Transactional Caching of Application Data using Recent Snapshots

Dan R. K. Ports   Austin T. Clements   Irene Y. Zhang

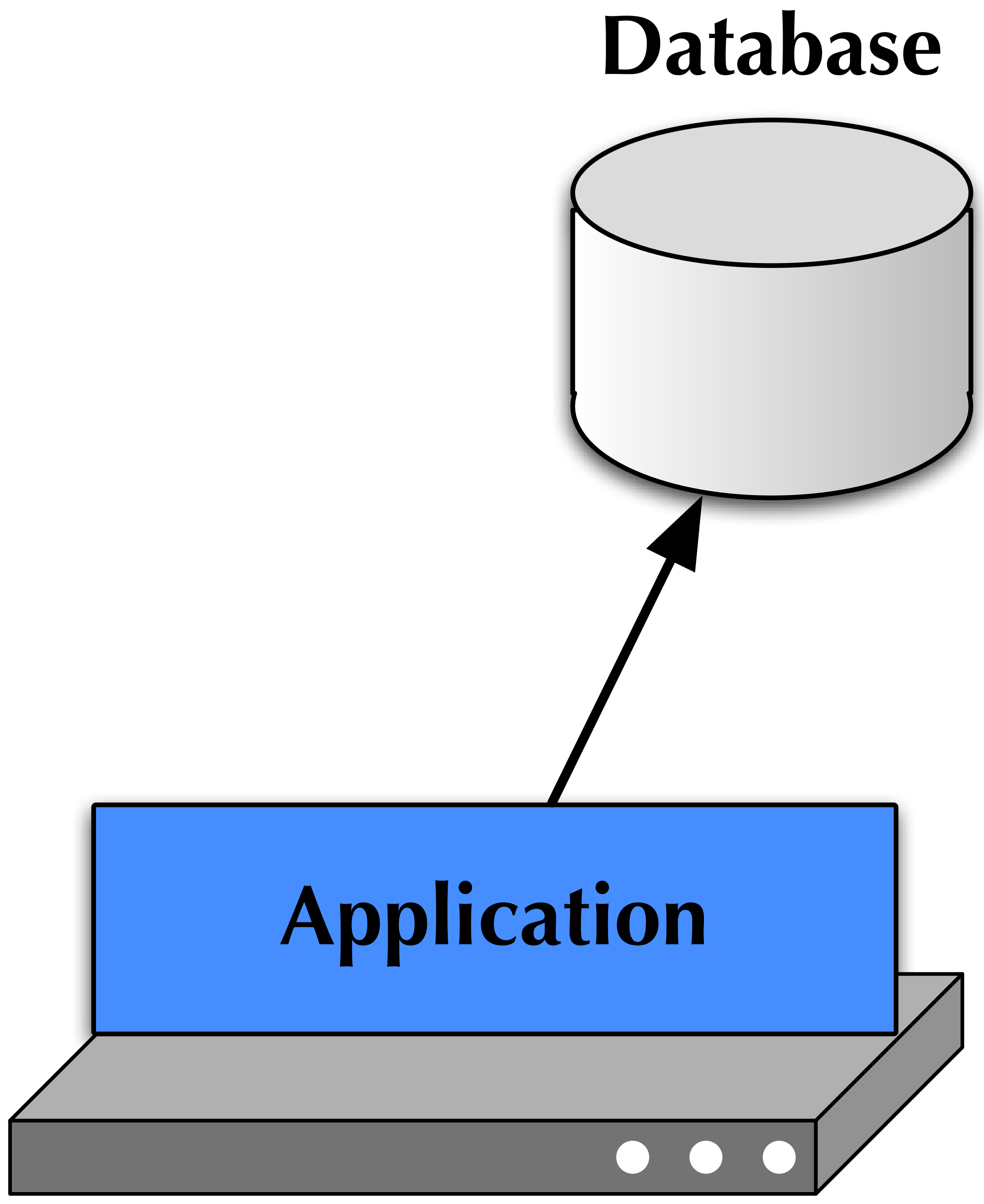
Samuel Madden   Barbara Liskov

MIT CSAIL

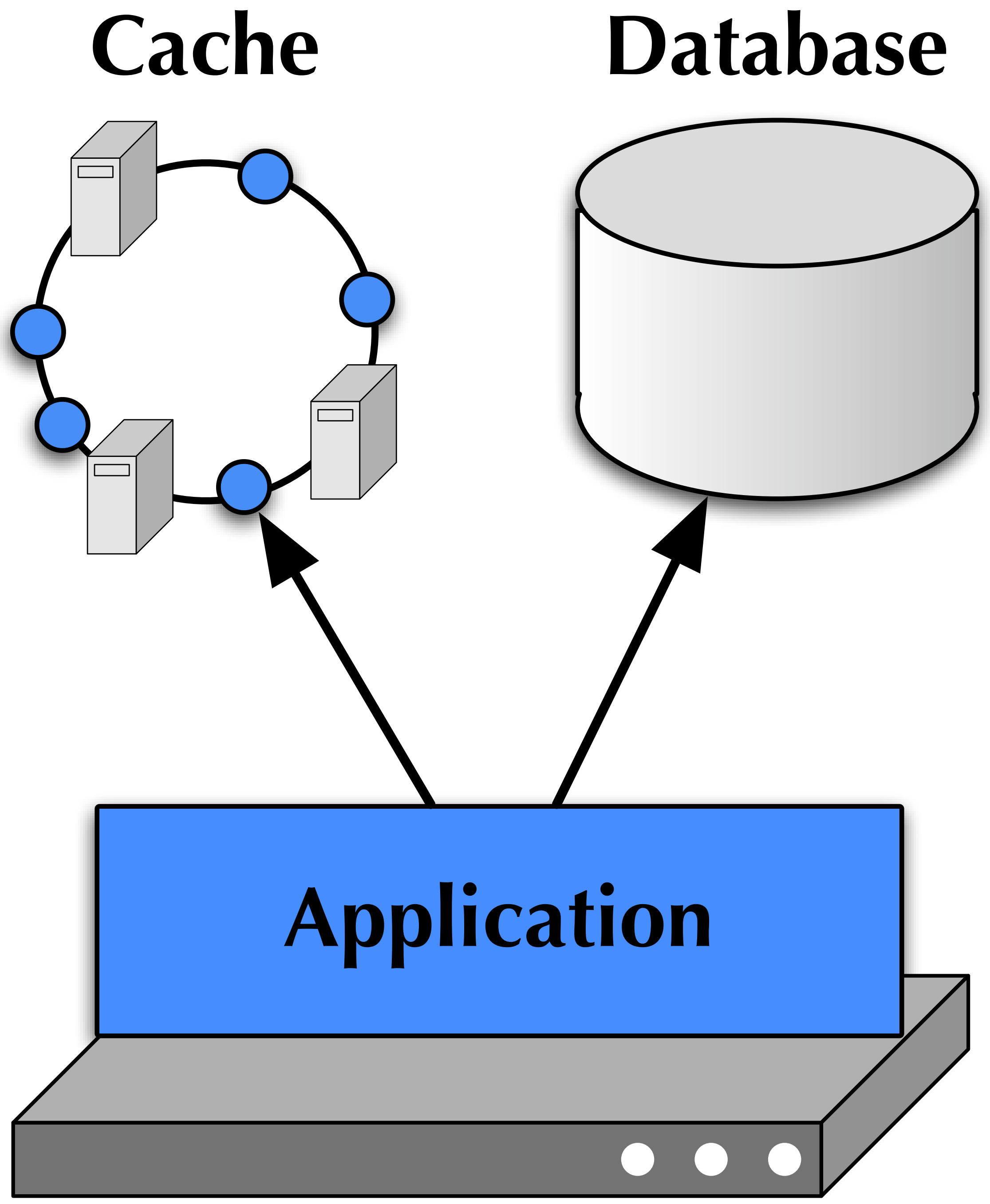
How to improve performance of DB-driven web site?

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

Distributed In-Memory Caching



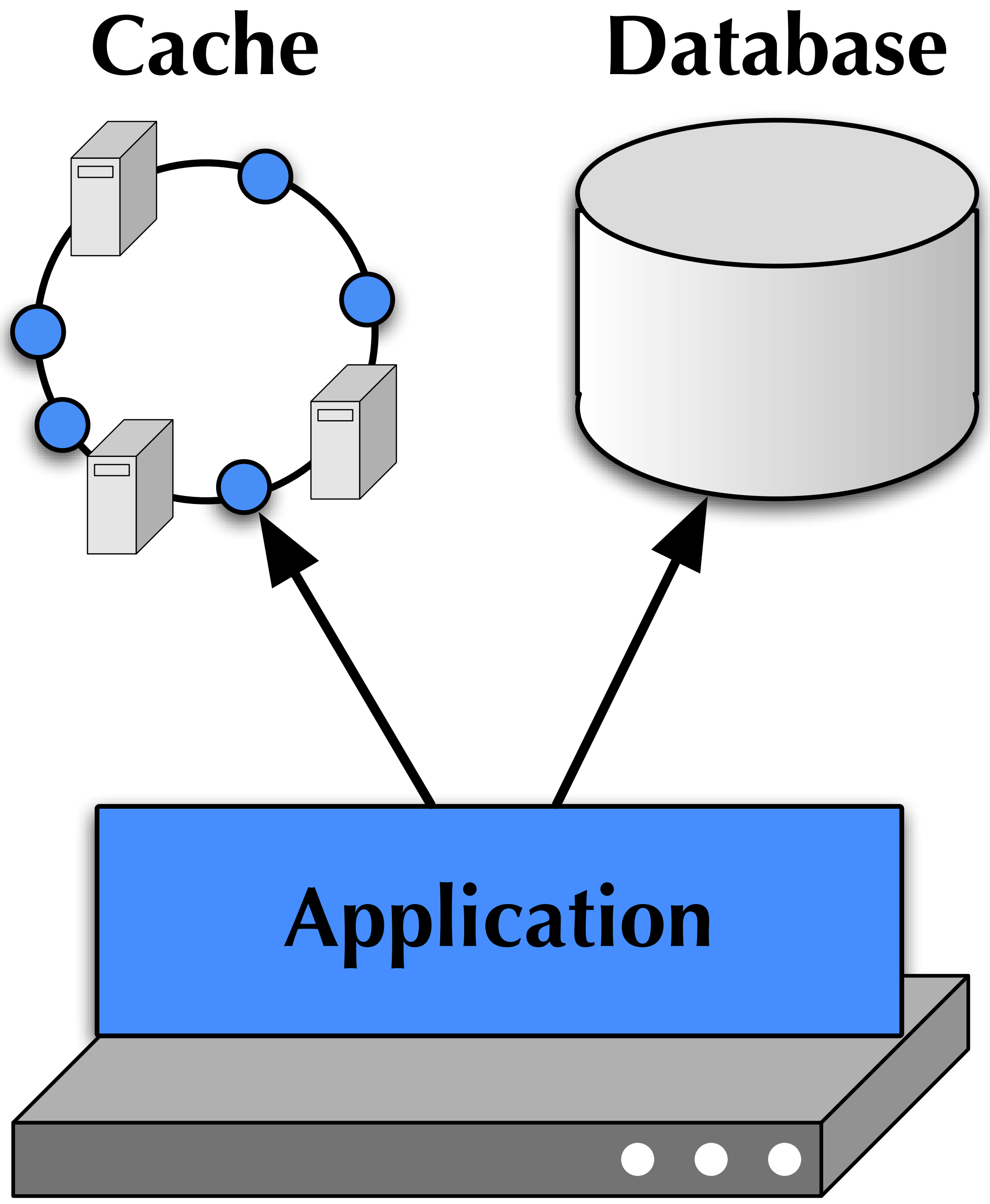
Distributed In-Memory Caching



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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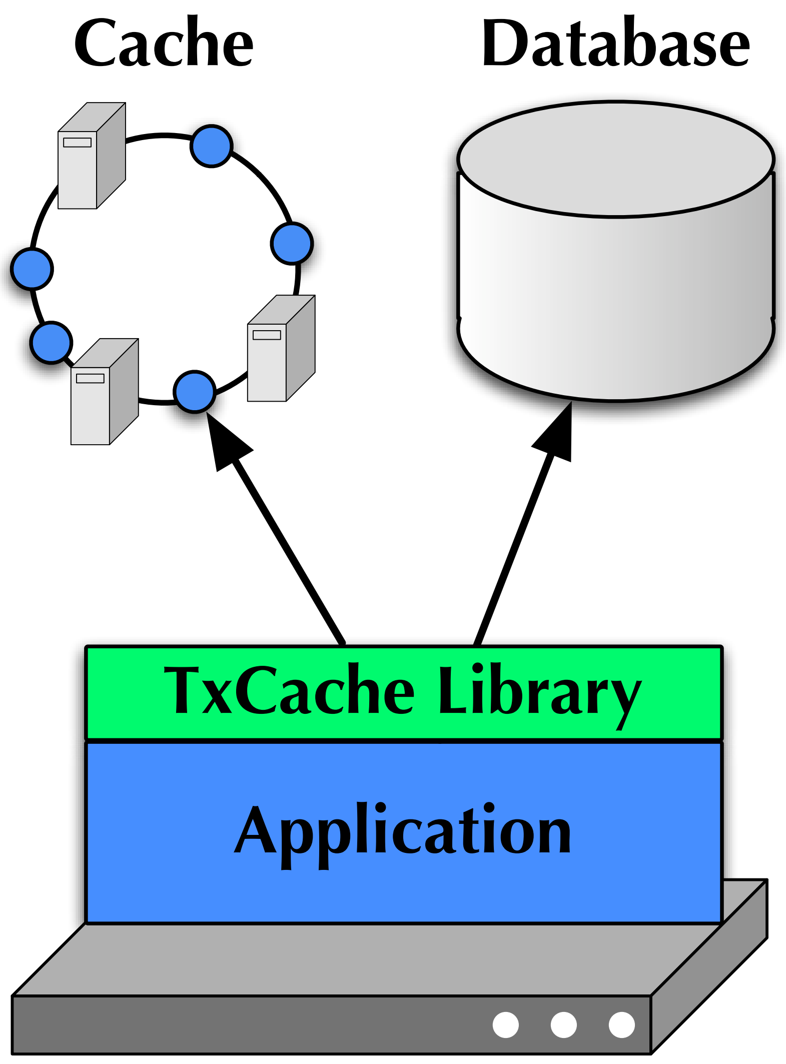
Embracing Staleness

Run r/o transactions on *previous* snapshots
- – avoids blocking
- – improves cache utilization

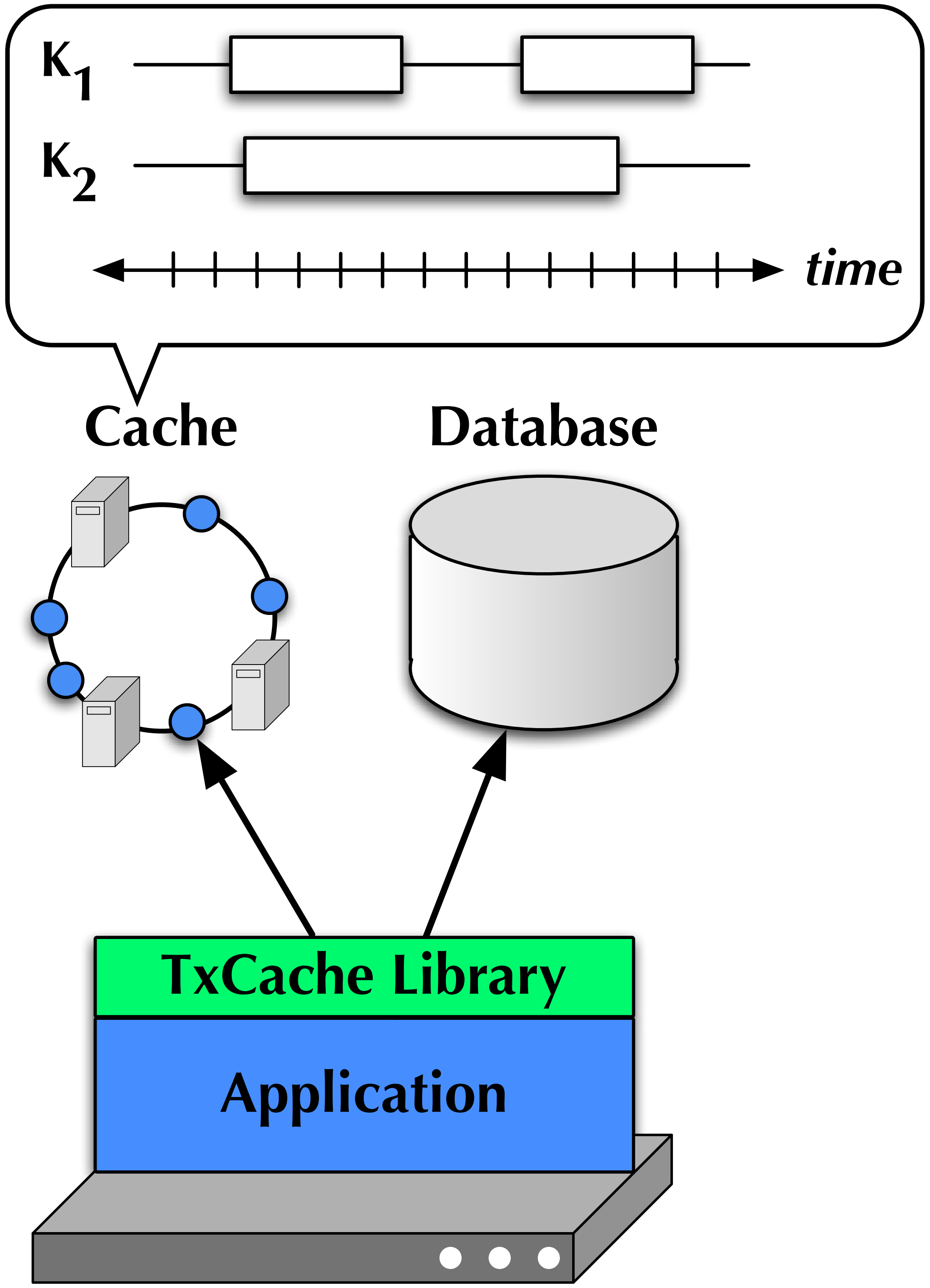
Safe: stale data is *already* everywhere!

Allow application control over staleness

TxCache Anatomy

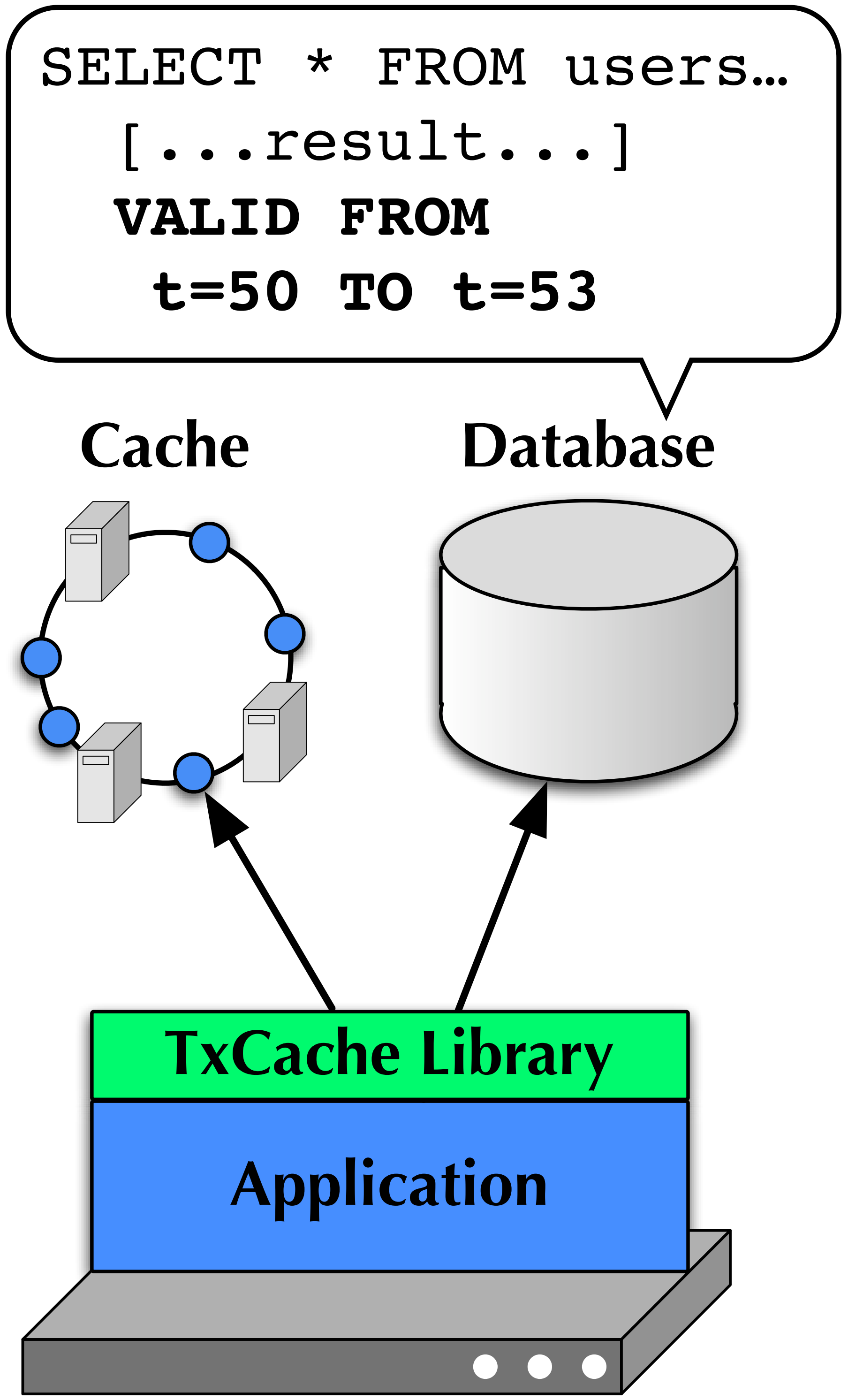


TxCache Anatomy



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

TxCache Anatomy



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- Database returns validity interval with each query

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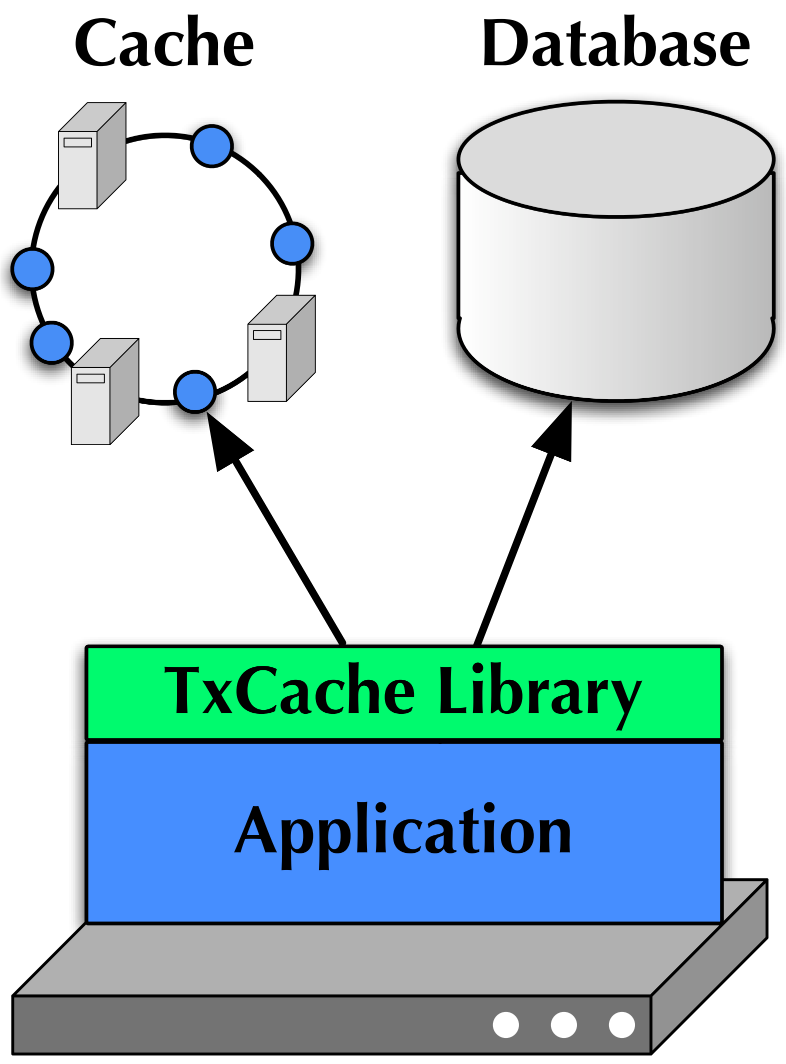

- Cache is a versioned DHT, tagged by *validity interval*
- Database returns validity interval with each query
- Library assigns timestamp to each transaction
- Uses timestamp to request data from cache & DB