Lazy recovery

• Single record transactions.
• No multi-item ACID transactions.

Heterogeneous APIs and query languages.

Transactions across Heterogeneous Stores

Example Application

```java
public record UserTransaction()

record checking = tx.read(wds, "checking");
record saving = tx.read(gds, "saving");

UserTransaction() {
    tx.commit();
}
```

Assumptions

Properties of Datastore

• Strong consistency – read single record.
• Atomic single item update and delete.
• Test-and-set like operations
• Enables optimistic transactions
• Ability to add user-defined metadata to data
• HTTP headers

Client-coordinated transactions

Intuition

• Treat each record as a single item database
• Coordinate transactions across them with 2PC
• Deconstructed write-ahead-log (WAL)
• No central coordination infrastructure
• Use client to coordinate
• Keep data item state with it
• Keep transaction state in the TSR

Cherry Garcia Protocol

2 Phase Commit

• Keep current and previous state with the data.
• Prepare in order of the hash value of the key.
• Prevent and detect deadlocks
• Write the Transaction Status Record (TSR)
• Commit in parallel
• Done asynchronously for performance

Lazy recovery

• TSR exists \(\rightarrow\) commit
• TSR does not exist \(\rightarrow\) abort

Conclusions

Transactions across heterogeneous stores

• Client-based transaction coordination.
• Deadlock detection and lazy recovery.
• No central infrastructure.

Heterogeneity

• Windows Azure Storage, Google Cloud Storage and own REST+T based store (Tora).

Evaluations

• Near linear scalability.
• Snapshot isolation semantics.

Future work

Extensions

• Serializable ACID transactions.

Time

• Explore techniques to obtain consistent time.
• Use datasource as the source of time.

Richer API with query support

• Support wider variety of datastores.
• HBase, Cassandra, MongoDB and others.

Open source implementation

• Make it available under Apache License.

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References


