Transactional Caching of Application Data using Recent Snapshots

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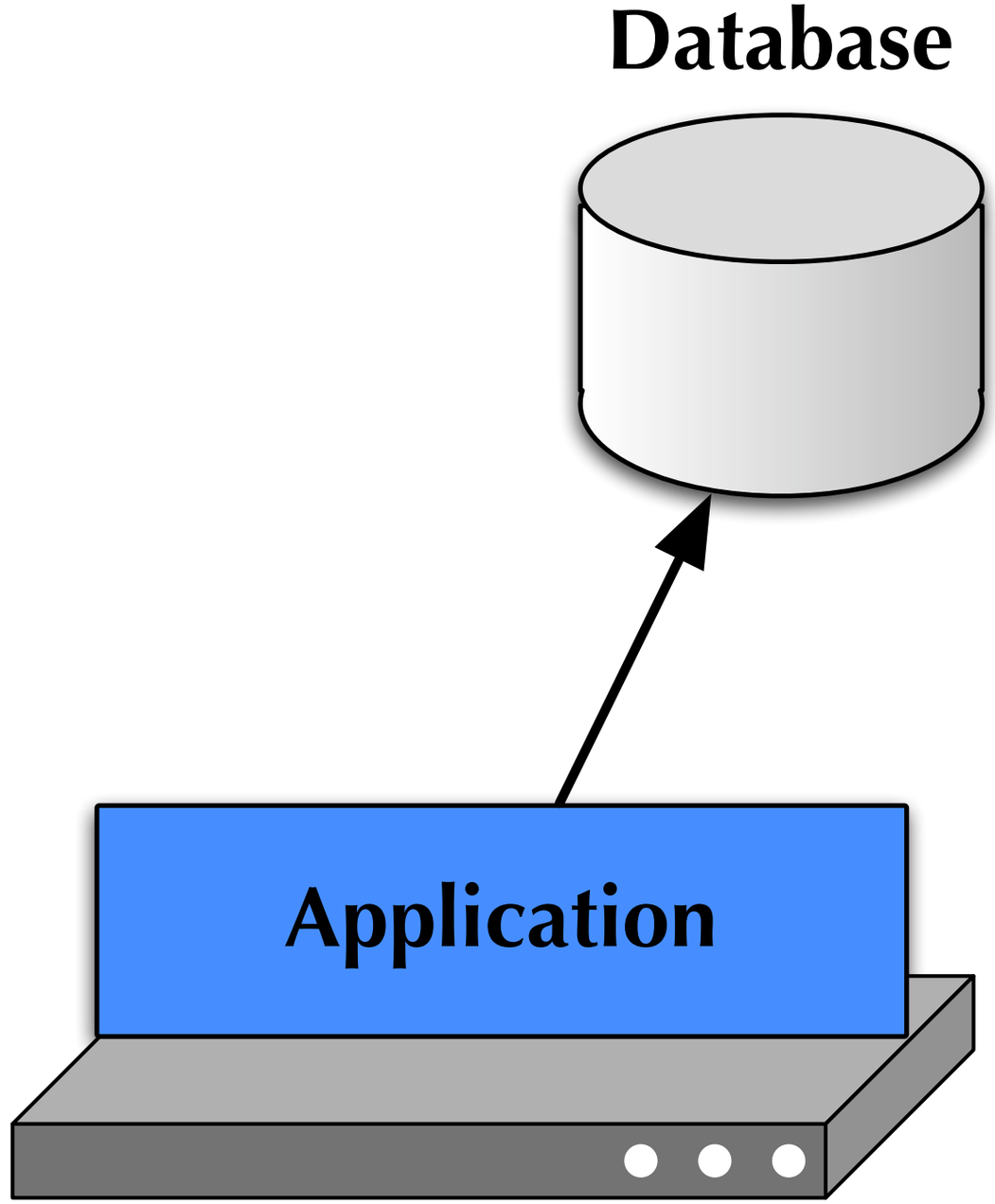
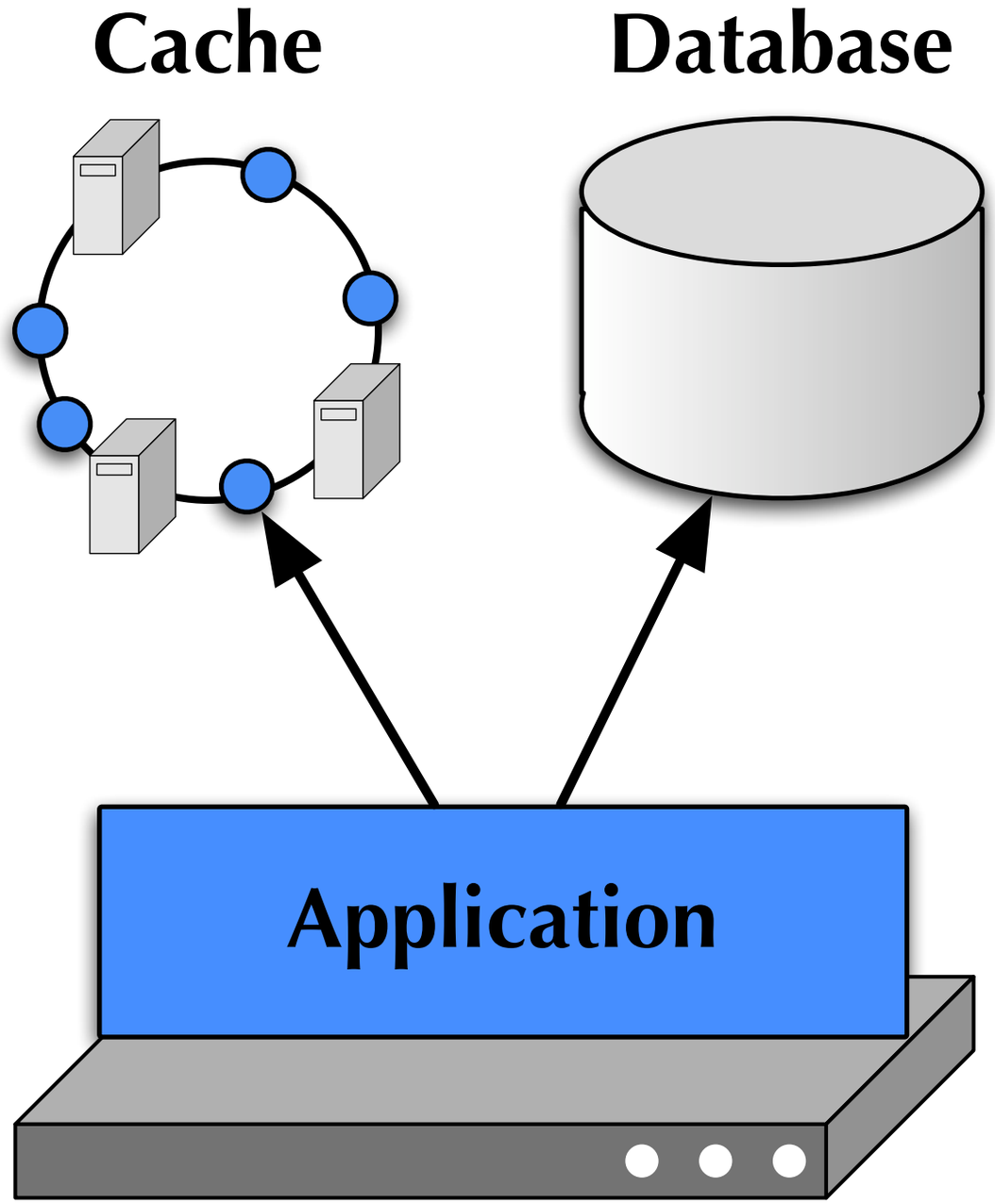
How to improve performance of DB-driven web site?

Distributed in-memory caching (e.g. memcached)

Distributed In-Memory Caching

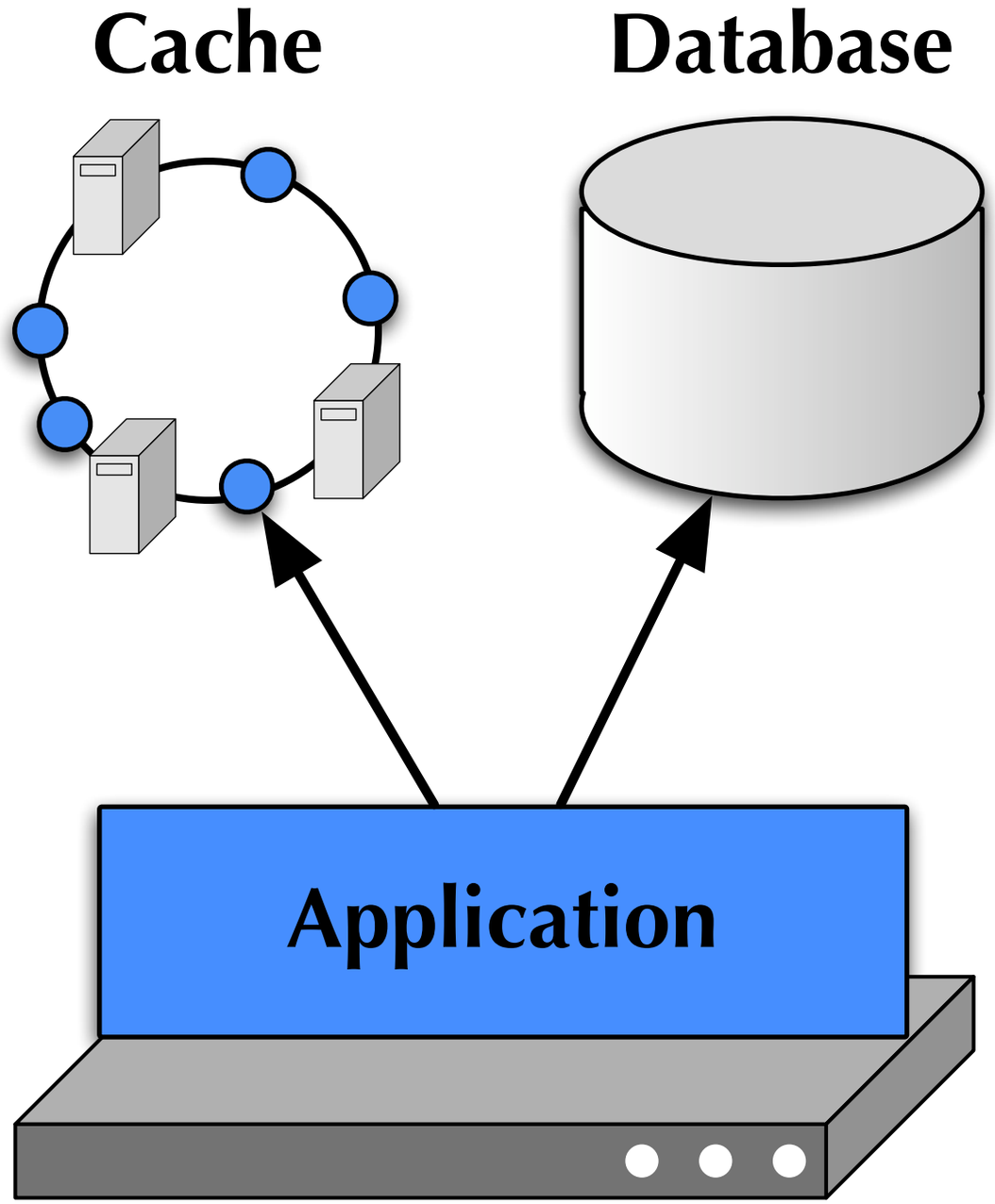


Distributed In-Memory Caching



Distributed In-Memory Caching

- in-memory DHT; very lightweight
- stores *application* objects (not part of DB)



Databases work hard to provide transactional consistency.

Existing application caches violate these guarantees!

Consistency Properties

usual goal:

***freshness*: cache is up-to-date with database**

our goal:

***consistency*: all accesses to cache and database in a transaction see the same snapshot**

Can't guarantee both without blocking!

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Embracing Staleness

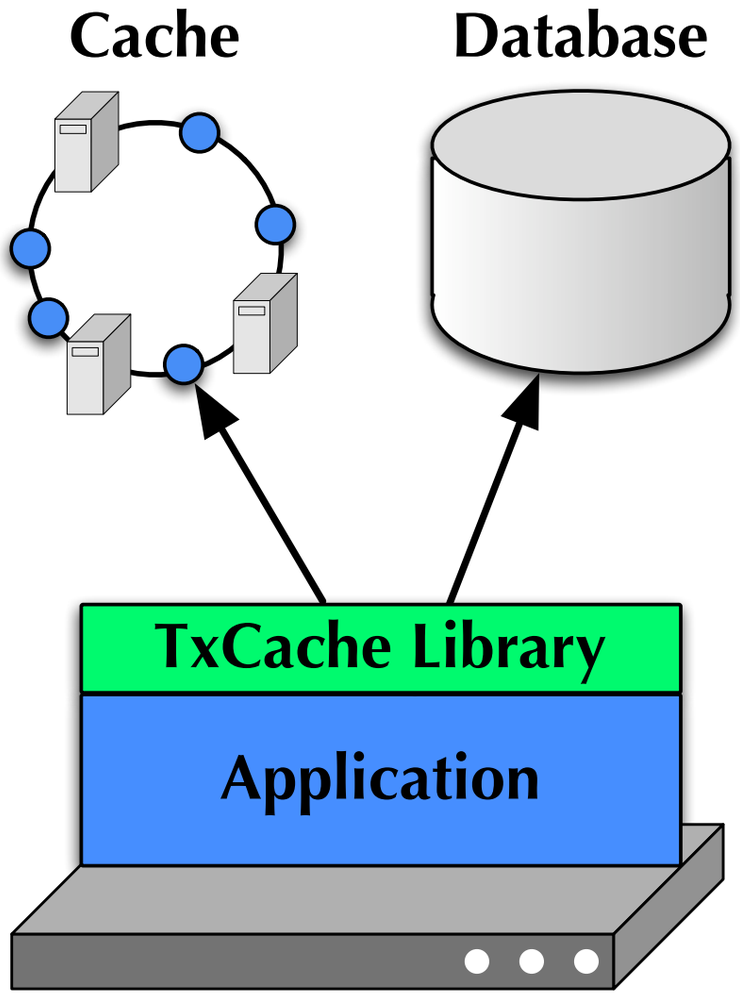
Run r/o transactions on *previous* snapshots

- **avoids blocking**
- **improves cache utilization**

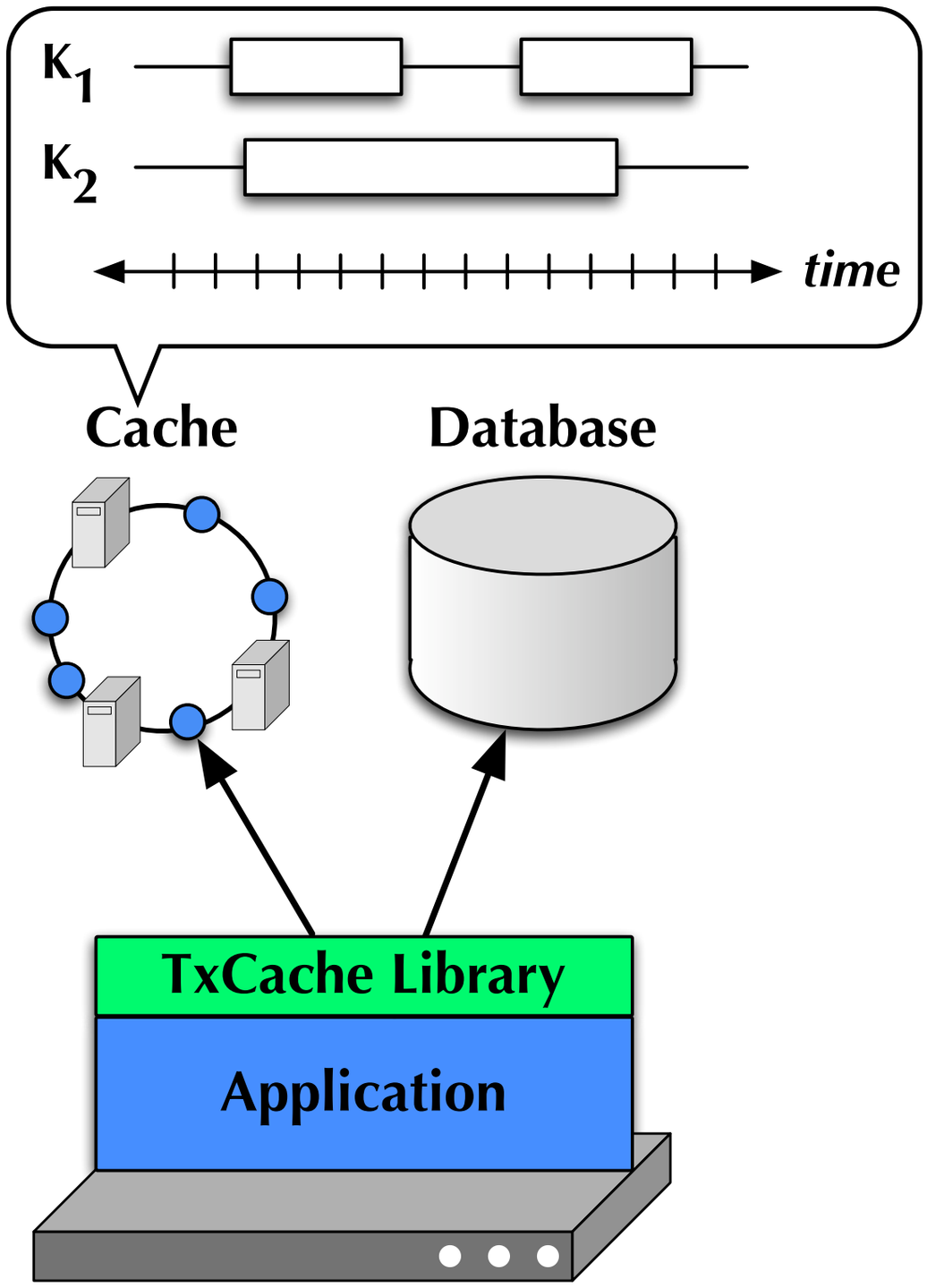
Safe: stale data is *already* everywhere!

Allow application control over staleness

TxCache Anatomy

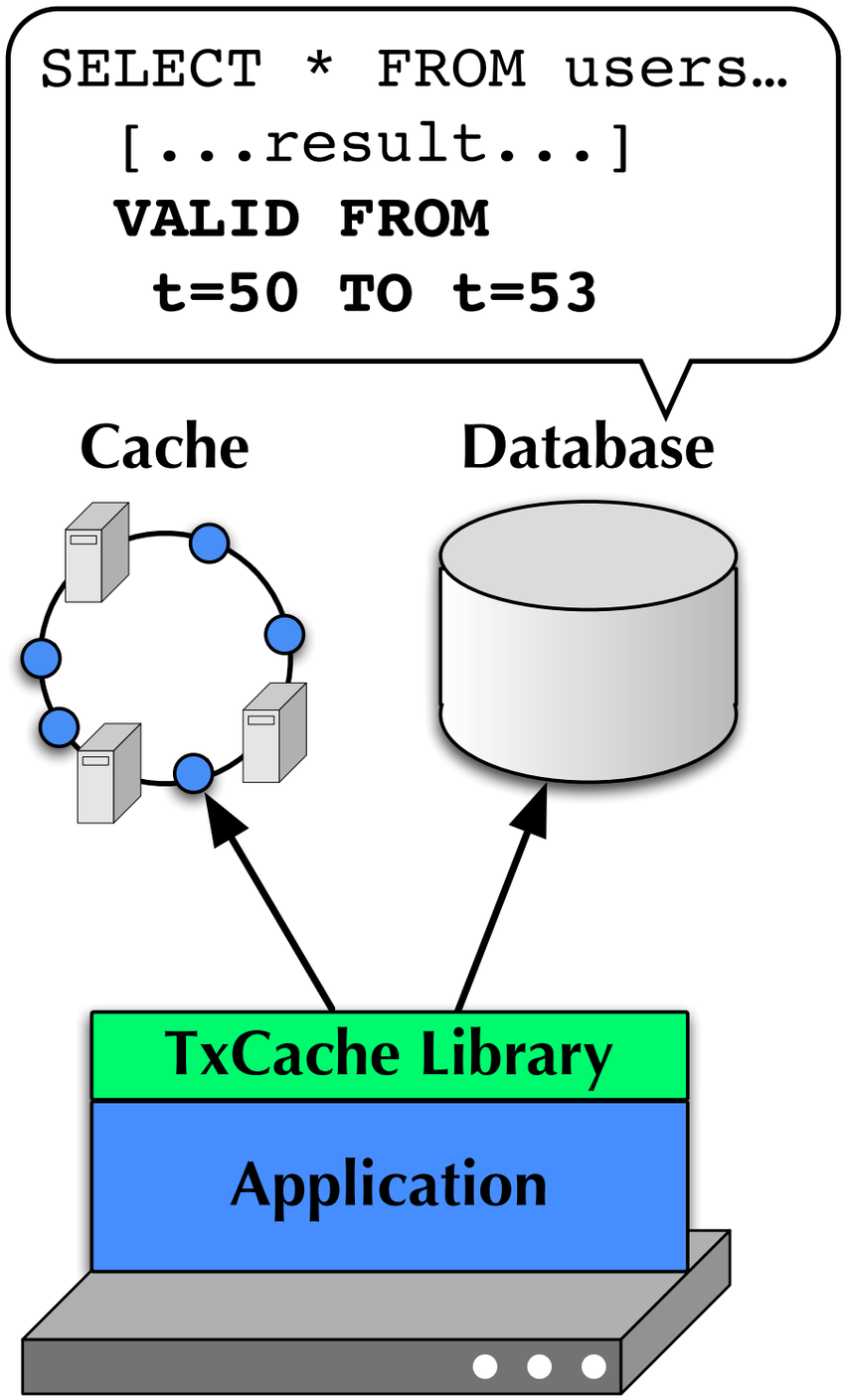


TxCache Anatomy



- **Cache is a versioned DHT, tagged by *validity interval***

TxCache Anatomy



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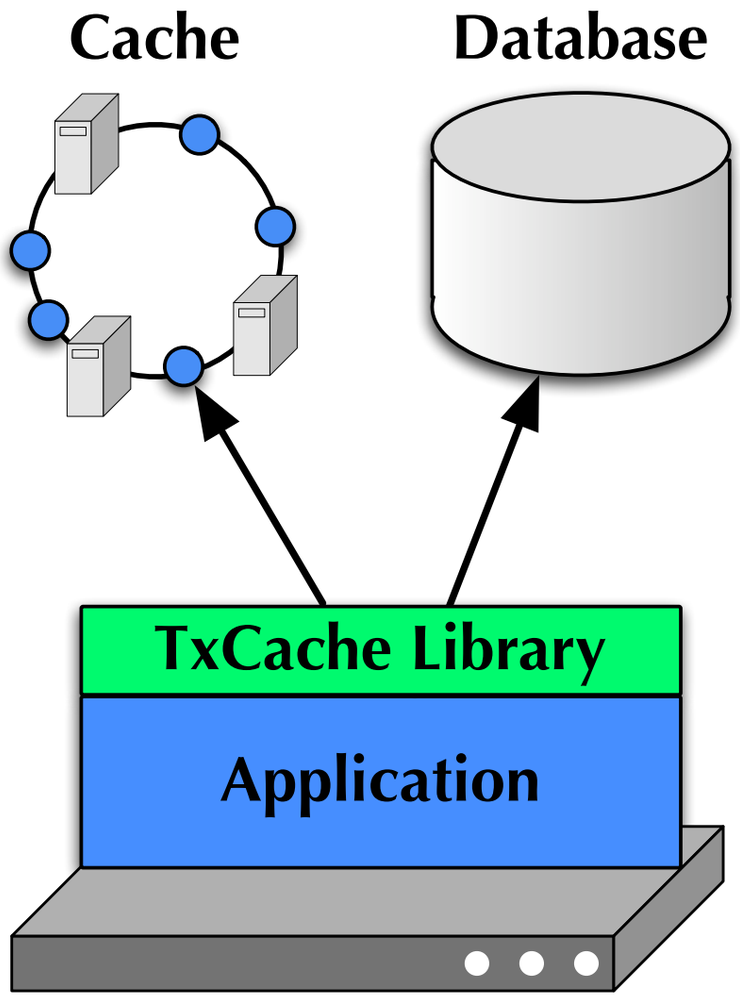

- Cache is a versioned DHT, tagged by *validity interval*
- Database returns validity interval with each query
- Library assigns timestamp to each transaction
- Uses timestamp to request data from cache & DB