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Not Logged Table Spaces

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Agenda

- NOT LOGGED Table Spaces
- NOT LOGGED Table Space Attribute
- Restart and Rollback Considerations
- COPY and RECOVER
- Other Utility Support
- Operational Considerations

NOT LOGGED Table Spaces

- Get an SQL equivalent option to LOAD LOG(NO)
- Use less storage for log data
- Useful for situations where the data need not be completely recoverable.
 - Materialized Query Tables
 - Summary Tables
 - Propagation Staging Tables
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- May also be useful when many changes are concentrated in a short period of time.
- Not a performance option

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NOT LOGGED Table Spaces (cont'd)

- For batched changes to recoverable data:
 - Take a Full Image Copy
 - Alter the table space to NOT LOGGED
 - Perform your batch update process
 - Alter the table space to LOGGED
 - Take another Full Image Copy
- Should anything go wrong during NOT LOGGED period, original data can be recovered from a prior image copy, and the batch process rerun
- Use `-CANCEL THREAD ... NOBACKOUT` to avoid long unnecessary backout processing.

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NOT LOGGED Table Space Attribute

- Logging attribute specified at table space level
 - Cannot be specified for Catalog, XML, or work file table spaces
- Allows data in table spaces to be logged or not logged
- Indexes inherit their logging attribute from their base table's table space
- XML table spaces inherit their logging attribute from their associated base table's table space
- NOT LOGGED is incompatible with DATA CAPTURE CHANGES
- Default logging attribute is LOGGED except for work file table spaces
- NOT LOGGED suppresses Undo and Redo logging of data in base table spaces. Control records (e.g., OPEN, CLOSE, DBET) continue to be logged

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NOT LOGGED Table Space Attribute (cont'd)

- For a LOB table space,
 - If the **base** table space has a logging attribute of LOGGED:
 - The logging attribute of the LOB table space continues to be independent of the base table space.
 - The LOB table space's logging attribute may be altered without restriction
 - If the **base** table space has a logging attribute of NOT LOGGED:
 - The logging attribute of the LOB table space must also be NOT LOGGED.
 - Expected Utility behavior and SQL results will remain as they were in previous releases.

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NOT LOGGED Table Space Attribute (cont'd)

- Cannot have Not Logged data updates in same commit scope as CREATE and ALTER NOT LOGGED. This is also true for indexes.
 - No DML before DDL in the same commit scope
- A Unit of Recovery is established when the table space is opened for update
 - Begin UR is needed to produce message DSNR035I (long running UR).
 - Begin UR is needed for data sharing for Commit-LSN checking to keep track of the oldest UR with uncommitted updates.

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LOB and XML table spaces

- When a base table space has the LOGGED logging attribute:
 - Associated LOB table spaces can be either LOGGED or NOT LOGGED
 - All associated XML table spaces also must be LOGGED
 - Altering the base table space's logging attribute from LOGGED to NOT LOGGED implicitly alters associated XML and LOGGED LOB table spaces to NOT LOGGED also
 - When an XML or LOB table space's logging attribute is implicitly altered in this way, its logging attribute is said to be *linked* to the base table's logging attribute
- When a base table space has the NOT LOGGED logging attribute:
 - All associated LOB and XML table spaces must also be NOT LOGGED
 - Altering the base table space's logging attribute from NOT LOGGED to LOGGED implicitly alters associated XML and LOB table spaces whose logging attribute is *linked* to the base to LOGGED also
 - Associated LOB table spaces that were not *linked* remain NOT LOGGED.
- All LOB table spaces may now be LOGGED regardless of maximum LOB size.

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The LOG Column of SYSIBM.SYSTABLESPACE

- Existing LOG column of SYSIBM.SYSTABLESPACE is now used for non-LOB table spaces as well as LOB table spaces.
- Possible values are:
 - ‘Y’, LOGGED.
 - ‘N’, NOT LOGGED.
 - ‘X’, NOT LOGGED, *linked* to the base.
- Valid alternatives for a base table space are ‘Y’ or ‘N’.
- Valid alternatives for a LOB table space are ‘Y’, ‘N’, or ‘X’.
- Valid alternatives for an XML table space are ‘Y’ or ‘X’.
- Indexes always inherit the same value as their associated base table space

Restart and Roll Back Considerations

- If UNDO processing is needed, without logs DB2 cannot guarantee data integrity, so NOT LOGGED table spaces must be recovered.
- This could be caused, for example, by a ROLLBACK, abort, after trigger error, duplicate key or referential constraint violation.
- The Base table space or partition is marked Recover Pending (RECP).
- The entire Base table space or partition is placed in the LPL (logical page list).
- COPY YES indexes on NOT LOGGED base table spaces are treated the same way.
- COPY NO indexes on base are marked Rebuild Pending (RBDP).
- The table space is unavailable until manual action is taken.
- Since -CANCEL THREAD causes an abort, care should also be exercised in cancelling a thread involved in modifying a NOT LOGGED table space.

Restart and Roll Back Considerations (cont'd)

- XML table spaces are placed in the LPL and are marked Recover Pending when UNDO processing is necessary for a NOT LOGGED table space where XML columns have been updated
- NOT LOGGED LOB table spaces are not placed in the LPL, nor are they marked Recover Pending when UNDO processing is necessary
 - Individual LOB value is marked invalid and the LOB table space is marked in the non-restrictive Auxiliary Warning state
- Recommendation:
 - Take image copies for a NOT LOGGED base table space, all of its COPY YES indexes, and all associated LOB and XML table spaces at the same time to create a recovery set

LPL Considerations

- When a NOT LOGGED table space or partition is placed in the LPL
 - Automatic LPL recovery is **not** initiated
 - A -START DATABASE command will not change the LPL status of the table space
- To remove a table space from the LPL and reset Recover Pending (RECP), use any of the following:
 - REFRESH TABLE to repopulate a Materialized Query Table, but only if the Materialized Query Table is alone in its table space.
 - The RECOVER utility, to recover either to the most recent recoverable point or to a prior recoverable point.
 - LOAD REPLACE or LOAD REPLACE PART, either with an input data set to repopulate the table, or without one so that INSERT can repopulate the table.
 - Drop and recreate the table space and repopulate the table.
 - Use Delete without a WHERE clause or new TRUNCATE statement (restrictions apply)

SYSLGRNX and SYSCOPY

- SYSLGRNX records are not maintained for NOT LOGGED table spaces.
- SYSCOPY records are written for the following events.
 - When a table space is created as LOGGED; ICTYPE='C' and STYPE='L'
 - When a table space is created as NOT LOGGED; ICTYPE='C' and STYPE='O'
 - When a table space is altered to LOGGED; ICTYPE='A' and STYPE='L'
 - When a table space is altered to NOT LOGGED; ICTYPE='A' and STYPE='O'
- The LRSN in these SYSCOPY records reflects the point in the log at which the logging attribute was altered.
- A new column, LOGGED, is added to the SYSCOPY Catalog table. Values can be:
 - 'Y' - indicates the LOGGED attribute.
 - 'N' - indicates the NOT LOGGED attribute.
 - blank - indicates that the row was inserted prior to V9. For a non-LOB table space or an index space, this indicates the LOGGED attribute. For LOB table spaces, this does not indicate the logging attribute.

NOT LOGGED Table Spaces & Recoverable Points

- NOT LOGGED table spaces can be recovered to any ***recoverable point***.
 - When table space was altered to NOT LOGGED
 - Image copy taken while table space was NOT LOGGED.
 - SHRLEVEL(CHANGE) image copies are not supported.
 - Full and incremental SHRLEVEL(REFERENCE) image copies can still be taken
- Modifications made to not logged data after an image copy is taken, are not recoverable.

NOT LOGGED Table Spaces and ICOPY State

- Data modifications made to a table space with the NOT LOGGED attribute, are not recoverable.
- The table space is placed in the Informational Copy Pending (ICOPY) state (previously this state only applied to indexes).
 - COPY YES indexes on tables in NOT LOGGED table spaces are treated the same way.
- DISPLAY DATABASE ADVISORY command
 - The display is enhanced to display the ICOPY state for table spaces.

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Further COPY Considerations

- Best way to ensure recoverability is by running the COPY utility.
- Recommendation:
 - Copy the base table space, COPY YES indexes, LOB table spaces, and XML table spaces in the same COPY invocation to ensure that they all share the same recoverable point.
- COPY will not allow an image copy to be made of a COPY YES index in ICOPY status unless its table space is copied in the same COPY invocation
- SCOPE PENDING is added to the COPY syntax.
 - Image copy made of all COPY or ICOPY status table spaces in the list.
 - No messages issued for un-copied objects, but if no objects in the list are in COPY or ICOPY status, new message DSNU448I message is issued and COPY terminates.
 - SCOPE ALL can be specified and is the default.

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Recover considerations

- **Recover to any recoverable point**
 - When an image copy is taken against a not logged table space or a not logged index space
 - When a table space is altered from LOGGED to NOT LOGGED
- **Recover to current is to the most recent recoverable point**
 - If the table space was changed since the most recent recoverable point, then the recovery is treated like a point in time recovery for recovery set purposes
- **Recover to point in time**
 - TOCOPY, TOLASTFULLCOPY, TOLASTCOPY
 - TORBA or TOLOGPOINT keywords can also be used for a point in time recovery on a NOT LOGGED object, but the RBA or LRSN must correspond to a recoverable point
- **Recover with the LOGONLY option is not supported**
- **Recommendation:**
 - Recover the base table space, COPY YES indexes, LOB table spaces, and XML table spaces in the same RECOVER invocation to avoid various Check Pending states.

Utilities & NOT LOGGED Table Spaces

- **Load Utility**
 - If inline copy is not requested, then the object is placed in ICOPY
 - Even with inline copy, if there was discard processing, the object is placed in ICOPY
 - To use ONLINE LOAD Resume without logging (Cannot specify LOG NO)
 - Alter object to not logged
 - Run online load resume
 - Alter object back to logged
 - Take an image copy
 - Online Load Resume against a NOT LOGGED table space is not restartable if load fails (table space goes LPL/RÉCP; must recover from image copy)

Utility & NOT LOGGED Table Spaces (cont'd)

- Reorg Utility

- If inline copy is not requested, then the object is placed in ICOPY
- Reorg SHRLEVEL(CHANGE) is not supported
- Reorg TABLESPACE PART SHRLEVEL(REFERENCE) with NPIs defined, is not supported (due to log phase that occurs)
- For Reorg SHRLEVEL(REFERENCE) the LOG parameter is not supported and an inline copy is always produced
- For Reorg SHRLEVEL(NONE) if LOG YES specified, it is changed to LOG NO

Utility & NOT LOGGED Table Spaces (cont'd)

- Rebuild Index

- Rebuild Index SHRLEVEL(CHANGE), which requires log records be applied, is not supported

- Check Data

- Check Data LOG YES ignores the LOG YES option. If rows are deleted in a NOT LOGGED table space, ICOPY is set for the table space regardless of the LOG option requested

- Quiesce

- Quiesce on NOT LOGGED table space does not create a recoverable point because there are no log records that can be applied to recover to the quiesce point

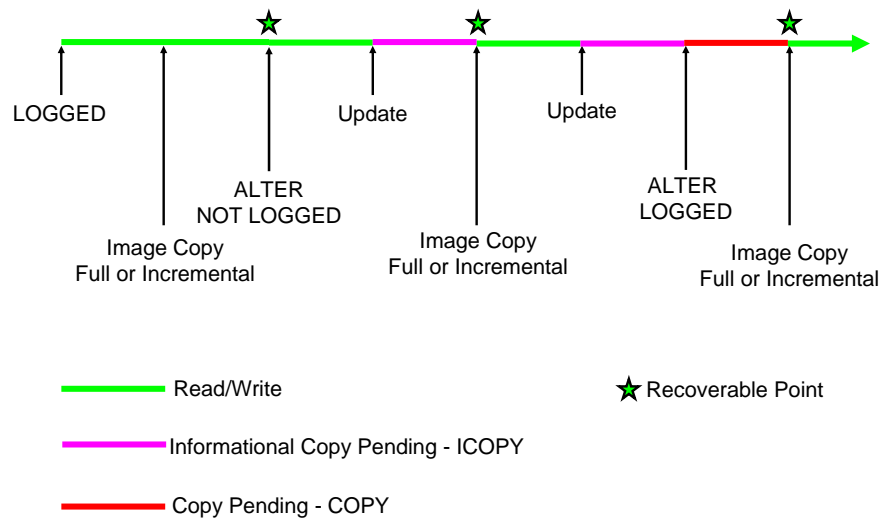
- Restore System

- Doing a system level copy, followed by updates, followed by Restore System, leaves NOT LOGGED table spaces in Recover Pending.
- This is determined by examining table space control records. If "open" is encountered, then the not logged table space or partition may have updates that will not be recovered, so it is marked Recover Pending.

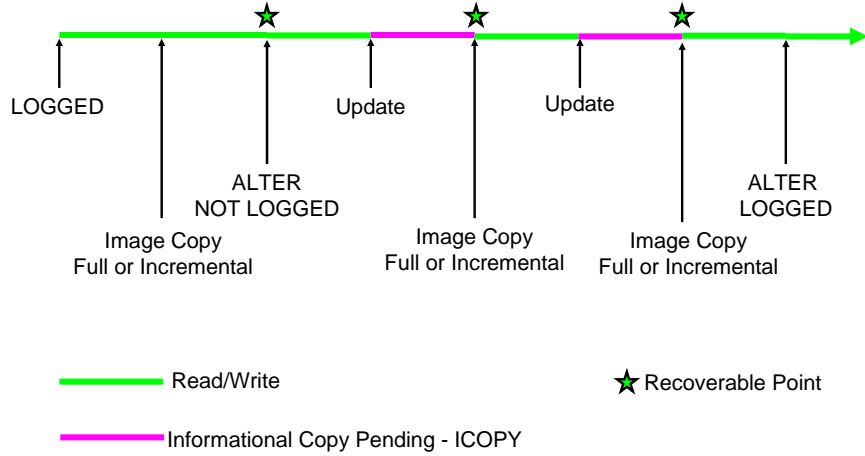
NOT LOGGED Operational Considerations

- It is desirable to externalize NOT LOGGED table space data modifications quickly, because the data is not protected by the DB2 log.
- To accomplish this
 - RO SWITCH CHKPTS (PCLOSEN) is set to 1 for NOT LOGGED table spaces.
 - RO SWITCH TIME (PCLOSET) is set to 1 for NOT LOGGED table spaces.
 - DB2 converts the table space from read-write to read-only (buffers forced out)
 - In data sharing environment, due to PCLOSEN and PCLOSET considered to be 1, NOT LOGGED table spaces may tend to change GBP-dependency more often than LOGGED table spaces.
- DSN1LOGP SUMMARY(YES) is enhanced to show object log attribute, when possible.
 - That accuracy depends on whether or not range of log records specified contains the Begin UR log record.
- DSN1LOGP formatting of control records is enhanced to indicate whether the object is logged or not logged.

Example Timeline



Example Timeline



Example Timeline

