Trouble with transactions

Evan Jones

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A love story


I fell in
love...

...with transactions

...with transactions

Transactions = correct programs

A four year romance

A four year romance

Main memory transactions

A four year romance

Main memory transactions

Automatic partitioning

A four year romance

Main memory transactions

Consolidating workloads

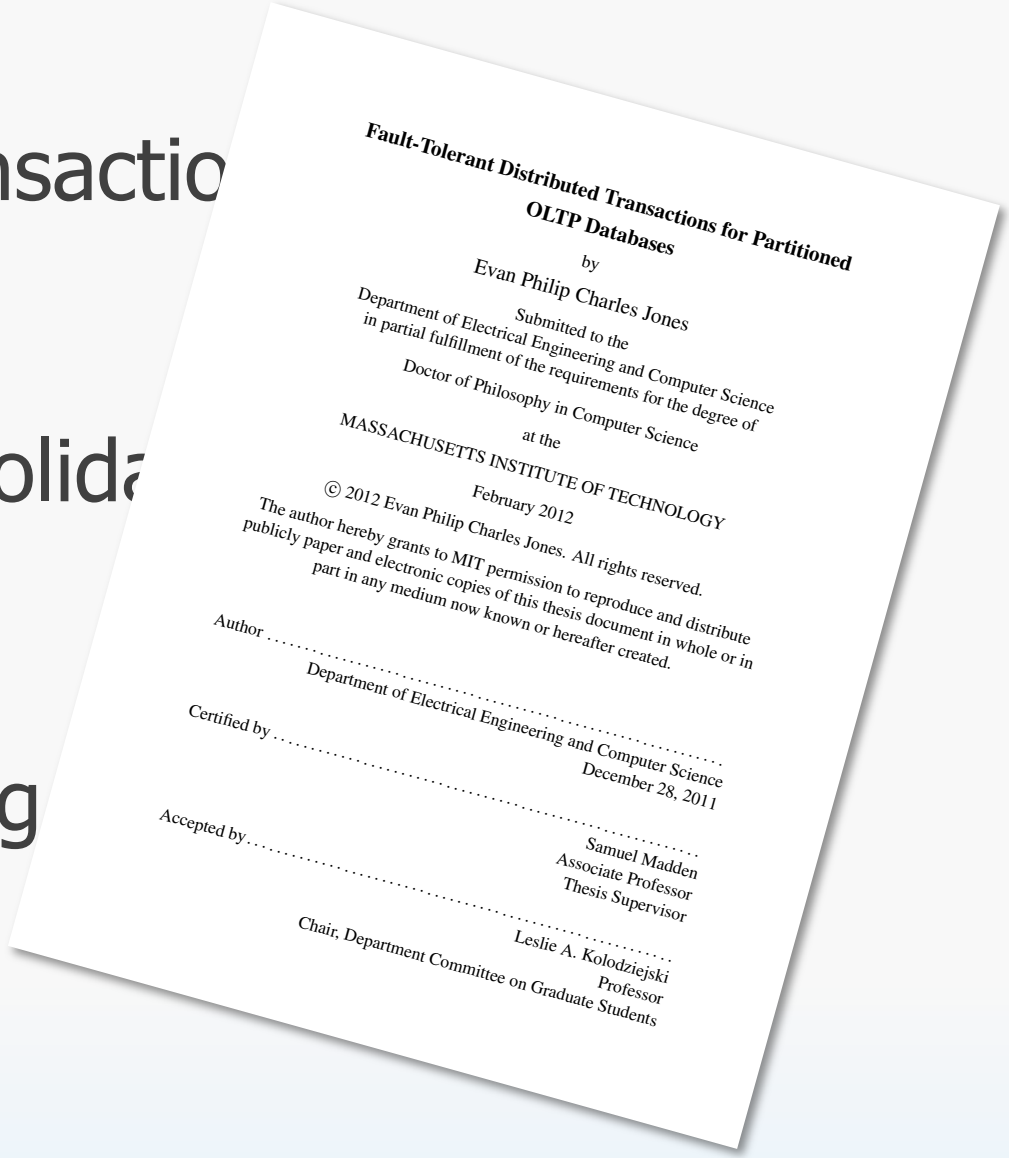
Automatic partitioning

A four year romance

Main memory transactio

Consolida

Automatic partitioning



Fault-Tolerant Distributed Transactions for Partitioned OLTP Databases

by

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Mitro

Mitro

Applications, not databases

Example: Read bank balance

```
connection.begin_transaction()
print connection.query_balance()
# ... do some computation ...
print connection.query_balance()
connection.commit()
```

Example: Read bank balance

```
connection.begin_transaction()
print connection.query_balance()  = $1000
# ... do some computation ...
print connection.query_balance()
connection.commit()
```

Example: Read bank balance

```
connection.begin_transaction()
print connection.query_balance()  = $1000
# ... do some computation ...
print connection.query_balance()  = $1500
connection.commit()
```

Example: Read bank balance

```
connection.begin_transaction()
print connection.query_balance()  = $1000
# ... do some computation ...
print connection.query_balance()  = $1500 💔
connection.commit()
```

💔#1: Weak defaults

Transactions = Serializability

Postgres: Read committed

MySQL/InnoDB: “Repeatable read”

(reality: something weird)

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Postgres: Read committed

MySQL/InnoDB: “Repeatable read”

(reality: something weird)

Set SERIALIZABLE by default

Example 2: Withdrawal

```
try:
  connection.begin_transaction()
  balance = connection.query_balance()
  connection.update_balance(balance – 500)
  some_function(connection)
  connection.commit()
except e:
  connection.rollback()
  print connection.query_balance()
```

Example 2: Withdrawal

```
try:
  connection.begin_transaction()
  balance = connection.query_balance()      = $1000
  connection.update_balance(balance - 500)
  some_function(connection)
  connection.commit()
except e:
  connection.rollback()
  print connection.query_balance()
```

Example 2: Withdrawal

```
try:
  connection.begin_transaction()
  balance = connection.query_balance()        = $1000
  connection.update_balance(balance - 500)  = okay!
  some_function(connection)
  connection.commit()
except e:
  connection.rollback()
  print connection.query_balance()
```

Example 2: Withdrawal

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💔#2: Implicit begin

`some_function` committed (my fault)

DB automatically started new txn

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`some_function` committed (my fault)

DB automatically started new txn

If you begin, you commit

Like memory in C/C++

Nested transactions can help

Don’t implicitly start transactions

Transactions: Use with care

- Communication with external systems
- Accidental long running transactions
- Retry loops for concurrency errors

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Make it hard to use systems incorrectly

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