

Student1: Jingshuai jiang (jj2903)

Student2: Jiaming liu (jl10986)

Professor: Dennis shasha

Advanced Database Systems

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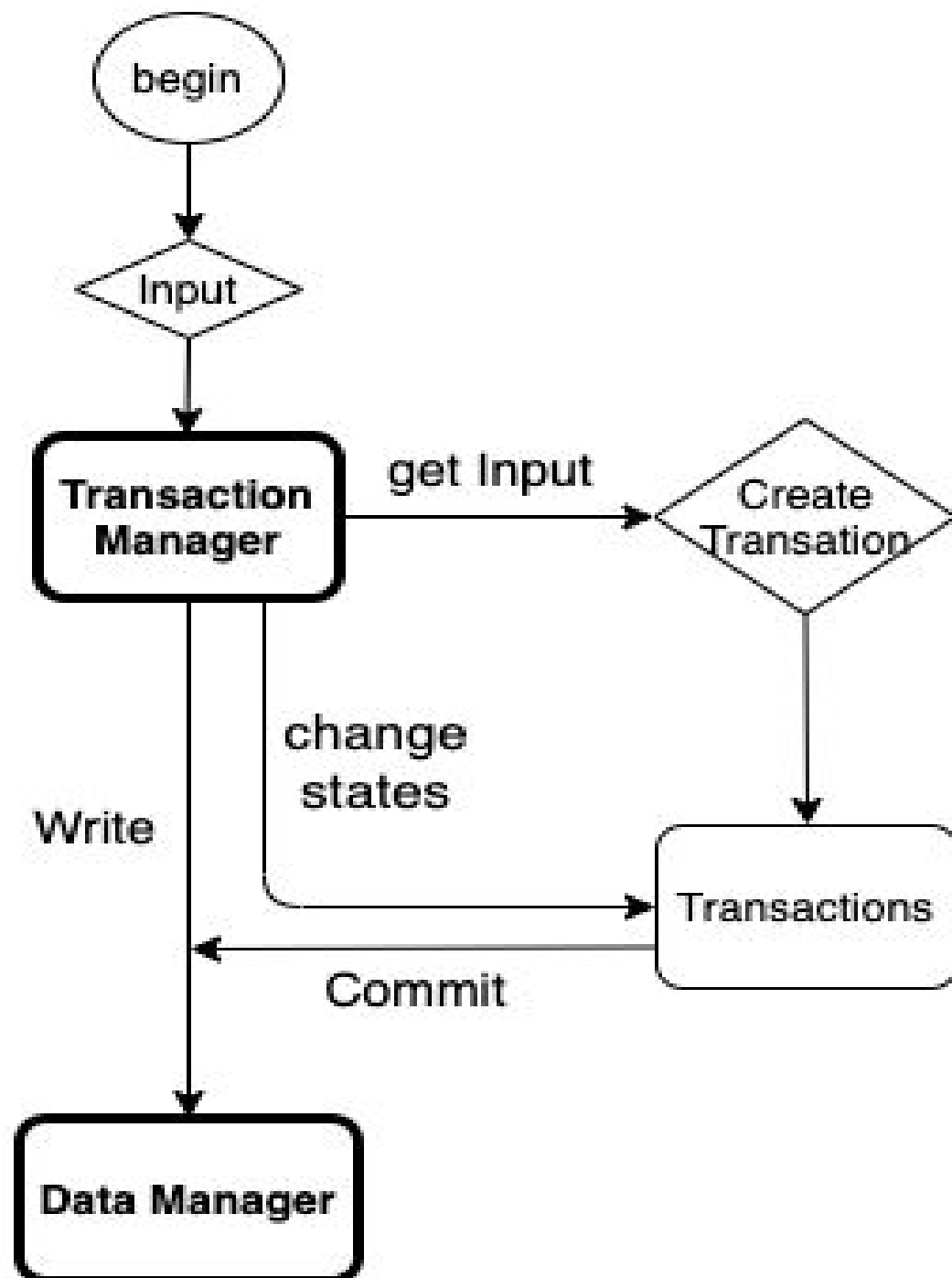
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Project Language: Java

Project :Distributed replicated concurrency control and recovery

# **Project Design document**

## System Architecture



# Classes Details

## Transaction

### Attributes:

- Blocked: boolean; use to check if this transaction is blocked
- Start\_time: int; use to record the transaction begin time, useful in deadlock abortion
- Aborted: boolean; use to record if abort transaction
- Readonly: boolean; use to record if readonly
- Readonlysnapshot: list; shadow copy of committed value array of 10 sites at the beginning of the read only transaction.

### Functions:

- Public Transaction(int begintime,int readonly)
  - Effect: Construction function; initialize a transaction object.
  - Author: Jingshuai jiang

## Site

### Attributes:

- SiteId: int, use to record the site id.
- ValueArray: int [20] , use as memory to record the values of all variables.
- CommittedValueArray: int[20], use as the committed value of all variables.
- LockTable:List<Pair<transaction, read/write lock>[20], use to record the lock acquired by transaction on some variable.
- justRecovery: boolean, use to record if a commit write has been issued.

### Functions:

- Void site(int siteID)
  - Effect: construction function, which initialize the siteid and valuearray, committedvalue array.
  - Author: Jingshuai Jiang
- Boolean HasVariable(int VariableID)
  - Effect: return whether this site kept this variable.
  - Author: Jingshuai Jiang
- Void EraseSite()

- when failure, erase the lock table.
- Author: Jingshuai Jiang

## Lock

### Attributes:

- Locktype: char, use to record whether w or r lock.
- ?Transaction: int, which transaction this lock belongs to
- AcquireTime: int, use to record the time we get this lock.

## DataManager

### Attributes:

- Site[10] sites: SiteArray, use to store the site object.

### Functions:

- Public void fail(int siteid)
  - Effects: Fail the site
  - Author: Jingshuai jiang
- Public void recover(int siteid)
  - Effects: recover this site, and make this site unwritten.
  - Author: Jingshuai jiang

## TransactionManager

### Attributes:

- List<Transactions> livetranslist: list; use to record the live transactions

### Functions:

- Public Transaction get(int TransactionID)
  - Effect: return the transaction with the ID given.
  - Author: Jiaming Liu
- Public Boolean AcquireReadLock(int TransactionID,int SiteID)
  - Effect: acquire read lock for transaction i on site j
  - Author: Jiaming Liu
- Public Boolean AcquireWriteLock(int TransactionID, String Var)

- Effect: acquire write lock for transaction i on all site that kept this variable
  - Author: Jiaming Liu
- Public void DetectDeadLock()
  - Effect: detect whether there exist a deadlock in the live transaction and abort the youngest transaction.
  - Author: Jingshuai Jiang
- Public void AbortTransaction(int TransactionID)
  - Effect: abort this transaction
  - Author: Jiaming Liu
- Public void begin(int TransactionID)
  - Effect: create and initialize a new Transaction
  - Author: Jingshuai Jiang
- Public void beginRO(int TransactionID)
  - Effects: create and initialize a new Transaction with read\_only = True and call take
  - Author: Jingshuai Jiang
- Public void Read(int TransactionID, String Var)
  - Effects: call AcquireReadLock(int TransactionID,int SiteID); read x on returned site; if False, call blockTransaction(int Transaction) to block the transaction.
  - Author: Jiaming Liu
- Public void Write(int TransactionID, String Var, int Value)
  - Effects: call AcquireWriteLock(int TransactionID, String Var); write x = v on returned site; if False, call block\_trans()
  - Author: Jiaming Liu
- Public void blockTransaction(int TransactionID)
  - Effects: set transaction state to blocked.
  - Author: Jingshuai Jiang
- Public void end(int TransactionID)
  - Effects: end this transaction. Print commit or abort
  - Author: Jingshuai Jiang
- Public void dump()
  - Effects: print the values of the variables on each site.
  - Author: Jiaming Liu
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- TakeSnapshot()
  - output: copy of committed value array of available site
  - Effects: take snapshot of the available site and store it in the read only transaction.
  - Author: Jingshuai jiang
- AddWaitlist()
  - Effects: add operation to waitlist
  - Author: Jiaming Liu

## InputManager

### Functions:

- ReadCommandFromFile(String filepath)
  - Effects: add operation to waitlist
  - Author: Jiaming Liu
- ReadCommandFromTyping()
  - Effects: add operation to waitlist
  - Author: Jiaming Liu