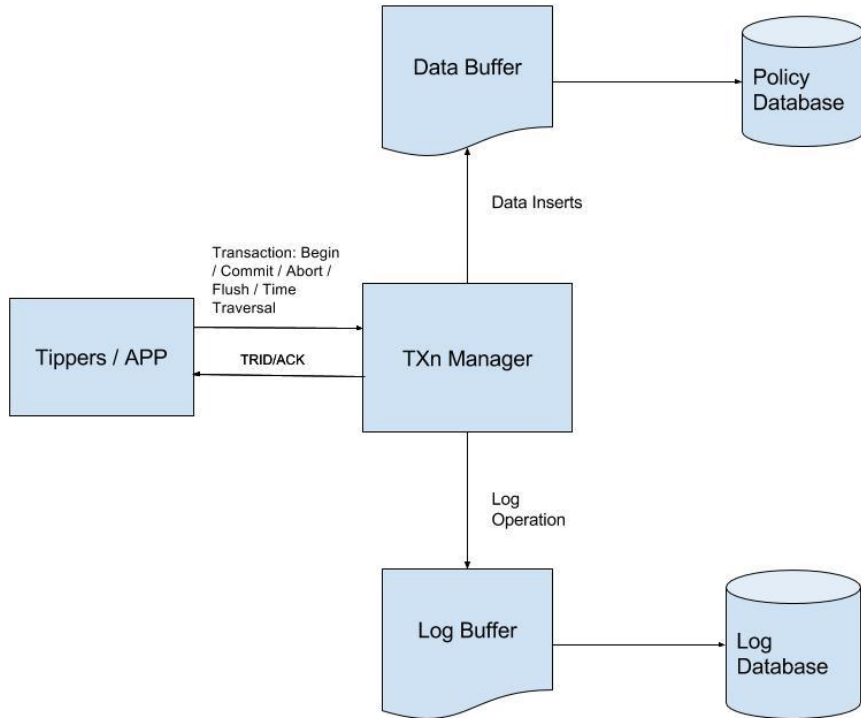# Transaction Manager for Policies

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Design

Features

1) Transaction - Begin, Write, Commit/Abort, Flush
2) Recovery - UNDO/REDO
3) View state of DB at given timestamp
4) Multiple Backward Time traversal*
5) Multiple Forward Time Traversal*

* - Assumption: We don't allow new transactions after time traversal has occurred.

Data Structures

- Log Buffer - Maintains buffer of logs which is flushed to the database on commit/abort.
- Data Buffer - Maintains buffer of data which is flushed to the database on any of the following:
  - Commit
  - Time based
  - On demand (API provided)
- PolicyID -> List of LSN

Transaction Manager Interface

```java
public interface ITxnManager {
   // @return unique transaction id
   public String begin();

   /*write the data and log in the buffer*/
   public void writePolicy(String transID, JSONObject payload);

   /* Completion of commit */
   public void commit(String txnID);

   /* Completion of abort */
   public void abort(String txnID);

   /*Flushes the contents of data buffer into the DataBase */
   public void flush();

   /*Traverse to timestamp T */
   public void timeTraversal(Timestamp timestamp);

/*Traverse to timestamp T */
public void viewHistory(String timestamp) throws ParseException;
}
```

Example Policy Input

attributes	policyID	author	querier	from	to	entered	invalidated*
types	int	string	string	timeStamp	timeStamp	timeStamp	timeStamp
Example 1	1	Alice	John	2017-05-15 13:00:00	2017-05-15 15:00:00	2017-05-15 10:00:00	2017-05-15 11:00:00
Example 2	2	John	Alice	2017-05-16 13:00:00	2017-05-16 14:00:00	2017-05-16 10:15:00	infinity
Example 3	1	Alice	John	2017-05-15 13:00:00	2017-05-15 14:00:00	2017-05-15 11:00:00	infinity

PolicyDB after Write Policy

policyID	author	querier	from	to	entered
2	John	Alice	2017-05-16 13:00:00	2017-05-16 14:00:00	2017-05-16 10:15:00
1	Alice	John	2017-05-15 13:00:00	2017-05-15 14:00:00	2017-05-15 11:00:00

Tables

- Log DB

LSN	Prev LSN	Next LSN	TRID	Prev Payload	Next Payload

1. Pending TID - Keeps track of ongoing transactions.
2. <TID, FirstLSN> - Keeps track of first LSN of every Txn.

- Policy DB
  1. CurrentPolicyDB
  2. OldPolicyDB - is a queryable interface for view history.