



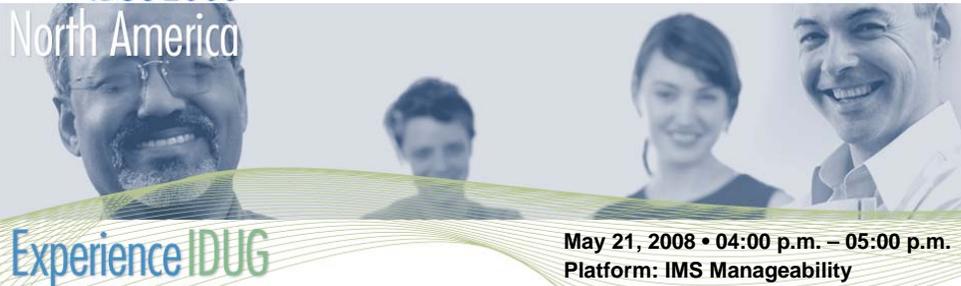
Session: K12

Taking the Sting Out of DBRC

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IDUG 2008
North America



May 21, 2008 • 04:00 p.m. – 05:00 p.m.
Platform: IMS Manageability

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Agenda



- General review of failures, recovery, and DBRC
- Ensure recoverability of databases
- Prevent lengthy outages for database recovery
- Prevent unnecessary consumption of resources
- Indications of database availability
- Modify RECONs for Disaster Recovery

This is the list of topics that will be covered in this presentation.

Facts about Failures



- Unplanned downtime is an unfortunate fact of life.
- 80% of unplanned downtime is due to human error or application failure.
- Unplanned downtime results in:
 - Lost revenue
 - Up to \$6M/hour for e-Business
 - 2-3% of annual revenue for every 10 hours of outage
 - Lost customers
 - Nearly 14 times your initial investment and 3 years to win them back
 - Lost market share
 - Approximately ½ point of market share for every 8 hours of outage



Recovery is not a matter of if, but when. While companies spend millions of dollars on Disaster Recovery, most outages are local. If databases have been corrupted, then mirror copies have been corrupted as well and a recovery is required. The longer it takes to recover, the greater the loss of revenue, customer satisfaction, and market share.

Facts about Recovery

- Lack of DBA expertise and resources
 - A DBA supports multiple database systems
 - IMS, DB2, Oracle
 - Companies are reducing DBA headcount
 - IMS DBAs are retiring
- Failures are unique
 - One size does NOT fit all
 - 70% of recovery time is “think time”
- Recoveries are infrequent
 - DBAs are not familiar with the tools available
 - DBAs do not invest time into learning and practicing



*Answer!
What answer?
I don't even know
the question!*

Recovery is scary because it is not a routine part of the DBA's job. DBA expertise is being stretched across many database platforms. Each failure is unique and requires a unique decision process. Every failure takes a DBA into uncharted territory.

Secret to Recoverability



DBRC!

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DBRC is the answer, the only answer to recoverability. DBRC uses RECON data sets as its huge repository of recovery information. Anything that has happened to a database is stored in the RECONS and is valuable for recovery: both on site and disaster recovery scenarios.

Facts about DBRC

- From IBM's book: *An Introduction to IMS*, the Database Recovery Control (DBRC) facility:
 - Ensures IMS system and database integrity
 - Controls log and database recovery
 - Controls access to databases by various IMS subsystems sharing those databases
- "Don't leave home without it!"



In general, DBRC:

Ensures IMS system and database integrity

Controls log and database recovery

Controls access to databases by various IMS subsystems sharing those databases

Advice from DBRC RECONS

- DBRC has information that helps:
 - Ensure recoverability of databases
 - Prevent lengthy outages for database recovery
 - Prevent unnecessary consumption of resources
 - Indicate database availability



Today, I am going to share with you what customers have told us they need to know from the RECONS to ensure recovery. By interrogating RECON information, you can ensure recoverability of databases, within acceptable time frames, and without consuming too many resources. The RECON also stores information about each database that will declare its availability for access by batch and online systems.

Ensure Recoverability of Databases

- Recovery is in jeopardy when:
 - Recovery assets (image copies, change accums, and logs):
 - Do not exist
 - Are in error
 - Are not catalogued
 - Secondary assets are missing
 - Generations are inadequate



Image copies and logs are necessary for recovery and recorded in the RECONS for each database. Change accums may not be necessary, but if you do run change accum, then you want to ensure they are catalogued.

It is also important to know if any assets have been marked in error and are not available for recovery.

Secondary image copies and logs may be necessary for off site recovery or necessary for on site recovery when a primary asset is not available or readable.

The amount of image copy information that is kept in the RECON is largely controlled by a database data set parameter called GENMAX. (For change accum, the parameter is GRPMAX.) GENMAX can be influenced by your recovery period specification, RECOVPD. The combination of these keywords can help you if you make extra image copies and want to make sure you retain a set number of days of copy information.

Unfortunately, there is no magic reconciliation that occurs between the OS catalog, tape catalog, and RECON data sets. It is of little use to keep image copy information in the RECONS that is obsolete to the OS and tape catalogs. Your image copy frequency, GENMAX, and RECOVPD values need to match your GDG definitions and retention periods.

Otherwise, you may not be able to recover to the point in time that you

Prevent lengthy outages for recovery

- Recovery time can be elongated if:
 - Image copies are infrequent
 - Change accums are infrequent
 - Databases are not in a change accum group
 - EEQEs are present



For shops that change accum to help meet recovery service level agreements (SLAs), it is critical that all recoverable databases belong to a change accum group. The RECONS contain information for each database with regards to which change accum group they belong.

If image copies and optional change accums are not taken at expected frequency, recovery can be elongated by too much log input.

If read/write errors, EEQE, go undetected for a long period of time, an increase in recovery time is possible. Worse yet, you may have to recover other than when you planned.

Prevent unnecessary consumption of resources

- The absence of an image copy (for recoverable databases) results in the inability of DELETE.LOG INACTIVE to remove unnecessary RECON records.
 - ALLOC
 - RECOV
 - REORG
 - PRILOG



Image copy data is necessary for automatic deletion of extraneous RECON log records accomplished with the DELETE.LOG INACTIVE request. Adequate image copy information makes it possible for deletion of unnecessary ALLOC, RECOV, and REORG records also.

Indications of database availability

- DBRC has numerous indicators that dictate database availability
 - Recovery needed
 - Backout needed
 - Image copy needed
 - Prohibit authorization
 - Read-only
 - ADS not defined
 - ADS not available
 - HALDB partition not initialized



The RECONS contain flags and information that reflect these conditions and prevent data base access by online and batch programs. Early detection makes resolution possible prior to availability attempts.

Modify RECONS for Disaster Recovery

- RECON copies occur while IMS systems are active
- Modification is necessary for IMS startup and database recovery



For IMS availability reasons, many shops copy their RECONS while their IMS systems are active. Therefore, modifications are required to the RECONS before the IMS systems can be started off site. The RECON information is also essential for database recovery.

There are shops that recover their production databases to alternate, shadow, or test databases. They need the production DBRC information and in order to get as current as possible, they will copy and modify the production RECONS and use them in the alternate recovery.

Required Modifications

- Delete active SUBSYSTEM records
- Close online open PRILOG records
- Delete batch open PRILOG records
- Close/delete open PRISLD, SECLOG, and SECSLD records
- Delete PRIOLD and SECOLD records
- Deletes/changes reorganization records as appropriate



IMS cannot be restarted if another subsystem by the same name is active. Data base authorization is not possible, if already authorized by another subsystem.

Once all online PRILOG records are closed, recovery to an acceptable time stamp is possible.

Batch PRILOG records must be deleted because the job did not complete and the log is not created until job completion.

All PRILOG partner records, PRISLD, SECLOG, SECSLD records, must be closed or deleted as well.

PRIOLD/SECOLD records must be deleted, as they are not available off site.

Required Modifications (continued)

- Update ALLOC and LOGALL records as required by PRILOG modification
- Mark concurrent/online image copies invalid if times are greater than PRILOG close
- Delete database authorization information



Any database allocations that occurred after the last SLDS archive must be deleted, because the PRILOG has been closed with the last SLDS stop time. LOGALL records have to be adjusted when ALLOC records are deleted.

Concurrent and online image copies that occur after the last SLDS stop time must be marked invalid because the OLDS data is not available off site.

Database authorization information must be removed so databases can be recovered.

Batch reorganization records and IMS HALDB online reorganization (OLR) records might need modification depending on the start time associated with the reorganization.

Desirable Modifications

- Mark all database data sets as “recov needed”
- Mark all change accum runs as “invalid”
- Mark all primary image copies and logs as “invalid”



If all databases are marked as “recovery needed” then a recovery will not be accidentally missed.

Since the RECONS do not store secondary change accum information and the primary change accum may not have been sent off site, it might be desirable to invalidate all change accum run records.

It might be desirable to invalidate all primary image copy and log records to force recovery utilities to use the secondary assets.

Recovery Warnings with Modifications

- Recovery point selection requires consideration, especially in IMSPLEX environments
 - Cannot recover to the end of closed logs
 - Point in time recovery no later than the stop time of the earliest PRILOG closed
 - Standard time stamp recovery based on
 - Database quiesce
 - Batch image copy
 - Complete change accum runs



Once RECON modifications take place, care is needed in choosing an adequate recovery point. You cannot recover to the end of the logs, because the PRILOG close does not represent a true shutdown of IMS. The last SLDS on each PRILOG could have transactions in-flight.

You can recover with a tool that supports point in time recovery. In a data-sharing environment, a point in time recovery should not occur beyond the stop time of the earliest PRILOG.

Some shops are able to create standard recovery points by quiescing (/DBRing) their data bases. Batch image copies created during the quiesce represent standard recovery points. Change accums created with logs from a database quiesce (including log switches) represent complete change accum runs and standard recovery time stamps.

Taking the Sting Out of DBRC

DBRC may seem like a bear at times, but if it is database integrity that you desire, then DBRC is where the honey can be found!



DBRC may seem like a bear at times, but it is always a friend of recovery.

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