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IMS Online Recovery Service

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IMS Online Recovery Service

- Capability
  - Shared databases and areas need to be recovered quickly and easily
- Availability
  - Recovery can not leave databases and areas offline for extended periods of time
    - Log data sets should not be read sequentially
    - Multiple DBDS and areas should be recovered simultaneously

IMS Online Recovery Service (continued)

- ■ Timestamp Recovery
  - ► The recovery timestamp should not be limited to allocation boundaries
    - – Does not allow sufficient database availability in modern computing environments

Design Goals

- No impact to IMS activity that is not recovery related

- Simplify the recovery process for shared databases and areas

- Reduce the amount of time required for recovery of multiple databases and areas

- Allow recovery to any prior point in time

Highlights

- Recover multiple DL/I DBDS and Fast Path areas in a single pass of the IMS log

- Timestamp recovery to allocation boundaries or any prior point in time
- A new facility executing in conjunction with the IMS control region

Highlights (continued)

- Executes in parallel with online IMS activity

- Recovery is initiated via IMS commands
- Supports all IMS recoverable database types

  - ► Databases marked non-recoverable in RECON can have image copies restored if available
  - ► GSAM, HSAM, SHSAM, and MSDB database types are not supported

Highlights (continued)

- Shared DBDS and areas can be recovered directly from logs
  - ► Or a combination of change accumulation data and log record

- Incomplete change accumulation data sets can be used for recovery
- Databases and areas can be started automatically
  - ► On ALL applicable IMS systems
  - ► Only on the IMS systems performing recovery
  - ► Only on a full recovery

Highlights (continued)

- Tape management system environments can cache log data
  - ► Log data sets are optionally cached during image copy restore

- Catalog entries automatically deleted for Image Copy 2 at user option
  - ► Local disaster (reformatted volume) recovery by automatically deleting catalog entries via SMS

- ORS messages sent to IMS MTO if recovery is initiated from IMS Version 8
  - ► Automation control of recovery events

Characteristics

- Users must restore nonstandard image copies prior to recovery

- Log data required for recovery must reside on SLDS or RLDS

- IMS Online Recovery Service is not restartable

- All resources required for recovery must be registered in RECON

- A DLI/SAS region is required to recover full function databases

Timestamp Recovery

- Timestamp Recovery can be enforced to allocation boundaries

- Timestamp Recovery can be to any prior point in time (PITR)
  - ► The user determines the timestamp to be used
  - ► The timestamp is not restricted by allocation ranges
- All updates that are committed as of the specified timestamp are applied

Timestamp Recovery (continued)

- All DBDS in a database or partition must be recovered to the same point in time before they can be used for online or batch processing

- Related DBDS and areas are optionally identified at the start of recovery

- Indirect List Entries and primary indices for partitioned databases must be rebuilt by the DFSPREC0 utility if PITR timestamp recovery is performed
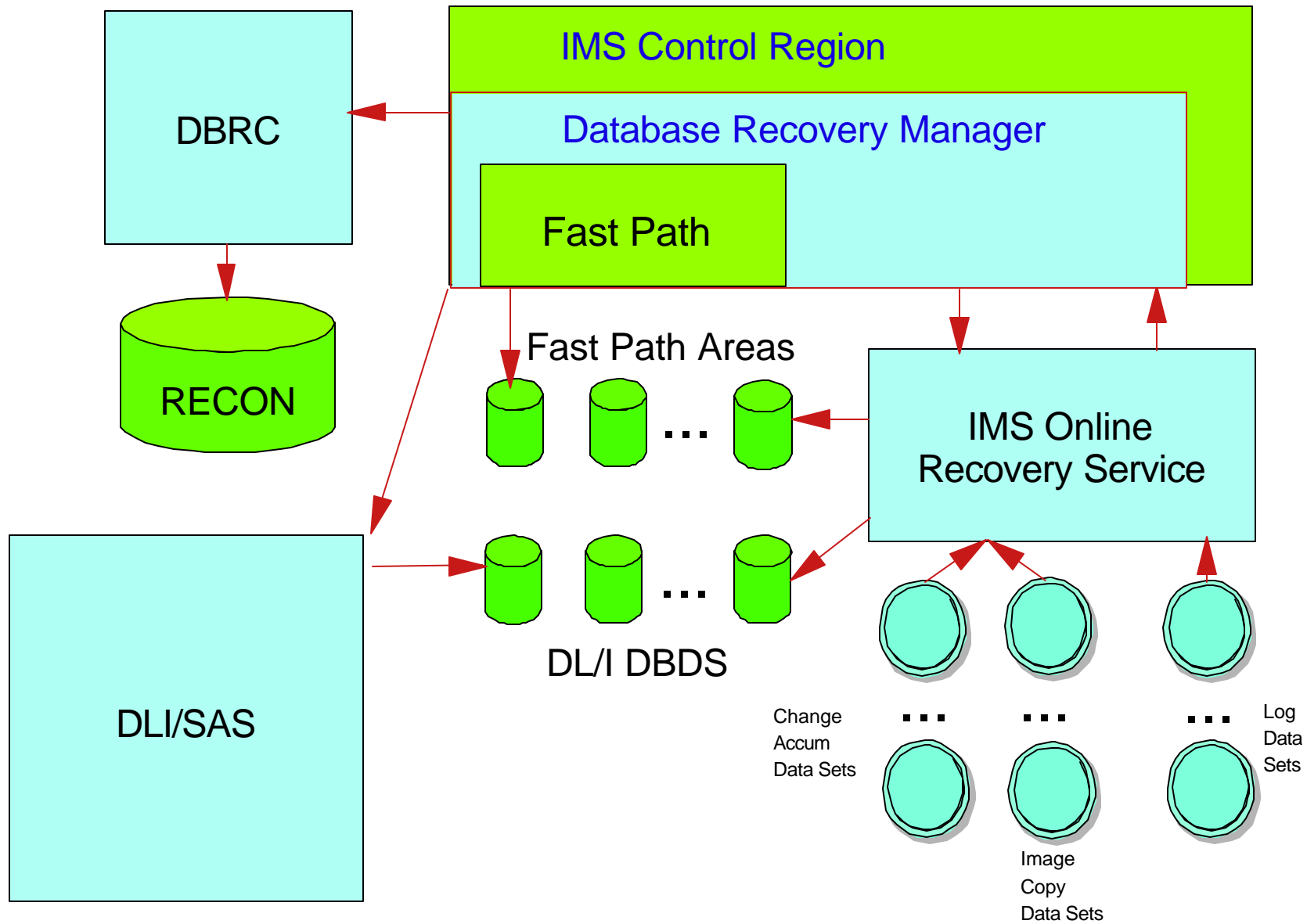
Timestamp Recovery (continued)

- RECOVERY NEEDED is turned on in RECON for all DBDSs in a DB or partition that need to be recovered to the same point in time

- DBDS and areas are marked "image copy needed" in RECON if PITR timestamp recovery is performed

- ICs prior to recovery any point in time are not allowed for later (non-PITR) timestamp recoveries once the PITR timestamp recovery is hardened

Components

- IMS Online Recovery Service is a new facility
  - A new address space which interacts with the IMS control region

- Changes in IMS to support IMS ORS consist of a new component and changes to DBRC and database components:
  - Database Recovery Manager
    - Executes in the IMS control region
  - Fast Path
  - Full Function

Components and Flow

IMS Control Region

Database Recovery Manager

Fast Path

DBRC

RECON

Fast Path Areas

IMS Online Recovery Service

DLI/SAS

DL/I DBDS

Change Accum Data Sets

Image Copy Data Sets

Log Data Sets

IMS Online Recovery Service

- Started when the first /RECOVER command is entered
  - ► Terminates on command

- Restores image copies, if required, with change accumulation data, if available
  - ► Image copies are restored in parallel
  - ► Change accumulation data sets are read in parallel with image copies

IMS Online Recovery Service (continued)

- **Reads log data and processes records related to this recovery**
  - ► RLDS are read if available

- **Merges log data into a single recovery stream**
  - ► Sends the stream to the Database Recovery Manager

Database Recovery Manager

- Driven by the IMS Command Processor to process recovery related commands
- Creates the IMS Online Recovery Service address space
  - When the first /RECOVER command is processed

- Establishes communication with the IMS Online Recovery Service address space

Database Recovery Manager (continued)

- Receives log data from the IMS Online Recovery Service address space

- Passes updates to the database trackers

- Coordinates recovery termination and IMS Online Recovery Service participation in IMS shutdown processing

DBRC

- Maintains recovery related information for
  - ► DL/I database data sets
  - ► Fast path areas

- All resources required for recovery must be registered with DBRC

- Validates recovery initiation and results

- Maintains a new group type: RECOVGRP

PROCLIB Changes

- The IMS Online Recovery Service address space procedure must be specified in a PROCLIB available to the IMS control region

  - ► The IMS Online Recovery Service parmlib member is identified on the control region EXEC statement: ORSMBR=xx

  - ► The IMS Online Recovery Service RESLIB must be part of the IMS control region STEPLIB concatenation
    - The IMS Online Recovery Service RESLIB must be APF authorized

PARMLIB Changes

- The DFSORSxx parmlib member contains specifications on
  - ► Number of available input devices
  - ► IMS Online Recovery Service proclib member name
  - ► DL/I data space size
  - ► FP data space size
  - ► Spill data space maximum size

- The BPECFG member contains specifications for IMS Online Recovery Service trace levels

- The IMS Online Recovery Service entry point must have an entry in the MVS Program Properties Table

DFSORSxx PARMLIB Example

- **READNUM(10)**
- **RDMNM(DFSRDM00)**
- **DLIDSIZE(DSIZE(1000) REDO(1000))**
- **FPDSIZE(1000)**
- **SPSIZE(1000)**

- **READNUM default is 3, range is 1-99**
- **RDMNM default is RDM**
- **DLIDSIZE(DSIZE) default is 15, range is 15 to 1600 MB**
- **DLIDSIZE(REDO) default is 256, range is 128 to 4096 MB**
- **SPSIZE default is 1000, range is 15 to 1600 MB**

Sample PPT Entry

- PPT PGMNAME(FRDRVS00) /* IMS ONLINE RECOVERY SERVICE */
-       CANCEL   /* PROGRAM CAN BE CANCELED   */
-       KEY(7)   /* PROTECT KEY ASSIGNED IS 7   */
-       NOSWAP   /* PROGRAM IS NOT-SWAPPABLE   */
-       NOPRIV   /* PROGRAM NOT PRIVILEGED   */
-       DSI   /* DOES REQUIRE DATA SET INTEGRITY */
-       SYST   /* PROGRAM IS A SYSTEM TASK   */
-       NOPASS   /* CAN BYPASS PASSWORD PROTECTION */
-       AFF(NONE) /* NO CPU AFFINITY   */
-       NOPREF   /* NO PREFERRED STORAGE FRAMES   */

Sample RDM JCL

```
//FRDRDM00 PROC
//************************************
/*    IMS ONLINE RECOVERY SERVICE JCL       *
//************************************
//STEP1     EXEC PGM=FRDRVS00,PARM='ORS,BPECFG=ORSCONFG'
//               REGION=2048K,TIME=1440
//STEPLIB  DD    DSN=IMSORS.SFRDRESL,DISP=SHR
//PROCLIB  DD    DSN=IMSORS.PROCLIB,DISP=SHR
//SYSPRINT DD    SYSOUT=*
//*
```

- FRDRVS00
  - ORS startup program name
- 'ORS,BPECFG=ORSCONFG'
  - ORS - Type of program being started
  - BPECFG=ORSCONFG - System configuration file
- STEPLIB - must be authorized
- PROCLIB - location of system configuration file

Recovery via Command

- Recovery is initiated via command:
  - ▶ /RECOVER

- Commands can be issued from
  - IMS Master Terminal
  - MVS System Console
  - Logical Terminal
  - AOI Program
  - OTMA
  - APPC

Recover Command

- /RECOVER ADD identifies DBDS and areas and builds a "recovery list"
  - ► A recovery list is the set of the DBDSs and Areas being recovered by one recovery instance
  - ► Mulitiple recovery lists can exist at the same time on the same IMS

- /RECOVER REMOVE eliminates database data sets and areas from the recovery list before recovery is started

Recover Command (continued)

- /RECOVER START initiates recovery
  - ▶ Only one recovery list can be active (being recovered) at any one time

- /RECOVER STOP aborts recovery for one or more database data sets and/or areas

- /RECOVER TERMINATE shuts down the recovery environment

Changed Commands

- /DISPLAY
  - ►/DISPLAY RECOVERY provides information on recovery activity
  - ►/DISPLAY DATABASE indicates to the user that the database is being recovered
  - ►/DISPLAY AREA notifies the user that the area is being recovered

- /STA, /DBD, /DBR, /LOCK
  - ►Rejected for DBDS and areas if they are being recovered by Online Recovery Service

Changed Commands (continued)

- ## NOTIFY.RECOV
  - ► Allows the user to add information about a point in time recovery for a specific DBDS or area to RECON

- ## INIT.DBDSGRP
  - ► Specifies the RECOVGRP members for a recovery group

- ## CHANGE.DBDSGRP
  - ► Add or delete members of a recovery group

Coexistence

■ Recovery can be initiated from either IMS Version 7 or Version 8

■ Log data used as input to recovery must be from IMS 6.1 or later

  ► Log data can be no higher than the IMS version that initiated recovery

■ Change accumulation data sets must be created by the IMS Version 7 or Version 8 Change Accumulation utility