

Making Fast Databases

FASTER

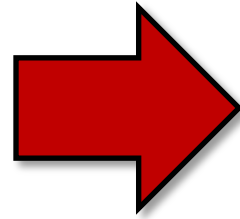
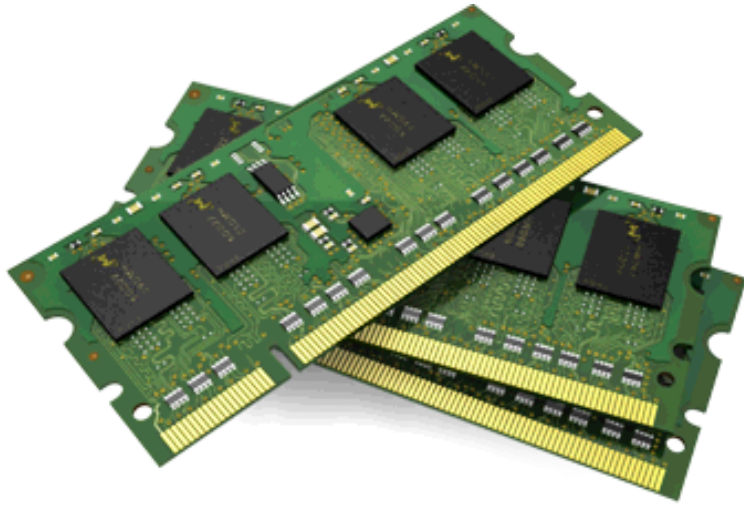
@andy_pavlo



BROWN

NEDB 2012





**Fast
+
Cheap**

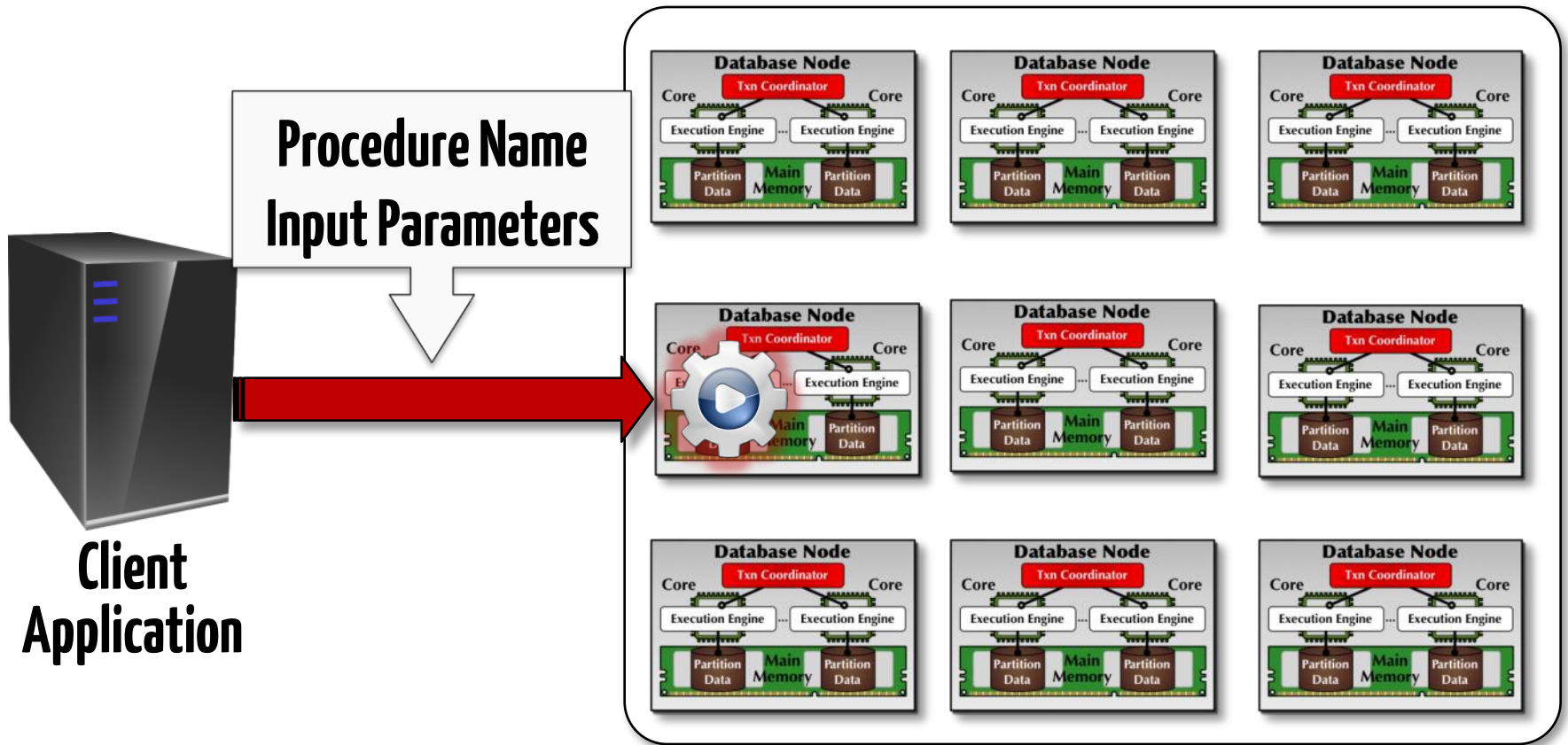
**If a system is already fast, can we
make it faster without giving up ACID?**



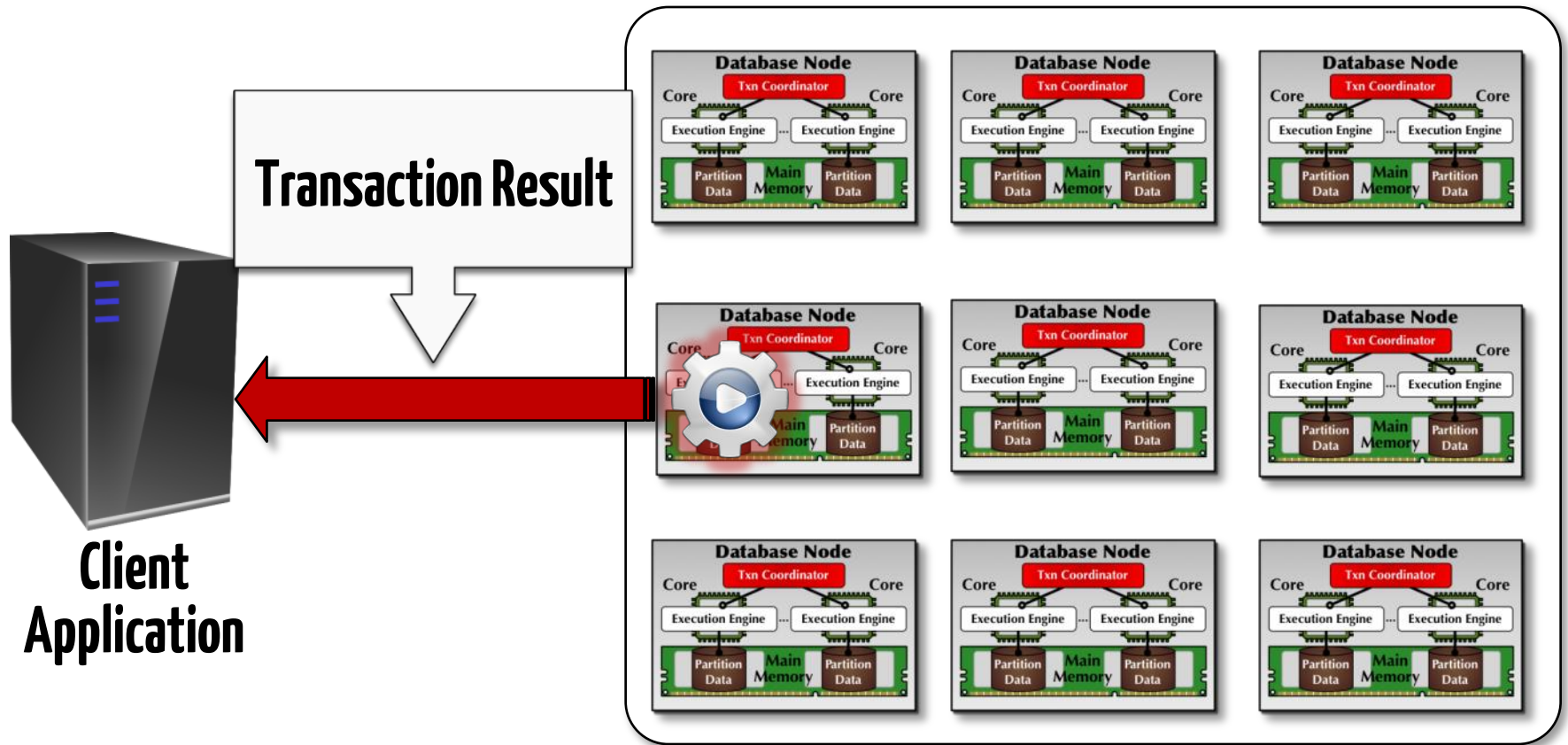
-Store

**Main Memory • Parallel • Shared-Nothing
Transaction Processing**

H-Store

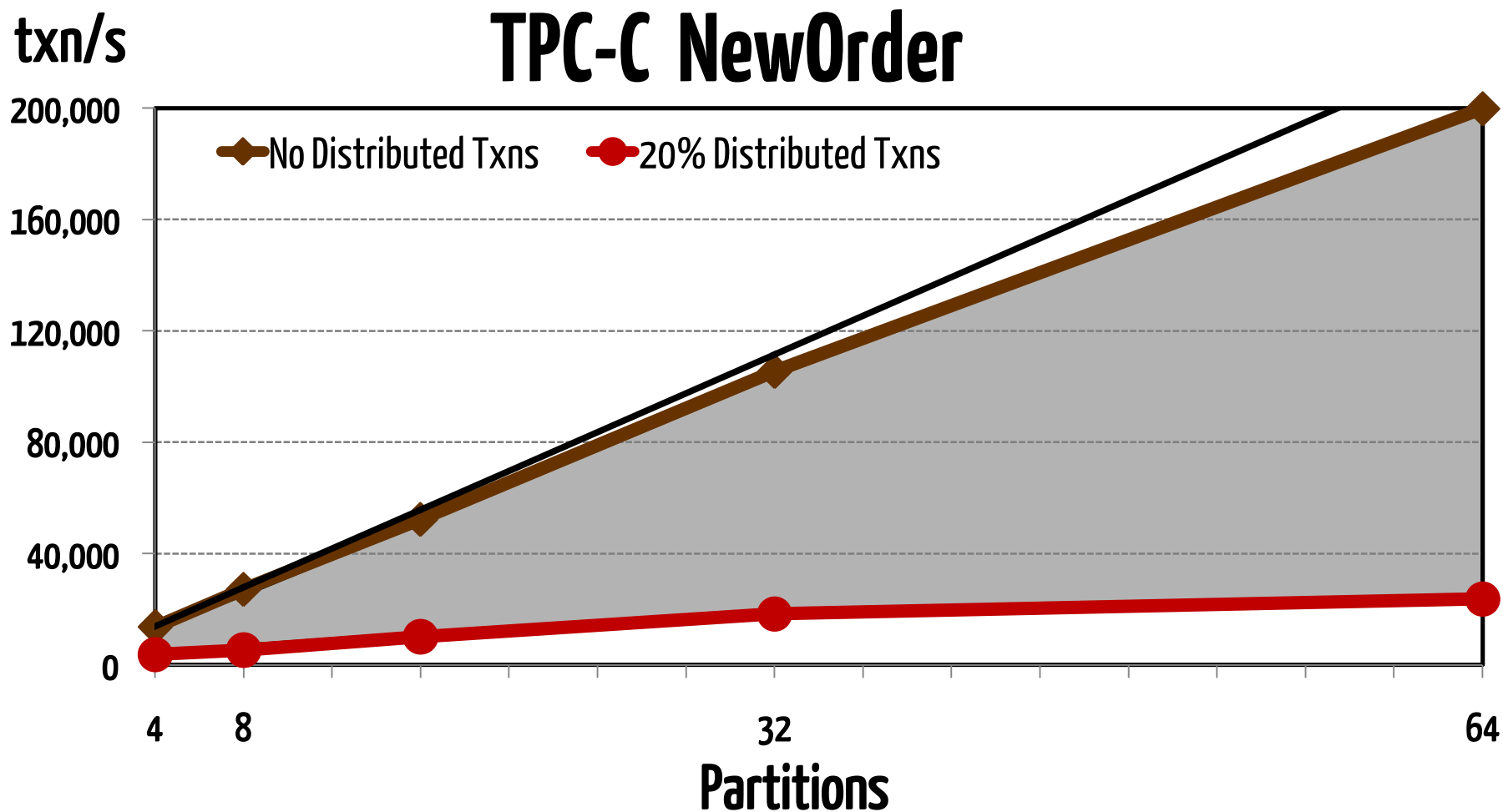


H-Store





H-Store



Optimization #1:

Partition database to
reduce the number of
distributed txns.

**Skew-Aware Automatic Database Partitioning in
Shared-Nothing, Main Memory OLTP Systems**
In Submission





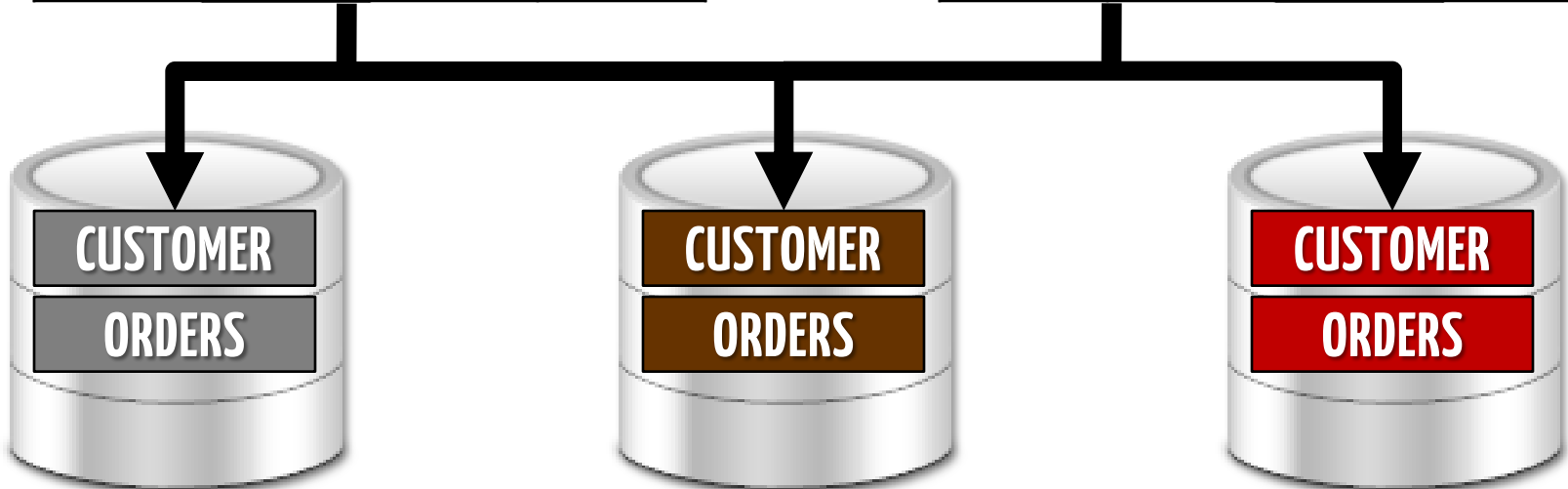
Horticulture

CUSTOMER

c_id	c_w_id	c_last	...
1001	5	RZA	-
1002	3	GZA	-
1003	12	Raekwon	-
1004	5	Deck	-
1005	6	Killah	-
1006	7	ODB	-

ORDERS

o_id	o_c_id	o_w_id	...
78703	1004	5	-
78704	1002	3	-
78705	1006	7	-
78706	1005	6	-
78707	1005	6	-
78708	1003	12	-

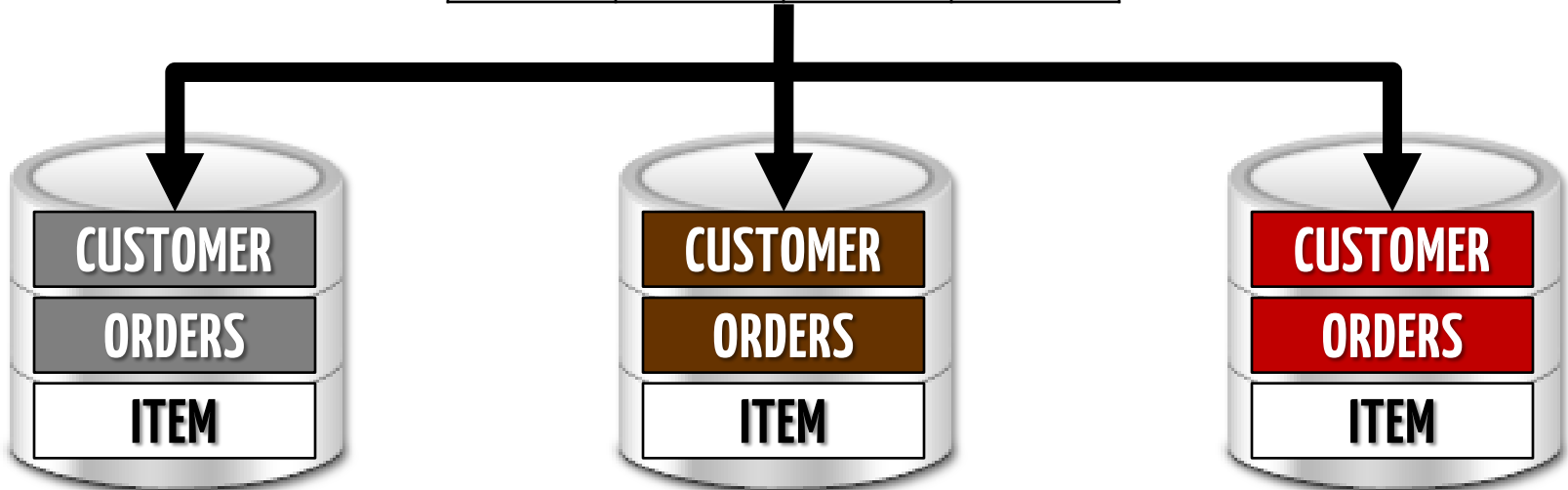




horticulture

ITEM

i_id	i_name	i_price	...
603514	XXX	23.99	-
267923	XXX	19.99	-
475386	XXX	14.99	-
578945	XXX	9.98	-
476348	XXX	103.49	-
784285	XXX	69.99	-





Horticulture

CUSTOMER

c_id	c_w_id	c_last	...
1001	5	RZA	-
1002	5	GZA	-
1003	5	Raekwon	-
1004	5	Rak	-
1005	5	Killa	-
1006	5	OP	-



Horticulture

DDL

CUSTOMER

ITEM

ORDERS

NewOrder

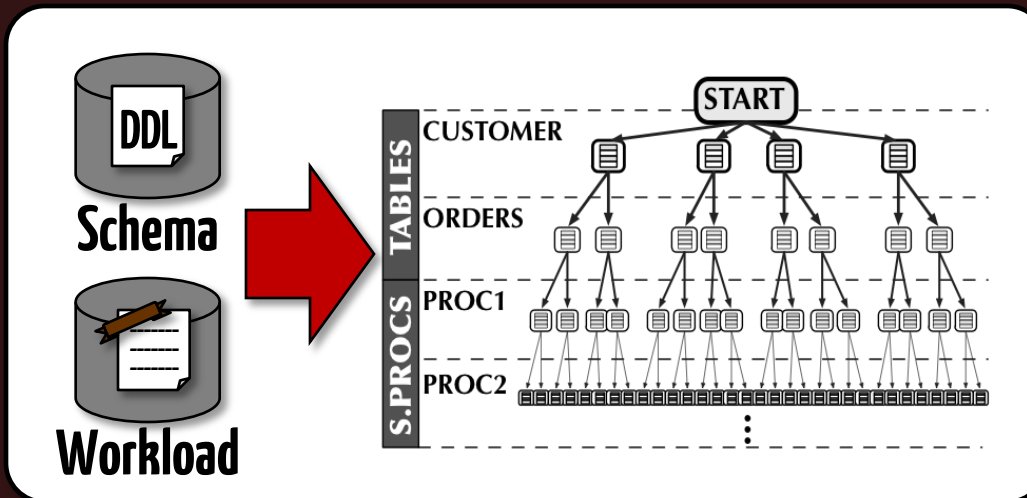
```
SELECT * FROM WAREHOUSE  
WHERE W_ID = 10;
```

```
SELECT * FROM DISTRICT WHERE  
D_W_ID = 10 AND D_ID = 9;
```

```
INSERT INTO ORDERS  
(O_W_ID, O_D_ID, O_C_ID,...)  
VALUES  
(10, 9, 12345,...);
```

⋮

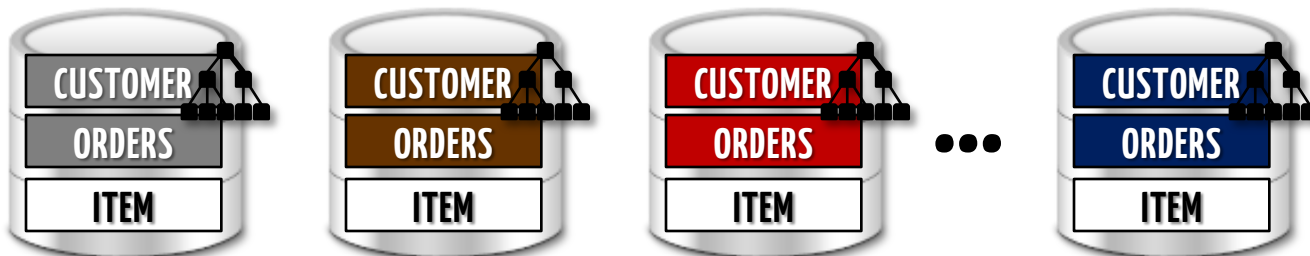
Horticulture



DTxn
Estimator

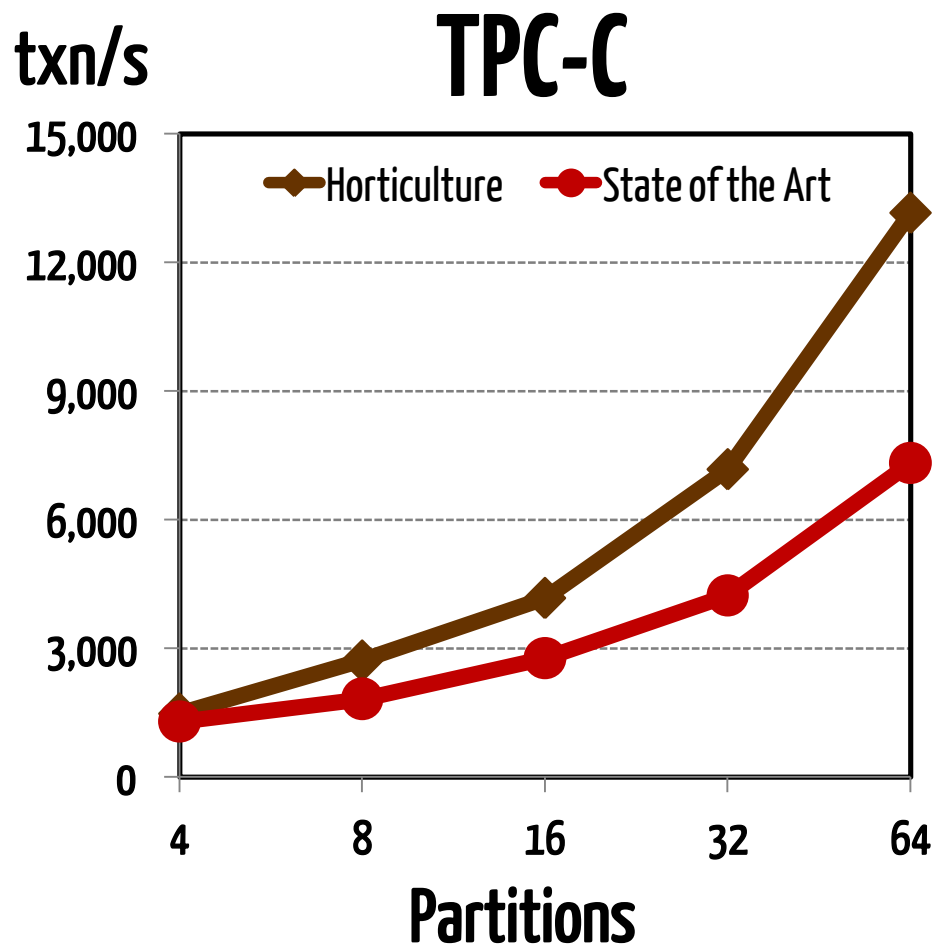
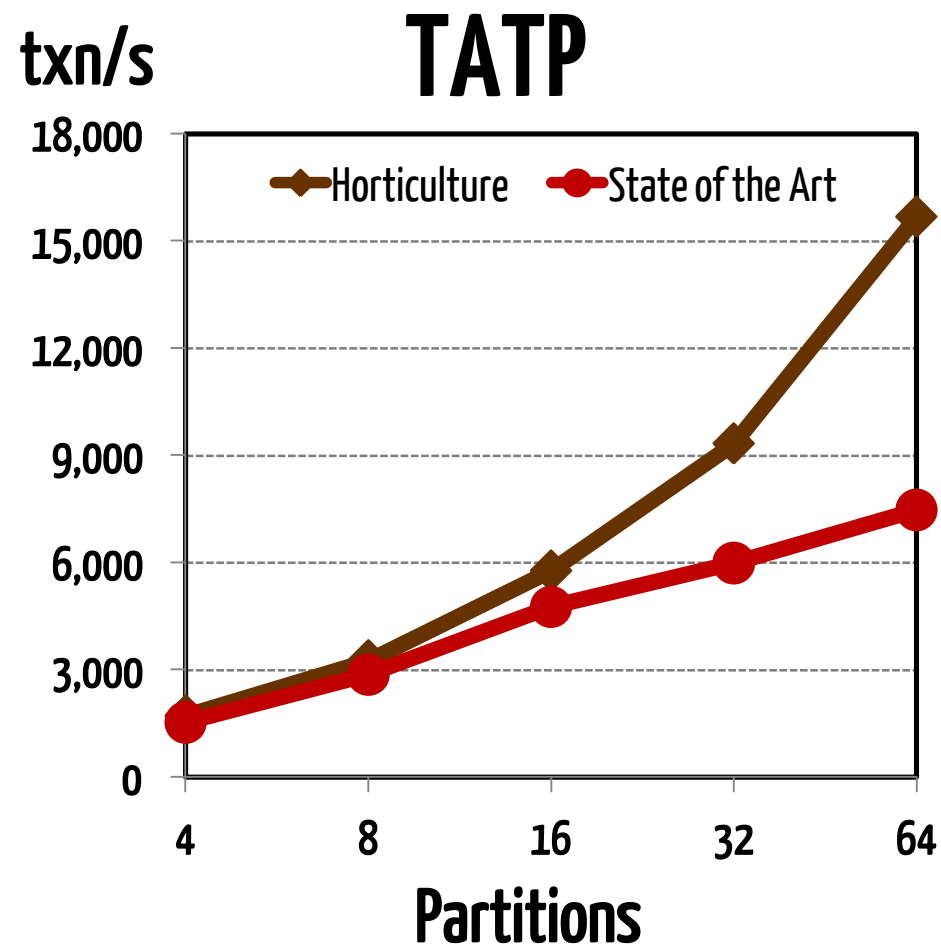
Skew
Estimator

Large-Neighborhood Search Algorithm



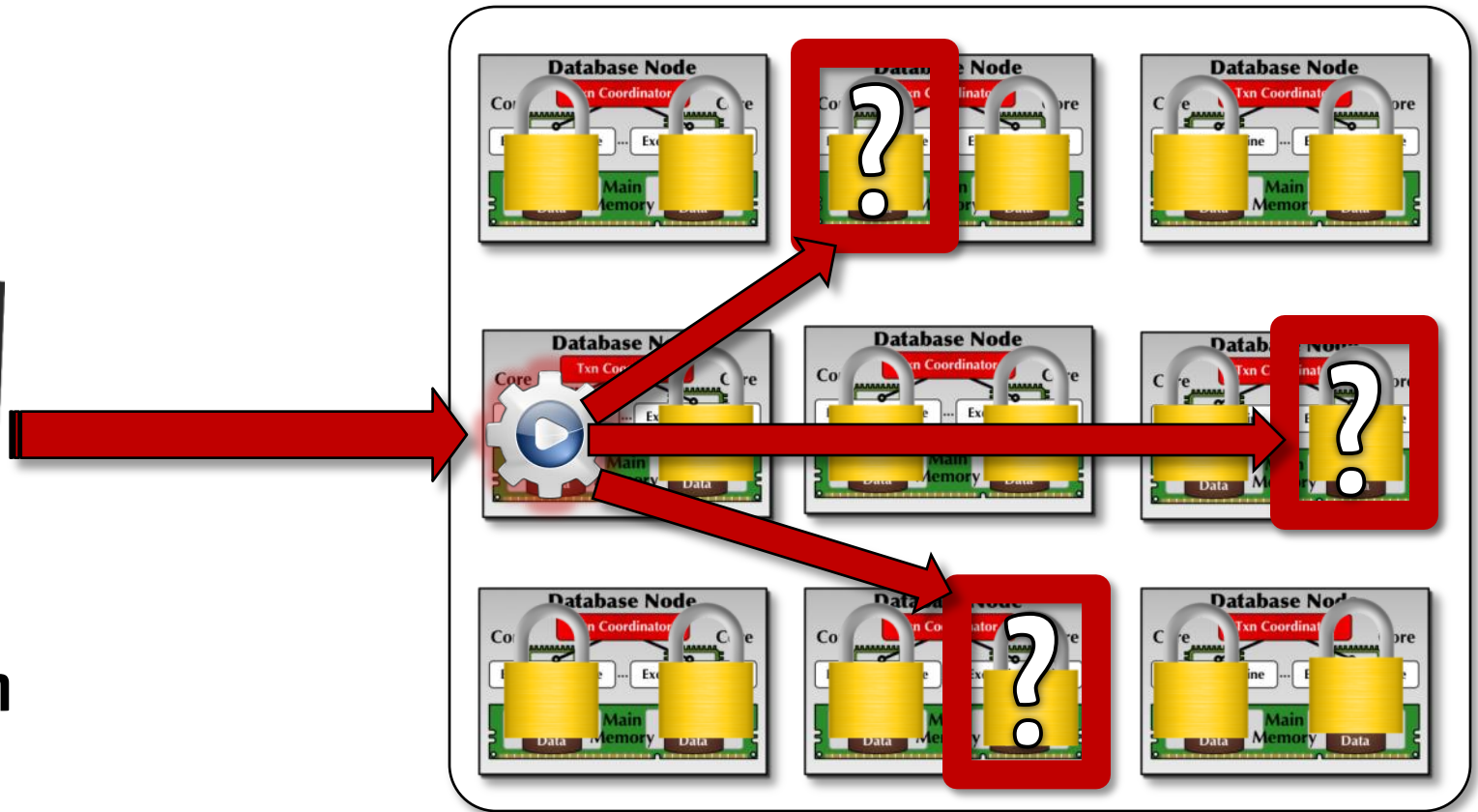


Horticulture





H-Store



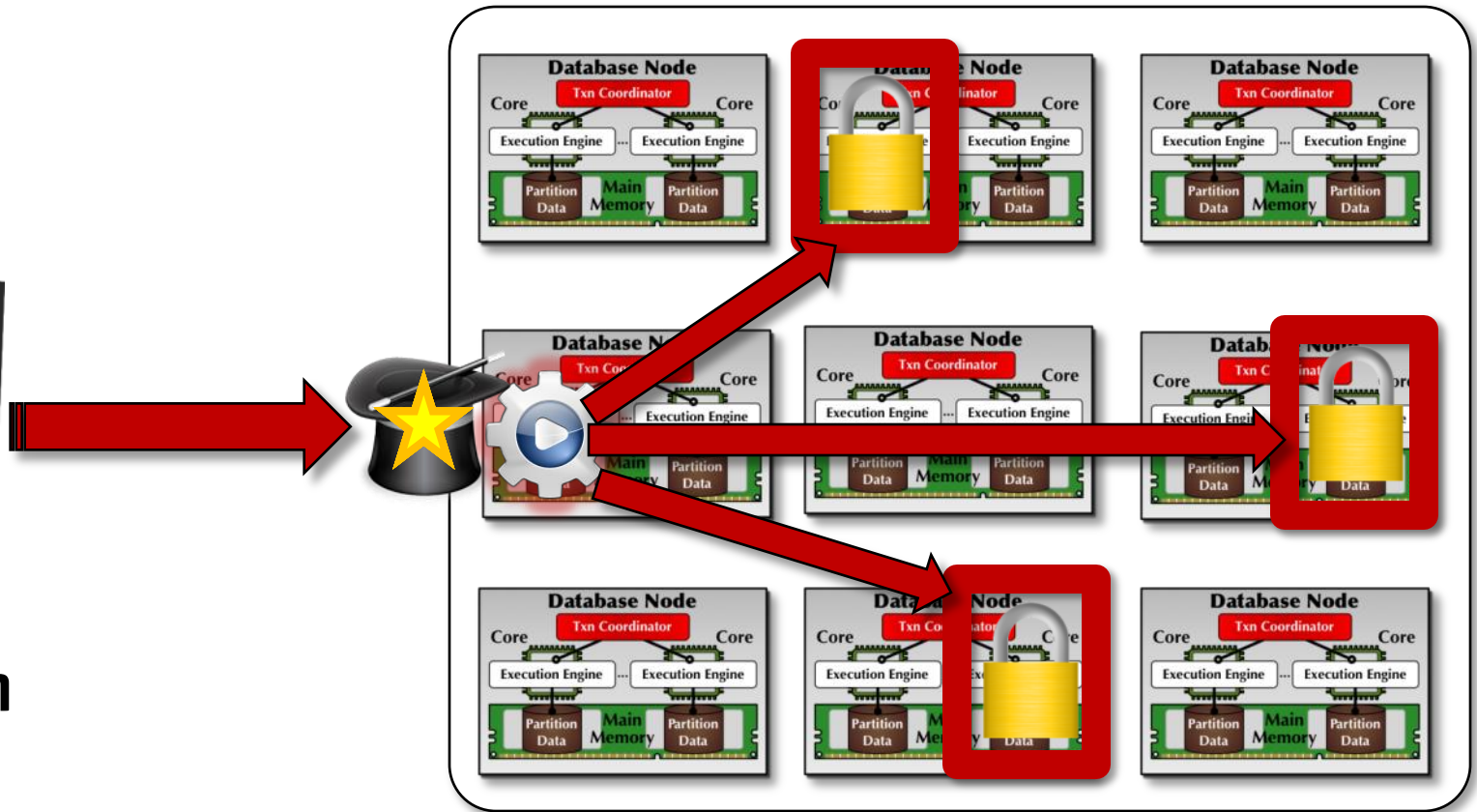
Optimization #2:

Predict what txns will
do before they
execute.

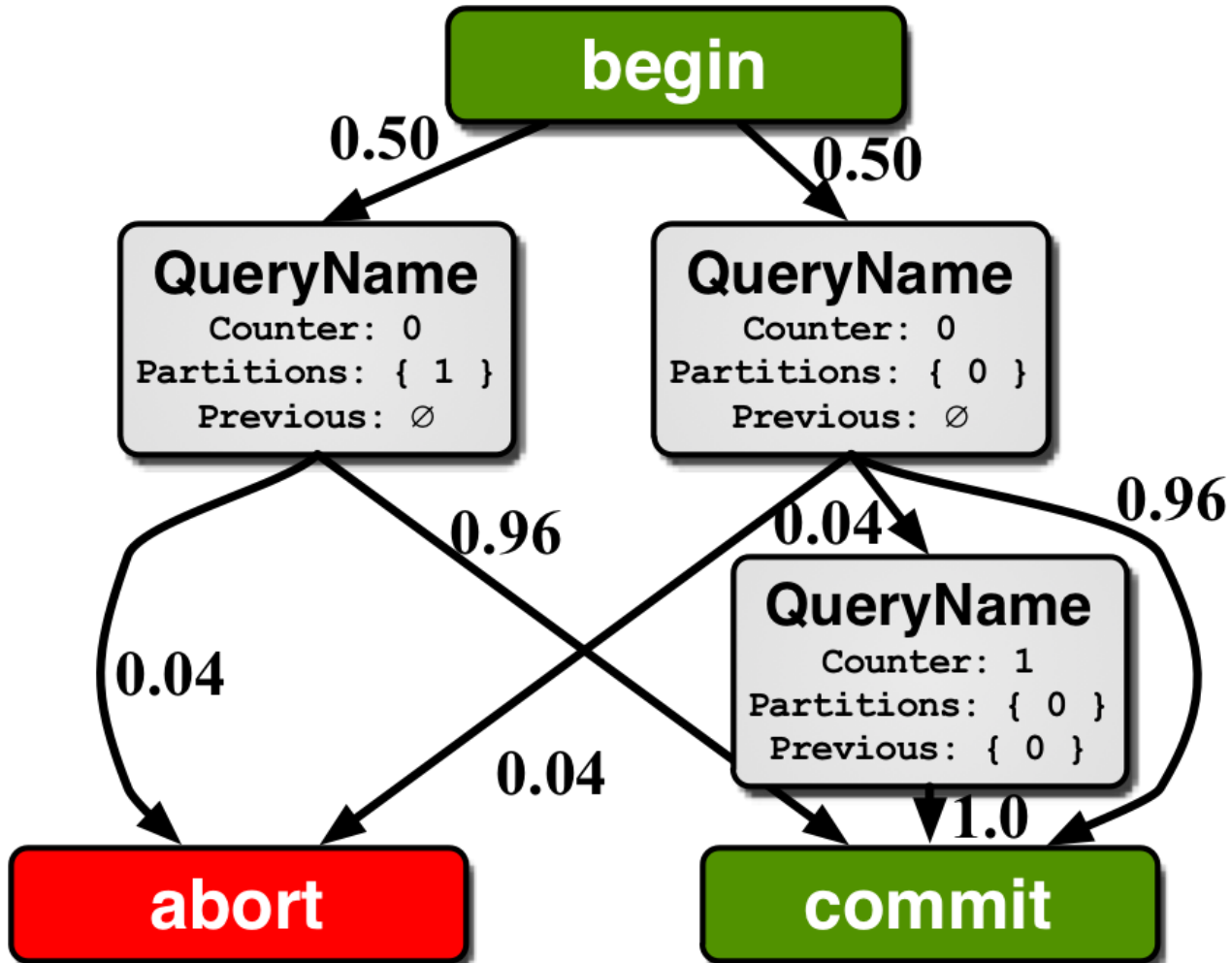
**On Predictive Modeling for Optimizing
Transaction Execution in Parallel OLTP Systems**
in PVLDB, vol 5, issue 2, October 2011



Houdini



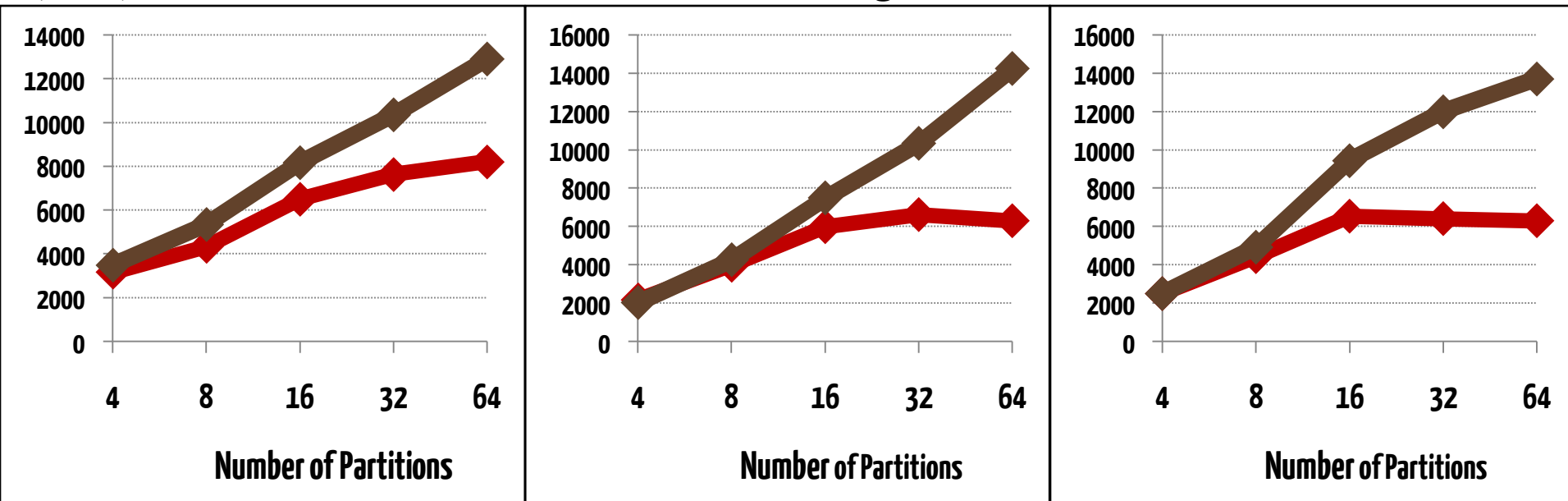
Houdini



Houdini

(txn/s)

■ Houdini ■ Assume Single-Partitioned



TATP
+57%

TPC-C
+126%

AuctionMark
+117%



Conclusion:

Achieving fast performance is more than just using only RAM.

Future Work:

Reduce distributed txn overhead through creative scheduling.

h-store

hstore.cs.brown.edu

github.com/apavlo/h-store

Help is Available

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Graduate Student Abuse Hotline

Available 24/7

Collect Calls Accepted