Database Management System – cs422 DE

Assignment 8 – Week 12

This assignment is based on lecture 10 (chapter 22 – Database Recovery).

- Submit your *own work* on time. No credit will be given if the assignment is submitted after the due date.
- Note that the completed assignment should be submitted in .doc, .docx, .rtf or .pdf format only.
- In MCQs, if you think that your answer needs more explanation to get credit then please write it down.
- You are encouraged to discuss these questions in the Sakai forum.

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

ANS: The size of data items chosen as the unit of protection by a concurrency control protocol. Typically, a data item is chosen to be one of the following, ranging from coarse to fine.

- 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: Failure may be the result of a system crash due to hardware or software errors. There are many different types of failure that can after database processing, each of which has to be deal with in a different manner.

- System Crashes: This is due to hardware or software errors.
- Media Failures: Such as head crashes or unreadable media
- Application Software Errors: Such as logical errors in the programs that is accessing the database.
- Nature Physical Disasters: Such as fires, floods, earthquakes, power failures
- Sabotage: intentional corruption or destruction of data, hardware or software facilities.

(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: To keep all records of database transaction, the DBMS maintain a special file called a log (journal) that contain information about all updates to the database. Log contains transaction records, before-records and after image.

The process of a redo of the previous transaction is known as forward recovery. Some of the transaction which didn't complete successfully needs to roll back which is known as backward recovery.

As log Niles contain before images and after images where before images can be used to undo changes to the database known as backward recovery and after-images can be used to redo changes to the database known as forward recovery.

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

ANS: It is essential that log records are written before the corresponding write to the database. This is known as the write-ahead log protocol. If update were made to the database first and failure occurred before the log record was written. Under the write-ahead og protocol, the recovery manager can safely assume that if there is no transaction commit record in the log file for a particular transaction, then that transaction was active at the time of failure and must therefore be undone.

Checkpoints are used to improve database recovery. At a checkpoint, all modified buffer blocks, all log records, and a checkpoints record identifying all active transaction are written to disk. If a failure occurs, the checkpoint record identifies which transaction need to be redone.

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

ANS:

Immediate Update:

- Updates are as they occur without waiting to reach to commit phase.
- Write-ahead logs should be written.
- As compared to written in logs Undo operations are performed in reverse order.

Deferred Update:

- Database Updates are not written after the transaction reached its commit.
- If the transaction fails before the commit, then no undo is required means no modification on the database.
- Need to redo updates of committed transactions as their effect may not be reached to the database.