03 – Multi-Version Concurrency Control

1. The DBMS maintains multiple physical versions of a single logical object
    A. Write operation doesn't overwrite object, but create new version
    B. Read operation searches newest version that is visible to txn
    C. No conflicts between write operations and read operations
    D. When write-write conflict, first writer wins
    E. Write Skew Issue
2. Concurrency Control Protocol
    A. approach
        i. Timestamp Ordering
        ii. Optimistic Concurrency Control
        iii. Two-Phase Locking
    B. Timestamp problem
        i. If timestamp hits its maximum value, then next timestamp will wraparound (overflow)
        Logically, it means, future txn can be seen as past txn.
        ii. In postgres, set "frozen" bits to say that tuple is frozen in the past (What it actually means? I should find some paper of it)
3. Version Storage
4. Garbage Collection
5. Index Management