Data Systems Project - Phase 3

Ahana Datta 2019111007
Tanvi Narsapur 2019111005

Video link:
https://drive.google.com/file/d/1l_QQ-6eS7NpDRCqzjLOHReVnZWwVuz_u/view

Analysis and Learnings

While performing simultaneous read and write operations on the same table in a database system, we need to follow specific protocols to keep the database consistent and in sync with the transactions being performed. These protocols are as follows -

- Transaction 1 - Update and Transaction 2 - Read
  - When we are updating entries of a table, it would be inappropriate to read the table simultaneously for some other transaction since the table entries are being updated with new values and the process of updating has yet to finish.
  - Thus we have to halt the read operation till the update operation ends.
  - Once the table is updated with new values, we can perform the read operation.
- Transaction 1 - Read and Transaction 2 - Update
  - When we are reading a table, it would be inappropriate to update the table entries simultaneously for some other transaction as this would lead to reading some old values and some updated values.
  - Thus we halt the update operation till the read operation is finished.
  - Once the table entries are read, the table is available for updating.
- Transaction 1 - Update and Transaction 2 - Update
  - It would be inappropriate to perform two update operations simultaneously on a table since it would lead to inconsistent data.
  - Thus we halt the update operation till the write operation is completed
  - Once one transaction completes the write operation, the write lock is released and the other transaction can access the table for writing.
- Transaction 1 - Read and Transaction 2 - Read
  - When we are reading a table in one transaction, there is no problem if we try to read it in another operation.
  - Thus there is no need to halt either transaction and multiple transactions can read a table simultaneously.

Thus we can perform two read operations simultaneously but performing two update operations or a read and an update operation simultaneously is conflicting.

Approach

Locking mechanism

We are using a locking mechanism for updating and reading the table concurrently taking into account the ananlysis in the previous section. An integer variable is being maintained for each of the tables in the database that denotes the lock status of the table the variable can have values 0, 1 and 2 where 0 means the table is accessible for both read and write operation one implies that the table is being involved in a read operation currently and to implies that the table is being updated currently.

Lock status value:

0 = No lock applied

1 = Read lock

2 = Write lock

So if the lock status of a table is 0, we can access it for both reads and write operations. If it is 1, we need to wait to perform an update but we can access the table for read operation and if the status of the lock is 2, then both the read and write operations have to halt until the update is completed. The value of the lock status is updated to 1 or 2 before performing a read or write operation respectively.

Once any operation has been completed the status of the lock is set back to 0 so that the table again becomes available for further transactions.