E88

Database Recovery: What's on the Way

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Presentation Overview

- IMS Database Recovery Services
- IMS Online Recovery Service for z/OS V1R1 (ORS) - Overview
- IMS Database Recovery Facility for z/OS V2R1 - Overview
- Installing Database Recovery Facility
- Using Database Recovery Facility

IBM - IMS Recovery Services

- IMS Database Recovery (DFSURDB0)
- IMS Image Copy Extensions Enhanced Recovery
- IMS Database Recovery Services
  - IMS Online Recovery Service for z/OS (ORS) - V1
  - IMS Database Recovery Facility for z/OS (DRF) - V2

IMS Database Recovery Services Products

- Version 1 - IMS Online Recovery Service for z/OS
  - **License Product ID: 5655-E50**
  - **General Availability: April 2001**
- Version 2 - IMS Database Recovery Facility for z/OS
  - **License Product ID: 5655-I44**
  - **General Availability: July 2003**

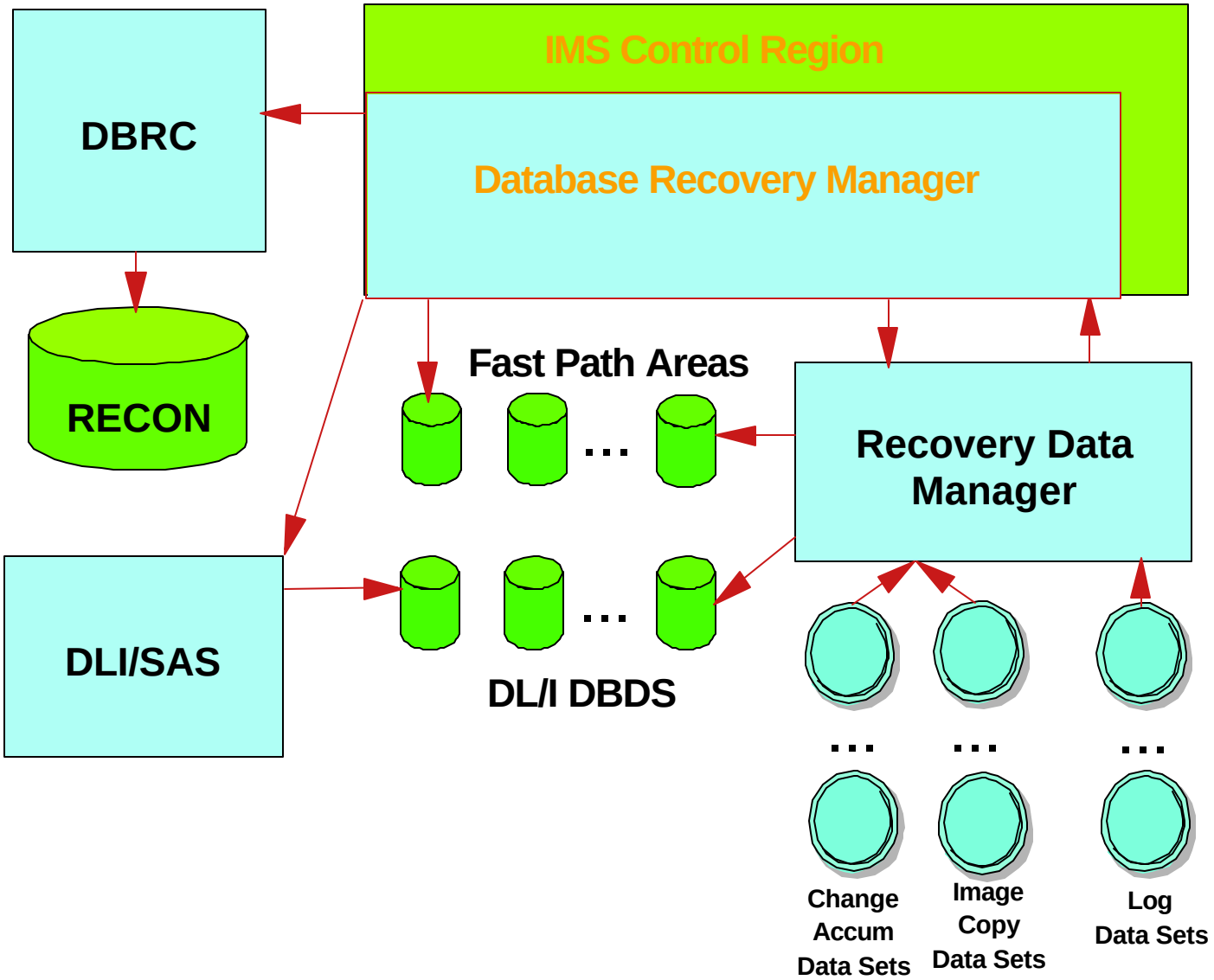
IMS Database Recovery Services Objectives

- High Performance Recovery
  - **Parallel I/O**
  - **Parallel Recovery Processing of Multiple DBDS or Areas**
  - **Single Log and CA Data Set Pass**
- High Usability
  - **DBRC Actuated**
  - **Minimal JCL - Dynamic Allocation**
  - **Results Recorded in RECON**

IMS Online Recovery Service for z/OS V1

- On-line Invocation Only
- Invoked by IMS Commands only (/RECOVER)
- Environment Created at First /RECOVER Command
- Requires IMS Control Region to Apply Log Updates
- Not Restart-able
- Results Displayed as Messages to the User
  - Originating Source of the Command
  - MTO
  - System Message Log

ORS System Organization



IMS Database Recovery Services - Common Attributes

- Log Data is read from RLDS or SLDS only
- Reads RLDS or SLDS Logs in Parallel
- Accepts Change Accumulation Input - Complete or Incomplete
- Accepts All IMS Image Copy Data Sets
  - Image Copy Utility
  - ICE Image Copy
  - IC2 (DFSMS format)
  - User Image Copy (USEDBDS)
- User responsible for restoring non-standard Image Copy Data

IMS Database Recovery Services - Common Attributes

- Recovery Time Options
  - Recover to End of Logs
  - Time Stamp Recovery (Recovery Point)
  - Point-In-Time Recovery (Arbitrary Point)
- Recovery of Multiple DBDS or Areas in one Run
- Runs in Parallel with IMS Transaction Processing
- Supports all Recoverable IMS Database Types (Not GSAM, HSAM, SHSAM, or MSDB types)
- Support for VTS Data Staging/Caching
- Supports DFSMS DELCAT option

IMS Database Recovery Services - Common Attributes

- The Catalog is used if the RECON has not recorded data set migration
- "Image Copy Needed" state is set in RECON for recovered databases after PITR
- Multi-Address Space Environment
- Optionally Automates DB Start Command (Local or Global)

IMS Database Recovery Services - Common Attributes

- Recovery List Concepts - On-line Invocation
  - Multiple Recovery Lists are supported
  - Each recovery list has a unique token supplied by the user
  - Recovery in progress can be stopped with an option to save the recovery list
  - Only one recovery list can be started per IMS Region
  - Each recovery list entry is validated in the RECON data set
  - All resources required for recovery must be recorded in the RECON data set

IMS Database Recovery Services - Common Attributes

- Recovery List Concepts (Continued)
  - Entries added to the Recovery List by
    - Individual DBDS or Area
    - Entire Database
    - Entire CA Group
    - Entire DBDS Group
    - Entire RECOV Group
  - Entries Removable from Recovery List by any of the above entities
  - Processing of a Recovery List can be Stopped
  - Recovery Lists are volatile ->deleted at the end of recovery

IMS Database Recovery Facility for z/OS (DRF) V2

- On-line Invocation like ORS with minor exceptions
- Key features added
  - Batch Invocation
  - Full Formatted Recovery Report
  - Report Only Execution (VERIFY option)
  - Parallel Outputs
  - Distinguishes Mount-able and non-Mount-able devices
- Keywords Dropped
  - DATAGROUP - from Add and Remove Commands
- Eliminated
  - Need for an active IMS region in Batch
  - Using IMS resources for Database Data Set Updates
  - All entry options for STOP except ALLENTRIES

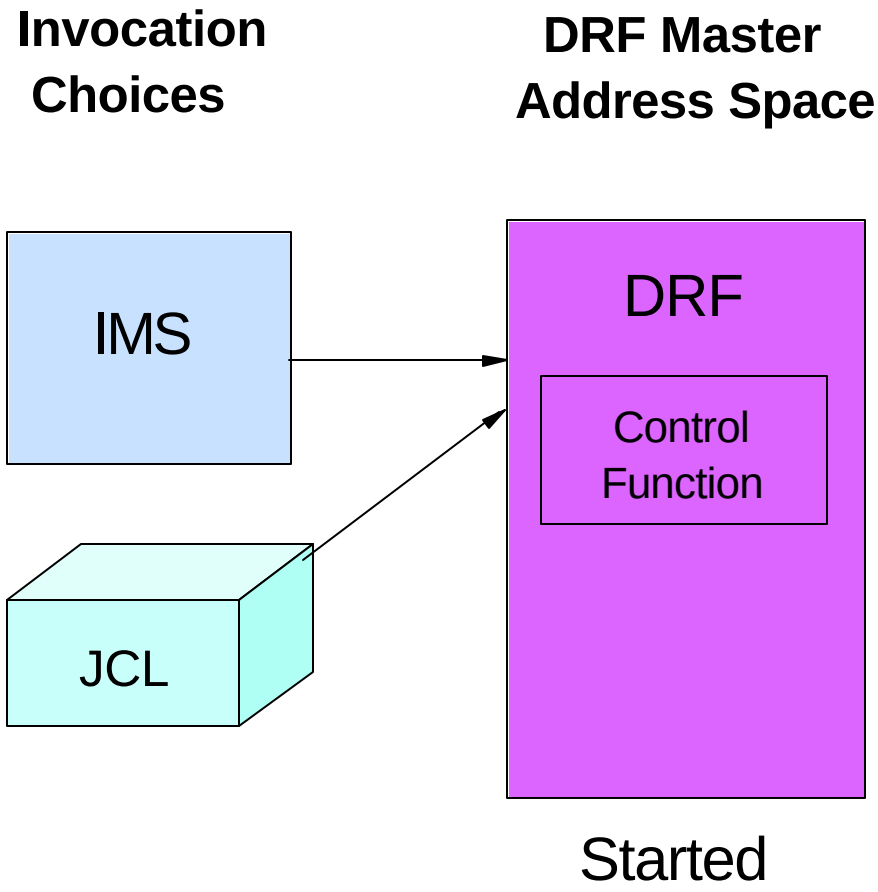
Performance Features in DRF

- Parallel Input
- Parallel Output
- Sequential or Skip Sequential Output
- Single Log Pass for Multiple DBDS Recovery
- No IMS involvement in Output

Major Characteristics of DRF Processing

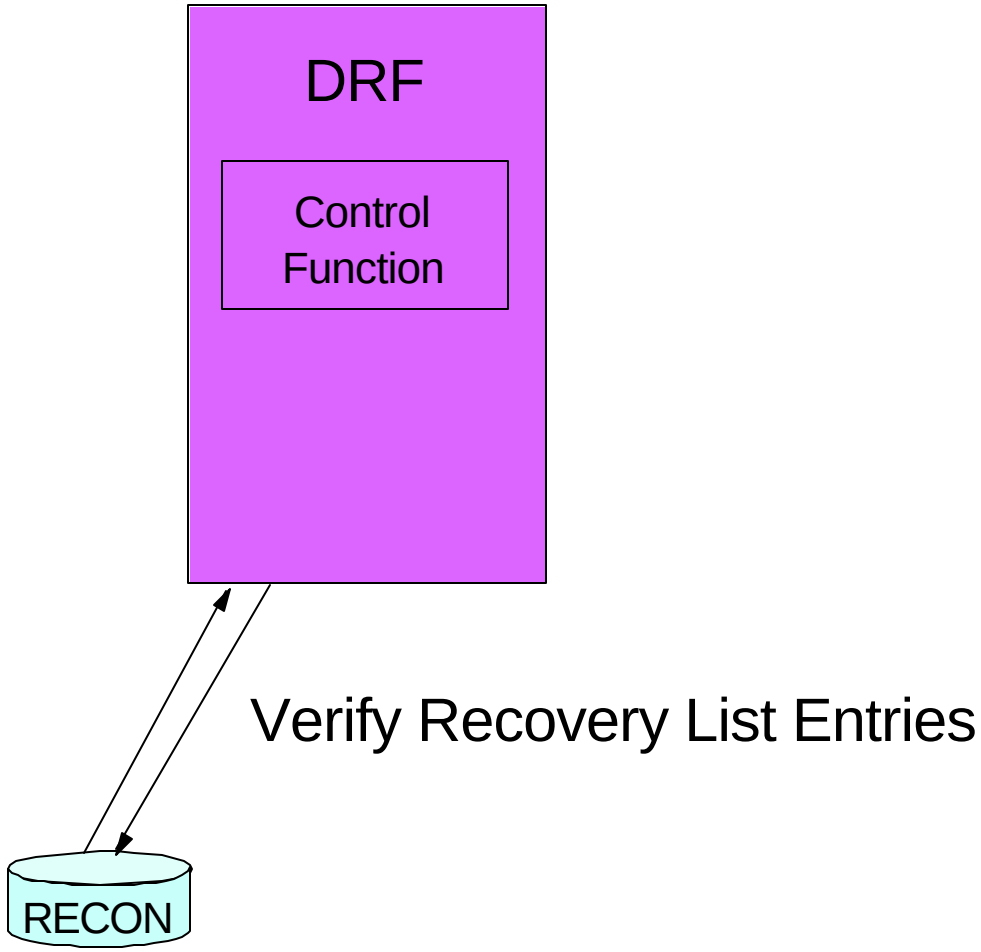
- Read Log data sets first
- Read Change Accumulation datasets concurrently with Log data sets
- Sort Log Records
- Update Image Copy data with log and change accumulation data in a single pass
  - Standard IC - Changes applied as data is read
  - IC2 - Data is restored - Only updated records are read

Database Recovery Facility Control Flow



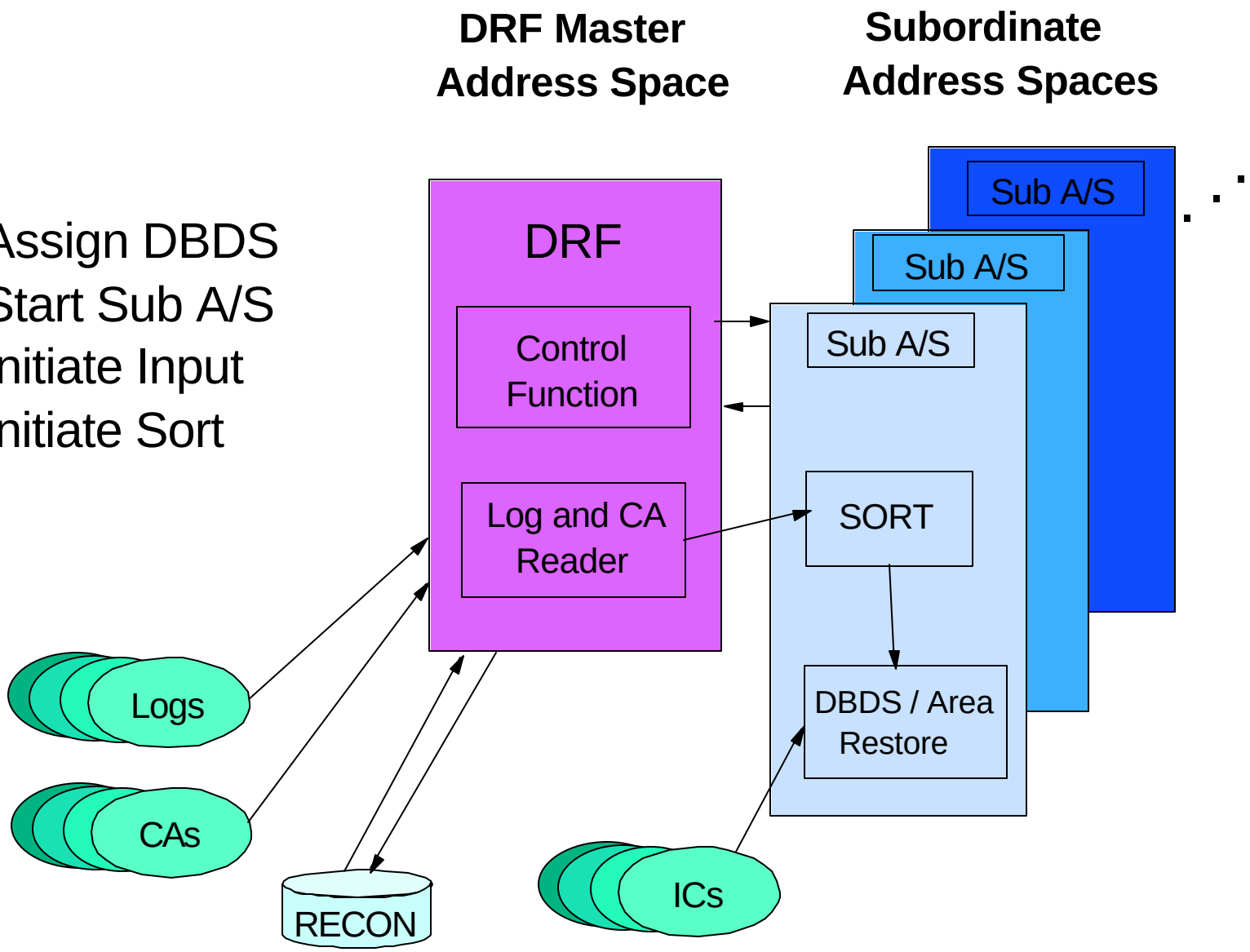
Database Recovery Facility Control Flow

DRF Master Address Space



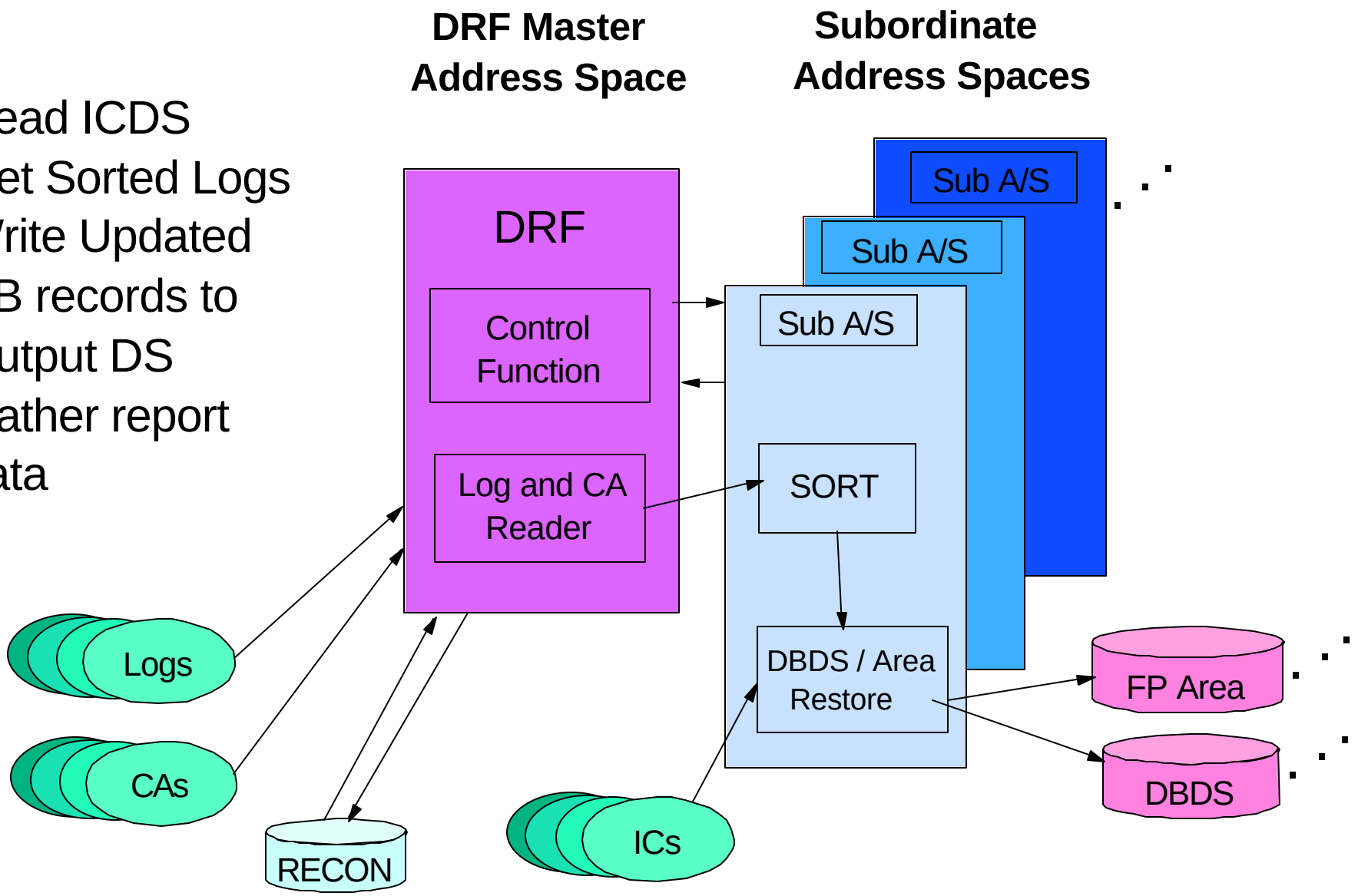
Database Recovery Facility Control Flow

1. Assign DBDS
2. Start Sub A/S
3. Initiate Input
4. Initiate Sort

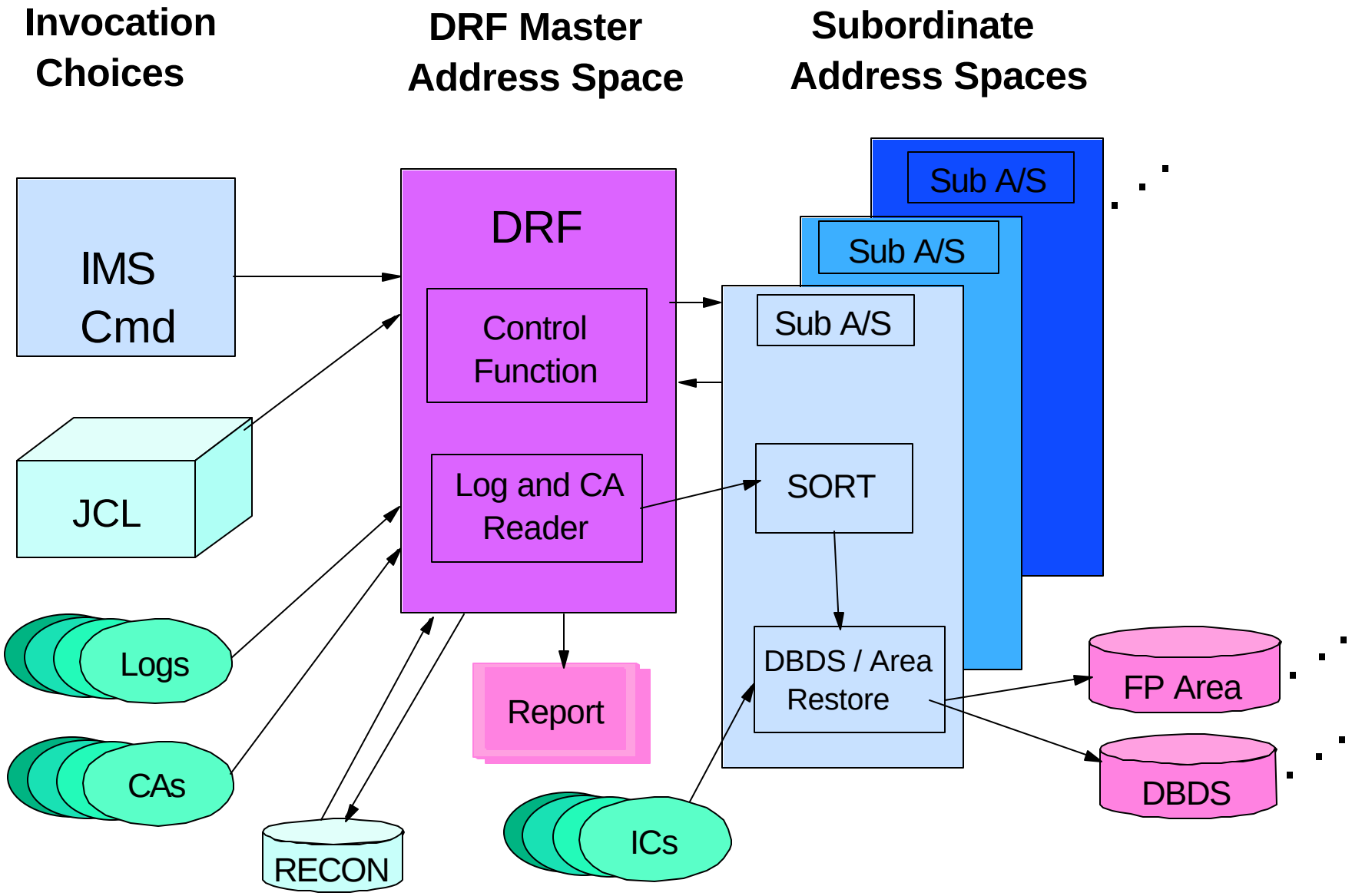


Database Recovery Facility Control Flow

1. Read ICDS
2. Get Sorted Logs
3. Write Updated DB records to Output DS
4. Gather report data



Database Recovery Facility Control Flow



INSTALLING Database Recovery Facility

- IMS Start Up Parameters
  - IMS JCL
  - DFSORSxx Member
  - BPE Configuration File
- Database Recovery Facility Start Up Parameters
  - FRXDRFxx Member
  - DRF Master Region Procedure
  - DRF Subordinate Region Procedure

Installation Steps

- Create Members in PROCLIB
  - Master and Subordinate Cataloged Procedures
  - See Samples in SAMPLIB on Product Tape
- If Use is ON-LINE then
  - Add ORSMBR=xx to DFSPBxxx or IMS PROCs
  - Add DRF Load Library to IMS STEPLIB Concatenation
- If Use is Batch then
  - Create JCL members with SYSIN control statements
- Ensure that FRXSDR00 is in the MVS Program Properties Table

IMS Startup Parameters

- IMS JCL PARM
  - "ORSMBR= nn" in IMS JCL
  - Used to Find DFSORSxx Member
- DFSORSxx Contents
  - Only One Parameter used
  - DRFNAME(procname)
  - Ignore all other keyword parameters
- BPECONFG Contents
  - TRCLEV=(DRF,HIGH,DRF) /* DRF Trace */

FRXDRFxx Member

- READNUM (tn,total)
- SORTPARM (parms)
  - NUM(nn)
  - HIPRMAX(vvvv)
  - MAINSIZE(mmmm)
  - ASPREF(cccc)
  - AVGRLEN(nnnnn)
  - FILSZ(nnnnnnnn)
- LBI (y | n)
- SPSIZE (yyyyy)

JCL - DRF Master Address Space

- Skeleton Procedure

```
//PRS   PROC DRFM=01,BPECF=BPECONFG,
//           GSGNM=GSGNAME,DRFPROC=DRFS,PLEXNM=PLXNAM
//STEP  EXEC PGM=FRDRVS00,PARM=('DRF','DRFMBR=&DRFM',
//           'BPECFG=&BPECF','GSGNAME=&GSGNM',
//
'DRFPROC=&DRFPROC','PLEXNAME=&PLEXNM'),etc.
//STEPLIB   DD   DSN=... (DRF & IMS Reslibs)
//PROCLIB   DD   DSN=...
//DBDLIB    DD   DSN=IMS.DBDLIB,...
//SYSPRINT  DD   SYSOUT=...
//REPORT    DD   SYSOUT=...
//SYSUDUMP  DD   SYSOUT=...
//*
```

JCL - DRF Subordinate Address Space

- Skeleton Procedure

```
//SUBSTEP  PROC BPECFG=BPECONFG
//STEP1  EXEC PGM=FRDRVS00,PARM=('DRF','BPECFG=&BPECFG')
//STEPLIB   DD   DSN=... (DRF & SORT Reslibs)
//PROCLIB   DD   DSN=...
//SORTOUT   DD   SYSOUT=...
//SYSUDUMP  DD   SYSOUT=...
//*
```

MVS Program Properties Table

- DRF runs in Supervisor State - Key 7
- The program must reside in an authorized library
- The program name must be in the Program Properties Table (PPT)
- Adding DRF to the PPT
  - Edit the SCHEDxx member of SYS1.PARMLIB
  - Add an entry for FRXSDR00
  - Issue MVS Command: SET SCHED=xx
    or IPL MVS

Using Database Recovery Facility

- Pre-Recovery Options
- Recovery Control Commands
- Batch Notes
- The Recovery Report
- Miscellaneous Items

Pre-Recovery Actions

- /DBR command to take DBDS offline
- Delete and Redefine the DBDS where necessary
- Define the Recovery Scope
  - Build the Recovery List
  - On-line - Use /RECOVER ADD commands
  - Batch - Use SYSIN Control Statements

Building the On-line Recovery List

- /RECOVER ADD command
- /RECOVER REMOVE Command
- /DISPLAY RECOVERY - Monitor progress
- Multiple List Identification
- Recovery List Disposition
  - Normal Completion
  - Abnormal Completion
  - STOP / Save Option

On-Line Recovery Control

- /RECOVER START Command - On-line
  - Identify the correct Recovery List with a token
  - VERIFY Option
  - ERROR Option
  - READNUM Override
  - RCVTIME - time stamp
    - TSR vs PITR
    - Check vs NOCHECK
- /RECOVER STOP ALLENTries Command
- /RECOVER TERMINATE Command

VERIFY Option

- Verify Performs
  - Recovery List Syntax Validation
  - Obtaining of Recovery Input File Information from DBRC
  - Listing of All Input Data Sets in Formatted Report
- Verify Does NOT Perform
  - Recovery Processing
  - Allocation of Input Data Sets
  - Opening of Input Data Sets
  - Purge of Recovery List

Batch Notes

- SYSIN Control Statements
  - ADD
  - REMOVE
  - START
- No IMS Control Region
- DBRC / RECON Access Required
- Runs Authorized, Key 7
- User ID requires RACF Access to All Protected Resources
- Single Recovery List - No Token Entered
- ERRORABORT -> ERROR(STOP); ERRORCONT ->ERROR(CONT)

Examples

- Batch Control Statements
  - ADD DB(DBOVLFPC)
  - ADD DB(HIDAM001)
  - START
- Verify Option
  - ADD DB(HDAMW440)
  - ADD DB(HIDAM001)
  - START VERIFY

The Recovery Report

- Display of Batch Control Statements
- Display of Processing Options
- Lists of All Input Data Sets with Statistics
  - Log Data Sets
  - Change Accumulation Data Sets
  - Image Copy Data Sets
- List of all DBDS and Areas Recovered and Status
- List of Open UOW in the Case of PITR Recovery

MIscellaneous Items

- Sort Work Space vs Log Record Volume
- Parallelism affected by
  - Stacked ICDS
  - Tape Drive Availability
  - DFSMSdss SAMEDS usage
- Online AOI Programs - review required
  - Some Messages are different
  - DATAGROUP Support Removed

Sample Report

```
==>
RD0000I  D A T A B A S E   R E C O V E R Y   F A C I L I T Y   05/21/2003 08:57                    Page 1


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   C O M M A N D S / C O N T R O L   S T A T E M E N T S

RD7201I   ADD DB(DBOVLFPC)
RD7201I   ADD DB(DEDBDD01)
RD7201I   START /* VERIFY */


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   R E C O V E R Y   P A R A M E T E R S

PROCESS : RCVDBDS            RECOVERY OPTIONS
SOURCE  : PRI                  RCVTIME : Not Specified
READNUM : 06,20                TYPE    : Full
ERROR   : STOP                 CHECK   : Yes
RCVTOKEN: DRFBASE1


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   S U M M A R Y   R E P O R T

Database   DD/Area    DSID        --------- Records Read ---------     Records    Subord.     Final
Name       Name                         IC          CA         LOG     Written    Reg Name    Status

DBOVLFPC   VLOSAM01    1             1011           0        4229        1011    DRFI0001    No errors encountered
DEDBDD01   DD01AR0     1               84           0         205          84    DRFI0002    No errors encountered
RD0000I  D A T A B A S E   R E C O V E R Y   F A C I L I T Y   05/21/2003 08:57                    Page 1
```

Report - Continued

```
FRD0000I  D A T A B A S E   R E C O V E R Y   F A C I L I T Y   05/21/2003 08:57                    Page 1


D A T A B A S E   R E C O V E R Y   F A C I L I T Y   D A T A   S E T   I / O   R E P O R T

Recover to point: Not Specified

Image Copy Data Set Name                        Volume     IC DS      IC        ---------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count  Type          1st Record                          Last Record

IMSVS.DEDBDD01.DD01AR0.IC.IC163902              222222          84    STD
IMSVS.DBOVLFPC.VLOSAM01.IC.IC163932             222222        1011    STD

Change Accum Data Set Name                      Volume     CA DS                ---------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count              1st Record                          Last Record

No data available for this type data set

Log Data Set Name                               Volume     Log DS     IMS       ---------------- Time Stamp Range -----------------
---------.---------.---------.---------.-----   Serial   Read Count  SYSID         1st Record                          Last Record

IMSVS.RLDSP.IMS1.D03140.T1641368.V00            000000          41  IMS1      2003.140 23:41:36.8            2003.140 23:42:59.7
  Prilog: 2003.140 23:37:58.7
IMSVS.RLDSP.IMS1.D03140.T1638265.V00            000000        4472  IMS1      2003.140 23:38:26.5            2003.140 23:41:36.8
  Prilog: 2003.140 23:37:58.7
```