S26

IMS From the RECON's Point of View

Karen Tischer

Miami Beach, FL October 22-25, 2001

RETURN TO INDEX

AGENDA

- TOPIC 1
  - Introduction
  - RECON Initialization
  - Database Registration
- TOPIC 2
  - Batch/Online Interfaces
  - Utility Interfaces
- TOPIC 3
  - Summary of changes in IMS/ESA V7
- Appendix: Reference Only
  - IMS V6.1 DBRC Enhancements
  - Diagnostic Information
  - RECON Record Usage Summary

TRADEMARK ACKNOWLEDGEMENTS

The following terms are trademarks of the IBM Corporation:

- ACF/VTAM
- CICS
- CICS/ESA
- DB2
- DFSMS
- DFSMS/MVS
- ESA/390
- ESCON
- ES/9000
- IBM
- IMS
- IMS/ESA
- MVS/ESA
- Parallel Sysplex
- RACF
- S/390
- Sysplex Timer
- VTAM

TOPIC 1: INTRODUCTION

- What are RECONs ?
- RECON Allocation
- RECON Initialization & Management
- Database Registration

DBRC: You can run but ...

- Required for:
  - IMS Database Sharing
  - IMS Online log management
  - Enhanced database functionality
- Protects database integrity
- Prevents inadvertent database use
- Allows IMS System access to IMS databases
- Tracks database recovery information

RECON Data Sets

- Repository for IMS/ESA TM and DB system control information
- VSAM KSDS data sets managed by DBRC to ensure integrity and recoverability of the data required by DBRC
  - "Pair and a spare"
- Configure
  - to prevent possible deadlocks
  - to maximize availability
- DBRC issues Hardware RESERVEs
  - For the Catalog(s)
  - For the active RECONs (copy1 & copy2)

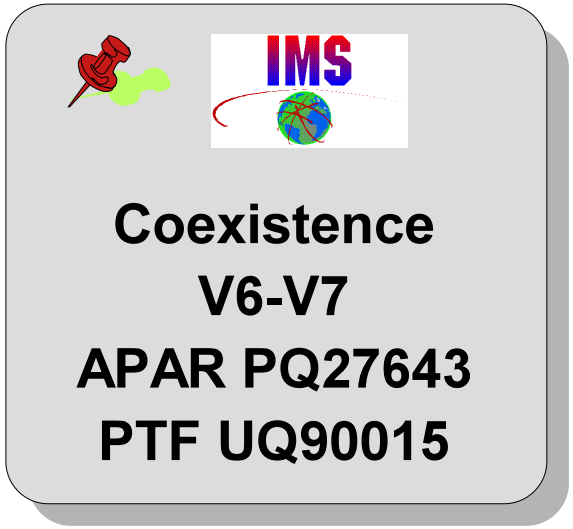
Beware of non-IMS Catalogs on any volume with RECONs or CATALOGs

Avoiding RECON Contention Problems

- For Maximum Availability, each RECON must:
  - Have different space allocations
  - Be on different volumes
  - Be on different channels
  - Be in different user catalogs
- To eliminate deadlocks, the RECONs must:
  - Be the only objects cataloged in their respective catalogs
  - Be on the same device as their catalogs
  - Specify RECON1 and RECON2 consistently throughout jobs

RECON Initialization & Management

- INIT.RECON command
  - Builds RECON Header & Header Extension records
    - Initialization time-stamp (DUI processing)
  - Controls System options
    - FORCER, ...
    - Shared DASD control information (CI/CA splits, new extents)
    - Error & update indicators
  - Controls RECON management
    - Pair and a spare tracked in header



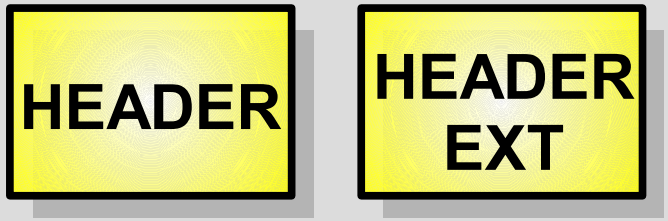
INIT.RECON

- NOCATDS | CATDS
- DASDUNIT(3400 | unittype)
- NOFORCER | FORCER
- CHECK17 | CHECK44 | NOCHECK
- NOLISTDL | LISTDL
- LOGRET('001' | 'time interval')
- SSID(name)
- NONEW | STARTNEW
- TAPEUNIT(3400 | unittype)

CHANGE.RECON

- NOCATDS | CATDS
- DASDUNIT(3400 | unittype)
- NOFORCER | FORCER
- CHECK17 | CHECK44 | NOCHECK
- NOLISTDL | LISTDL
- LOGRET('001' | 'time interval')
- SSID(name)
- NONEW | STARTNEW
- TAPEUNIT(3400 | unittype)
- **LOGALERT(3 | dsnum, 16 | volnum)**
- **SIZALERT(15 | dsnum, 16 | volnum, 95 | percent)**
- TRACEOFF | TRACEON
- TIMEZONE((label,offset),(,), ...)
- TIMEZIN(%SYS| label,offset)
- TIMEFMT(offset,offset_display, form,year_size,duration | precision)
- **[UPGRADE]**

RECON Header Records



LIST.RECON STATUS

RECON

RECOVERY CONTROL DATA SET, IMS/ESA **V7V1**

DMB#=536 INIT TOKEN=97352F1625030F

NOFORCER LOG DSN CHECK=CHECK44 STARTNEW=NO

TAPE UNIT=CART DASD UNIT=SYSDA TRACEOFF SSID=IMST

LIST DLOG=YES CA/IC/LOG DATA SETS CATALOGED=YES

LOG RETENTION PERIOD=00.014 00:00:00.0

SIZALERT DSNUM=15 VOLNUM=16 PERCENT=95

LOGALERT DSNUM=3 VOLNUM=16

TIME STAMP INFORMATION:

TIMEZIN = %SYS

-LABEL-	-OFFSET-
EST	-05:00
EDT	-04:00

OUTPUT FORMAT: DEFAULT = LOCORG NONE PUNC YY

CURRENT = LOCORG LABEL PUNC YYYY

Listing (cont.)

-DDNAME-	-STATUS-	-DATA SET NAME-
RECON1	COPY1	IMS710.SAMPLE.RECON1
RECON2	COPY2	IMS710.SAMPLE.RECON2
RECON3	SPARE	IMS710.SAMPLE.RECON3

Initial DBRC Exit Processing

- Allocate RECON1, RECON2, RECON3
- Reserve all 3 in DDNAME or MDA entry sequence
- OPEN data sets: Note spares
- Perform VERIFY if necessary
- Read HEADER and HEADER EXTENSION
- Determine active pair: Restore duality if necessary & possible
- Deallocate & release unused RECON data set(s)
- Perform partial update backouts if necessary
- Perform EXIT processing
- Release active RECONs

Subsequent DBRC Exit Processing

- RESERVE active RECONs
- Invalidate RECON buffers
- Read HEADER & HEADER EXTENSION
- Close and reopen RECONs if needed
- Issue VERIFY if needed
- If active pair has changed, allocate other RECONs
  - Determine active pair
  - Restore duality if necessary and possible
- Deallocate unused RECON data sets
- Perform partial update backouts if necessary
- Perform exit processing
- If 'TERM' exit, close RECONs
- Release RECONs

RECON Access Preference: V7

- Minimizes online RECON I/O bottlenecks
  - caused by many concurrently executing batch jobs
- Batch (DLI | DBB | Utilities): RESERVEs serialized per MVS
  - Enqueue QNAME=DSPURI02
  - Enqueue RNAME=dsn of COPY1
  - SCOPE=SYSTEM to limit enqueue to ONE per MVS
- Online can not be waiting behind more than one batch job for RECON access
  - Enqueue QNAME=DSPURI01
  - Enqueue RNAME=dsn of COPY1
  - SCOPE=SYSTEMS

REGISTRATION

- Registering databases, areas, and partitions
  - Full Function
  - Fast Path DEDB
  - HALDB
- Registering Groups
  - Change accumulation
  - Database Data Set
  - DataBase
  - Recovery

DB Registration Required For

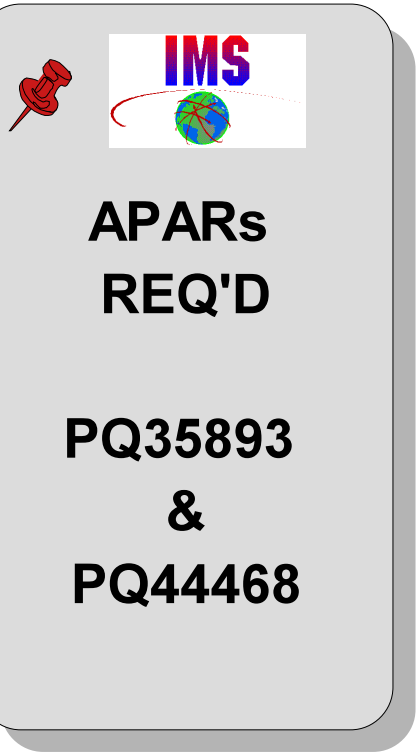
- Tracking database:
  - status
  - usage
  - recovery information
- Protecting database integrity
- Allowing database sharing
- Using enhanced database function support
  - HALDB
  - nonrecoverable databases
  - Concurrent Image Copy
  - Image Copy 2
  - Fast Path area options (PREOPEN, VSO [PRELOAD, CFSTR1, CFSTR2, LKASID])
  - XRF, RSR, . . .

Database Registration

- INIT.DB command:
  - Builds Database (DB) record
  - Used for control of full function database authorization, allocation and sharing
  - Used for control of fast path DEDB authorization and sharing
- INIT.DBDS command:
  - Builds Database Data Set record (DBDS) for full function database data sets or fast path DEDB AREAs
  - Used for data set and / or area recovery processes
  - Used for authorization and dynamic allocation of areas
- INIT.ADS:
  - Builds Area Data Set records for fast path DEDB AREAs (ADS)
  - Used for dynamic allocation

Database Registration: HALDB

- INIT.DB command:
  - Builds Database record for HALDB master
  - Used to control HALDB sharing
- INIT.PART command: one per partition
  - Builds Partition record
  - Builds Database record for partition authorization
  - Builds Database Data Set records for HALDB partition
    - Used for Recovery processes
    - Used for dynamic allocation of HALDB Partition data sets



Group Registration

- **INIT.DBDSGRP: Optional**
  - Builds GROUP records
  - DBDSGRP records are used for DBRC command processing
  - DBGRP records are used for IMS command processing
  - RECOVGRP records are used for Online Recovery Service (ORS)
- **INIT.CAGRP: Optional**
  - Builds Change Accumulation Group (CAGRP) records
  - Used for change accum processing for Recovery processes
  - Required if recovering a block level data shared database

Full Function Registration

1. Register database

```
INIT.DB -
      DBD(dbdname) -
      SHARELVL (0|1|2|3) -
      TYPEIMS -
      RECOVABL|NONRECOV
```

2. Register data sets

```
INIT.DBDS -
      DBD(dbdname) -
      DDN(ddname) -
      DSN(dsname) -
      GENMAX(2 | value) -
      DEFLTJCL(mbr) -
      ICJCL(ICJCL | mbr) -
      NOREUSE | REUSE -
      OICJCL(OICJCL | mbr) -
      RECOVJCL(RECOVJCL | mbr) -
      RECOVPD(0 | value)
```

Full Function DB Record

```
DB
    DBD=SAMPDBD1              IRLMID=*NULL          DMB#=3        TYPE=IMS
    SHARE LEVEL=3             GSGNAME=**NULL**      USID=0000000002
    AUTHORIZED USID=0000000002 RECEIVE USID=0000000002 HARD USID=0000000002
    RECEIVE NEEDED USID=0000000002
   DBRCVGRP=**NULL**
 FLAGS:                                    COUNTERS:
    BACKOUT NEEDED          =OFF           RECOVERY NEEDED COUNT        =0
    READ ONLY               =OFF           IMAGE COPY NEEDED COUNT  =0
    PROHIBIT AUTHORIZATION  =OFF           AUTHORIZED SUBSYSTEMS        =2
    RECOVERABLE             =YES           HELD AUTHORIZATION STATE     =3
                                                 EEQE COUNT
=0
    TRACKING SUSPENDED      =NO            RECEIVE REQUIRED COUNT       =0
    OFR REQUIRED             =NO

ASSOCIATED SUBSYSTEM  INFORMATION:
                                        ENCODED    B/O NEEDED
   -SSID-      -ACCESS INTENT-      -STATE-       -COUNT-      -SS ROLE-
    IMS3          UPDATE               3             0          ACTIVE
    IMS1          UPDATE               3             0          ACTIVE
```

Full Function DBDS Record

```
DBDS
   DSN=IMSPROD.SAMPDBD1.SAMPDDN1                                    TYPE=IMS
   DBD=SAMPDBD1   DDN=SAMPDD1   DSID=001   DBORG=HDAM   DSORG=OSAM
   CAGRP=MYGRP    GENMAX=2   IC AVAIL=0   IC USED=1   DSSN=00000001
   NOREUSE        RECOVPD=0
   DEFLTJCL=**NULL**   ICJCL=ICJCL   OICJCL=OICJCL   RECOVJCL=RECOVJCL
   RECVJCL=ICRVJCL
   FLAGS:                                              COUNTERS:
      IC NEEDED            =OFF
      IC RECOMMENDED       =ON
      RECOV NEEDED         =OFF
      RECEIVE NEEDED       =OFF                          EEQE COUNT    =0
```

Fast Path Registration

1. Register database

```
INIT.DB DBD(dbdname) -
      SHARELVL (0|1|2|3) -
      TYPEFP -
      RECOVABL|NONRECOV
```

2. Register areas

```
INIT.DBDS  DBD(dbdname) -
      AREA(areaname) -
      GENMAX(2 | value) -
      DEFLTJCL(mbr) -
      ICJCL(ICJCL | mbr) -
      NOREUSE | REUSE -
      NOPREO | PREOPEN -
      RECOVJCL(RECOVJCL | mbr) -
      RECOVPD(0 | value) -
      VSO | NOVSO -
         NOPREL | PRELOAD -
         CFSTR1(str1name) -
         CFSTR2(str2name) -
         NOLKASID | LKASID
```

3. Register area data sets

```
INIT.ADS DBD(dbdname) -
   AREA(areaname) -
   ADDN(ddname) -
   ADSN(dsname) -
   UNAVAIL | AVAIL
```

Fast Path DB Record

```
DB
   DBD=SAMPDBD5                                    DMB#=217        TYPE=FP
   SHARE LEVEL=3
   FLAGS:                                      COUNTERS:
                                                  RECOVERY NEEDED COUNT      =0
                                                  IMAGE COPY NEEDED COUNT    =0
      PROHIBIT AUTHORIZATION=OFF               AUTHORIZED  AREAS             =4
      RECOVERABLE              =YES               EEQE COUNT                    =0
```

Fast Path DBDS Record

```
DBDS
   DBD=SAMPDBD5   AREA=AREA01                                    TYPE=FP
   GSGNAME=**NULL**                 USID=0000000002
   AUTHORIZED USID=0000000002  RECEIVE USID=0000000002  HARD USID=0000000002
   RECEIVE NEEDED USID=0000000000
   CAGRP=MYGRP    GENMAX=3   IC AVAIL=0   IC USED=1   DSSN=00000001
   NOREUSE        RECOVPD=0   VSO    PREOPEN     PRELOAD
   CFSTR1=AREA01STR1       CFSTR2=AREA01STR2       LKASID
   DEFLTJCL=**NULL**   ICJCL=ICJCL   RECVJCL=RECVJCL   RECOVJCL=RECOVJCL
   FLAGS:                                        COUNTERS:
      PROHIBIT AUTHORIZATION=OFF                  AUTHORIZED SUBSYSTEMS      =2
                                                        HELD AUTHORIZATION STATE
     =3
      IC NEEDED                  =OFF                  ADS AVAIL#                    =1
     IC RECOMMENDED          =ON
      RECOV  NEEDED             =NO                   REGISTERED ADS #              =1
      DATABASE LEVEL TRACK   =NO              EEQE COUNT                    =0
      RECEIVE NEEDED            =NO
      OFR REQUIRED              =NO
      TRACKING SUSPENDED   =NO
      HSSP CIC IN PROGRESS   =NO
```

Fast Path DBDS Record . . .

ADS LIST:

-ADS DDN-	-ADS DSN-	-STAT-	CREATE -RUNNING-
CUSTDD10	IMSSET.NOS.CUSTDB10	AVAIL	NO
CUSTDD11	IMSSET.NOS.CUSTDB11	UNAVAIL	YES

ASSOCIATED SUBSYSTEM INFORMATION:

-SSID-	-ACCESS INTENT-	ENCODED -STATE-	B/O NEEDED -COUNT-	-SS ROLE-
IMS3	UPDATE	3	0	ACTIVE
IMS1	UPDATE	3	0	ACTIVE

HALDB Registration

1. Register master

```
INIT.DB -
   DBD(master dbdname) -
   SHARELVL (0|1|2|3) -
   TYPHALDB -
   RECOVERABL|NONRECOV -
   PARTSEL(exitname)
```

2. Register partition & data sets

```
INIT.PART  -
      DBD(master dbdname) -
      PARTNAME(partition name) -
      KEYSTRNG(value) -
      DSNPREFX(dsn prefix) -
      RANDOMIZER(module,anch,rbn,bytes) -
      FREESPCE(fbff,fspf) -
      BLOCKSZE(nnnnn, . . .) -
      GENMAX(2 | value) -
      DEFLTJCL(mbr) -
      ICJCL(ICJCL | mbr) -
      NOREUSE | REUSE -
      OICJCL(OICJCL | mbr) -
      RECOVJCL(RECOVJCL | mbr) -
      RECOVPD(0 | value)
```

HALDB Master DB Record

```
DB
    DBD=HALMASTR                          DMB#=6       CHANGE#=6
   TYPE=HALDB
    SHARE LEVEL=3              GSGNAME=**NULL**
    PSNAME=**NULL**
 FLAGS:                                          COUNTERS:
    RECOVERABLE                =YES             PARTITIONS          =4
```

HALDB Partition DB Record

```
DB
    DBD=HLPART1          MASTER=HALMASTR          CHANGE#=6          TYPE=PART
    USID=0000000002      AUTHORIZED USID=0000000002      HARD USID=0000000002
    RECEIVE USID=0000000002      RECEIVE NEEDED USID=0000000002
   DBRCVGRP=**NULL**

   RANDOMIZER:
      NAME=DFSHDC40    ANCHOR=7       HIGH  BLOCK#=10000       BYTES=2000
   FREE  SPACE:
      FREE   BLOCK  FREQ  FACTOR=0       FREE  SPACE  PERCENTAGE=0

   PARTITION  HIGH  KEY/STRING  (CHAR):              (LENGTH=5)
      K0200
   PARTITION  HIGH  KEY/STRING  (HEX):
      D2F0F2F0F040404040404040404040404040404040404040404040404040404040

   OSAM  BLOCK  SIZE:
      A:  8192
      B:  8192
```

HALDB Partition DB Record ...

```
 FLAGS:                                    COUNTERS:
    BACKOUT NEEDED              =OFF       RECOVERY NEEDED COUNT          =0
    READ ONLY                   =OFF       IMAGE COPY NEEDED COUNT   =0
    PROHIBIT AUTHORIZATION      =OFF       AUTHORIZED SUBSYSTEMS          =2
                                                HELD AUTHORIZATION STATE
=3
                                                     EEQE COUNT
=0
    TRACKING SUSPENDED          =NO        RECEIVE REQUIRED COUNT         =0
    OFR REQUIRED                =NO
   PARTITION  INIT  NEEDED      =NO

ASSOCIATED SUBSYSTEM  INFORMATION:
                                        ENCODED    B/O NEEDED
  -SSID-      -ACCESS INTENT-          -STATE-      -COUNT-      -SS ROLE-
   IMS3          UPDATE                   3            0           ACTIVE
   IMS1          UPDATE                   3            0           ACTIVE
```

HALDB Partition DBDS Records

```
DBDS
     DSN=IMSPROD.HALMASTR.A00001                                    TYPE=PART
     DBD=HLPART1   DDN=HLPART1A    DSID=001   DBORG=HDAM   DSORG=OSAM
     CAGRP=MYGRP    GENMAX=2   IC AVAIL=0   IC USED=1   DSSN=00000001
     NOREUSE        RECOVPD=0
     DEFLTJCL=**NULL**    ICJCL=ICJCL       OICJCL=OICJCL        RECOVJCL=RECOVJCL
    RECVJCL=PRECVJCL
     FLAGS:                                              COUNTERS:
        IC NEEDED           =OFF
        RECOV NEEDED        =OFF
        RECEIVE NEEDED      =OFF                          EEQE COUNT    =0

DBDS
   DSN=IMSPROD.HALMASTR.L00001                                   TYPE=PART
   DBD=HLPART1   DDN=HLPART1L    DSID=003   DBORG=INDEX   DSORG=VSAM

   FLAGS:                                              COUNTERS:
       RECOV NEEDED      =OFF                          EEQE COUNT    =0
```

INIT.DBDSGRP

- DBRC Command Processing (DBDSGROUP)
  - GRPNAME(name)
  - MEMBERS((dbdname,ddname), ... (dbdname,ddname))
- IMS Command Processing (DATAGROUP)
  - GRPNAME(name)
  - DBGRP(dbdname,areaname, ... areaname,dbdname)
- RECOVERY GROUP for Timestamp or ORS recovery
  - GRPNAME(name)
  - RECOVGRP(dbdname,areaname, ... areaname,dbdname)

NOTE 1: 2000 members

NOTE 2: Members must be registered

DBDSGRP Record Listing

```
DBGRP
      GRPNAME=DBGRP1          #MEMBERS=3        -DBD-
                                                    SAMPDBD1
                                                    SAMPDBD2
                                                FPAREA01

DBDSGRP
      GRPNAME=DBDSGRP1        #MEMBERS=3        -DBD-          -DDN/AREA-
                                                    SAMPDBD1
SAMPDDN1
                                                    SAMPDBD2
SAMPDDN2
                                                    FASTPATH
FPAREA01


RECOVGRP
      GRPNAME=RCVGRP1         #MEMBERS=3        -DBD-          AREA-
                                                    SAMPDBD1
                                                    SAMPDBD2
                                                    FASTPATH
FPAREA01
```

INIT.CAGRP

- GRPNAME (name)
- GRPMAX (value)
- CAJCL (CAJCL | member)
- DEFLTJCL (member)
- NOREUSE | REUSE
- GRPMEM ((dbdname,ddname) , (dbdname,areaname) , ...)

NOTE 1: 2000 members

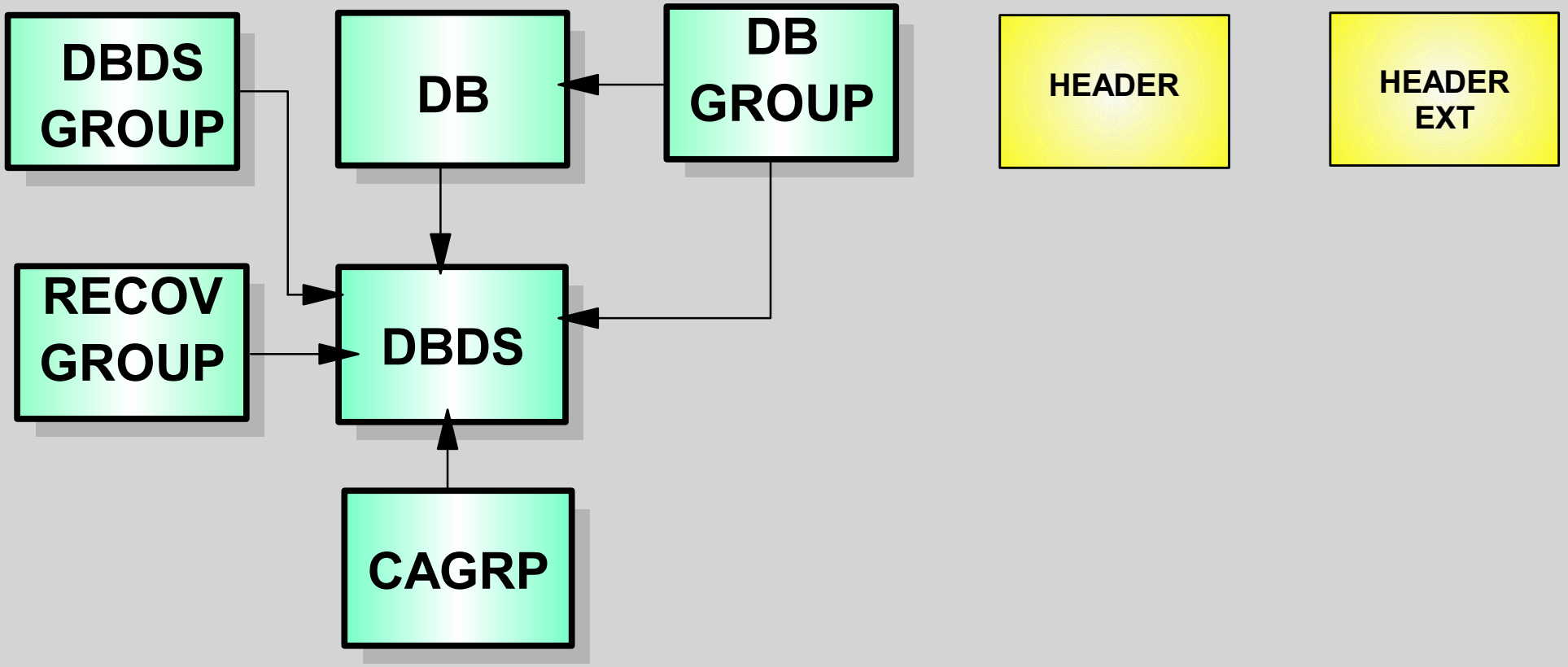
NOTE 2: Members must be registered

NOTE 3: HALDB Index and ILDS DBDSs are not recoverable therefore this command does not support these data sets

LIST.CAGRP GRPNAME(groupname)

```
CAGRP
    GRPNAME=SMPLCAGP        GRPMAX=2              CA AVAIL=0    CA USED=1
    NOREUSE      CAJCL=CAJCL        DEFLTJCL=**NULL**
                                    #MEMBERS=3       -DBD-          -DDN-
                                                         SAMPDBD1  SAMPDDN1
                                                         SAMPDBD2  SAMPDDN2
                                                       FASTPATH    FPAREA01
```

RECON Records: Database



TOPIC 2: BATCH / ONLINE INTERFACES

- Sign-on
- Log Open
- Authorization
- DB Open
- DB Update
- DB I/O Error
- Log Processing
- Termination

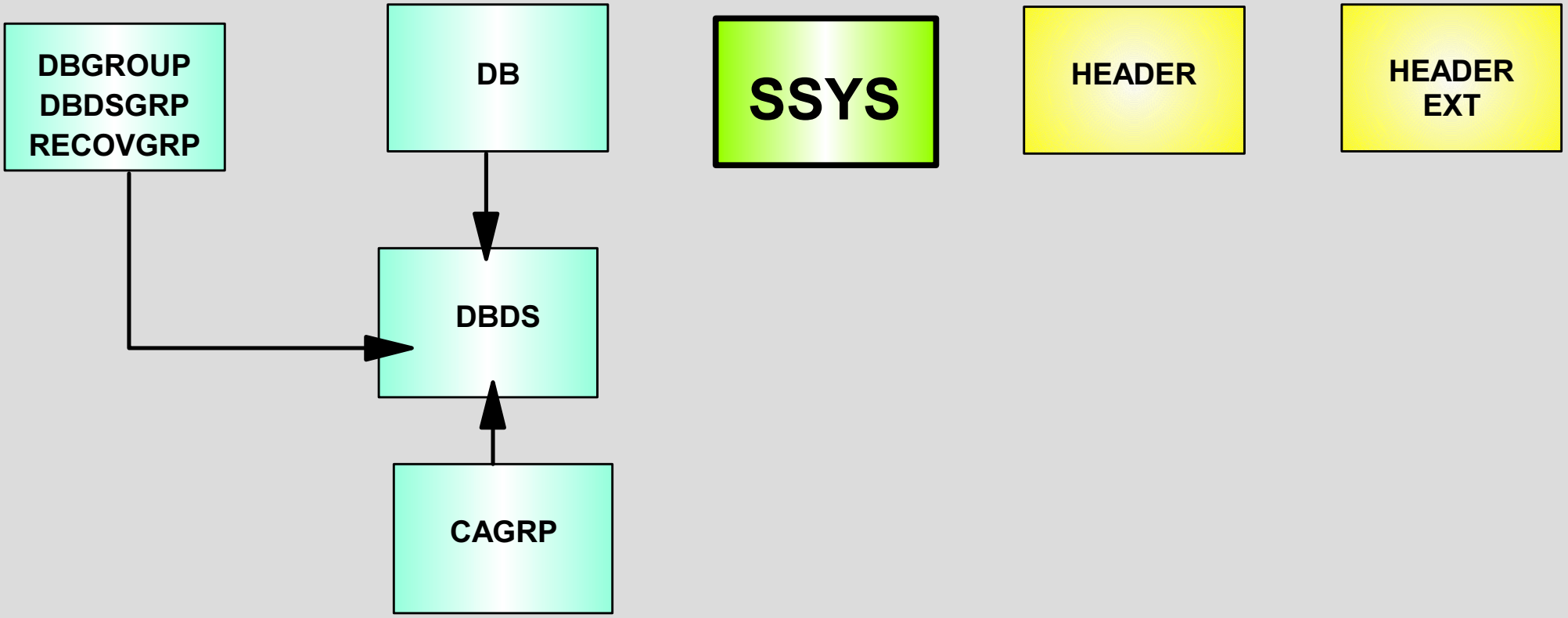
SIGN-ON NORMAL

- Normal Sign-on
  - Performed by DLI/DBB batch initialization
    - Subsystem name is the MVS Jobname
  - or by /NRE online processing
    - Subsystem name is the IMSID
    - Cold start updates the BACKOUT record (if one exists)
  - Builds a SUBSYS record
  - Fails if a SUBSYS record already exists

SIGN-ON RECOVERY START / END

- Sequence issued by:
  - /ERE online processing
  - Batch Backout Utility
- Sign-On Recovery Start
  - Turns on 'Recovery Started' in SSYS record
    - fails if a SUBSYS record:
      - does not exist for the subsystem
      - exists but ABNORMAL=OFF
- Sign-on Recovery End
  - Releases database authorizations
  - Online processing continues .. looks like 'sign-on normal'
  - Batch backout deletes SUBSYS record

RECON Records: SUBSYSTEMS



LIST.SUBSYS ALL

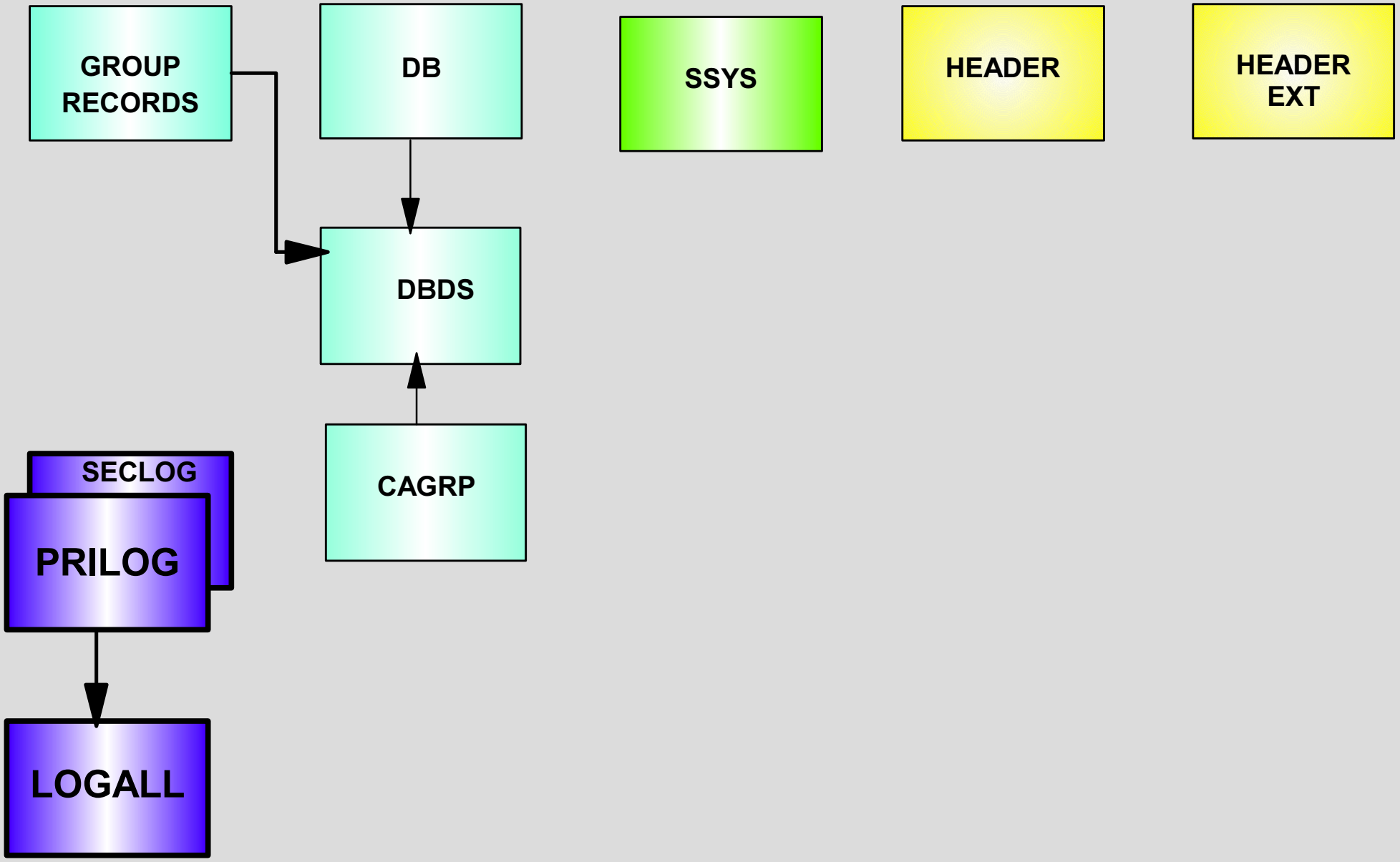
```
SSYS
      SSID=IMS1                                          LOG  START=2001.150  12:37:49.3 EST
       SSTYPE=ONLINE    ABNORMAL TERM=OFF    RECOVERY STARTED=NO   BACKUP=NO
       TRACKED=NO       TRACKER TERM=OFF     SHARING COVERED DBDS=NO
       IRLMID=IRL1       IRLM STATUS=NORMAL            GSGNAME=**NULL**

    ASSOCIATED DATA BASES/AREAS=703       VERSION=7.1
                                                                          ENCODED
       -DBD-            -AREA-       -LEVEL-       -ACCESS INTENT-      -STATE-
       SAMPDBD01        **NULL**       3                 UPDATE             3
       SAMPDBD02        **NULL**       3                 UPDATE             3
          .
          .
          .
       SAMPDBD5         AREA240        3                 UPDATE             3
```

Batch Log Open Processing

- Build PRILOG [& SECLOG] records
  - **ONE per subsystem execution**
- Build empty LOGALL record
- Update SUBSYS record with log start time

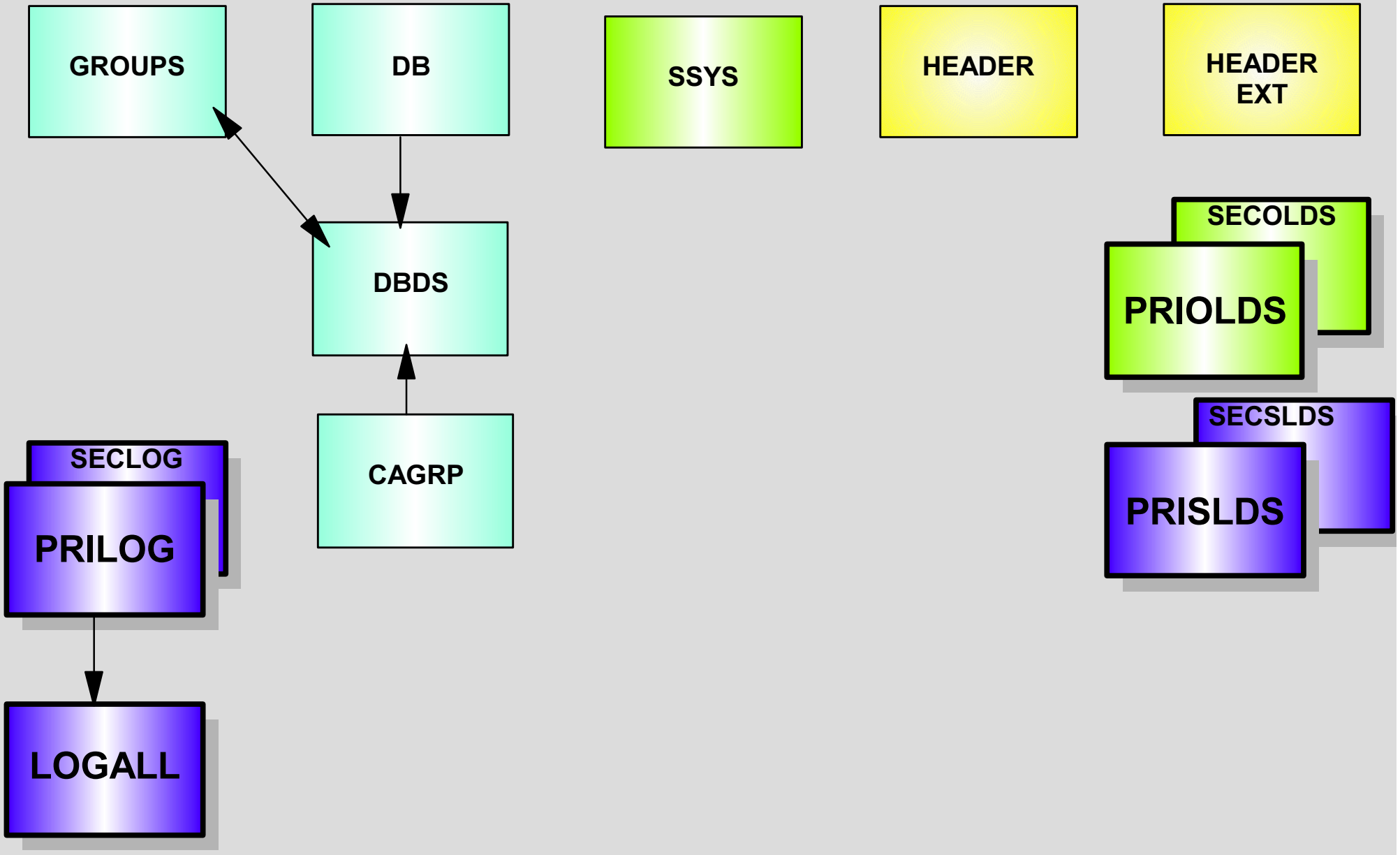
RECON Records: Batch Log Open



Online Log Open Processing

- Build PRIOLDS & SECOLDS for subsystem
  - If they do not exist, else update OLDS status in existing
  - Note: ONE set per online subsystem
- Build PRILOG record
  - ONE per subsystem EXECution
- Build PRISLDS record
  - ONE per subsystem EXECution
- Build empty LOGALL (log allocation) record
- Update SUBSYS record with log start time

RECON Records: Online Log Open



LIST.LOG SSID(IMS1)

```
PRIOLD
 SSID=IMS1          # DD ENTRIES=6
 EARLIEST CHECKPOINT = 2001.152   14:56:16.9 EST

 DDNAME=DFSOLP04   DSN=IMSPROD.IMS1.DFSOLP04
 START   = 2001.152   14:26:52.5 EST                    FIRST DS  LSN=  000000009BDFEF9A
 STOP    = 2001.152   14:54:28.9 EST                    LAST DS  LSN =  000000009BEC65DE
 LOCK SEQUENCE#  = 000000000000
 STATUS=ARC COMPLT                                                FEOV=YES
AVAIL
 PRILOG TIME=2001.150 12:37:49.3 EST                ARCHIVE JOB NAME=IMS1AR
 VERSION=7.1

 DDNAME=DFSOLP05   DSN=IMSPROD.IMS1.DFSOLP05
 START   = 2001.152   14:54:28.9 EST                    FIRST DS  LSN=  000000009BEC65DF
 STOP    = 2001.152   15:25:53.2 EST                    LAST  DS   LSN =
000000009C0112D2
 STATUS=ARC COMPLT                                                FEOV=NO        AVAIL
 PRILOG TIME=2001.150 12:37:49.3 EST                ARCHIVE JOB NAME=IMS1AR
 VERSION=7.1
```

PRILOG / SECLOG / PRISLDS / SECSLDS

```
PRILOG
 START   = 2001.150   12:37:49.3 EST          *                    SSID=IMS1       VERSION=7.1
 STOP    = 0000.000   00:00:00.0  +00:00                          #DSN=14
 GSGNAME=**NULL**
 FIRST RECORD ID= 0000000000000001       PRILOG TOKEN= 0
 EARLIEST CHECKPOINT =2001.152   14:56:16.9 EST

 DSN=IMSPROD.IMS1.PRIRLDS.D97352.T1237493.V00          UNIT=CARTRIDG
 START   =2001.150   12:37:49.3 EST                  FIRST DS  LSN=  0000000000000001
 STOP    = 2001.150   13:23:53.9 EST                 LAST  DS LSN=   000000000009F88D
 FILE SEQ=0001    #VOLUMES=0001

    VOLSER=190806    STOPTIME = 2001.150  13:23:53.9 EST
       CKPTCT=1       CHKPT ID  = 2001.150  12:38:16.9 EST
        LOCK SEQUENCE#=     000000000000

 DSN=IMSPROD.IMS1.PRIRLDS.D97352.T1323539.V00          UNIT=CARTRIDG
 START   =2001.150   13:23:53;9 EST                  FIRST DS  LSN=  000000000009F88D
 STOP    = 2001.150   13:32:36.9 EST                 LAST  DS LSN=   000000000013EC0B
 FILE SEQ=0001    #VOLUMES=0001

    VOLSER=190806    STOPTIME = 2001.150  13:32:36.9 EST
       CKPTCT=1       CHKPT ID  = 2001.150   13:22:11.8 EST
        LOCK SEQUENCE#=     000000000000
```

LOGALL Record Listing

```
LOGALL
 START   = 2001.150     12:37:49.3  EST     *
 DBDS ALLOC=410                  -DBD-          -DDN-         -ALLOC-
                                 SAMPDBD3    SAMPDDN3         3
                                 SAMPDBD2    SAMPDDN2         3
                                 SAMPDBD1    SAMPDDN1         3

                                  ...    ...    ...
```

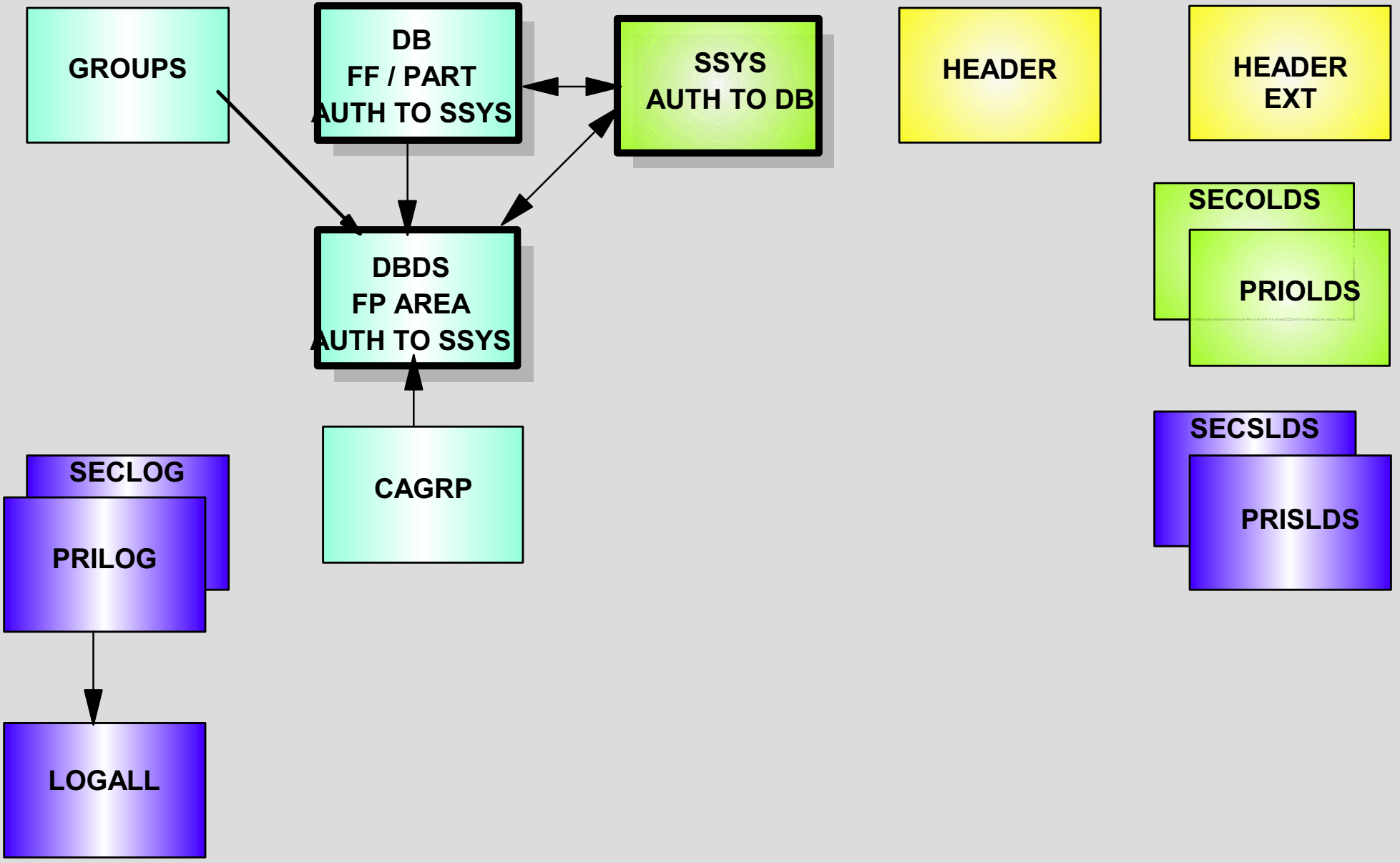
Authorization Processing

- For Batch: At initialization time
- For Online TM system:
  - At first PSB schedule for full function
  - At AREA OPEN for DEDB
    - PREOPEN
    - First application CALL
  - At PARTITION OPEN for HALDB: first application CALL
- Unregistered databases - always granted
  - Unless 'FORCER' has been specified
- Database treated as registered
  - if DBD, DD and DSN match RECON information

Authorization Processing Flow

- Check status flags in DB and DBDS records
- Check current authorizations for compatibility
- If all DB's requests can be granted
  - update SUBSYS and DB records
- Authorization Failure: DFS047A RC=reason code
  - Batch jobstep abends
  - Online
    - Database stopped
    - PSB Scheduled ... program may abend U3303

RECON Records: Authorization



Open Processing

- Does not update RECONs
- Verifies that all data sets of a database / area / partition are registered if the database is registered
- Performs Database Usage Intent (DUI) processing, with possible error messages:
  - DFS0485W THE RECON DATA SET WILL NOT BE UPDATED FOR [DATA BASE dbdname|AREA areaname|]
  - DFS0486W THE RECON DATA SET WILL NOT BE UPDATED FOR [DATA BASE dbdname|AREA areaname]
  - DFS0487W THE RECON DATA SET USED FOR [DATA BASE dbdname|AREA areaname] HAS CHANGED
- Return EEQEs for full function, HALDB partition, and single ADS fast path area

At first DB update

- Performed at 'first update' following ***authorization***
- Checks to make sure database is registered by comparing DBD name, DD name, and DSN
- Builds ALLOC (allocation) record
- Updates LOGALL record
- Returns data sharing information data set synchronization number (DSSN)
- Returns RSR information Update Set Identifier (USID)

ALLOC Record Listing

```
ALLOC
 ALLOC   = 2001.150  12:57:43.8 EST          *     ALLOC LRID=0000000000000000
 DSSN=0000000001  USID=0000000002      START = 2001.150   12:37.49.3 EST
 DEALLOC = 2001.151   04:52:55.4 EST     DEALLOC LRID=0000000000000000

ALLOC
 ALLOC   = 2001.150   13:00:24.0 EST          *     ALLOC LRID=0000000000000000
 DSSN=0000000001  USID=0000000002      START = 2001.150    12:27.37.6 EST
  DEALLOC = 2001.151   04:52:53.0 EST     DEALLOC LRID=0000000000000000

ALLOC
 ALLOC   = 2001.151   05:30:43.8 EST          *     ALLOC LRID=0000000000000000
 DSSN=0000000002  USID=0000000003     START = 2001.150   12:37.49.3 EST
 DEALLOC = 2001.152   04:32:25.2 EST     DEALLOC LRID=0000000000000000

ALLOC
 ALLOC   = 2001.151   05:31:14.1 EST          *     ALLOC LRID=0000000000000000
 DSSN=0000000002  USID=0000000003      START = 2001.150    12:27.37.6 EST
  DEALLOC = 2001.152   04:32:43.8 EST     DEALLOC LRID=0000000000000000

                          ...          ...          ...
```

Note: Deallocation information only shown if /DBR or /DBD performed

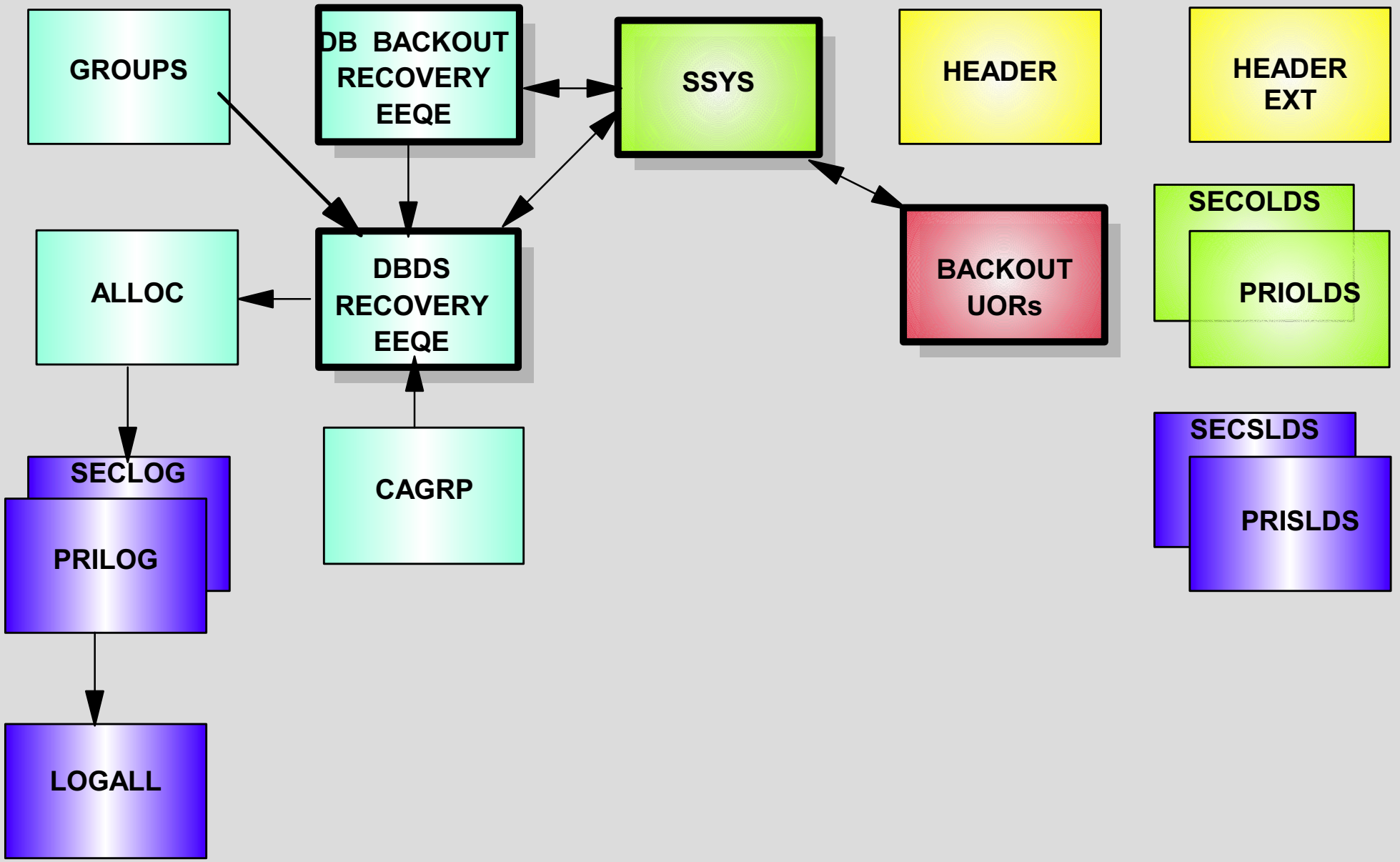
I/O Error Processing

- Performed for read and write errors
- DB and DBDS records updated with EEQE (Extended Error Queue Element) information
- If write error - full function and HALDB
  - "Recovery Needed" flag turned on in DBDS record
  - "Recovery Needed" counter incremented in DB record
- If severe error - DEDB
  - "Recovery Needed" flag turned on in DBDS (area) record
  - "Recovery Needed" counter incremented in DB record

Backout Error Processing

- Invoked for
  - Dynamic backout failures
  - /ERE backout failures
  - /ERE NOBMP
- To prevent authorization prior to recovery
  - "Backout Needed" counter incremented in DB record
  - "Backout Needed" flag turned on in DB record
- BACKOUT record updated (created) with UOR (unit of recovery) information
- Not invoked for DLI/DBB batch abends

RECON Records: I/O Errors & Backout



BACKOUT Record listing

```
BACKOUT
 SSID=IMS1      #UORS=2

  RECOVERY TOKEN=C9D4E2F140404040000000000300000002
  TIME=2001.152  14:37:04.3 EST                      PSB=PSB001
                        INFLT
   ASSOCIATED DATA BASES=1

                        BACKED   DYN BKOUT
   -DBD-                -OUT -   -FAILURE-
   SAMPDBD1               NO           YES

 RECOVERY TOKEN=C9D4E2F140404040000000000200000003
  TIME=2001.152  19:43:44.7 EST                      PSB=GARBAGE
   CANDIDATE     INFLT              BMP
   ASSOCIATED DATA BASES=2

                        BACKED   DYN BKOUT
   -DBD-                -OUT -   -FAILURE-
   GARBGEIN                NO           NO
   GARBGOUT               NO           NO
```

Batch Log Processing

- Updates PRILOG/SECLOG records
- Log EOV
  - Add new volume serial number to current (only) RLDS entry
  - Set EOV time stamp for prior volume in RLDS entry
- Log Close SETS
  - EOV time stamp for last volume in RLDS entry
  - Data set stop time for RLDS entry
  - Subsystem stop time for PRILOG/SECLOG record

Online Log Processing

- Updates PRIOLDS/SECOLDS records
- OLDS switch
  - For the Current OLDS:
    - Set OLDS close time,
    - Change STATUS from 'IN USE' to 'ARCHIVE NEEDED'
  - For the new OLDS:
    - Set OLDS open time,
    - subsystem start time, and
    - Change STATUS to 'IN USE"
- To close an OLDS the current OLDS
    - Set OLDS close time,
    - Change STATUS from "IN USE" to "ARCHIVE NEEDED"

OLDS Archive Processing

- Create SECLOG/SECSLDS records for subsystem execution
  - if they do not exist
- Add SLDS entry to PRISLDS/SECSLDS records
  - using time stamps from the archived OLDS
- Add RLDS entry to PRILOG/SECLOG records
  - using time stamps from the archived OLDS
- If archive did not create a separate RLDS,
  - use SLDS information for RLDS entry
- Set status of archived OLDS data sets to "ARC COMPLT"

OLDS Archive Processing ...

- Place "checkpoint ID prior to oldest unit of work"
  - in SLDS and RLDS data set entry
- If all OLDS for subsystem execution archived,
  - set subsystem stop time in PRILOG family records
    - PRILOG
    - SECLOG
    - PRISLDS
    - SECSLDS

Archive Processing: SLDS or RLDS

Batch Log

- Search RECONs for SLDS or RLDS being archived
  - Match on data set name
    file sequence number, and
    volume serial numbers
  - Look for "duplicates"
  - Can be time consuming
- Upon completion, update data set entry with
  - new data set name
  - file sequence number
  - unit type, and
  - volume serial numbers

PRILOG Compression

- Invoked
  - Automatically by ARCHIVE completion
  - Manually via DELETE.LOG INACTIVE
- Deletes ***inactive*** data set entries from beginning of OPEN records
  - INACTIVE defined as OLDER THAN
    - LOGRET and
    - Oldest ALLOC for any DB updated on that log and
    - Earliest restart checkpoint for online
- Compression thresholds
  - 50% of maximum record size
  - 75% of maximum record size if prior compression attempt failed
- Once compressed, compression is attempted at every OLDS

/DBRECOVER Processing

- Database data set update "span" terminated
  - ALLOC record updated with deallocation time
- Database authorization released
  - DB and SUBSYS records updated
- "Prohibit Further Authorizations" flag in DB, AREA or PARTITION record
  - Set if /DBR ... GLOBAL
  - Not set if /DBR ... GLOBAL NOPFA

/DBDUMP Processing

- Database data set update "span" terminated
  - ALLOC record updated with deallocation time
- "READ ONLY" flag in DB or PARTITION record
  - Set if /DBD ... GLOBAL
  - Not set if /DBD ... GLOBAL NOPFA

Normal Subsystem Termination

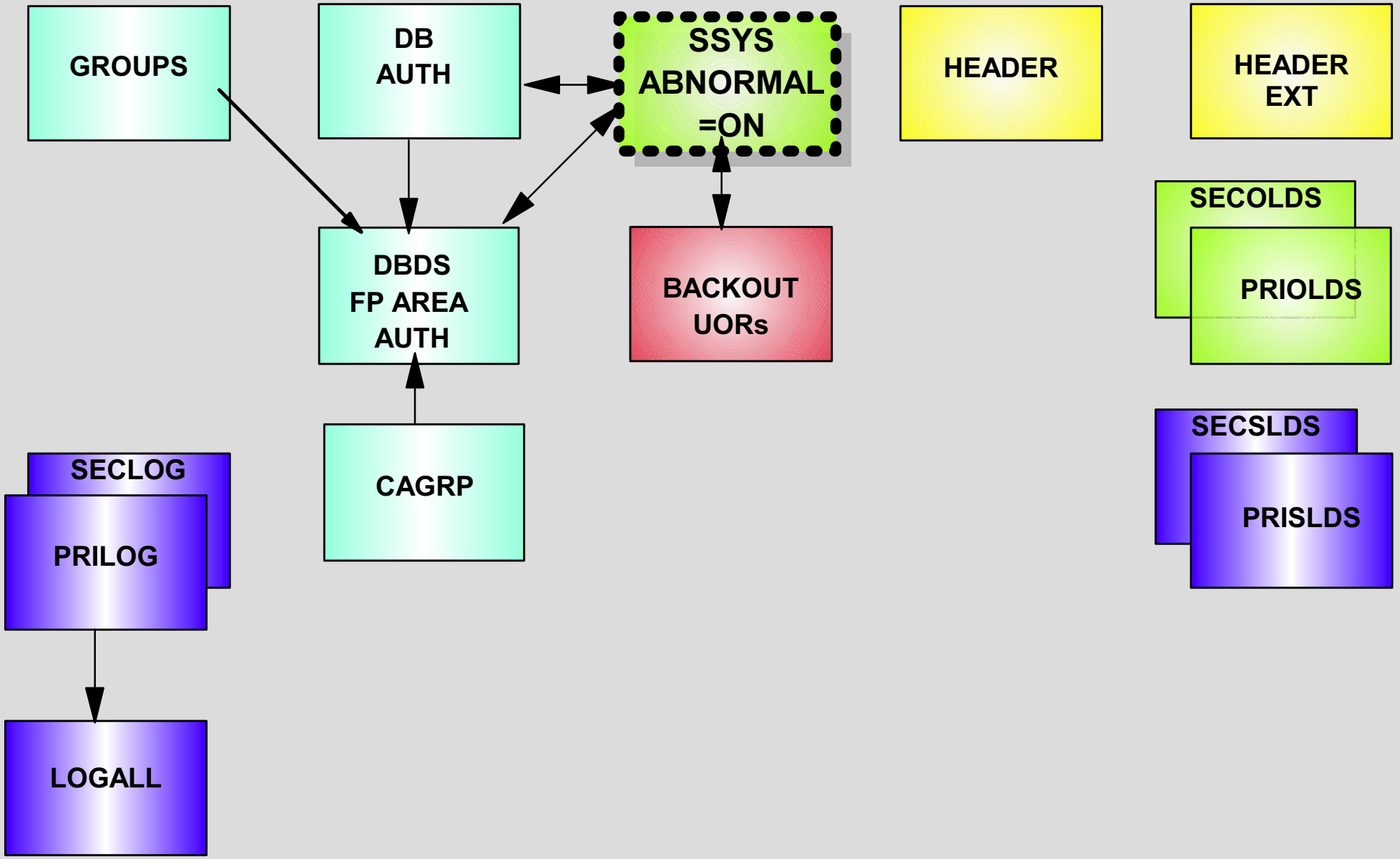
- Sign-Off Normal
- Database Authorizations released
- DB Records updated
- SUBSYS record is deleted

Abnormal Subsystem Termination

- No Action (in case of MVS failure)
- Sign-Off Abnormal (ESTAE)
  - Authorizations released
    - for databases that have NOT been updated
  - SUBSYS record may be deleted,
    - .... ONLY if no databases* were updated

      * - registered or not registered databases
  - SUBSYS record will remain
    - if **ANY** database(s) have been updated

RECON Records: Subsystem Abend



UTILITY INTERFACES

- Participate in DATABASE LEVEL SHARING
  - READ EXCLUSIVE access intent or
  - EXCLUSIVE access intent
- Reorganization Utilities (unload, reload, scan, prefix update
- Image Copy Utilities
- Batch Backout
- Database Recovery
- Change Accumulation

Utility DBRC Interaction

- Sign-On: create SSYS
- Database Authorization
  - Bypasses IC NEEDED flag
  - Bypasses PROHIBIT AUTHORIZATION flag
  - Updates DB and SSYS records
- Utility Completion
  - Unauthorizes database
  - May add a record to the RECON
  - May reset flags / counters
- Sign-Off: delete SSYS

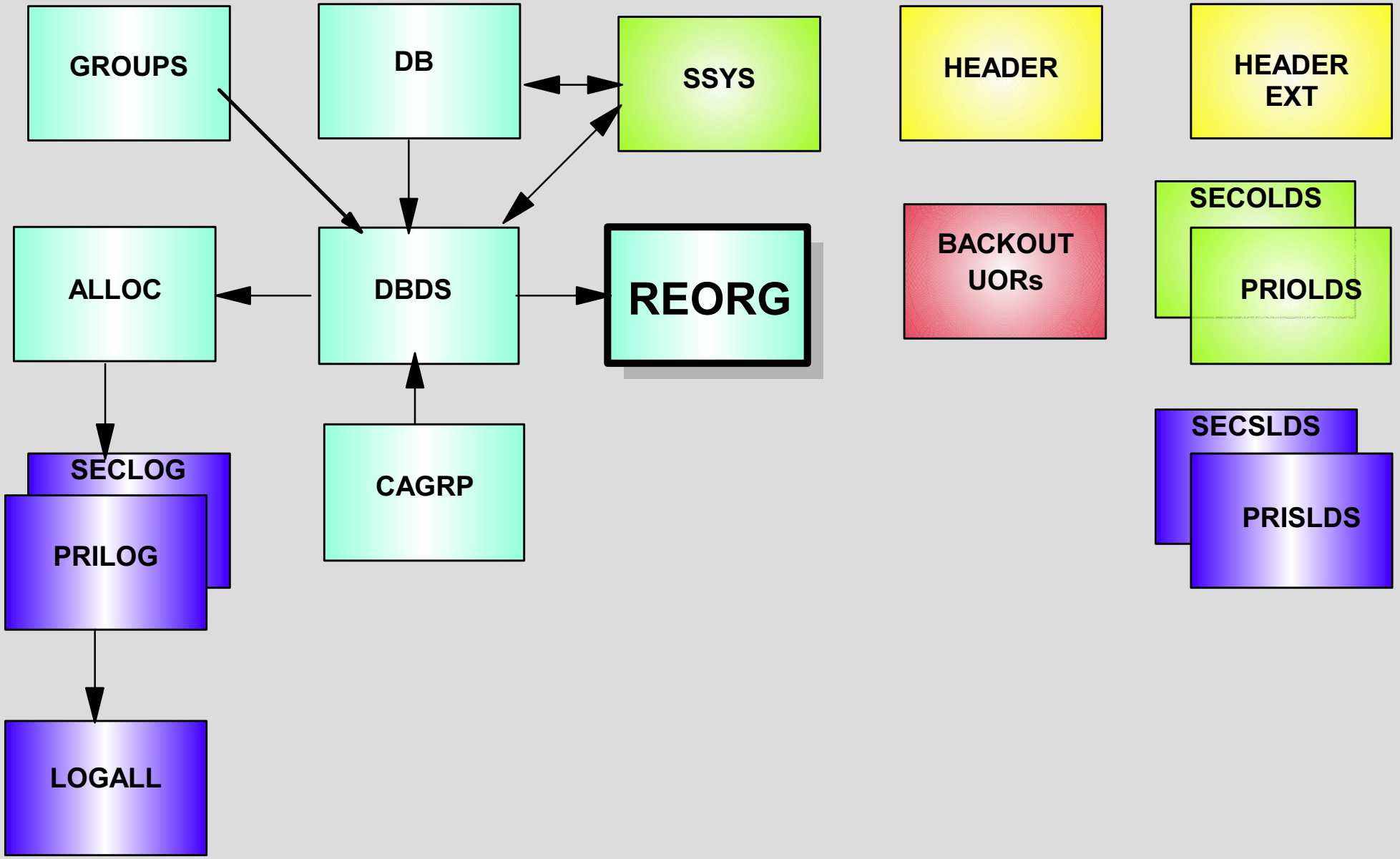
DB Unload and Scan Utilities

- Database authorized as needed
  - ACCESS = RD (read exclusive)
  - "Recovery Needed" flag will fail authorization
- RECONs are not updated
  - (These utilities do not alter the database)

DB Reload Utilities

- HISAM Reload and HD Reload
- Participates in database level sharing
  - ACCESS = EX
  - "IC Needed" and "Prohibit Authorizations" flags are ignored
  - Authorization FAILS if database updated since unload
- Creates REORG record
- Create an IMAGE record for HISAM Reload if NOREUSE
- IC NEEDED
  - Flag ON in DBDS record
  - Counter incremented in DB record

RECON Records: Reorganization



REORG Record Listing

```
REORG
 RUN     = 2001.148   01:39:17.4  EST          *     USID=0000000155
```

Reload Utility Differences

- Authorization
  - HD occurs at initialization
  - HS occurs as required
- "IC Needed" Flag
  - HD always sets
  - HS sets if IC REUSE
- IMAGE record
  - HD never creates
  - HS creates if IC NOREUSE

Prefix update

- Authorization obtained as required
  - ACCESS = EX
- If no logging, "IC Needed" flag is turned on
- If logging, acts like normal batch update job
  - ALLOC, PRILOG, and LOGALL records created

Image Copy Authorization

- Participates in **database level sharing**
  - Batch ACCESS = RD
  - Online Image Copy ACCESS = UP or EX
  - Image Copy 2 (SMSNOCIC) ACCESS = RD
- Participates in **block level data sharing**
  - Concurrent ACCESS = RO
  - Image Copy 2 (SMSCIC) ACCESS = RO
- Authorization obtained as required
  - Authorization will fail if "Recovery Needed" flag is on

Image Copy Completion

- IMAGE record created
  - If ***REUSE*** and "available" IC used, IC record describing "available" data set is deleted
- If GENMAX is exceeded and RECOVPD exceeded
  - delete oldest IMAGE record

GENMAX and RECOVPD

PRE IMS VERSION 7

- GENMAX value is DEPENDENT on RECOVPD
  - GENMAX increases when RECOVPD requires more ICs
  - IC on day 24 causes GENMAX to increment to '3'

```
DSP0065I  PREDEFINED IC HAS BEEN USED AND GENMAX
          VALUE  HAS BEEN INCREASED DBDNAME=dbdname
          DDNAME=ddname NEW GENMAX=value

DPS0066I  GENMAX HAS BEEN INCREASED AND NEW IC
          RECORDED DBD=dbdname DDN=ddname NEW
          GENMAX=value
```

GENMAX and RECOVPD . . .

IMS VERSION 7

- GENMAX value and RECOVPD are INDEPENDENT
  - GENMAX will NOT increment when RECOVPD requires more ICs
  - IC on day 24 leaves GENMAX at '2'
- GENMAX may be set to less than RECOVPD requirements
  - CHANGE.DBDS DBD(dbname) DDN(ddname) GENMAX(n)

```
DSP0063I  IMAGE COPY DATA SET WITHIN RECOVERY PERIOD CANNOT
          BE REUSED DBD= dbdname  DDN=ddname  RUNTIME=timestamp
```

GENMAX and RECOVPD . . .

Example of GENMAX and RECOVPD in V7

GENMAX=2
RECOVPD=14

DAY	KEEP	DELETE	#ICs IN RECON	AGE OF OLDEST IC IN RECON
7	7	-	1	0
14	7 & 14	-	2	7
21	14 & 21	7	2	7
24	14 , 21, & 24	-	3	10
28	21, 24, & 28	14	3	7
35	24, 28 & 35	21	3	11
42	35 & 42	24 & 28	2	7

IMAGE Record Deletion

- Records created prior to oldest IMAGE record are ***deleted***:
  - REORG
  - RECOV
  - ALLOCs not needed for database recovery (OLIC & CIC implications)
    - If ALLOC records are deleted, associated LOGALL records are updated
- ALLOCs created prior to oldest IC and **needed for recovery are *updated***
  - ALLOC timestamp set to IC timestamp
  - START timestamp set to starting log volume (PRILOG compression implications)

RECON Records: Image Copy

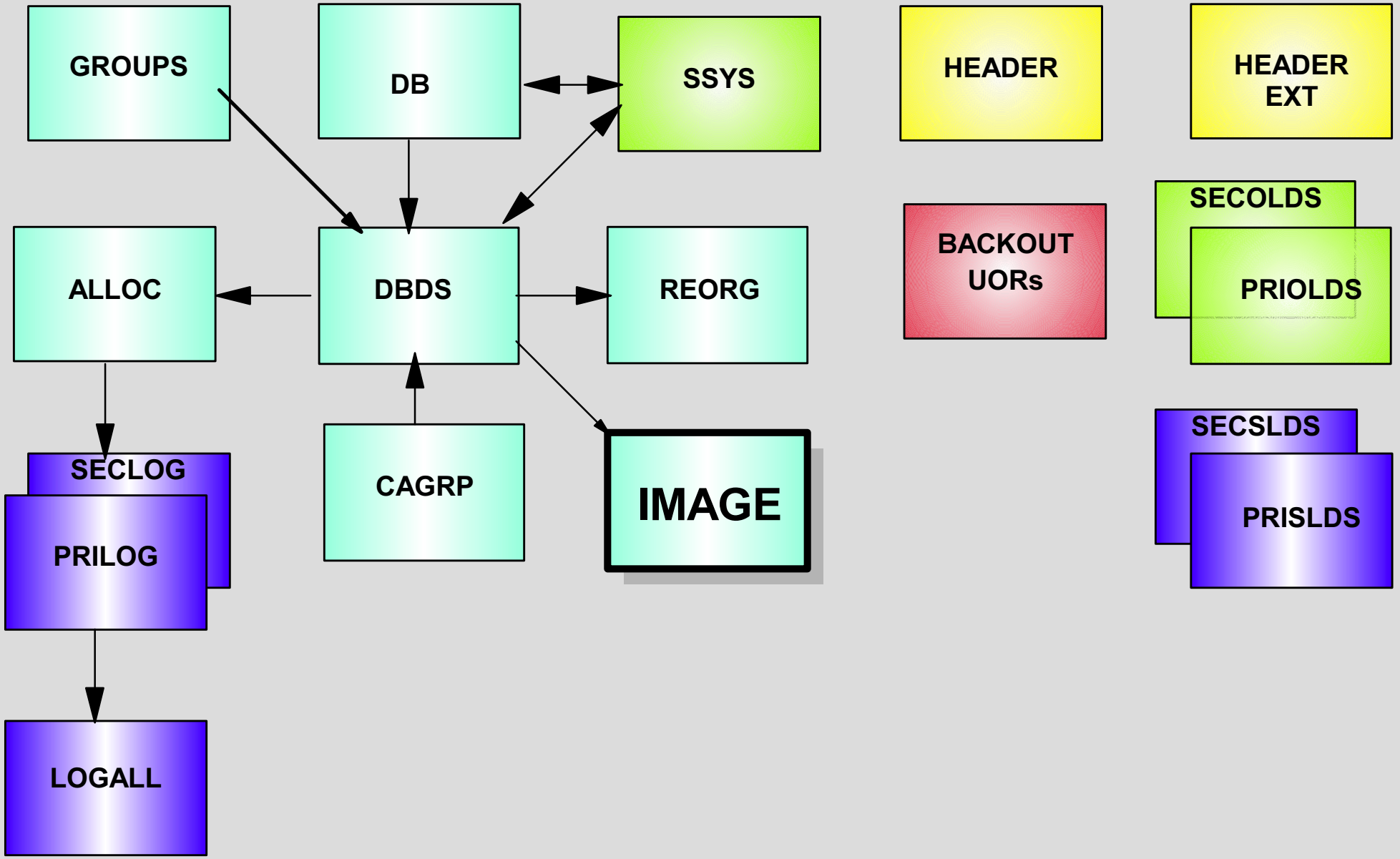


Image Record Examples

```
IMAGE
 RUN    = 2001.117   09:29:13.9 PST        *                    RECORD COUNT = 68
 STOP   = 0000.000   00:00:00.0              BATCH     USID=0000000008

IC1
 DSN=IMS.DI21PART.UNLOAD                                FILE SEQ=0001
 UNIT=SYSDA                          VOLS DEF=0001  VOLS USED=0001
                                          VOLSER=MVS115
--------------------------------------------------------------------------------
IMAGE
 RUN    = 2001.117   11:06:04.4 PST          *                    RECORD COUNT = 68
 STOP   = 2001.117   11:06:17.5 PST     ONLINE     USID=0000000008

IC1
 DSN=K5E00.DI21PART.IC1.G0070V00          FILE SEQ=0001
 UNIT=SYSDA                           VOLS DEF=0001  VOLS USED=0001
                                          VOLSER=MVS115
--------------------------------------------------------------------------------
IMAGE
 RUN    = 2001.117   11:06:04.4 PST          *              RECORD COUNT = 68
 STOP   = 2001.117   11:06:17.5 PST     CONCUR     USID=0000000001

IC1
 DSN=K5E00.DI21PART.IC1.G0070V00                FILE SEQ=0001
 UNIT=SYSDA                           VOLS DEF=0001  VOLS USED=0001
                                          VOLSER=MVS115
```

Image Record Examples ...

```
IMAGE
 RUN    = 2001.117   11:06:04.4 PST            *
 STOP   = 0000.000   00:00:00.0            SMSNOCIC     USID=0000000008

IC1
 DSN=K5E00.DI21PARO.IC1.G0070V00                    FILE SEQ=0001
 UNIT=SYSDA                                VOLS DEF=0001  VOLS
USED=0001
                                                    VOLSER=MVS115
-------------------------------------------------------------------------------
IMAGE
 RUN    = 2001.117   11:06:04.4 PST            *
 STOP   = 2001.117   11:13:05.7 PST             SMSCIC
USID=000000008

IC1
 DSN=K5E00.DI21PARO.IC1.G0070V00             FILE SEQ=0001
 UNIT=SYSDA                           VOLS DEF=0001  VOLS USED=0001
                                          VOLSER=MVS115
```

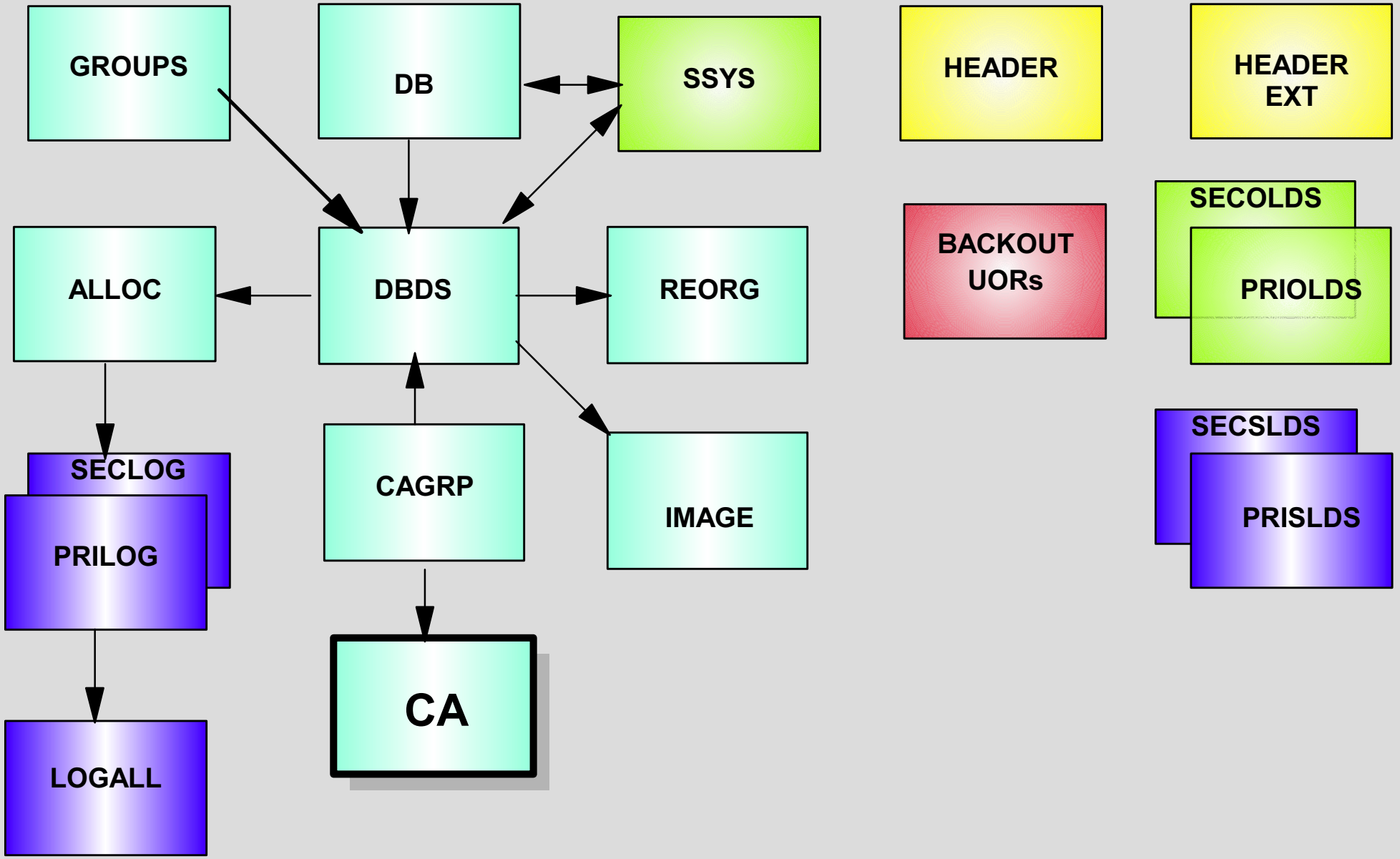
Change Accumulation Processing

- GENJCL.CA GROUP(cagrpname)
  - Select latest VALID CA for old accum file
  - Select all needed log volumes
    - ✓ Contain change records for the DBDS (ALLOC records) and
    - ✓ Are available (log volume has stop time in PRILOG record) and
    - ✓ Have a stop time greater than the computed purge time and
    - ✓ Have not been processed in the old accum file and
    - ✓ Do not follow an archiving "gap"
  - Create DB0 control cards for all members of CAGRP
    - ✓ Purge time stamp = latest valid image copy time stamp; earlier if CIC is input

Change Accum Processing ...

- Order in log volume start time sequence
- Log selection ignores impacts of time stamp recoveries
- CA record created
  - If REUSE and "available" CA used
    - **CA record describing "available: data set is deleted**
  - If GRPMAX exceeded, delete oldest CA

RECON Records: Change Accum



LIST.CAGRP ALL

```
CA
 DSN=IMSPROD.CA.SMPLCAGP.D97043.T0520213        FILE SEQ=1
 CAGRP=SMPLCAGP     STOP    =2001.152   09:10:40.7 EST        *
                              UNIT=CARTRIDG         VOLS DEF=6    VOLS USED=6
                                                  VOLSER=194340,171899,171915,171948,
                                                         171960,184080
 RUN     = 1997.352   09:14:28.4  EST

  DBD=SAMPDBD1  DDN=SAMPDDN1  PURGETIME =2001.151   01:40:21.9  EST
   CHANGES ACCUMULATED=YES COMPLETE CA=YES INDOUBT EEQES=NO
   LSN    = 000000000000                  DSSN   = 0000000001
   LRID   = 0000000000000424     USID   = 0000000002

  DBD=SAMPDBD2  DDN=SAMPDDN2  PURGETIME =2001.150   00:24:21.7  EST
   CHANGES ACCUMULATED=YES COMPLETE CA=YES INDOUBT EEQES=NO
   LSN    = 000000000000             DSSN   = 0000000001
   LRID   = 000000000000043A     USID   = 0000000002

  DBD=SAMPDBD3  DDN=SAMPDDN3  PURGETIME = 2001.152   01:40:35.5  EST
   CHANGES ACCUMULATED=NO   COMPLETE CA=YES INDOUBT EEQES=NO
   LSN    = 000000000000                  DSSN   = 0000000000
   LRID   = 0000000000000000     USID   = 0000000000
```

Batch Backout Processing

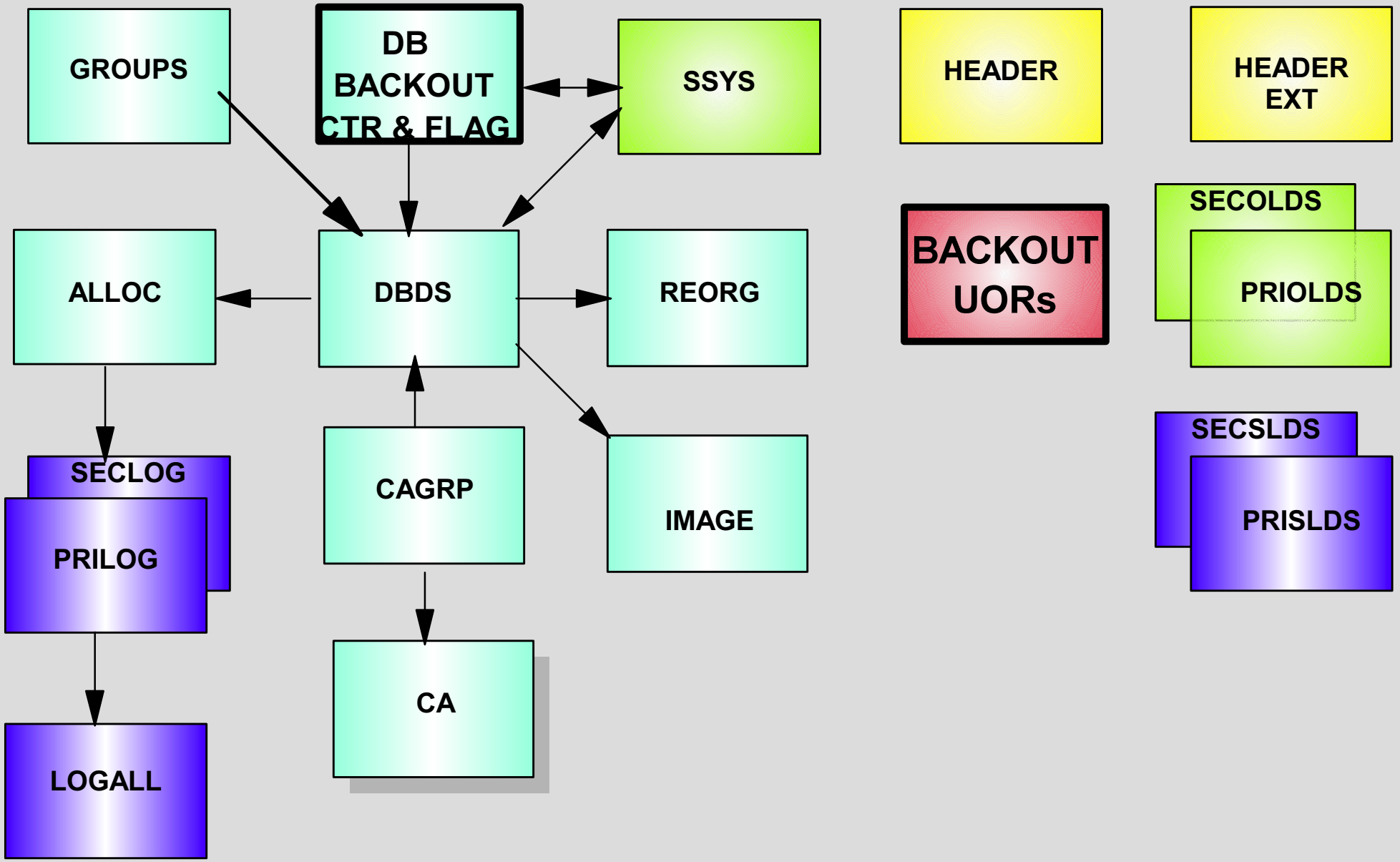
- DBRC validates input log to ensure that
  - For Batch:
    - log is last non-backout generated log for the subsystem
    - no "volume gaps" exist
  - For Online
    - no "volume gaps" exist
- DBRC returns UORs that need backing out

... ... more

Batch Backout Processing ...

- With COLDSTART or ACTIVE control statement,
  - Returns all inflight / indoubt UORs that may need backing
  - UORs added to BACKOUT record as CANDIDATEs if they do not already exist
- Following successful backout,
  - UORs removed from backout record
  - if no more UORs
    - BACKOUT record deleted
  - Backout Counter in DB record decremented
    - If all BKO CTRs = 0, BKO NEEDED flag set OFF

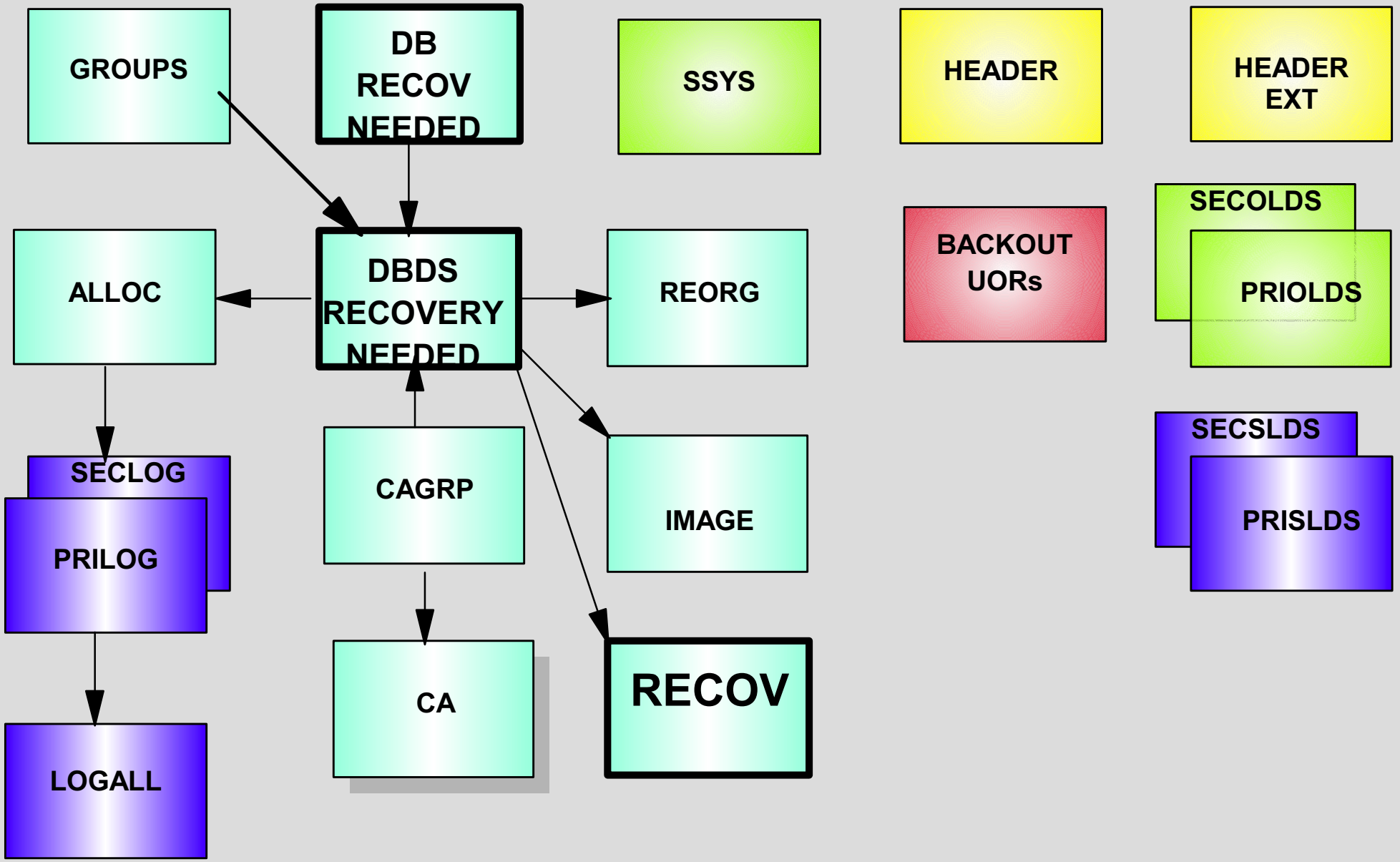
RECON Records: Batch Backout



DB Recovery Processing

- Authorization
  - ACCESS = EX
  - All currently authorized subsystems must be marked ABNORMAL=ON
- List of valid USIDs passed at execution time
- "Recovery Needed" flags and counters
  - Set at beginning of execution for full function and HALDB
  - Must already be set at beginning of execution for fast path
  - Reset at end of execution
- RECOV record added at successful termination

RECON Records: Recovery



Recovery Record Listing

```
RECOV
 RUN     = 2001.142   06:14:46.9  EST          *    RUN USID = 0000000129
 RECOV TO= 2001.142   02:39:56.1  EST               RECOV TO USID = 0000000128


RECOV
 RUN     = 2001.142   06:14:46.9  EST          *    RUN USID = 0000000129
```

Full Recovery

- GENJCL.RECOV DBD(dbdname) DDN(ddname)
  - Determines prior timestamp recovery "gaps"
  - Selects latest valid IC that does not include changes from a "gap"
  - Selects latest valid CA that
    - Has same purge time stamp as selected IC
    - Does not include changes associated with a "gap"
    - Does not span a REORG
    - Contains changes

... ... more

Full Recovery ...

- Selects log volumes that
  - **Contain changes (updates)**
  - **Have a stop time greater than the IC "purge" time**
  - **Not included in selected CA**
  - **Not created in a "gap"**
- Order logs in EOV time sequence

- GENJCL fails if selected logs:
  - Cross a REORG boundary
  - Need merging with "Merged Needed" message

Time Stamp Recovery

- Used to recover a database data set to an earlier state
  - "as at a point in time"
  - Cannot ensure application or multi-database system integrity
  - Is sometimes used as a substitute for application error-recovery
- GENJCL.RECOV DBD(name) DDN(name) RCVTIME(timestamp)
  - Determines "gaps" caused by prior time stamp recoveries
  - Validates RCVTIME
    - Must not be within "span" of an ALLOC record
  - Selects latest valid IC that
    - Does not include changes from a "gap"
    - Run time is less than or equal to RCVTIME
    - Stop time (OLIC) is less than or equal to RCVTIME

Time Stamp Recovery ... ...

- Selects latest valid CA that
  - Has same purge time stamp as selected IC
  - Does not include changes associated with a "gap"
  - Does not span a REORG
  - Contains changes within recovery window and
  - Contains no changes beyond that window
- Selects log volumes that
  - Contain changes within recovery window
  - Have a stop time greater than the IC "purge" time
  - Not included in selected CA
  - Not created in a "gap"

... ... more

Time Stamp Recovery ... ...

- Orders log volumes in EOV sequence
- Request fails if selected logs:
  - Cross a REORG boundary,
  - Need merging, with "Merge Needed" message

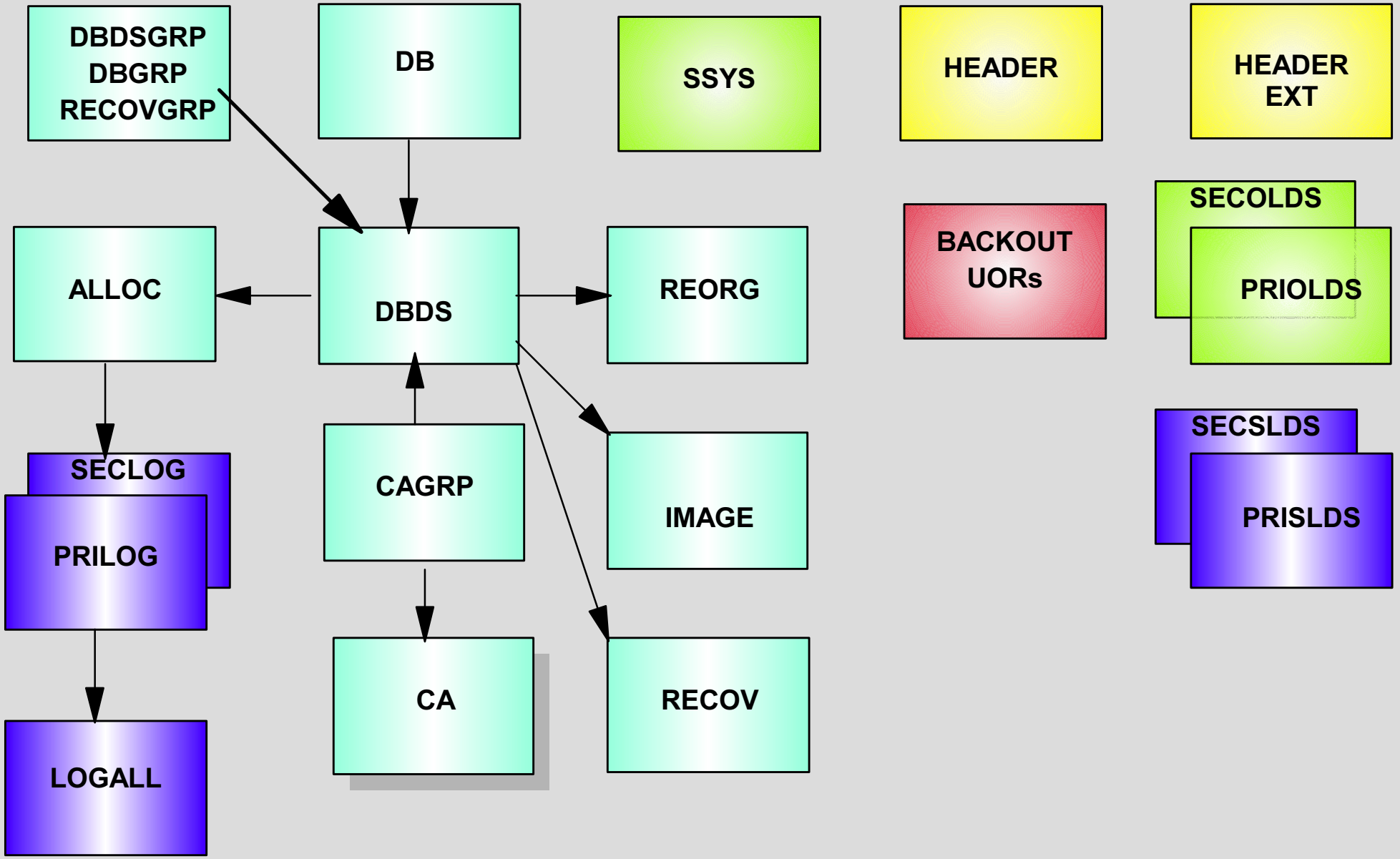
Non-Recoverable DB Considerations

- Registration
  - INIT.DB ... NONRECOV
  - CHANGE.DB ... NONRECOV
- Operation
  - No ALLOC records created
  - LOGALL not updated
- Recovery
  - GENJCL.RECOV DBD(name) DDN(name) RESTORE

DBDSGRP Considerations

- Used with GENJCL.IC, GENJCL.OIC, GENJCL.RECOV, and GENJCL.USER commands
  - Result is equivalent to issuing multiple identical GENJCL commands
    - for each member of the DBDSGRP
  - DBD is an implied group that contains all the DBDS in the DBD
  - CAGRP is treated as a valid DBDSGRP
- Used with LIST.DBDS and LIST.HISTORY commands
  - Same comments as above

RECON Records: Summary



Topic 3: IMS V7.1 DBRC Changes

- HALDB support
- IC GENMAX and RECOVPD
- Support for PROCOPT=L and LS
- Online upgrade of RECONs
- RECON Loss Notification
- Very Large RECON record warning
- Online RECON acess preference
- Serviceability

HALDB Support

- RECON Records:
  - Master database record
    - One per HALDB: TYPE=HALDB
  - New PARTITION record
    - One per HALDB Partition
  - Partition Database record
    - One per HALDB Partition: TYPE=PART
  - Partition database data set record
    - One per HALDB database data set: TYPE=PART

HALDB ... ...

- HALDB Support ... ...
  - DBRC Command Allowed
    - INIT.DB
    - INIT.PART
    - CHANGE.DB
    - CHANGE.DBDS
    - LIST.xxx
    - GENJCL.xxx
  - DBRC Commands NOT Allowed (must use PDU)
    - INIT.DBDS
    - DELETE.DB
    - DELETE.DBDS
    - DELETE.PART

HALDB ... ...

- Index and ILDS Restrictions
  - Data Sets are not recoverable therefore the following DBRC commands do not apply
    - INIT.IC
    - INIT.CAGRP
    - NOTIFY.ALLOC
    - NOTIFY.IC
    - NOTIFY.RECOV
    - NOTIFY.REORG
    - NOTIFY.UIC

GENMAX & RECOVPD

- IC GENMAX and RECOVPD will operate independently
  - RECOVPD will not cause changes in GENMAX value

PROCOPT=L & LS

- Support for PROCOPT=L and LS
  - IC NEEDED flag set ON:
    - makes DB recoverable
  - REORG record created
  - DB Recovery will not accept:
    - ICs before REORG date/time
    - Logs after REORG date/time
    - Improved data integrity

RECON UPGRADE

- Online upgrade of RECONs
  - No need to terminate IMS V6 systems to upgrade
    - Increased system availability
  - V7 does not use DSPURU00
    - New CHANGE.RECON UPGRADE command
      - V6 RECONs only
      - Utilities cannot be active
      - All subsystems must have V7 SPE installed
      - Enq's RECONs during conversion to new record format
      - Upgrades in place
      - If fails, reconfigures to V6 record format

RECON Loss Notification

- MVS Console message for RECON Loss
  - Lists active subsystems using RECONs
  - Easier to automate reconfiguration of RECONs
    - SSYS reconfiguration deallocates BAD RECON
      - DSP0388I nnnn SSYS RECORD(s) IN THE RECON AT RECONFIGURATION
      - DSP0388I SSID=ssidname FOUND
    - Automation could issue, in response
      - /RMLIST DBRC='RECON STATUS'

Very Large RECON Record Warning

- Very Large RECON Record Warning
  - User specified thresholds
    - **CHANGE.RECON LOGALERT(ds#,vol#) SIZALERT(ds#,vol#,%)**
  - Automation may react to SIZALERT for ds#,vol# exceeded
    - **DSP0387W *WARNING* : rrrrrr SIZE ALERT**
    - **DSP0387W RECORD LENGTH = LLLLLL, PP% OF RECORDSIZE ssssss**
    - **DSP0387W SSID = iiiiiii STARTIME = ttttttt**
  - Automation may react to LOGALERT for PRILOG
    - **DSP0287W *WARNING* PRILOG RECORD LENGTH CRITICAL**
  - Automation may react to SIZALERT for % exceeded
    - **DSP0007i RECORD LENGTH APPROACHING RECON MAXIMUM**
    - **DSP0007I RECORD LENGTH = llllll pp% OF RECORDSIZE ssssss formatted-record-key**

RECON ACCESS

- RECON access prioritized
  - Reserves by batch and utility jobs serialized within an MVS
  - Lessens I/O bottlenecks for online

Command Enhancements

- LIST.DBDSGRP ALL *((dbname,ddname),(dbname))* limits output
- LIST.HISTORY deletes extraneous records
  - Does not list ALL data from PRILOG
  - Does not list data from other members of CAGRP
  - Graphic timeline added

IMS V7.1 DBRC Changes Summary

- IC GENMAX and RECOVPD
- Support for PROCOPT=L and LS
- Online upgrade of RECONs
- RECON Loss Notification
- Very Large RECON record warning
- Online RECON acess preference
- Serviceability
- HALDB

Session S26 Summary

- TOPIC 1
  - Introduction
  - RECON Initialization
  - Database Registration
- TOPIC 2
  - Batch/Online Interfaces
  - Utility Interfaces
- TOPIC 3
  - Summary of changes in IMS/ESA V7
- Appendix: Reference Only
  - IMS V6.1 DBRC Enhancements
  - Diagnostic Information
  - RECON Record Usage Summary

S26

IMS From the RECON's Point of View

Please complete a session evaluation.
Thank you for attending.

Miami Beach, FL October 22-25, 2001

Appendix Contents

1. IMS V6.1 DBRC Enhancements
2. Diagnostics Information
3. RECON Record Usage Summary

IMS/ESA V6.1 DBRC CHANGES

- RECOVCTL support has been removed
- Functional enhancements support new IMS facilities:
  - Shared DEDBs with VSO
  - CA/DBD/DB Groups
  - Log retention Period
  - NOTIFY.RECOV timestamp
  - Identify batch backout logs
  - List deleted log data sets
  - LIST.RECON output
  - Support for DST/2000
  - Support for DFSMS CC

IMS/ESA V6.1 DBRC CHANGES

- Daylight Savings time and Y2000 support
  - New Time Stamp format
  - Internal changes
  - Impact on users
- DFSMS Concurrent Copy
- Functional changes to DBRC
- Performance changes to DBRC

IMS/ESA V6.1 DBRC CHANGES ... ...

- Daylight Savings Time & Y2K
  - Support 4-digit years
  - Use UTC (GMT) times internally
  - Allow for 'daylight savings time' changes during operation
  - Increase precision of times to micro-second level
  - Support cross time-zone IMS operation (Data Sharing & RSR)
  - Many internal changes to IMS and DBRC
    - ✓ Log records
    - ✓ Control blocks
    - ✓ Messages
    - ✓ DBRC formats and commands ... ... more

IMS/ESA V6.1 DBRC CHANGES ... ...

- Daylight saving time ... ...
  - New display and command formats
    - ✓ **AO applications may need alteration**
  - Wherever date / time occurs, changes in:
    - ✓ **Utility control statements**
    - ✓ **DBRC command formats**
    - ✓ **IMS log record formats**
    - ✓ **DBRC outputs, e.g. LIST.RECON**
  - Applications which access logs or RECONs
    - ✓ **RECON record formats have changed**
    - ✓ **IMS log records have changed**

IMS/ESA V6.1 DBRC CHANGES ... ...

- DFSMSS Concurrent Copy
  - New **Database Image Copy 2** Utility: DFSUDMT0
    - ✓ **Invokes DFSMSdss DUMP (using the DFSMSdss API) to create copy of data set**
    - ✓ **Can produce consistent (*clean*) or concurrent (*fuzzy*) image copy**
    - ✓ **May request 1-4 copies**
  - DBRC support for new image copy type
    - ✓ ***Registers 2 copies* with DBRC at completion of DUMP**
  - IMS Database Recovery Utility (DFSURDB0) runs without changes
    - ✓ **Must run with DBRC**

IMS/ESA V6.1 DBRC CHANGES ... ...

- DBRC RECON Performance Enhancements
  - Issues
    - ✓ **opening,**
    - ✓ **authorizing,**
    - ✓ **closing and**
    - ✓ **unauthorizing databases**
  - V6 enhancements reduce impact of these functions by
    - ✓ **Reducing number of calls to DBRC; and by**
    - ✓ **Reducing number of RECON records accessed when calls are made**
    - ✓ **Reducing pathlength (CPU cycles) required for DBRC functions**
    - ✓ **No externals**

IMS/ESA V6.1 DBRC CHANGES ... ...

- DBRC RECON Access: DEDB with large numbers of area
  - FP Pre-opening many Areas
    - ✓ **Can impact IMS Restart times significantly**
  - FP Area close
  - DBRC processing has been changed
    - ✓ **Substantially reduces number of IMS calls to DBRC**
    - ✓ **Reduce path length and RECON I/Os**

Diagnostic Information

- RECON record formats are documented in the DSECTs
  - Generate IMS with MACLIB=ALL then
  - DSECTS found in GENLIBB and MACLIB
    - IMS/ESA V6 DBRC Guide & Reference, Appendix B
    - IMS V7 DBRC Guide & Reference, Appendix C

- The format of the key fields for RECON records is documented in
    - IMS/ESA V6 Diagnosis Guide & Reference: Chapter 3.7.2 and Table 64.
    - IMS V7 Diagnosis Guide & Reference:

Diagnostic Information ...

When problems are suspected in DBRC

- DBRC internal trace:
  - Useful diagnostic tool
  - Always enabled.
- DBRC trace can help diagnose many different types of problems, such as:
  - RECON data set contention
  - RECON errors indicated by messages
  - System abends in which the PSW is pointing to DBRC
  - Whether DBRC or some other IMS component is causing the problem
- DBRC Trace is usually used in conjunction with advice from an IBM Support representative

RECON Records: Usage summary

Record	Created	Updated	Deleted	Notes
Header	INIT.RECON	- Initial DBRC Exit - VERIFY process		
Header Extension	INIT.RECON	- Initial DBRC Exit - VERIFY process		
DB	INIT.DB	- SUBSYS Authorization / unauthorization - DB I/O Error - Backout failure - /ERE NOBMP - /DBR deallocation - Normal SSYS Term. - Abnormal Term (if no Updates)	DELETE.DB	Full function authorization, HALDB Partition Authorization
DBDS	INIT.DBDS	- Image Copy - Change Accum - RSR Tracking - DB Recovery - DB I/O Error	DELETE.DBDS	Fast Path area authorization / unauthorization

RECON Records: Usage summary...

Record	Created	Updated	Deleted	Notes
BACKOUT	- Online dynamic backout failure - /ere nobmp. - /ere backout failure - /ere coldbase	- Online dynamic backout failure - /ere nobmp. - /ere backout failure - /ere coldbase. - Successful batch backout of UOR	- Successful BACKOUT of all UORs	
SUBSYS	- Batch Initialization - /NRE Online	- Log Open - Abend ESTAE - Signon Recovery Start - Signon Recovery end - Batch Backout - DB Alloc / Dealloc - Log Open (Begin Batch Job) - TM - First log Open - Subsys Auth / Unauth - /DBR Unauth/Dealloc	-Normal Termination - ABEND if no DB Updates.	

RECON Records: Usage summary...

Record	Created	Updated	Deleted	Notes
BACKOUT	- Online dynamic backout failure - /ere nobmp. - /ere backout failure - /ere coldbase	- Online dynamic backout failure - /ere nobmp. - /ere backout failure - /ere coldbase. - Successful batch backout of UOR	- Successful BACKOUT of all UORs	
DBDSGRP	INIT.DBDSGRP	CHANGE.DBDSGRP	DELETE.DBDSGRP	LIST & GENJCL commands
SUBSYS	- Batch Initialization - /NRE Online	- Log Open - Abend ESTAE - Signon Recovery Start - Signon Recovery end - Batch Backout - DB Alloc / Dealloc - Log Open (Begin Batch Job) - TM - First log Open - Subsys Auth / Unauth - /DBR Unauth/Dealloc	-Normal Termination - ABEND if no DB Updates.	

RECON Records: Usage summary ...

Record	Created	Updated	Deleted
ALLOC	- Full Function & HALDB Part: at first update - Fast Path: at Area Open	- /DBR dealloc - ALLOC recs prior to oldest IC will be updated, if needed for recovery, at IC completion	At IC record deletion, ALLOC recs prior to oldest IC will be deleted - if not needed for recovery
PRIOLDS **SECOLDS**	* First Online Log Open	- OLDS Switch - OLDS Close - Archive Scheduled - Archive Started - Archive Completed	DELETE.LOG
PRILOG **SECLOG**	- Log Open: Begin Batch Job - TM: first Log Open	- Log EOV (Batch) - Log Close (Batch) - Archive End - PRILOG Compress	DELETE.LOG
LOGALL	- Log Open: Begin Batch Job - TM: First log Open	- When ALLOC record created / deleted	When corresponding PRILOG deleted

RECON Records: Usage summary ...

Record	Created	Updated	Deleted
CA	INIT.CA CA Completion - if CA rec. for REUSE of available CA data set exists	CA Completion - if CA rec. for REUSE of available CA data set exists	At CA Completion If GRPMAX exceeded

RETURN TO INDEX