MIS 301 RELATIONAL DATABASE MANAGEMENT SYSTEM

DATABASE MANAGEMENT SYSTEM

System Implementation Techniques: Concurrency Control and Recovery Techniques

Lecture 26&27

CORE RESPONSIBILITY OF A DATABASE

❖Protect the data stored in the database

❖Provide correct access to the data where concurrent access by a large and diverse population is required even in presence of hardware and software failures

  ➢*The concurrency control and recovery modules of the DBMS perform these actions*

CONCURRENCY CONTROL AND RECOVERY IN DBMS

❖Concurrency control ensures database users see consistent states of the database even if operations of different users are interleaved by the database system

❖Recovery ensures that the database is not corrupted as a result of software or hardware failure

CONCURRENCY CONTROL

❖Isolation property of a transaction is taken care of by the concurrency control module of the database.

❖Serializability Property - The execution of a group of interleaved transactions has the same effect on the database and produce the same output as the serial execution of those transactions. Serializability ensures flexibility leading to increased responsiveness for the end user.

INTERLEAVED VS SIMULTANEOUS CONCURRENCY

- If the computer system has a single processor(CPU), concurrent programs(interleaved) are executed through CPU time sharing.

- If the computer system has multiple hardware processors (CPUs), simultaneous processing of multiple programs is possible, leading to simultaneous rather than interleaved concurrency.

CONCURRENCY CONTROL PROTOCOLS

❖ Two types of concurrency control protocols are :

- Lock based protocols
- Time stamp based protocols

❖**Lock based protocols-**Transaction cannot read or write data until it acquires an appropriate lock on it.

❖Locks are of two kinds –

- **Binary Locks**   –   A lock on a data item can be in two states; it is either locked or unlocked.
- **Shared/exclusive** – This type of locking mechanism differentiates the locks based on their uses.

❖**Timestamp-based Protocols-**This protocol uses either system time or logical counter as a timestamp.

- Every transaction has a timestamp associated with it to determine its age.
- Every data item is given the latest read and write-timestamp.

LOCKS

❖A lock is a kind of mechanism that ensures that the integrity of data is maintained.

❖There are two types of locks that can be placed while accessing the data so that the concurrent transaction can not alter the data while one is processing it.

❖The two types of locks are *Shared Lock*(S) and *Exclusive Lock*(X).

❖Shared lock: This lock can be applied by multiple users for reading the data but no one can apply an exclusive lock during this period for updating.

❖Exclusive lock: Exclusive lock is placed when we want to read and write the data. This lock allows both the read and write operation, Once this lock is placed on the data no other lock (shared or exclusive) can be placed on the data until the exclusive lock is released.

DATABASE RECOVERY TECHNIQUES IN DBMS

❖When a database fails it must possess the facilities for fast recovery.

❖Either transactions are completed successfully and committed or the transaction has no effect on the database.

❖The techniques used to recover the lost data due to system crash, transaction errors, viruses, catastrophic failure, incorrect commands execution etc. are database recovery techniques.

❖Recovery techniques are heavily dependent upon the existence of a special file known as a **system log** which contains information about the start and end of each transaction and any updates which occur in the **transaction**.

❖Commitment involves writing a commit entry to the log and writing the log to disk.

❖**Checkpoint** is a mechanism(point) from where all the previous logs are removed from the system and stored permanently in a storage system.

❖It declares a point before which the database management system was in consistent state and all the transactions were committed.

RECOVERY CONTINUED

- When concurrent transactions crash and recover, the checkpoint is added to the transaction.

- Recovery manager allows the database system to restore the database to a reliable and steady-state after any failure occurs.

- The recovery manager maintains both undo log and redo log.

- All the transactions in the undo log are undone and their logs are removed.

- All the transactions in the redo log and their previous logs are removed and then redone before saving their logs.

- TILL WE MEET AGAIN IN THE NEXT CLASS.........