18 – Timestamp Ordering Concurrency Control

1. Basic Timestamp Ordering Protocol

    A. Read situation
    If record's write-timestamp is bigger than txn's timestamp, txn should be abort, because of reading future value.

    B. Write situation
    if record's read-timestamp is bigger than txn's time stamp, txn should be abort, because of modifying future value

    C. Pros and cons

        i. Pros : no wait, so no deadlock

        ii. Cons : cause starvation for long txn, if short txn make conflict a lot.
        recoverable schedule issue : after commit T2, if T1 aborts?

2. Optimistic Concurrency Control

    A. Txn's timestamp is assigned at its validation phase, not beginning of txn.

    B. Process

        i. Each txn has private workspace,
        all operation of txn is executed at this workspace

        ii. if txn commits, check if workspace and DB has some conflicts.

        iii. If there are no conflicts, txn's workspace commited into DB

    C. Validation

        i. Backwards : check txn's read-write sets intersects any txn that already committed

        ii. Forwards : check txn's read-write sets intersects any txn that have not committed

        iii. Ti's write set should not intersect with Tj's read set
        (if Ti's timestamp is older than Tj)

        iv. Ti's read section should be completes before Tj's read section's end
        and Ti's write section should not intersect with Tj's read-write set

3. Partition-based Timestamp Ordering

   A. Process

      i. Partition DB into disjoint subset

      ii. If Txn tries to access and read a partition that it have a lock, allow it
      if not having lock, abort and restart txn.

      iii. If Txn tries to access and write a partition that it have a lock, allow it
      and maintain buffer to rollback if txn abort
      if not having lock, abort and restart txn

   B. Issue

      i. Multi-partition txn can cause idle partition when execute

4. What is it?

   A. Thomas Write Rule

   B. Multi-partition Timestamp Ordering (interesting)

5. Introduced Papers

   A. On Optimistic Methods for Concurrency Control