Transactional Memory Simulator

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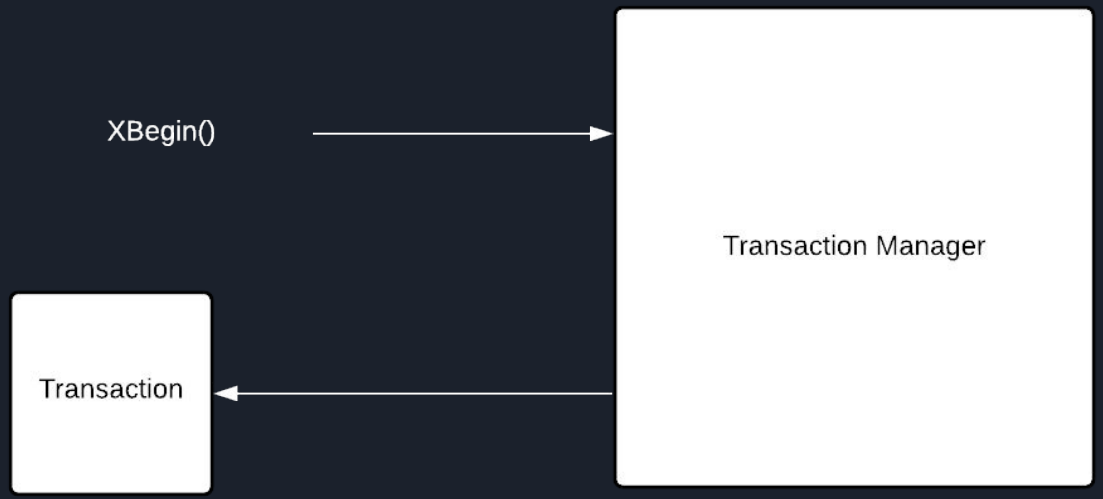
Transaction Manager API

```
/**
 * Begin memory transaction
 * @return transaction
 */
Transaction XBegin();
```



Transaction API

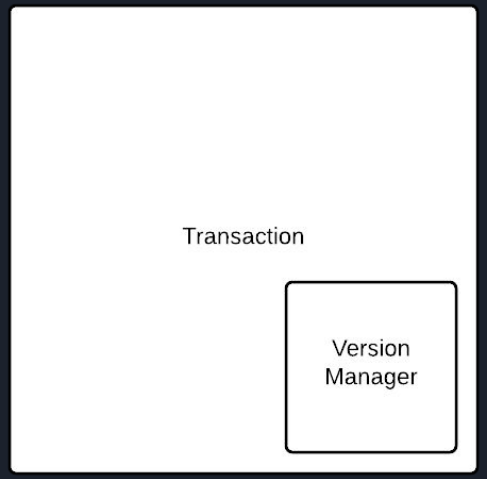
```
/**
 * Store value at address for transaction
 *
 * @tparam T type of value
 * @param address location to Store value
 * @param value value to Store
 *
 * @throws TransactionAbortException
 */
template<typename T>
void Store(T *address, T value);

/**
 * Loads value from address for transaction
 *
 * @tparam T type of value
 * @param address location that value is stored
 *
 * @return value stored at address
 *
 * @throws TransactionAbortException
 */
template<typename T>
T Load(T *address);

/**
* Commit memory transaction
*
* @param transaction_id id of transaction to commit
*
* @throws TransactionAbortException
*/
void XEnd();
```

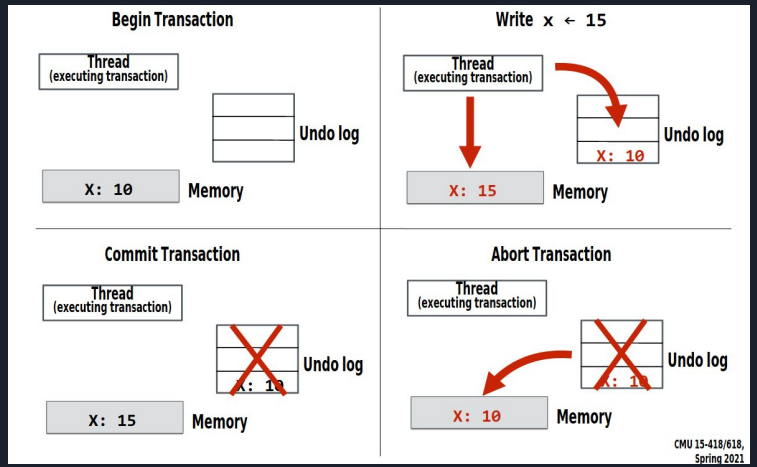
Version Manager

- Maintains versions of the values at each address for each transaction
- Each transaction maintains its own version manager

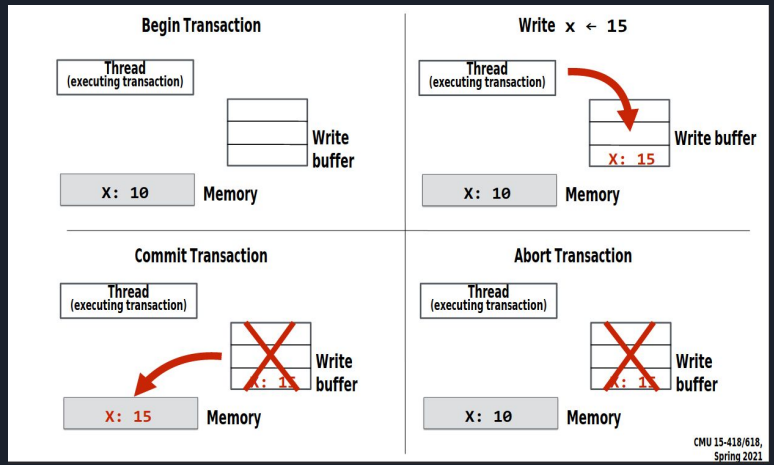


Eager vs Lazy Version Manager

Eager

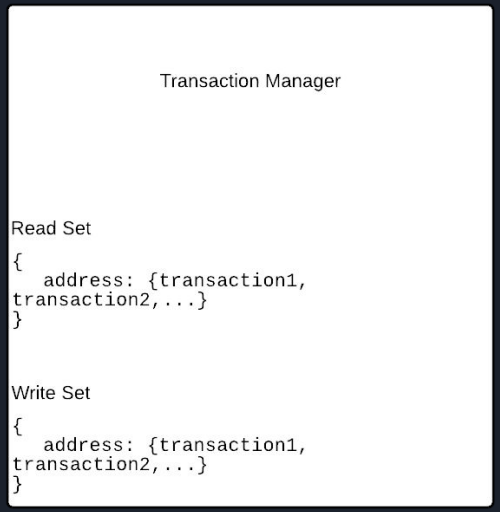


Lazy

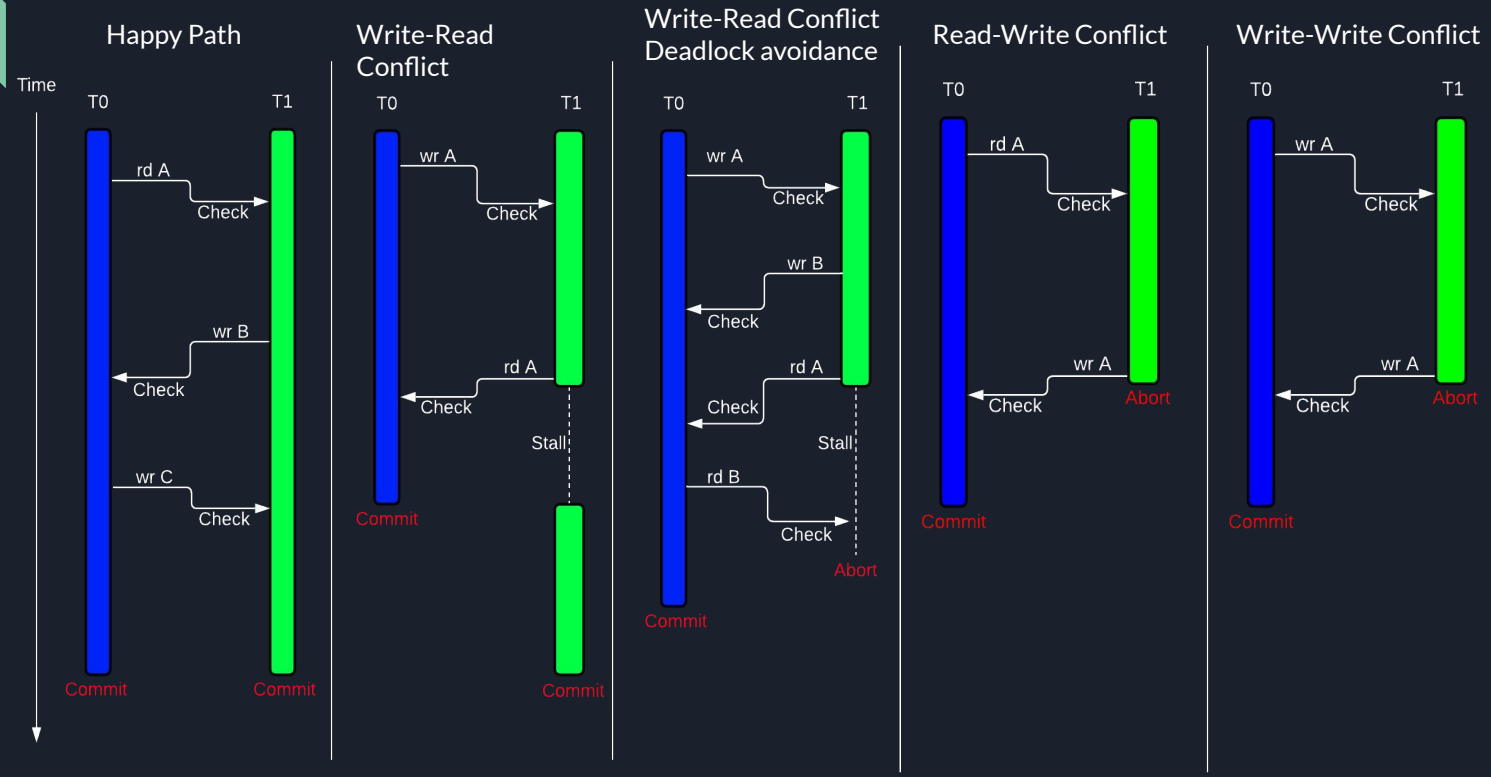


Transaction Manager

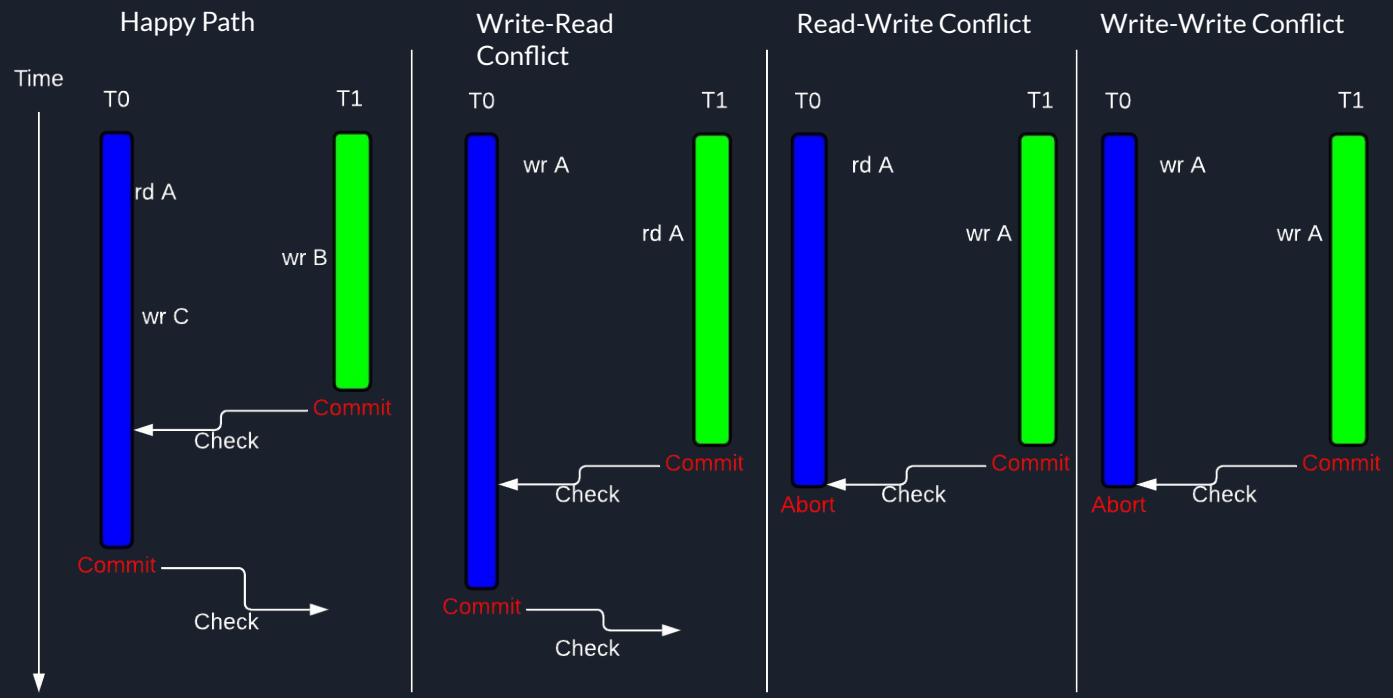
- Acts as conflict detection manager
- Handles conflicts as they’re detected



Pessimistic Conflict Detection



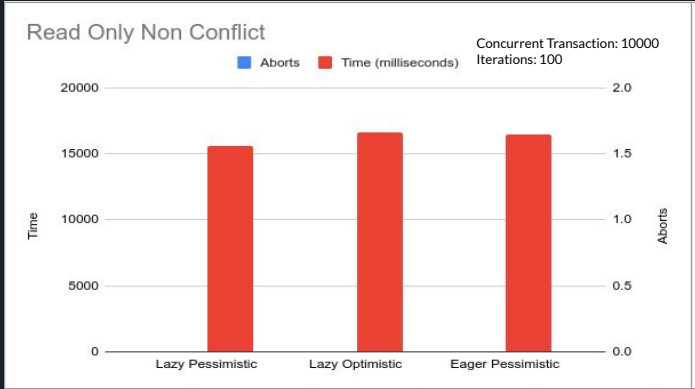
Optimistic Conflict detection

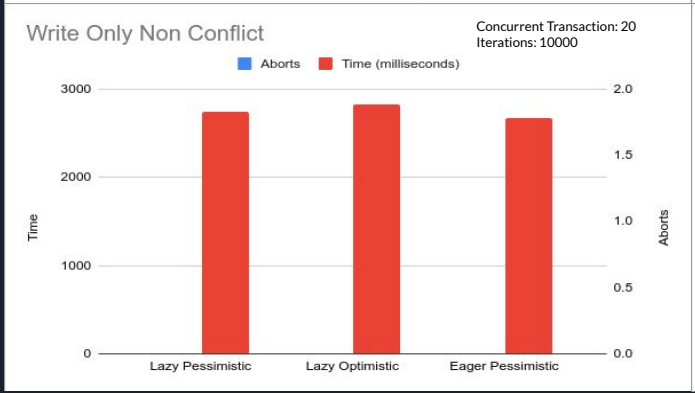


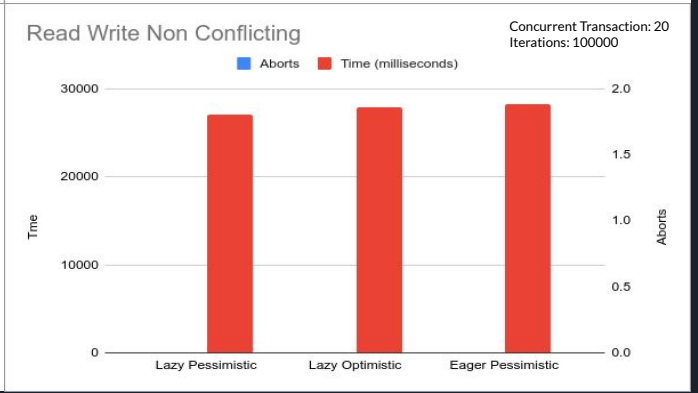
Benchmark

- Simulate bank transactions by using a map of account name to account value
- Two categories of workloads:
  - Conflict: Every transaction performs an action on every account in map
  - Non-Conflict: Every transaction performs an action on a unique subset of the accounts in map
- Three types of workloads:
  - Read only: transactions read values of accounts
  - Write only: transactions blindly write values to accounts
  - Read-Write: transactions read values of accounts and then adds/subtracts some value to that account.
- Tunable parameters for benchmark:
  - Concurrent transactions: number of transactions executing at once
  - Iterations: number of times to repeat the benchmark

Results Non-Conflict







Results Conflict