SOS IN COMPUTER SCIENCE & APPLICATION
JIWAJI UNIVERSITY

Class : MBA (E-Commerce) II Semester

Subject : DBMS

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Topic: Strategies For Database Recovery

Strategies for database recovery are −

- In order to recover from database failure, database management systems resort to a number of recovery management techniques. In this slide, we will study the different approaches for database recovery.
- **The typical strategies for database recovery are −**
- In case of soft failures that result in inconsistency of database, recovery strategy includes transaction undo or rollback. However, sometimes, transaction redo may also be adopted to recover to a consistent state of the transaction.
- In case of hard failures resulting in extensive damage to database, recovery strategies encompass restoring a past copy of the database from archival backup. A more current state of the database is obtained through redoing operations of committed transactions from transaction log.

Recovery from Power Failure

- Power failure causes loss of information in the non-persistent memory. When power is restored, the operating system and the database management system restart. Recovery manager initiates recovery from the transaction logs.
- In case of immediate update mode, the recovery manager takes the following actions −
- Transactions which are in active list and failed list are undone and written on the abort list.
- Transactions which are in before-commit list are redone.
- No action is taken for transactions in commit or abort lists.

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- In case of deferred update mode, the recovery manager takes the following actions –
- Transactions which are in the active list and failed list are written onto the abort list. No undo operations are required since the changes have not been written to the disk yet.
- Transactions which are in before-commit list are redone.
- No action is taken for transactions in commit or abort lists.

Recovery from Disk Failure

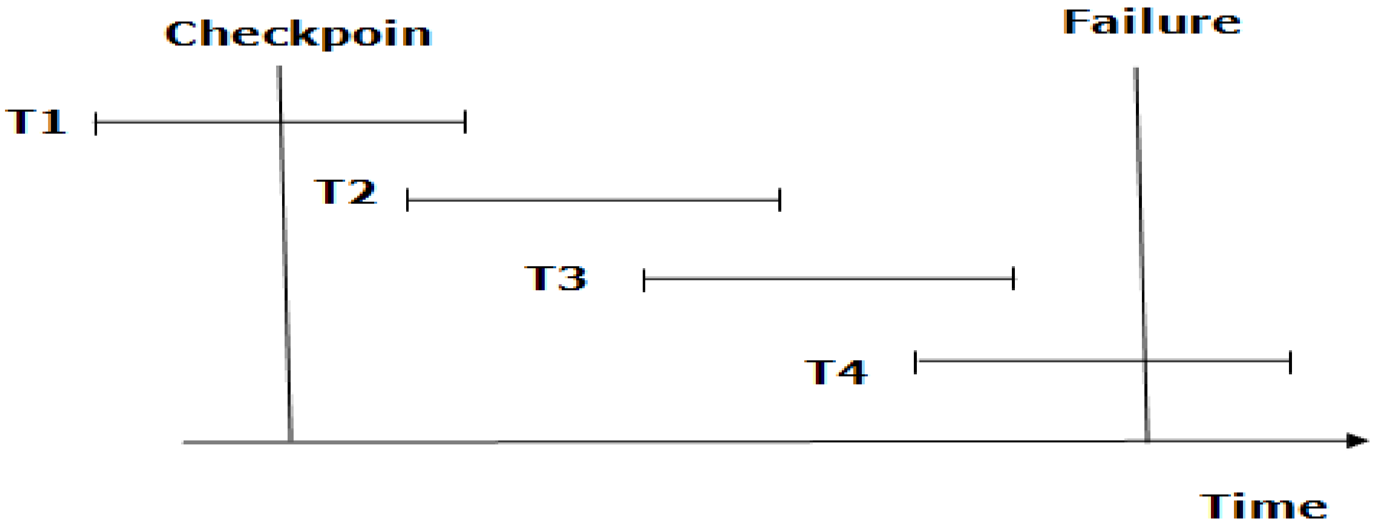
- A disk failure or hard crash causes a total database loss. To recover from this hard crash, a new disk is prepared, then the operating system is restored, and finally the database is recovered using the database backup and transaction log. The recovery method is same for both immediate and deferred update modes.
- The recovery manager takes the following actions −
- The transactions in the commit list and before-commit list are redone and written onto the commit list in the transaction log.
- The transactions in the active list and failed list are undone and written onto the abort list in the transaction log.

Checkpointing

- The checkpoint is a type of mechanism where all the previous logs are removed from the system and permanently stored in the storage disk.
- The checkpoint is like a bookmark. While the execution of the transaction, such checkpoints are marked, and the transaction is executed then using the steps of the transaction, the log files will be created.
- When it reaches to the checkpoint, then the transaction will be updated into the database, and till that point, the entire log file will be removed from the file. Then the log file is updated with the new step of transaction till next checkpoint and so on.
- The checkpoint is used to declare a point before which the DBMS was in the consistent state, and all transactions were committed.

Recovery using Checkpoint

- In the following manner, a recovery system recovers the database from this failure:



Recovery using Checkpoint

- The recovery system reads log files from the end to start. It reads log files from T4 to T1.
- Recovery system maintains two lists, a redo-list, and an undo-list.
- The transaction is put into redo state if the recovery system sees a log with <Tn, Start> and <Tn, Commit> or just <Tn, Commit>. In the redo-list and their previous list, all the transactions are removed and then redone before saving their logs.

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- **For example**: In the log file, transaction T2 and T3 will have <Tn, Start> and <Tn, Commit>. The T1 transaction will have only <Tn, commit> in the log file. That's why the transaction is committed after the checkpoint is crossed. Hence it puts T1, T2 and T3 transaction into redo list.
- The transaction is put into undo state if the recovery system sees a log with <Tn, Start> but no commit or abort log found. In the undo-list, all the transactions are undone, and their logs are removed.
- **For example**: Transaction T4 will have <Tn, Start>. So T4 will be put into undo list since this transaction is not yet complete and failed

Log-Based Recovery

- The log is a sequence of records. Log of each transaction is maintained in some stable storage so that if any failure occurs, then it can be recovered from there.
- If any operation is performed on the database, then it will be recorded in the log.
- But the process of storing the logs should be done before the actual transaction is applied in the database.