Database Management System – cs422 DE

Assignment 8 – Week 12

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(1) What is meant by granularity? Give examples.

ANS:

Granularity means the size of data items chosen as the units of protection by a concurrency protocol. It can range from small to large data items.
e.g., the entire database, a file, a page, a record, a field value of a record

(2) Discuss the types of failure that may occur in a database environment. Explain why it is important for a multi-user DBMS to provide a recovery mechanism.

ANS:

- system crashes: loss of main memory because of hardware or software errors
- media failures: loss of parts of secondary storage because of head crashes or unreadable media
- system software errors: failing one or more transactions because of logical errors
- natural physical disasters: floods, fires, earthquakes, or power failures
- carelessness: unintentional destruction of data or facilities
- sabotage: intentional destruction of data or facilities

A recovery mechanism is important for a multi-user DBMS to ensure that data is protected from various types of failures and that the system can quickly recover from any disruptions.

(3) Discuss how the log file (or journal) is a fundamental feature in any recovery mechanism. Explain what is meant by forward and backward recovery and describe how the log file is used in forward and backward recovery.

ANS:

The log file (or journal) is a fundamental feature in any recovery mechanism and is used to keep the record of all changes and ensures the integrity and consistency of the database at failure by forward and backward recovery.
Forward recovery is the process of redoing updates of the committed transactions after the last checkpoint to make the database up to date. In forward recovery, the log file is used to redo the changes made after the last checkpoint.
Backward recovery is the process of undoing updates of the transactions, which are not committed yet at failure, after the last checkpoint to restore the database to a previous state. In backward recovery, the log file is used to undo the changes made after the last checkpoint.

(4) What is the significance of the write-ahead log protocol? How do checkpoints affect the recovery protocol?

ANS:

The write-ahead log protocol is significant because it provides a reliable and efficient way to recover from failures in the DBMS. Checkpoints affect the recovery protocol with reduction of the amount of time needed for recovery and making the system to be restored to a consistent state more quickly.

(5) Compare and contrast the deferred update and immediate update recovery protocols.

ANS:

Both differed update and immediate update use the transaction logs in the event of failure.

The deferred update does not write any changes to disk until the transaction is committed but the immediate update does immediately.

Both need redoing updates of committed transactions at failure.

No undoing of changes is required at deferred update but immediate update needs undoing for transactions which are not committed yet.