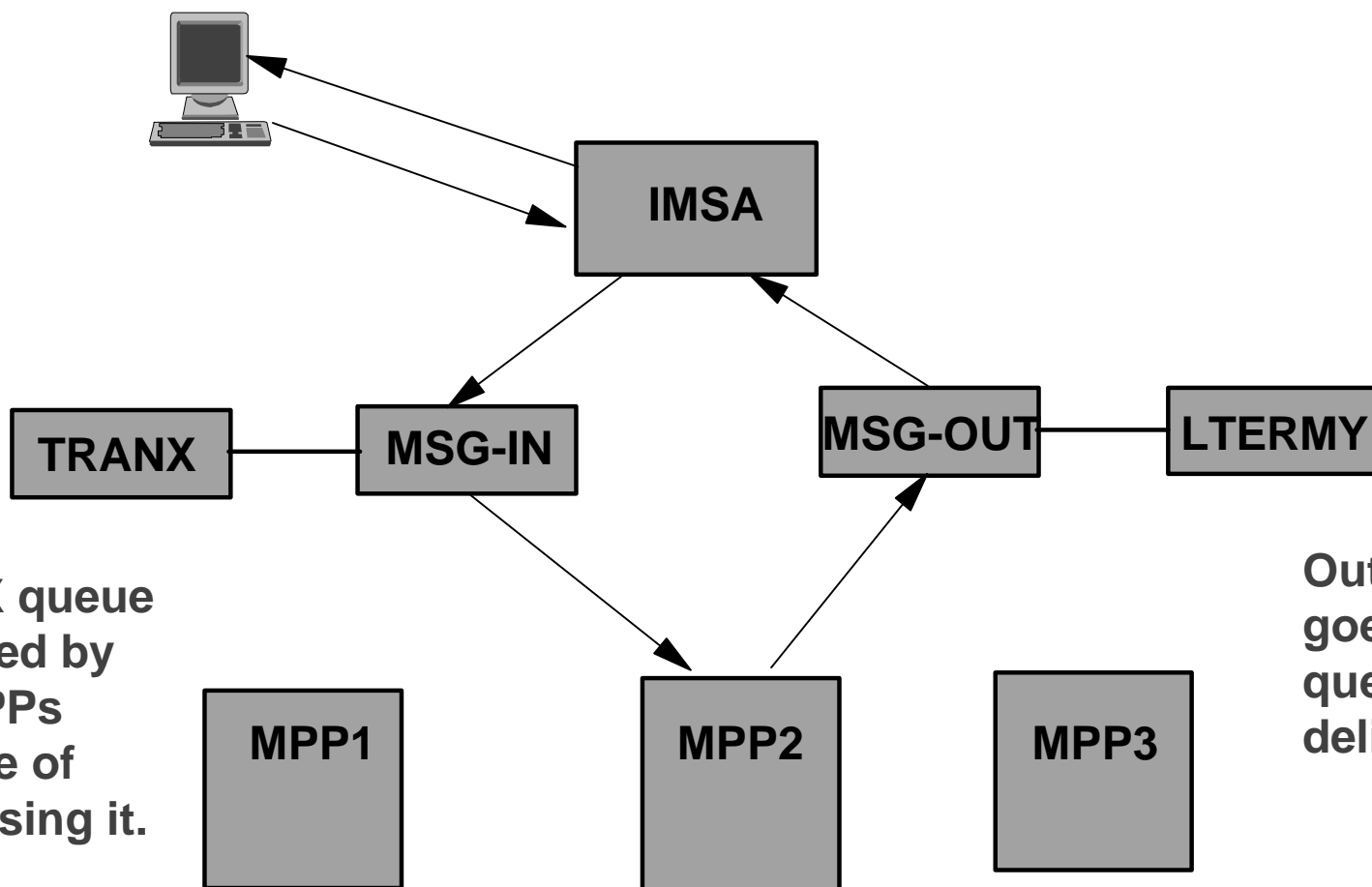
Implementation ...

■ Message handling

- ▶ When IMSn receives an input message it places it on a shared input queue (e.g. transaction ready queue)
 - ***Any IMS with registered interest in the transaction*** may retrieve it from the shared queue and process it

- ▶ When IMSn has an output message, it places it on a shared output queue (e.g. LTERM ready queue)
 - ***Any IMS with registered interest in the LTERM*** may retrieve it from the queue and send it
 - Should be only one IMS

Before Shared Queues



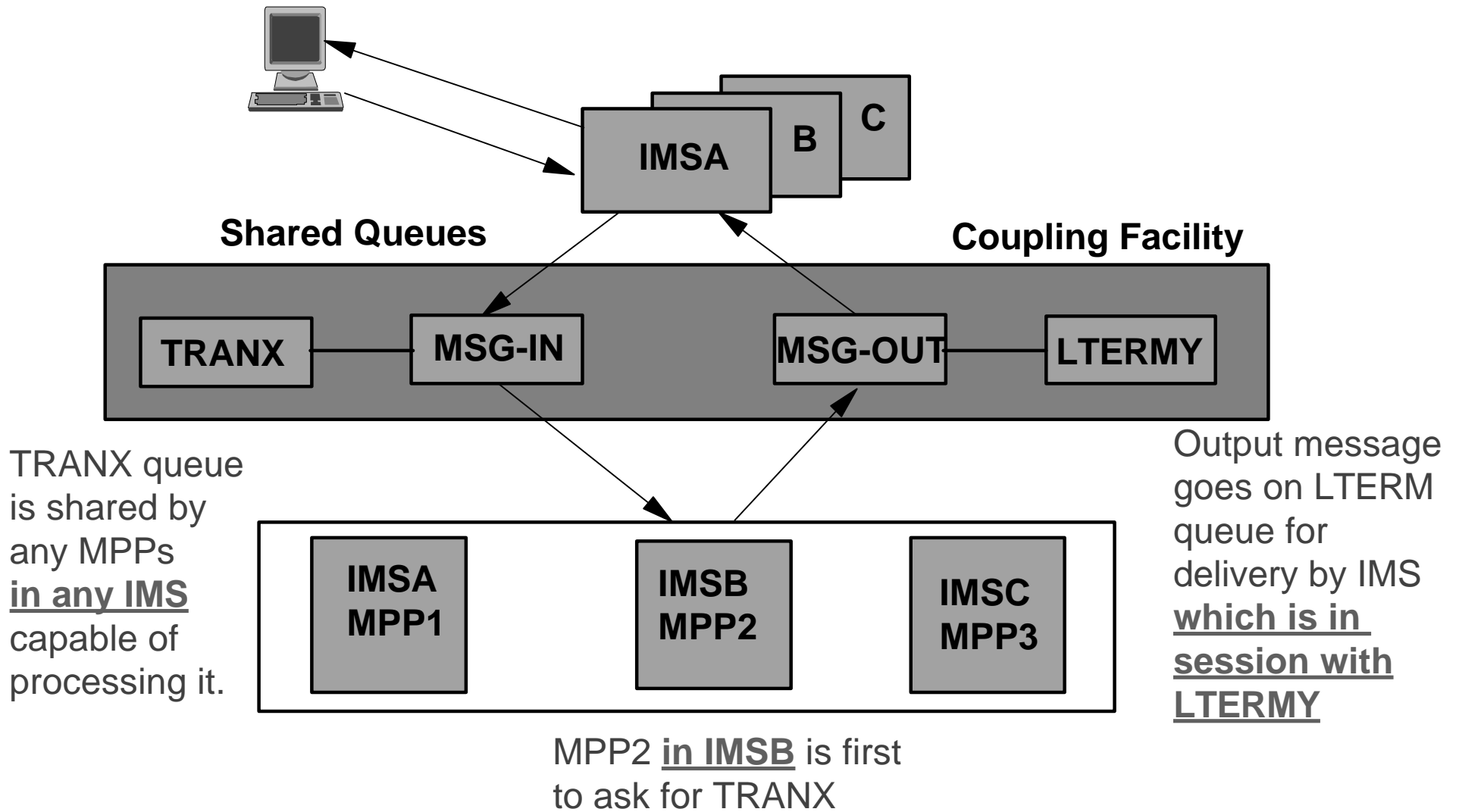
TRANX queue is shared by any MPPs capable of processing it.

Output message goes on LTERM queue for delivery by IMS.

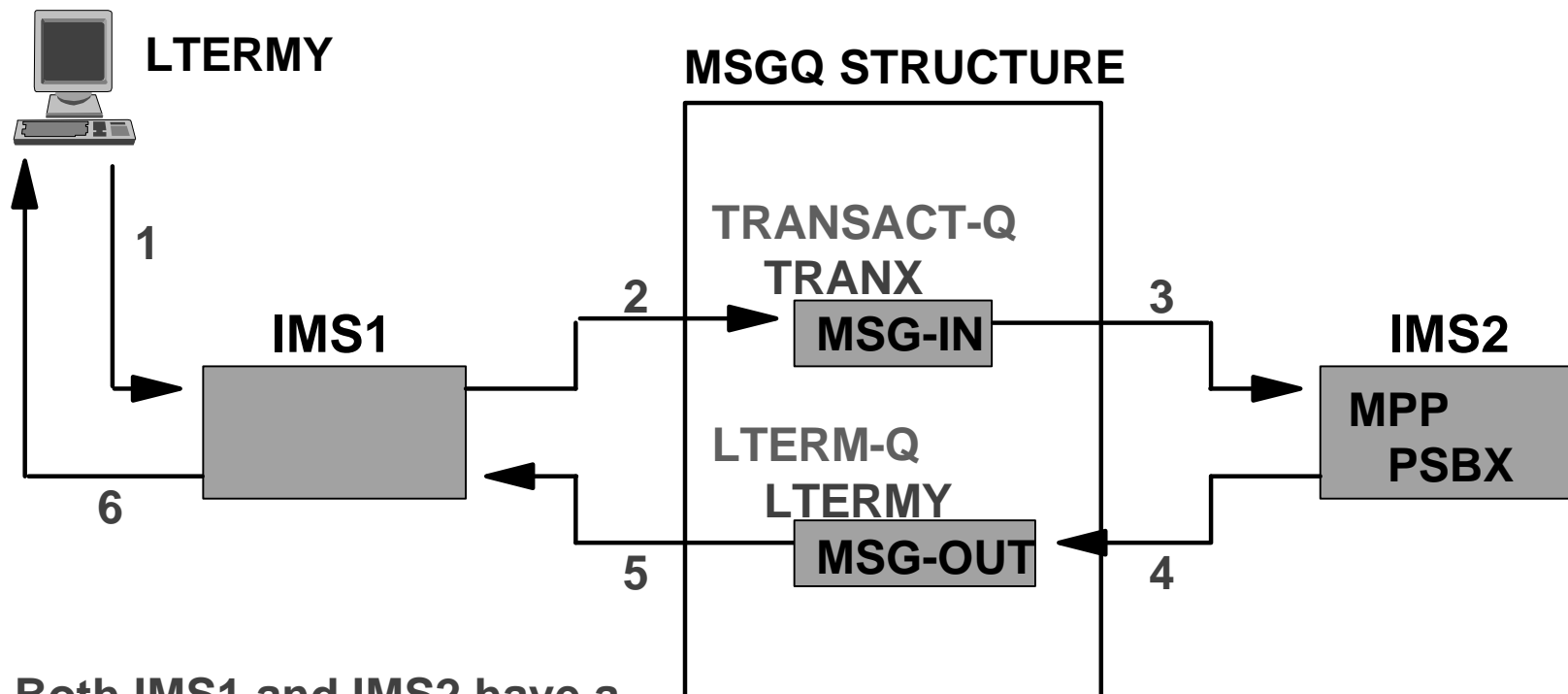
MPP2 is first to ask for TRANX



With Shared Queues



Shared Queues Example



Both IMS1 and IMS2 have a registered interest in TRANX.

Only IMS1 has a registered interest in LTERMY.



Shared Queues Example ...

- 1. Message (TRANX) is received by IMS1 from LTERMY**
- 2. IMS1 puts message on TRANX queue**
- 3. IMS2 is notified that there is a message on the TRANX queue, retrieves message from the queue, and schedules it into available message region**
- 4. IMS2 places committed response on LTERMY queue**
- 5. IMS1 is notified that there is a message on LTERMY queue and retrieves message from queue**
- 6. IMS1 sends response to LTERMY**



Shared Queues Components

■ Coupling facility structures

- ▶ Message Queue Structures (Primary and Overflow)
- ▶ EMH Queue Structures (Primary and Overflow)
- ▶ MVS Logger Structures (MSGQ and EMHQ log streams)

■ Common Queue Server (CQS) address space

- ▶ One per IMS
- ▶ Interface between IMS and shared queue structures

■ CQS Checkpoint Data Sets

- ▶ Two per CQS (MSGQ and EMHQ)
- ▶ Used for recovery/restart of CQS and for structure recovery



Shared Queues Components ...

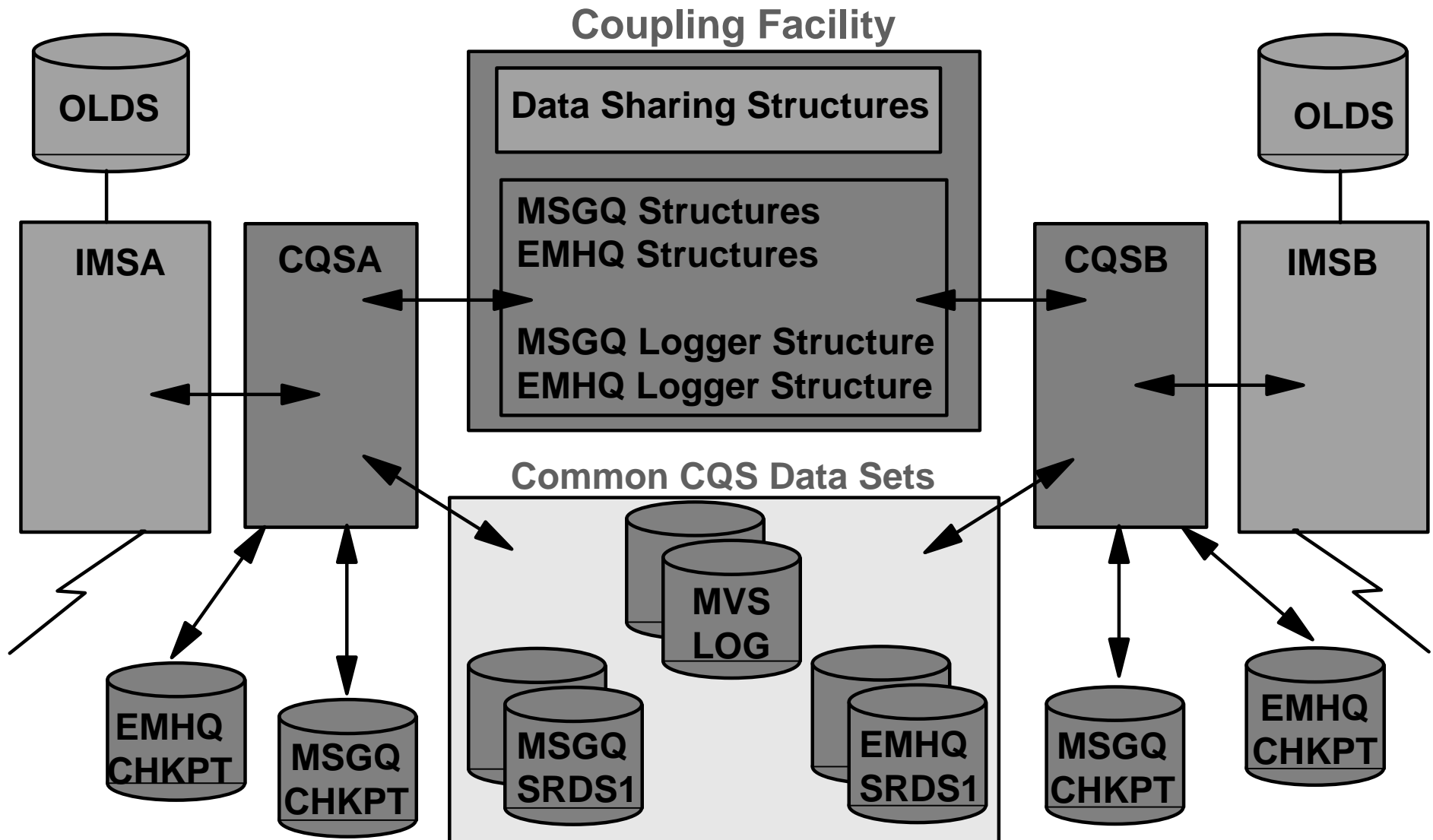
■ Structure Recovery Data Set

- ▶ Two pair per Shared Queues Group (MSGQ and EMHQ)
- ▶ Used, with MVS Log Stream, to recover structures

■ MVS Log Streams

- ▶ Two per Sysplex (one for MSGQ and one for EMHQ)
- ▶ CQS logs MSGQ and EMHQ activity into and out of structures
 - All CQSs use the same log stream(s)
- ▶ Used, with CQS Checkpoint Data Set or Structure Recovery Data Set for structure recovery and/or CQS restart

Shared Queues Components ...





Special Considerations

■ SERIAL transactions

- ▶ Will only be processed on the IMS on which the transaction was entered
- ▶ SERIAL is in effect within a single IMS but not across multiple IMSs

■ APPC and OTMA transactions

- ▶ Will be processed only on the IMS which received the transaction

■ Commands and command responses

- ▶ Not placed on the shared queues

Special Considerations ...



■ Fast Path EMH options (DBFHAGU0)

▶ LOCAL ONLY

- Schedule in the local IMS if there is an active PSB
- Queue it on local BALG if necessary
- Else, reject the input message

▶ LOCAL FIRST

- Schedule in the local IMS if there is an active PSB ready
- If none ready, put on shared queue

▶ GLOBAL ONLY

- Put on shared queue if there is an active PSB anywhere in the shared queues group
- Else, reject the message



Special Considerations ...

■ MSC

- ▶ MSC links can be defined between IMSs in the same shared queues group, but should not be started
 - Messages destined for SYSIDs in the same shared queues group go on the shared queue, not across an MSC link
- ▶ Messages received from an IMS remote to the Shared Queues Group may be processed by any IMS within the Group
- ▶ Messages destined for SYSIDs outside the shared queues group will be sent by whichever IMS has the active link



Special Considerations ...

■ LTERM destinations

- ▶ If ETO is not defined
 - LTERMs must be defined in the IMS SYSGEN
 - Exception: not required for response to IO-PCB

- ▶ If ETO is defined
 - Output creation exit (DFSINSX0) may create an LTERM destination if none exists



Special Considerations ...

■ Transaction destinations

- ▶ To place transaction input on shared queue
 - Transaction must be defined in IMS SYSGEN
 - Exception: Can use DFSINSX0 (Output Creation Exit) to create a dynamic transaction for purposes of placing message on shared queue - not for processing it
 - ETO not required for DFSINSX0 to create a transaction destination

- ▶ To process a transaction on the shared queue
 - Transaction must be defined in IMS SYSGEN



Structure Rebuild

■ Why

- ▶ CF failure, structure failure, connection failure
- ▶ Take CF offline for maintenance

■ Structure Recovery

- ▶ When no CQS has access to the structures
- ▶ CQS uses SRDS plus MVS Log Stream to rebuild structure

■ Structure Copy

- ▶ When at least one CQS has access to the structure
- ▶ Existing structure copied to new structure



Benefits of Shared Queues

■ Automatic work load balancing

- ▶ A message placed on the Shared Queues can be processed by any IMS with interest in the message

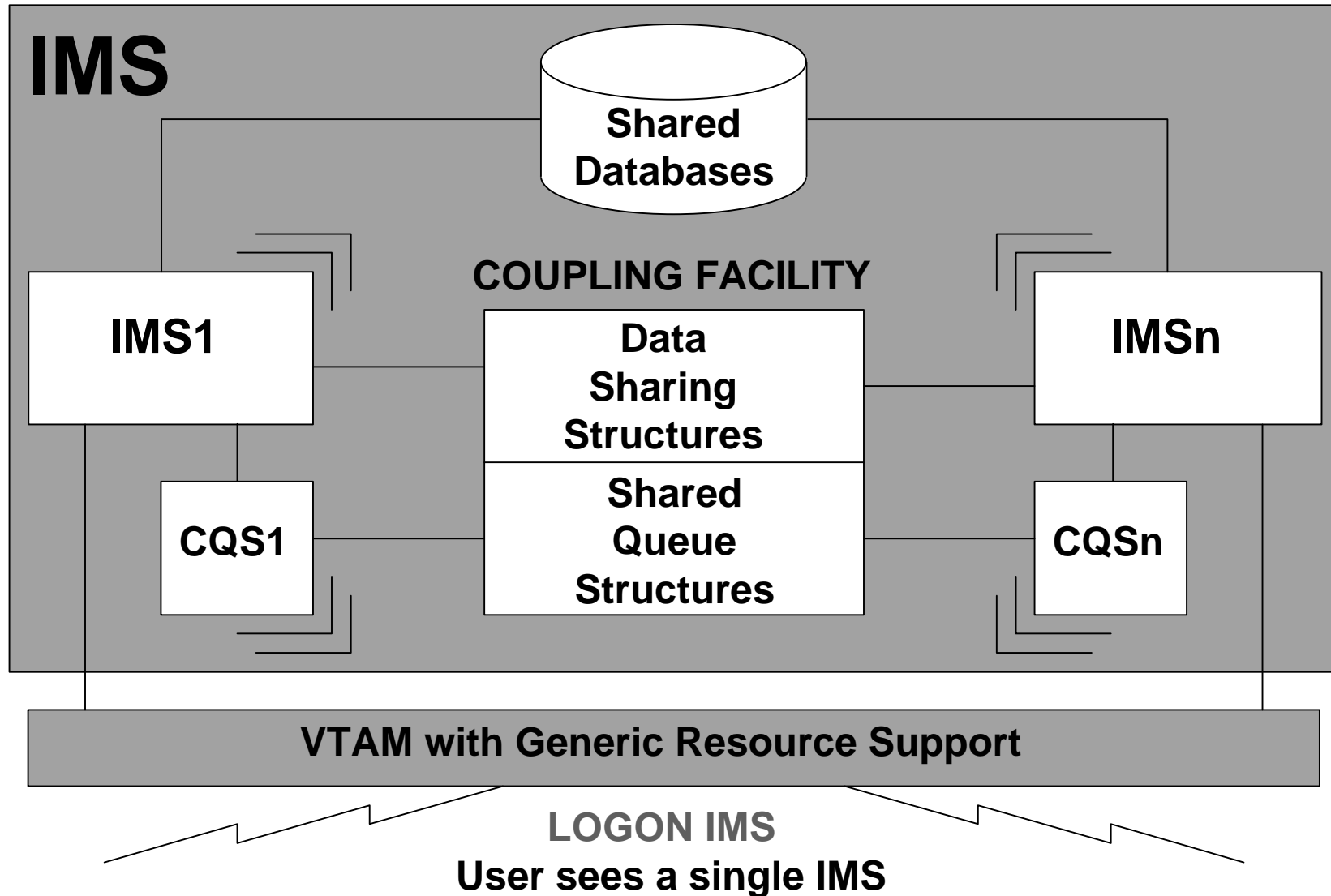
■ Incremental growth

- ▶ New IMS subsystems can be added as workload increases
- ▶ New IMSs can be for processing only (no network) during periods of heavy activity

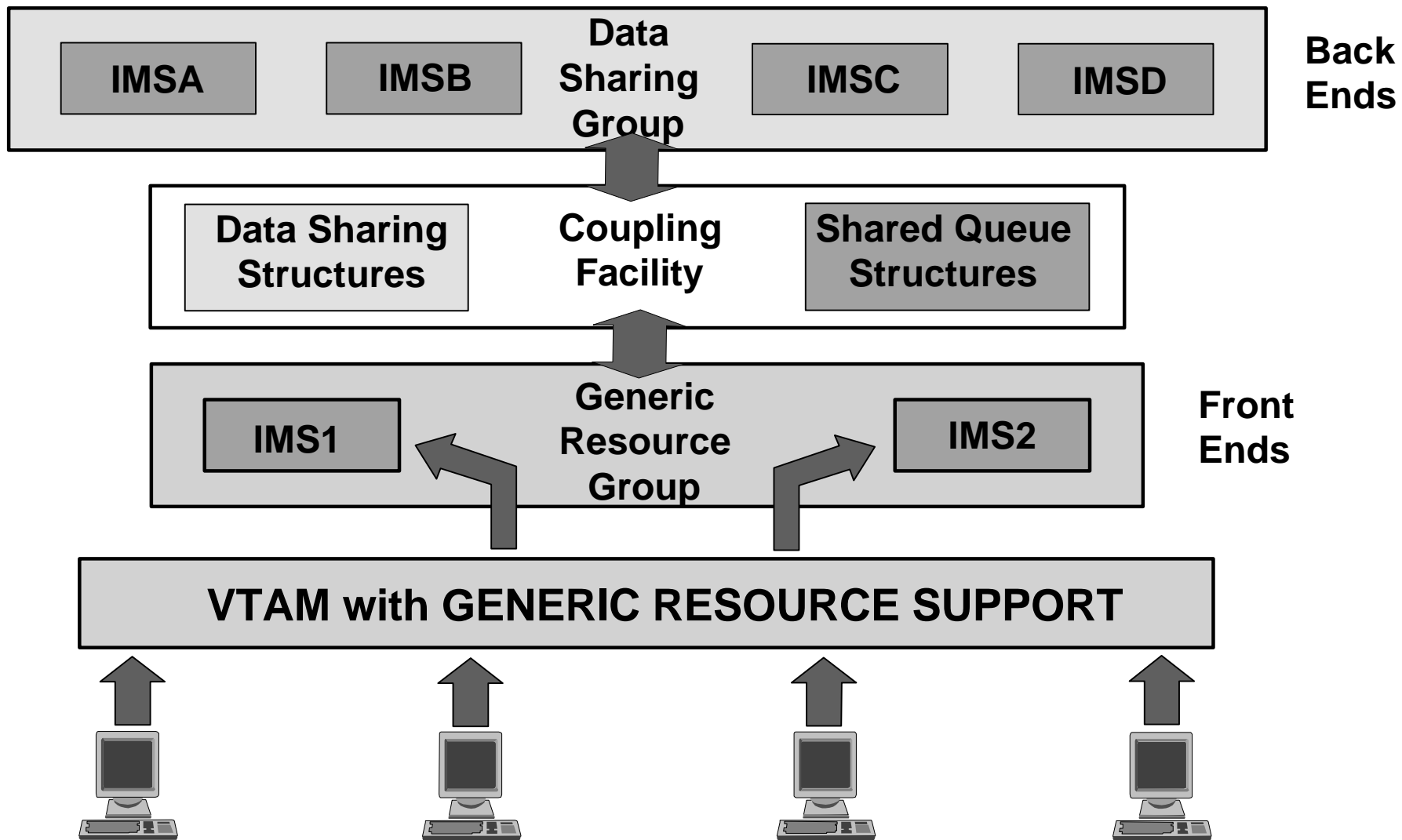
■ Improved availability

- ▶ If an IMS fails, the workload is assumed by the surviving IMSs
- ▶ Shared queues are not lost if one or more IMSs are cold started

IMS V6 in a Parallel Sysplex



Alternative Configuration





Fast Path Data Sharing Enhancements

■ **BLDS for DEDBs with Virtual Storage Option (VSO)**

- ▶ VSO introduced in V5 as replacement for MSDBs
- ▶ Area CIs stored in MVS data space
- ▶ Block level data sharing not supported in V5

■ **BLDS for DEDBs with sequential dependents (SDEPs)**

- ▶ Special segment type for DEDBs
- ▶ Committed updates not written to DASD until CI full
- ▶ Block level data sharing not supported prior to V6



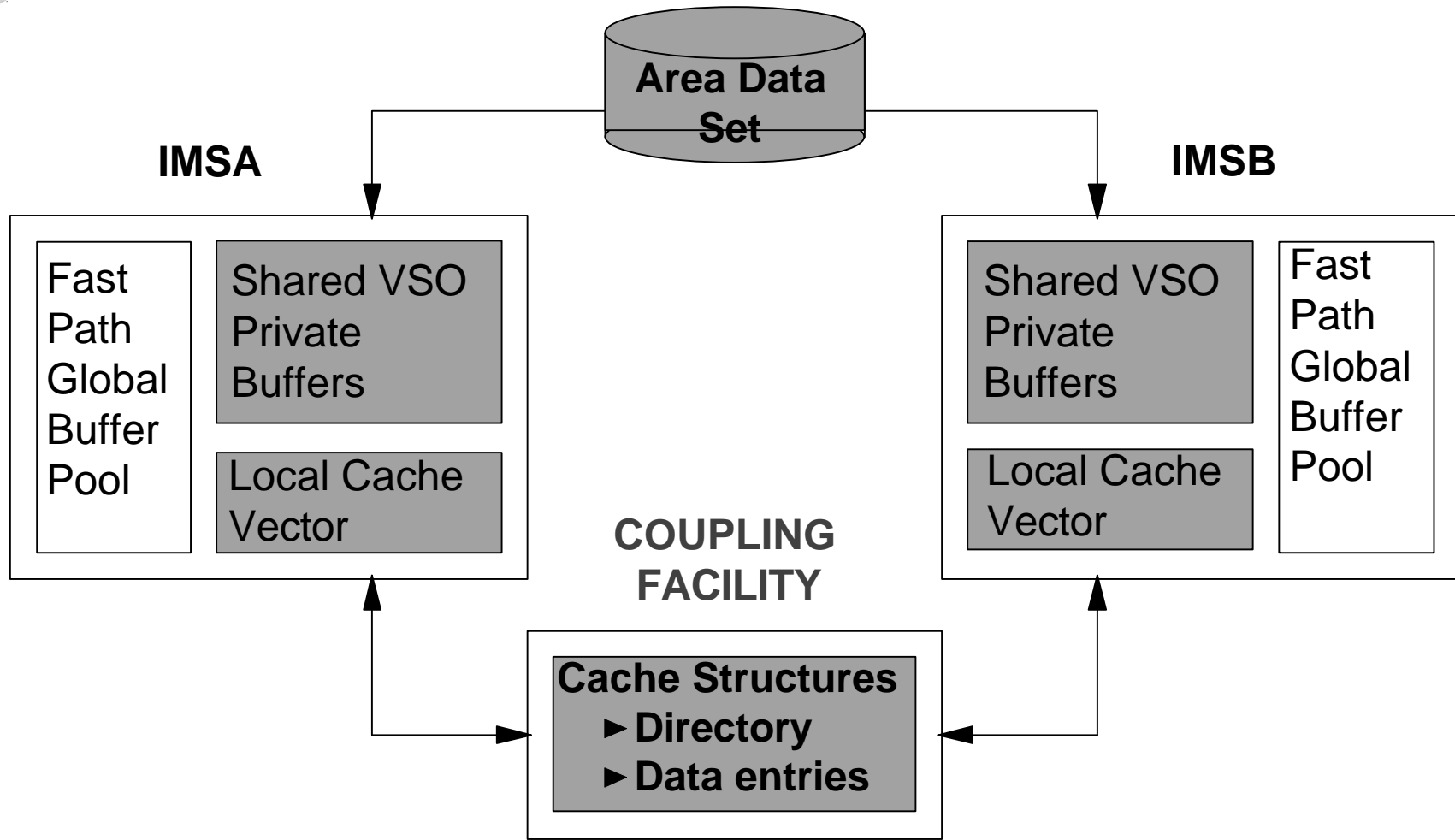
BLDS for DEDBs with VSO Areas

- **Utilizes structures in Coupling Facility instead of MVS data spaces**
 - ▶ ***Store-in Cache*** structures hold Area CIs in CF
 - Used to store data and for buffer invalidation
 - One structure for each shared VSO area
 - ▶ IRLM ***Lock*** structure still used for locking

- **Private buffer pools used within each IMS**
 - ▶ Provides ***look-aside buffering***
 - ▶ Fast path global buffer pool not used



Shared VSO Implementation



Each area has its own structure



BLDS for DEDBs with SDEPs

■ Implemented with

- ▶ SDEP segment format changes
- ▶ SDEP CI format changes
- ▶ Processing changes within each sharing IMS
- ▶ Changes to SDEP utility (SCAN/DELETE) processing

■ No changes to sharing of root and direct dependents

■ Transparent to application programs

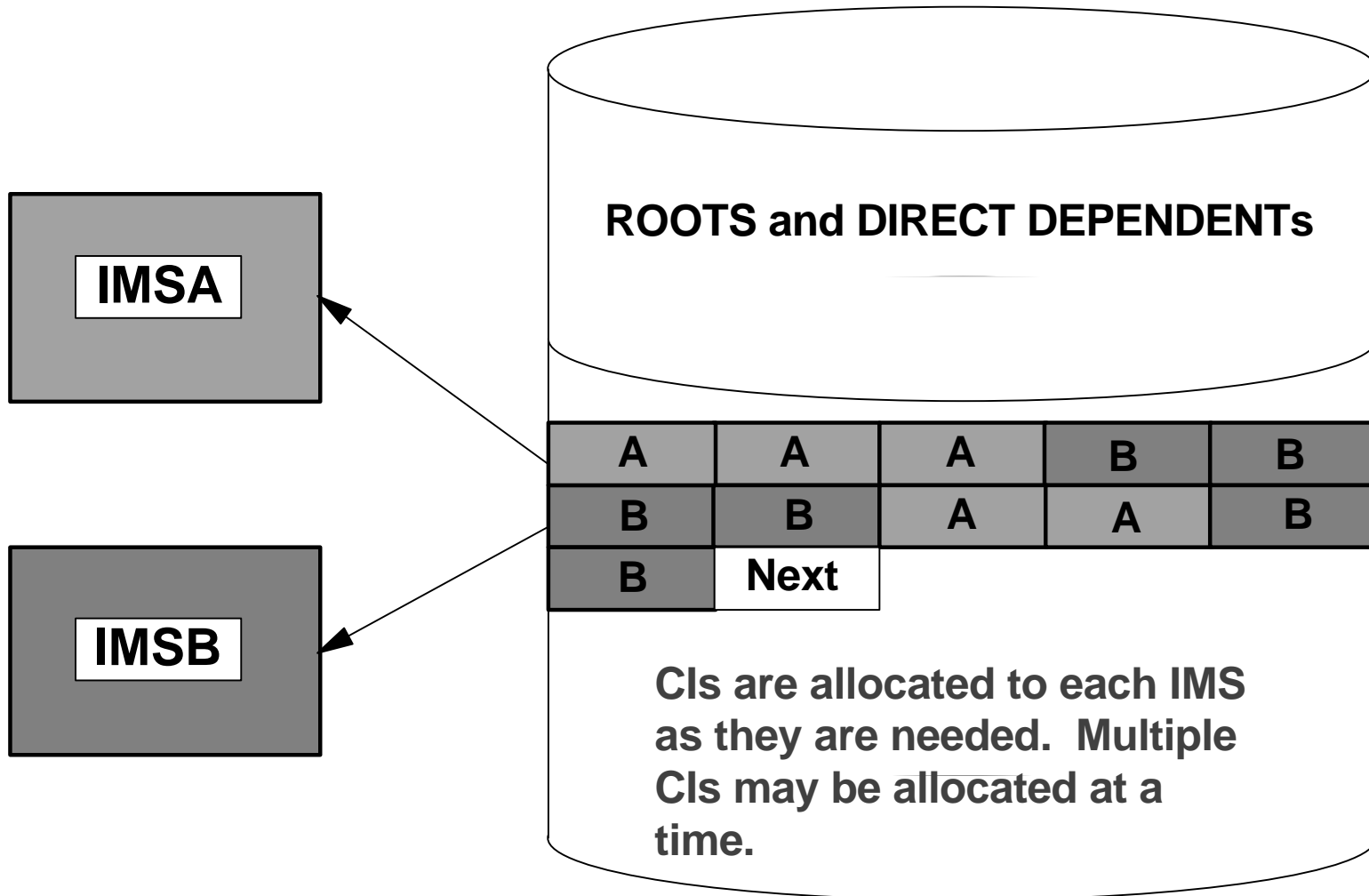
- ▶ ISRT and GNP processing functionally equivalent



Shared SDEP Processing Changes

- **SDEP space allocated to sharing IMSs on CI basis**
 - ▶ Allocated CI belongs to just one IMS
 - ▶ Individual CIs are not shared for insert purposes
 - ▶ Individual CIs are shared for read or utility purposes
- **Sequential Dependent Segments have timestamps**
 - ▶ Added to the end of the segment by fast path
 - ▶ All segments inserted in same sync interval have same timestamp
 - ▶ Removed before returning to application Get call or Scan Utility
- **Scan and Delete utilities function on timestamp boundary**
 - ▶ Scan utility sorts on timestamp (may be overridden by control card)

Shared SDEP Implementation ...





V6 OSAM BLDS Enhancements

■ Provides for CF caching of shared OSAM databases

- ▶ Objective is to reduce impact of OSAM *re-read* activity due to buffer invalidation
- ▶ Utilizes *store-through cache*
 - Only unchanged data written to cache
 - Changed data written first to DASD
- ▶ V5 used *directory only cache* (no data)

■ Caching is a user specified option

- ▶ Specified at the OSAM subpool level (IOBF statement)
 - Cache **ALL** data when read
 - Cache only data which has been **CHANGED**



Requesting Data Caching

Specified with IOBF subpool definition statement

IOBF=(l,n,f1,f2,id,co)

l = length of subpool buffers
n = number of buffers in subpool
f1 = buffer page fix option
f2 = buffer prefix page fix option
id = subpool name (1-4 characters)

co = **caching option**

N = no data caching

A = cache all data (when read)

C = cache only changed data (after written)



CFRM Policy

- **OSAM buffer invalidation structures are defined in the CFRM Policy and activated by MVS**

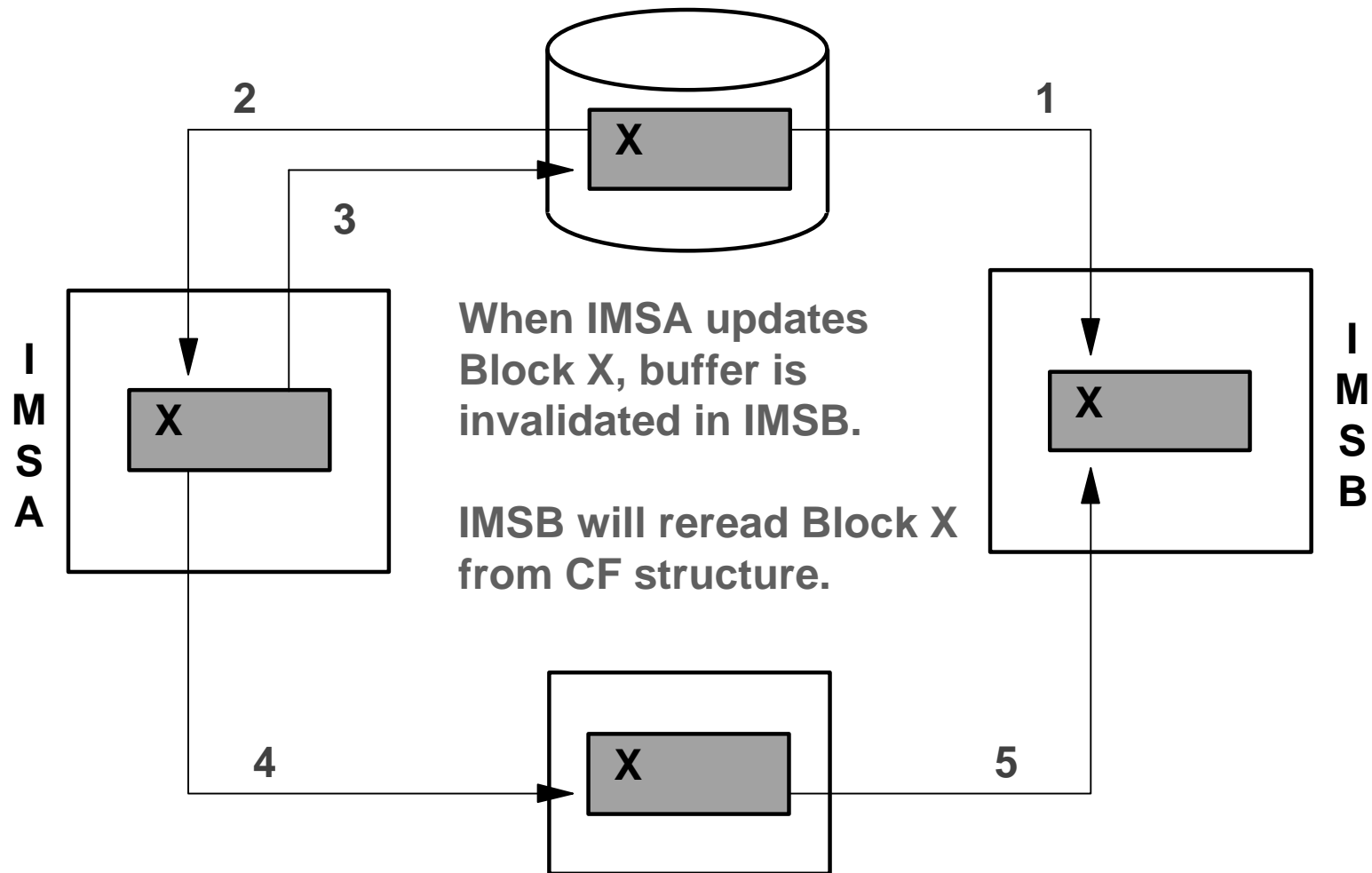
```
DEFINE POLICY,NAME(POLICY1)  
        STRUCTURE NAME(OSAM1) SIZE(1000)
```

- **Structure names defined to IMS in DFSVSMxx**

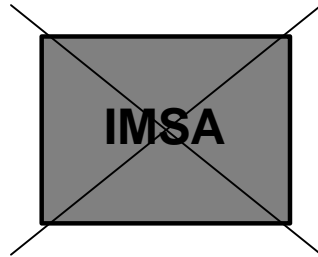
```
CFNAMES  
.....,CFOSAM=OSAM1
```

- **IMS connects to structure during initialization**
 - ▶ First IMS to connect builds structure

OSAM Caching Example

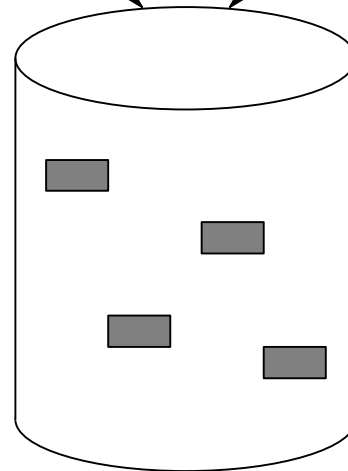
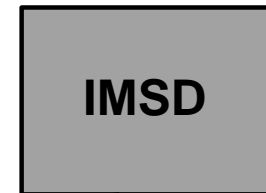
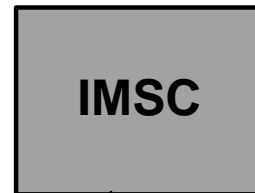


Fast Database Recovery



**IMSA has failed
holding update
locks in database.**

**These locks are
retained by IRLM
until IMSA ERE.**



**SHARED
DATABASE**

**Applications running
in IMSB, IMSC, and
IMSD get lock reject
conditions (U3303)
when trying to access
data protected by
retained locks.**

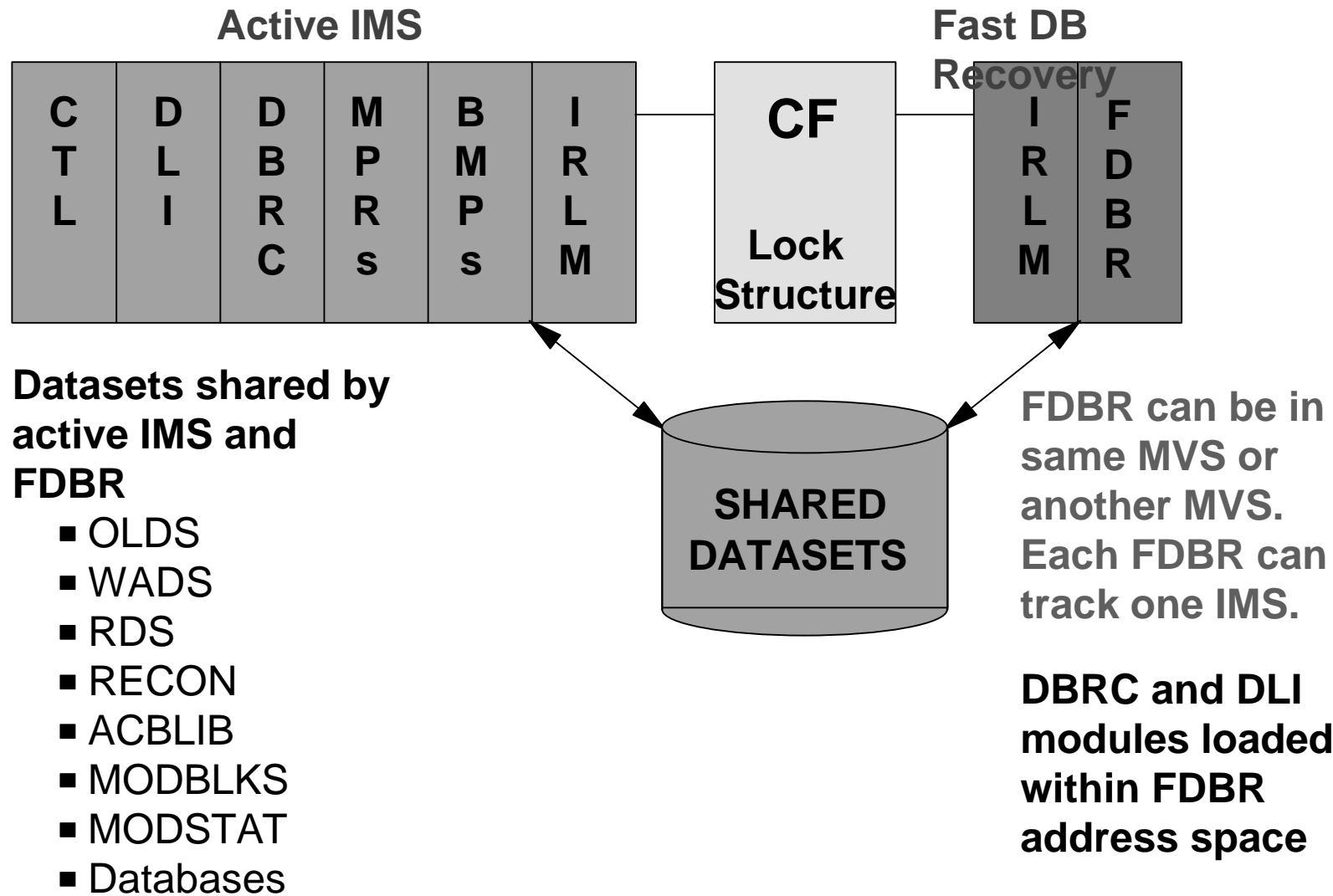


FDBR Approach

- **Track active IMS with independent FDBR region**
 - ▶ FDBR region may be on same or another MVS
- **When problem with active IMS detected, invoke FDBR**
 - ▶ Dynamically recover databases
 - DL/I dynamic backout
 - DEDB redo processing
 - ▶ Purge retained locks from IRLM
- **Still necessary to emergency restart failed IMS**
 - ▶ Message queues must be recovered
 - ▶ MSDBs must be recovered
 - ▶ DB2 and CICS indoubt threads must be resolved

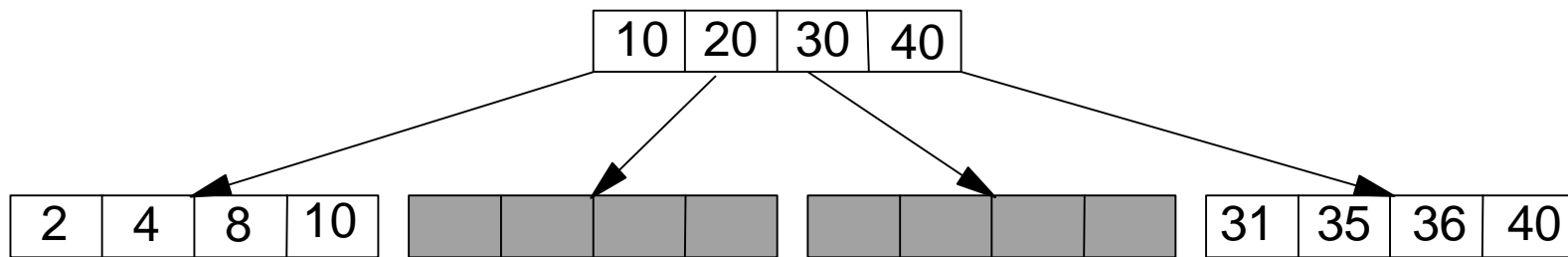


FDBR Configuration





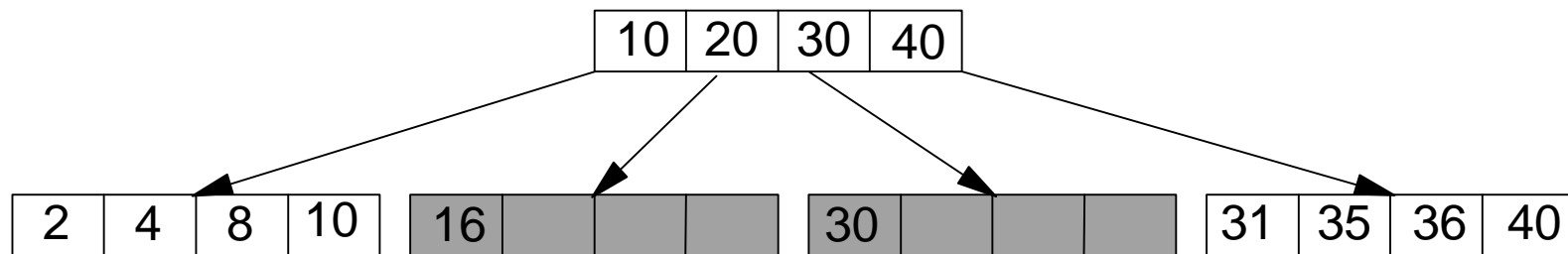
VSAM CI Reclaim Prior to V6



- **IMS turns off CI reclaim when BLDS or XRF are used**
- **When empty CIs are not reclaimed**
 - ▶ Index still points to empty data CI
 - ▶ CI is not reused unless correct key inserted (e.g. 11-20 or 21-30)
 - Space utilization decreases
 - ▶ Performance impact when call to VSAM is ***get greater than or equal***
 - Used by IMS for GU ROOT, GN ROOT, and ISRT ROOT
 - e.g. GU ROOT (ROOTKEY = 15)
 - VSAM ***reads empty CIs*** (20,30) until it finds a KEY \geq 15 (31)
 - Problem magnified with mass deletes in ***many consecutive CIs***



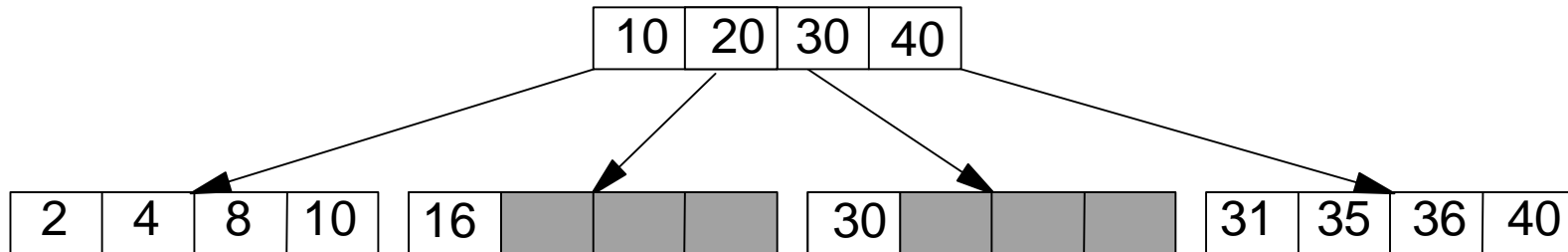
VSAM CI Reclaim in V6



- **IMS does not turn CI reclaim off for BLDS or XRF**
- **When last segment in CI is deleted and committed**
 - ▶ IMS flags segment as deleted instead of erasing it
 - Sets *delete flag* on in segment prefix
 - ▶ VSAM does not attempt CI reclaim, since there is *still a valid segment in CI* (from VSAM's perspective)
- **Last segment means**
 - ▶ Last segment in CI deleted by IMS (e.g. 16)
 - ▶ Not necessarily segment with highest key (e.g. 20)

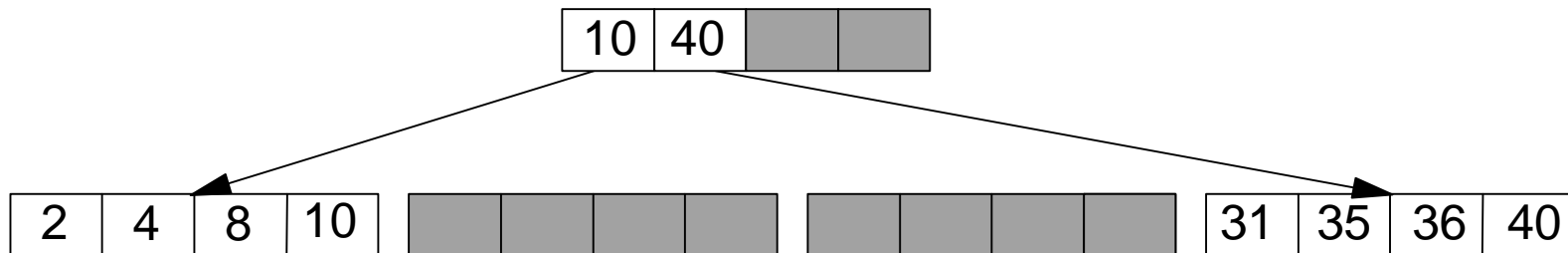


VSAM CI Reclaim in V6 ...



GU ROOT (KEY = 15)

Read ROOT 16, erase 16, reclaim CI
 Read ROOT 30, erase 30, reclaim CI
 Read ROOT 31, return GE to application



All subsequent application programs benefit

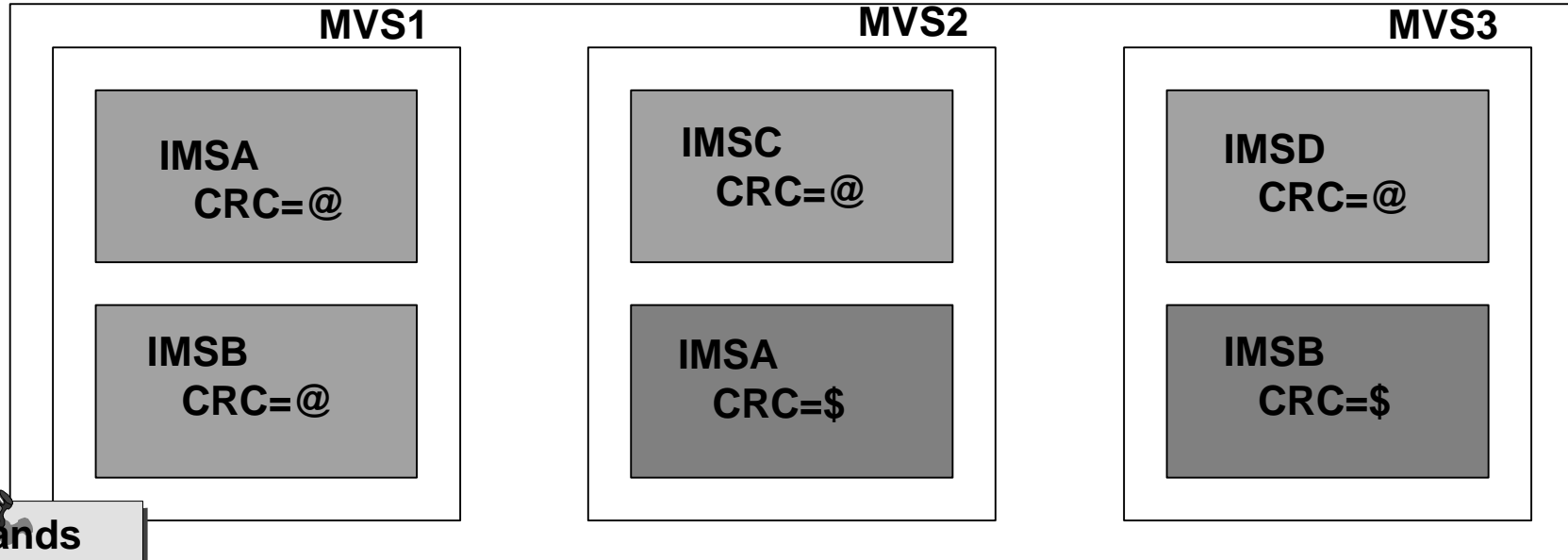
GU ROOT (KEY = 15)

Read ROOT 31, return GE to application



V6 Sysplex Communications ...

SYSPLEX



Commands entered at TSO-SDSF console on MVS1.

- | | |
|---|---------------------|
| <code>/ROUTE *ALL,@START DB ACCTMSTR</code> | All IMSs with CRC=@ |
| <code>IMSADISPLAY DB ACCTMSTR</code> | IMSA on MVS1 |
| <code>/ROUTE MVS2,@START DB CUSTMSTR</code> | IMSC on MVS2 |
| <code>/ROUTE MVS2,\$START VENDORDB</code> | IMSA on MVS2 |



Daylight Savings Time and Year 2000

■ The current situation

- ▶ IMS internal dates do not include the century (YYYYDDD)
- ▶ IMS internal times are local times
- ▶ Local times move backward in October and forward in April
- ▶ Database recovery uses timestamps in log records as a sort key
- ▶ DBRC will not accept times which are backwards

■ The current problem

- ▶ When the clocks are moved back in October
 - IMS must be ***shut down*** for at least an hour (usually more)
- ▶ When the clocks are moved forward in April
 - IMS must be ***shut down*** and restarted



DST/2000 Solution

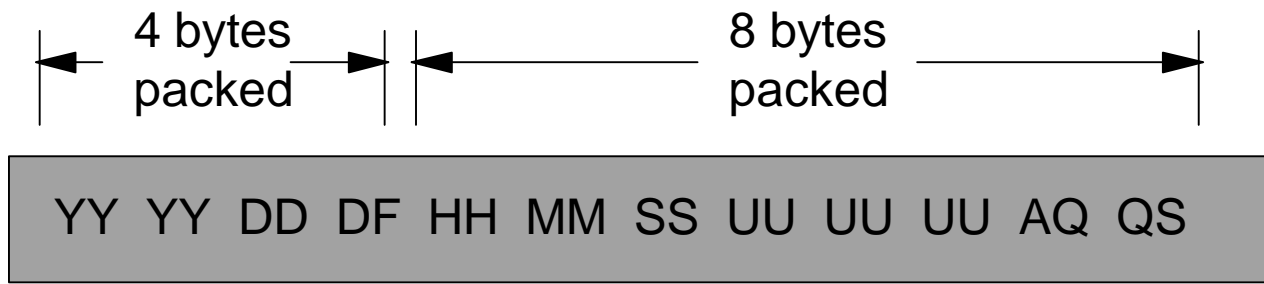
■ Define a revised internal timestamp which

- ▶ Includes a 4-digit year (YYYYDDDD)
 - Good for the next 8000 years, then more problems
- ▶ Uses **UTC/GMT** (Coordinated Universal Time/Greenwich Mean Time) for the time fields in DBRC, log records,
 - UTC doesn't change for daylight savings time
 - All IMSs throughout the world will use the same time, regardless of the local time
- ▶ Includes a *signed offset* from the UTC time to local time
- ▶ Increases the *precision* of the timestamp to the micro-second level



Timestamp Format

■ Internal timestamp format



■ External timestamp format

▶ **Punctuated** - for readability

– [yy]yy.ddd hh:mm:ss.t[hmiju] [offset/label]

– 97.252 08:35:45.2 -8:00

– 1997.252 08:35:45.2 PST

▶ **Compressed** - no punctuation



How New Timestamp Works

■ MVS TOD (time of day) clock

- ▶ Hardware clock set to UTC
- ▶ Set local time offset from UTC in SYS1.PARMLIB(CLOCKxx)

■ In parallel sysplex

- ▶ Sysplex timer required
- ▶ TOD set to UTC by sysplex timer (all CPCs use same time)
- ▶ Each MVS may have its own offset
 - Different MVSs in same sysplex can have different local time

■ When any IMS in parallel sysplex issues STCK

- ▶ UTC time is stored and local offset is added



DFSMS Concurrent Copy Support

■ DFSUDMT0 - Database Image Copy 2 Utility

- ▶ Invokes **DFSMSdss DUMP** to create copy of data set
- ▶ Can produce consistent (*clean*) or concurrent (*fuzzy*) image copy
 - Clean image copy requires /DBR until logical copy completes
 - Fuzzy image copy does not require /DBR
- ▶ IMS database data sets supported
 - HDAM, HIDAM, HISAM, DEDB
 - OSAM, ESDS, KSDS
- ▶ Will produce 1-4 copies
 - 2 copies registered with DBRC at completion of DUMP
 - 2 copies available for shipment offsite



DFSMS Concurrent Copy Support

■ DBRC enhanced to support

- ▶ New image copy types (**SMSNOCIC** and **SMSCIC**)
- ▶ GENJCL.IC for SMS image copy
- ▶ GENJCL.RECOV will generate recovery JCL using SMS CC

■ Database Recovery Utility (DFSURDB0)

- ▶ Must run with DBRC=Y
- ▶ Accepts SMSNOCIC and SMSCIC image copy as input
- ▶ Invokes **DFSMSdss RESTORE** for data set
- ▶ Recovers using logs and restored data set



FP Online Change Support

■ Online change for DEDBs

- ▶ Not necessary to recycle IMS
- ▶ Database level changes
 - Affects entire DEDB
 - Entire DEDB must be /DBRed
- ▶ Area level changes
 - Affects only a subset of the Areas within the DEDB
 - Only the affected Areas must be /DBRed
 - Requires a two-stage randomizer

```
DBD .....,ACCESS=DEDB,RMNAME=(MYRAND,2)
```



OSAM 8 Gigabyte Data Sets

■ Maximum size of OSAM data set increased to 8GB

- ▶ OSAM blocksize must be an even number
- ▶ No DBD changes
- ▶ Supported by all IMS utilities
- ▶ Available in IMS/ESA V5 (PN82671)

■ Bit 31 (low order bit) used for extended addressability

RBA = x'00 00 20 00'	8,192
RBA = x'00 00 20 01'	
= x'01 00 00 20 00'	→ 4,294,975,488



31-Bit UCBs/10,000 DD Statements

■ The problem

- ▶ The number of DD statements that could be defined in a single address space's JCL was limited by two factors
 - The virtual storage to contain the UCBs (unit control blocks)
 - The size of the TIOT (maximum of 3273 DD names)
- ▶ MVS/ESA 5.1 and 5.2 addressed these problems
 - XTIOT (Extended TIOT) above the line
 - UCBs above the line
- ▶ But IMS did not support 31-bit UCB addresses
 - Number of devices limited by virtual storage



UCB/10,000 - ENABLING

■ IMS V6

- ▶ Provides support for MVS UCB VSCR enhancement
- ▶ No external changes but
 - Only for *dynamically allocated datasets*
 - JCL allocation limited to TIOT size (3273)
- ▶ IMS supports 31-bit UCBs for the following
 - Fast path area data sets
 - Full function VSAM database data sets
 - Full function OSAM database data sets
- ▶ Limit applies to each address space
 - 10,000 FF data sets in DLISAS plus 10,000 FP ADSs in CTL



DBRC Performance

■ Reduction in CPU and RECON I/O for some DBRC calls

- ▶ Database DBOPEN processing
- ▶ Authorization processing
 - DEDB /DBR
 - DEDB PREOPEN
- ▶ Reduced log calls during RECON update
- ▶ Several others
- ▶ No externals



New MSC Limits

Resource	IMS Macro	V5	V6
Physical Links	MSPLINK	255	676
Sessions		255	676
Logical Links	MSLINK	254	676
Logical Link Paths	MSNAME	255	676
SYSIDs		255	2036

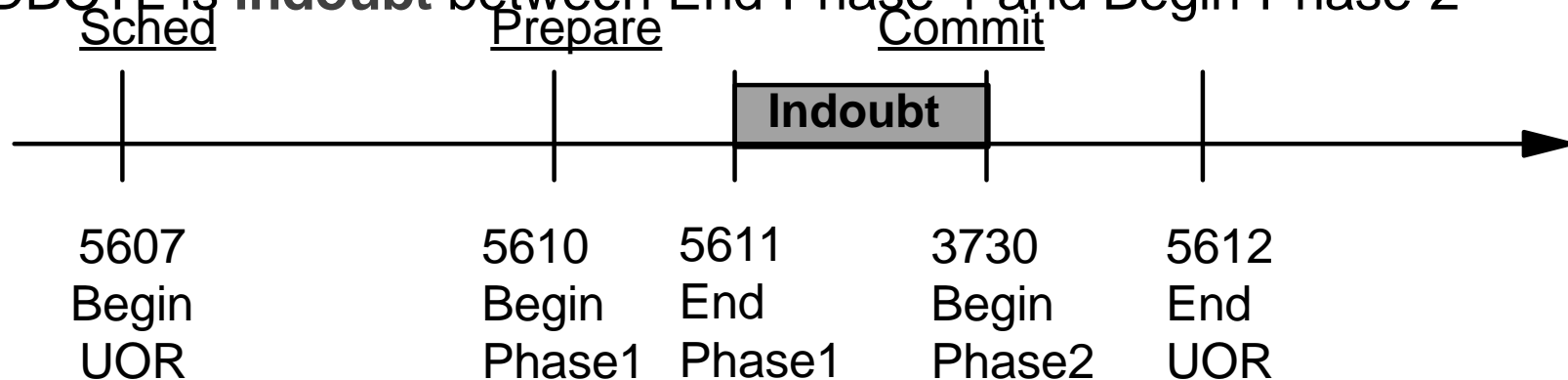


DBCTL - Two Phase Commit

■ When CICS transaction is ready to commit

- ▶ CICS enters two-phase commit process with DBCTL
- ▶ Multiple calls to DBCTL from CICS
 - **PREPARE** to commit
 - **COMMIT** (or abort)

- ▶ DBCTL is **indoubt** between End-Phase-1 and Begin-Phase-2

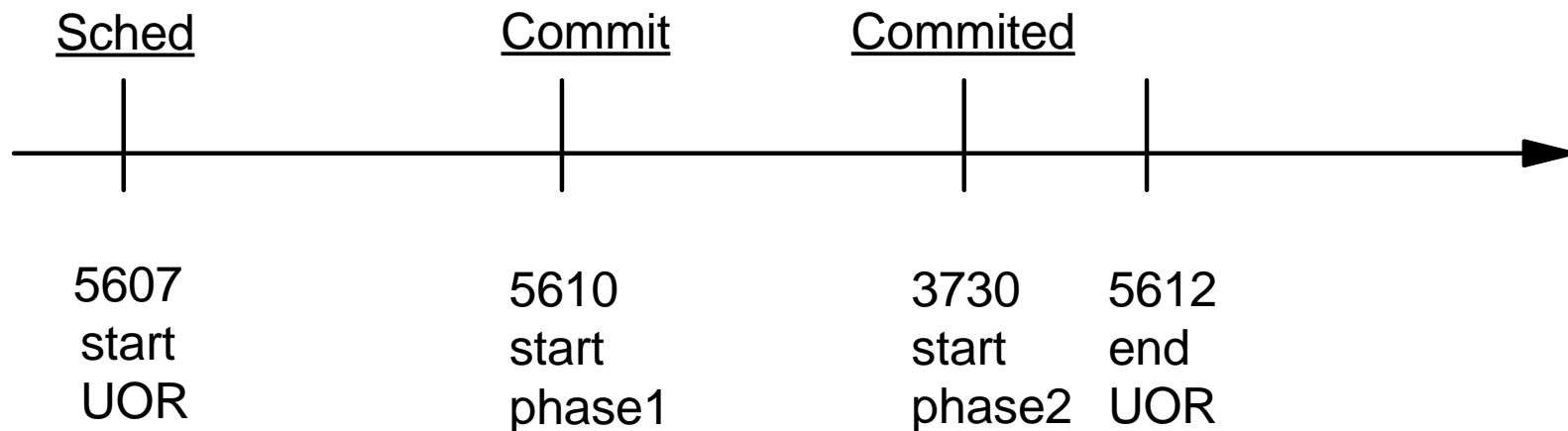




DBCTL - Single Cycle Commit

■ If DBCTL is the only external resource manager for UOR

- ▶ CICS calls DBCTL once to **commit** or **abort**
- ▶ No **indoubt** phase





RACF Signon

■ Prior to V6

- ▶ Single TCB (DYA) in control region for signon processing
- ▶ Signon requests are single threaded
- ▶ May have to wait for RACF I/O

■ V6 enhancement

- ▶ New TCB type (RCF)
- ▶ New startup parameter
 - **RCFTCB=1-20** (default is 1)
- ▶ Will allow up to 20 concurrent RACF signon requests, but ...
 - May bottleneck in the RACF database
 - May use IRRUT400 to split the RACF database



DBRC Functional Enhancements

■ Enhancements include

- ▶ Support for RECOVCTL dropped
- ▶ Support for DEDB shared VSO and shared SDEP
- ▶ DBRC groups
- ▶ NOTIFY.RECOV timestamp
- ▶ CHANGE.RECON LOGRET ... (minimum log retention period)
- ▶ CHANGE.RECON LISTDL ... (list deleted logs)
- ▶ LIST.RECON ... identifies logs created by batch backout
- ▶ Support for DST/2000
- ▶ Support for DFSMS Concurrent Copy



DBRC - Groups

- **Number of members in CA, DB, DBDS group**

- ▶ Increased from 1024 to 2000

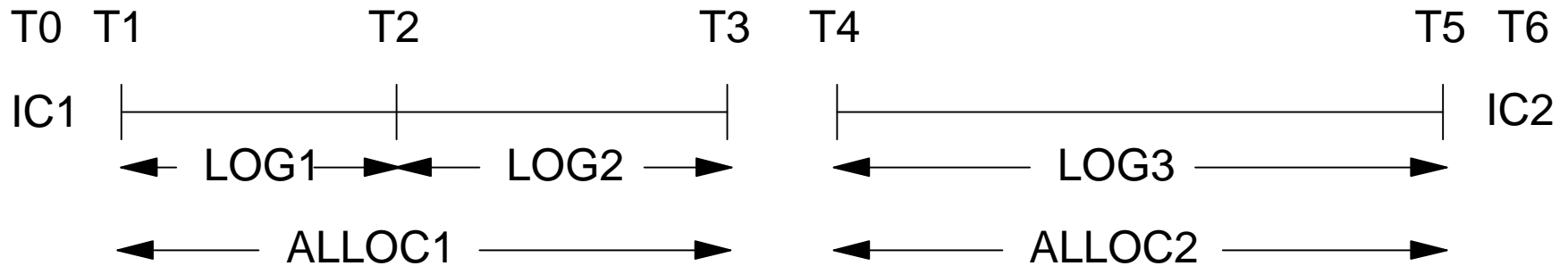
- **DBDS group name used for DATAGROUP in commands**

- ▶ **/START(/STOP,/DBR) DATAGROUP(DBDSGRP1)**

INIT.CAGRP	GRPNAME(CAGRP1) GRPMEM((db1,dd1),(db2,dd2),...)
INIT.DBDSGRP	GRPNAME(DBDSGRP1) MEMBERS((db1,dd1),(db2,dd2),...)
INIT.DBDSGRP	GRPNAME(DBGRP1) DBGRP(db1,db2,...)



DBRC - NOTIFY.RECOV



- To recover *without DBRC* to a time between T3 and T4
 - ▶ V5
 - Run recovery with IC1+LOG1+LOG2 at T6
 - Make image copy IC2 at T6+
 - NOTIFY.RECOV RUNTIME (T6) RCVTIME(T6)
 - ▶ V6
 - Run recovery with IC1+LOG1+LOG2 at T6
 - No image copy needed
 - NOTIFY.RECOV RUNTIME(T6) RCVTIME(T3.5)
[RCVTIME(T3.5) is any time between T3 and T4]



DBRC - Log Retention Period

■ Minimum log retention period specified on INIT.RECON

```
INIT.RECON ..... LOGRET(time interval)
```

Time interval is partial punctuated timestamp

- ▶ Format: 'ddd|hh|mm|ss|t'
- ▶ ddd must have leading zeros (max = 365, default = 001)
- ▶ | can be any non-numeric character ('014 12:00:00.0' '014 12')
- ▶ Single quotes not needed if there are no blanks or special characters (014)

■ Affects

- ▶ DELETE.LOG and PRILOG compression



Systems Management

■ System definition

- ▶ Macros (support new function and unsupported terminals)
- ▶ Process (conditional assemblies eliminated)

■ IMS execution time

- ▶ Security defaults, exits, JCL
- ▶ Non-discardable message exit (DFSNDMX0)
- ▶ Dynamic SAPs

■ System operations

- ▶ Sysplex Communications
- ▶ Generic /START REGION
- ▶ Commands (new and enhanced - e.g. for shared queues)



Input Message Handling - Prior to V6

■ Input message put on queue as a result of

- ▶ Terminal input
- ▶ Program-to-program message switch
- ▶ BMP (OUT=tcode) ISRT
- ▶ APPC device input

■ When PSB is scheduled

- ▶ GU IO-PCB retrieves message-1 from queue
- ▶ GU IO-PCB commits message-1 and retrieves next message-2

■ If application abends before commit

- ▶ Message is *discarded* (as in gone forever)
- ▶ Exceptions: U777, U3303, U2478, U2479



V6 - Non-discardable Messages

■ DFSNDMX0

- ▶ New exit may tell IMS how to handle input messages for programs which abended
 - Continue **normal** processing (ala V5)
 - **Discard** input message (including U777, U3303, U2478, U2479)
 - Queue message to transaction's **suspend** queue
 - **Requeue** message to same transaction and **USTOP** transaction
 - Requeue message to **new destination** (e.g. to another transaction code or to an LTERM)



Generic /START REGION

■ Objective

- ▶ Allow multiple IMS subsystems to share the same member in IMSRDR's //IEFRDER library (IMS.JOBS) for dependent regions of the same type
 - MSG, BMP, IFP

■ How it's done

- ▶ IMSID passed to dependent region as part of /START REGION processing
- ▶ Option to pass JOBNAME
 - Useful when multiple IMSs on same MVS



Generic /START REGION ...

```
/START REGION membername LOCAL
```

```
/START REGION membername JOBNAME jobname LOCAL
```

- ▶ **Membername** still optional (same default)
- ▶ If **LOCAL** specified
 - IMSID found in DFSVC000 (Secondary SCD) replaces IMSID on executed PROC (even if IMSID specified in JCL)
- ▶ If **JOBNAME jobname** specified
 - It becomes jobname of started region identified in *membername*
 - LOCAL is default if JOBNAME specified
- ▶ If *neither* LOCAL nor JOBNAME is specified
 - Command is processed as in prior releases



NOPFA Parameter

/DBR DATABASE (AREA) xxxx GLOBAL **NOPFA**

■ Version 5

- ▶ **/STOP GLOBAL** and **/DBR GLOBAL** turns on PFA (Prohibit Further Authorization) flag in DBRC
 - Batch jobs can't get authorization
 - Requires **/START GLOBAL** or **CHANGE.DB AUTH**
- ▶ **/DBD GLOBAL** turns on READON (Read Only) flag in DBRC
 - Batch update jobs can't get authorization
 - Requires **/START GLOBAL** or **CHANGE.DB READOFF**

■ Version 6

- ▶ **NOPFA** parameter specifies that these flags are not to be turned on



APPC Enhancements

■ APSP Security

- ▶ Applicable to CPI Communications Driven programs
 - Enables APSP (Allocate PSB) SAF security
 - Secures the requested PSB based on **USERID** of requestor

■ Distributed Sync Point Support (**SYNC_LEVEL=SYNCPT**)

- ▶ Applicable to Standard, Modified Standard, and CPI Communications Driven programs
- ▶ Allows IMS applications to be involved in *protected* conversations
 - Support for coordinated updates and resource recovery management of both local and distributed resources
 - Two-phase commit process



Miscellaneous Small Enhancements

■ Log Recovery Utility

- ▶ PSBLIST output will identify data set ID for DEDB areas

■ Waits for database locks when using IRLM

- ▶ IMS Monitor will report waits due to IRLM locks
- ▶ V4/V5 only reported PI waits

■ SNAP call

- ▶ Now supported for the REXX interface

■ Problem determination

- ▶ Contents of R1 saved for abend U0845 (identifies bad CI)
- ▶ SUPPRESS option available to suppress duplicate dumps with same symptom string



Miscellaneous ...

■ Extended STAT call for OSAM

- ▶ New sequential buffering counts
 - Anticipatory and immediate (synchronous) reads
- ▶ OSAM caching activity counts
 - Blocks read from CF
 - Blocks expected but not read
 - Blocks written to CF
 - Block written to CF (changed)
 - Blocks not written because storage class full
 - Blocks invalidated with XI
 - XI calls issued



IMS/ESA V6 Packaging

■ Single program number (5655-158)

- ▶ Services *
 - DBRC, Logging, CQS, BPE, CSObject
- ▶ IRLM 2.1 * (IRLM 1.5 is supported with V6, but not delivered with V6)
- ▶ Database Manager, Surveyor *
- ▶ Transaction Manager *
 - ETO *
- ▶ Remote Log Tracking (RSR) *
- ▶ Database Level Tracking *

* **FMIDs (7) - was 14 in V5**



Base Software Requirements

■ Minimum software requirements

- ▶ MVS/ESA SP 4.3 (JES2 or JES3)
- ▶ MVS/DFP 3.3 with DFDSS 2.5 -or- DFSMS/MVS 1.1
- ▶ High Level Assembler Release 2
- ▶ ACF/VTAM 3.4.2
- ▶ ISPF for MVS 4.1
- ▶ SMP/E 1.8
- ▶ TSO/E 2.3
- ▶ RACF 1.9, if RACF is used



Special HW/SW Requirements

■ **APPC Security**

- ▶ SW: RACF 1.9.2

■ **Sysplex (n-way) data sharing**

- ▶ HW: Coupling Facility Level 2 or 3
- ▶ SW: MVS/ESA SP 5.1
- ▶ SW: IRLM 2.1
- ▶ SW: DFSMS/MVS 1.2

■ **Fast DB Recovery**

- ▶ SW: IRLM 2.1



Special HW/SW Requirements ...

■ Shared Message Queues and Shared EMH

- ▶ HW: Coupling Facility Level 3
 - IBM 9674 Coupling Facility
 - LPAR on ES/9000 9021 (711-based)
 - LPAR on S/390 9672 Transaction Server
- ▶ SW: MVS/ESA SP 5.2 or OS/390 Release 1

■ DFSMS Concurrent Copy

- ▶ HW: DASD Controller with concurrent copy feature (e.g. 3990-3, -9)
- ▶ SW: DFSMS/MVS 1.3



Special HW/SW Requirements ...

■ UCB/VSCR Support

- ▶ SW: MVS/ESA SP 5.2 or OS/390 Release 1
- ▶ SW: HCD 5.2
- ▶ SW: DFSMS/MVS 1.3

■ VTAM Generic Resources

- ▶ SW: MVS/ESA SP 5.1
 - OS/390 Release 3 if used with APPC
- ▶ SW: ACF/VTAM 4.2

■ APPC Distributed Sync Point

- ▶ SW: OS/390 Release 3
- ▶ SW: ACF/VTAM 4.4



Migration - Compatibility

■ ACBGEN

- ▶ An ACBGEN is required for all PSBs and DBDs
- ▶ Each version of IMS has unique ACBLIB formats
 - ACBLIBs cannot be shared by IMS's at different releases

■ Applications

- ▶ Upward compatible from previous releases without change

■ User written utilities

- ▶ User code which accesses the IMS logs or RECONs will have to be updated to account for new record formats



Migration - Compatibility ...

■ MSC

- ▶ IMS V6 to IMS V4/V5/V6
 - SYSIDs must be ≤ 255 for communications with IMS V4/V5
- ▶ V6 messages have larger message prefix sizes
 - Verify that V4/V5 MSGQ LRECLs are large enough

■ ISC

- ▶ IMS V6 to IMS V4/V5/V6
- ▶ IMS V6 to CICS/VSE V2, CICS/ESA V3/V4, CICS Transaction Server

■ XRF

- ▶ XRF alternate must be same release as active IMS
- ▶ XRF will not coexist with Fast Database Recovery



Migration - Compatibility ...

■ DBCTL

- ▶ IMS V6 with CICS V3/V4, CICS Transaction Server

■ DB2

- ▶ IMS V6 with DB2 V2.3/V3/V4

■ Data Sharing

- ▶ Non-sysplex (1-way - SCOPE=LOCAL) between IMS V4/V5/V6
 - IRLM 1.5, IRLM 2.1
- ▶ Non-sysplex (2-way - SCOPE=GLOBAL) between IMS V4/V5/V6
 - IRLM 1.5
- ▶ Sysplex (N-way) between IMS V5/V6
 - IRLM 2.1



Migration - Compatibility ...

■ RSR (Remote Site Recovery)

▶ Definitions

- V5 = IMS V5 without coexistence SPE
- V5+ = IMS V5 with coexistence SPE

■ Supported configurations

ACTIVE	TRACKER
V5	V5, V5+
V5+	V5, V5+,
V6	V6
	V6



Migration - Compatibility ...

■ Utilities

- ▶ Use utility for IMS Version that created log (OLDS/SLDS/RLDS)
 - **Batch Backout**
 - **Log Recovery**
 - **Log Archive**

- ▶ **IMS V6 Database Recovery**
 - Can process IMS V4/V5/V6 logs, image copies, change accums, and/or HISAM Unload data sets for recovery



Migration - Compatibility ...

■ Utilities ...

▶ **IMS V6 Change Accumulation**

- Can process V4/V5/V6 input logs and/or V4/V5/V6 previous change accums

▶ **IMS V6 utility control cards**

- New format for utilities which have timestamp input
- Supported by V6 GENJCL



Migration - Compatibility ...

■ RECONs

- ▶ IMS V4/V5 RECONs must be *upgraded* to V6 level
 - IMS V4/V5 RECONs must be **SHARECTL** before upgrade
 - Will require new VSAM DEFINES to allow for *longer keys*
- ▶ Compatibility SPE for IMS V4/V5 to coexist with IMS V6 RECONs
- ▶ User written code which accesses the RECONs
 - Probably not compatible without change (new RECON formats)
- ▶ Automated operations procedures that issue DBRC commands
 - May not be compatible (changes to RECON output formats)
- ▶ Must maintain Time History Table for as long as V4/V5 releases share the RECONs



Migration - New Function

■ Shared VSO

- ▶ Can only be shared if all sharing systems are IMS V6
 - If access attempted from V5, open fails

■ Shared SDEPs

- ▶ SDEP segments will be larger (8 byte timestamp)
 - May need more space, or more frequent Scan/Delete
- ▶ Can only be shared between IMS V6 systems
- ▶ Only tested with IRLM 2.1 (not supported with IRLM 1.5)



Migration - New Function

■ Shared DEDBs

- ▶ DBFLHSH0 - Resource Name Hashing Routine is different between IMS V4 and IMS V5/V6
- ▶ To share between IMS V4 and IMS V5/V6, all IMSs must use the same module

■ OSAM Caching

- ▶ To share OSAM between V6 and V4/V5, V6 may not use caching
 - IMS V4 cannot access the CF
 - IMS V5 systems will get errors when accessing the CF



Migration - New Function ...

■ **Fast Database Recovery**

- ▶ Only supported for IMS V6

■ **VSAM CI Reclaim**

- ▶ No migration considerations

■ **OSAM 8-GB Support**

- ▶ Available for V5

■ **Increased number of MSC SYSIDs**

- ▶ If communicating with V4/V5, must use SYSID \leq 255



Migration - New Function ...

■ DST/2000 Support

- ▶ RECON support addressed by Upgrade Utility and Compatibility SPE
- ▶ AO routines will be affected by new timestamp formats
 - DBRC input timestamp formats
 - DBRC output messages
- ▶ Utility control card formats have changed
- ▶ Applications have new timestamp available in IO-PCB but original timestamp still exists
- ▶ Log records have new timestamp formats



Migration - New Function ...

■ UCB VSCR

- ▶ IMS V6 only
- ▶ Can't fallback if more than 3271 data sets defined

■ DFSMS Concurrent Copy Support

- ▶ DBRC support only in IMS V6
 - IMS V4/V5 will tolerate SMSCIC and SMSNOCIC image copy records, but won't be able to use them for recovery
- ▶ For database recovery from SMSCIC or SMSNOCIC
 - Use IMS V6 Database Recovery utility
 - Or RESTORE using DFSMSdss and recover with logs, change accum, and restored data set



Migration - New Function ...

■ **Command Authorization Exit (DFSCCMD0) for LU 6.2 Input**

▶ V5 Function Specific Parameter List

– +28 = A(input command buffer) - zeros for LU 6.2 input

▶ V6 Function Specific Parameter List

– +28 = A(first segment of input command buffer)

■ **Transaction Authorization Exit (DFSCTRN0) for LU 6.2 Input**

▶ Storage Area now contains A(USERID) for LU 6.2



Related Products

■ Supported in IMS V6 - no required maintenance

- ▶ 5665-348 - IMS ADF V2
- ▶ 5655-085 - IMS Hardware Supported Data Compression V1R2

■ Supported in IMS V6 - maintenance required

- ▶ 5798-CQP - IMSPARS V1
- ▶ 5798-CHJ - IMSASAP II V1



Related Products ...

■ **New version/release required for IMS V6**

- ▶ 5685-093 - IMS Data Base Tools (DBT) V2R3
- ▶ 5655-136 - IMS Message Requeuer (MRQ) V3
- ▶ 5655-A14 - IMS Batch Terminal Simulator (BTS) V2
- ▶ xxxx-xxx - Data Base Integrity Control Facility (DBICF) V6

■ **Refresh required for IMS V6**

- ▶ 5655-109 - IMS DEDB Fast Recovery (FDR) V1



Workload Router (5697-074)

■ Distributes IMS transactions to multiple IMS TMs via MSC

- ▶ Provides assistance with load balancing in parallel sysplex environment
- ▶ Arriving transactions can be processed locally or routed to one of multiple IMS back-end systems
 - User specifies transaction codes, weighting factors, affinities
- ▶ Migration path to shared queues
 - Available for IMS V5/V6



Partition DB (5697-A06)

■ Provides partitioning support for full function databases

- ▶ Transparent to application
- ▶ Up to 32 partitions per database
- ▶ Support for ...
 - Batch, DB/DC, DBCTL
 - Data sharing
 - HDAM and HIDAM databases
 - VSAM and OSAM
 - Secondary indexes and logical relationships
 - DBRC (views partitions as multiple data set groups)
 - IMS database utilities (image copy, reorg., recovery, batch backout)



IMS Ad-Hoc Reporting Tool (5697-A05)

■ Tool to provide quick

- ▶ Database query
- ▶ Reports
- ▶ Updates (e.g. to correct data)
- ▶ Extract
- ▶ Prototyping
- ▶

■ Implementation

- ▶ Runs as **batch** or **BMP**
- ▶ Driven by **scripts** containing ART commands
- ▶ Can be used with **flat files**