



WHAT ARE WE DOING WITH OUR LIVES?

NOBODY CARES ABOUT
OUR CONCURRENCY
CONTROL RESEARCH

SIGMOD 2017

I am only allowed 3 plugs in this talk.





DISK-ORIENTED CONCURRENCY CONTROL

3

Allows a DBMS to mask the latency of non-volatile storage.

Pioneering work on transaction processing from the 1970s.



Jim Gray



The Great
Phil Bernstein



New concurrency control schemes are needed if the database is assumed to be in memory.

Early research in 1980s.

Some commercial DBMSs from 1990s.



Partitioned Protocols

→ **H-Store** (VLDB 2007)

Non-Partitioned Protocols

→ **Microsoft Hekaton** (VLDB 2011)

→ **Silo** (SOSP 2013)



All of this research is great for “classic” OLTP applications.

We are not addressing the needs of new fields and environments.



Peter Bailis examined real-world DB applications. Few of them use txns and many of them don't use them correctly.



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We did an automated evaluation with the CMDBAC corpus. Few apps written in popular frameworks use txns.





Assumption #1: All transactions execute as stored procedures.

Assumption #2: All transactions execute with serializable isolation.



Examined SIGMOD and VLDB publications from 2011-2016.

We found **95** out of 1843 (5%) papers on transaction processing and concurrency control.

73%

57%

50%



We commissioned a survey of DBAs in April 2017 on how applications use databases.
50 responses for 79 DBMS installations.



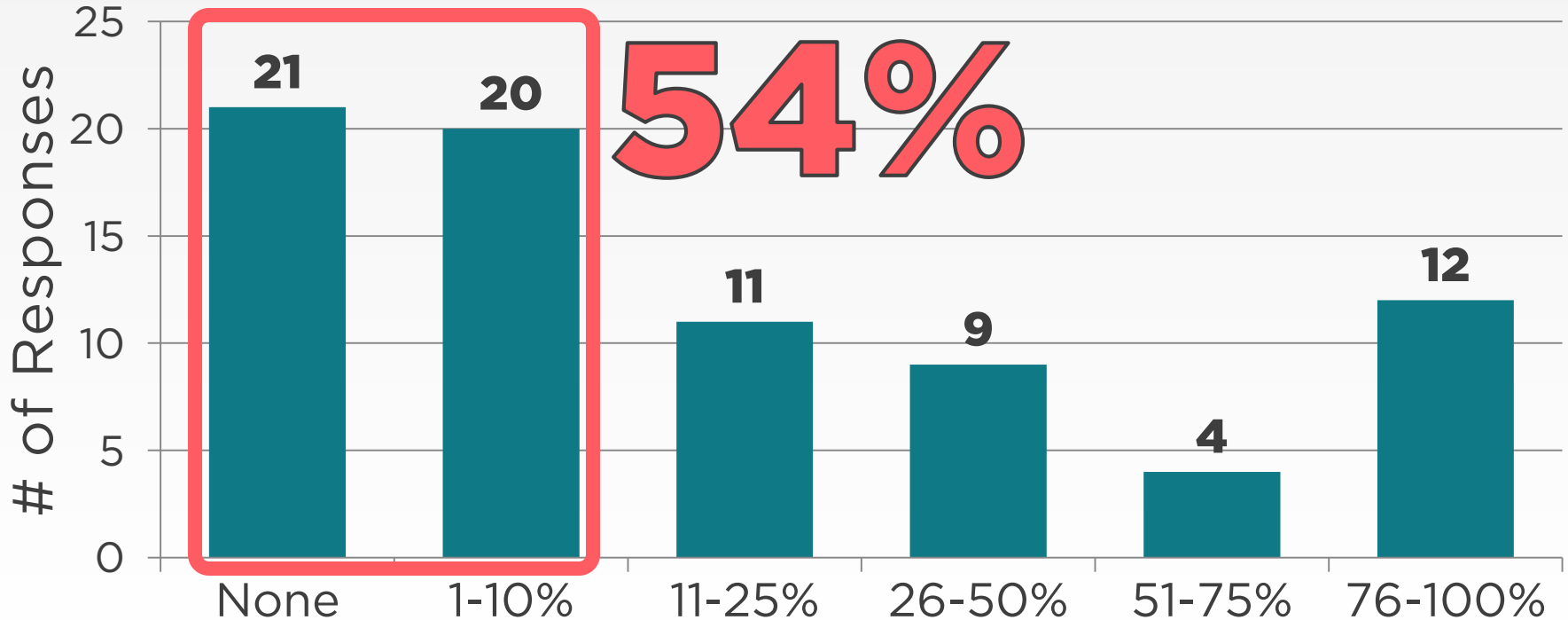
+Nine others



DATABASE ADMIN SURVEY

STORED PROCEDURES

What percentage of the transactions run on your DBMS are executed as stored procedures?

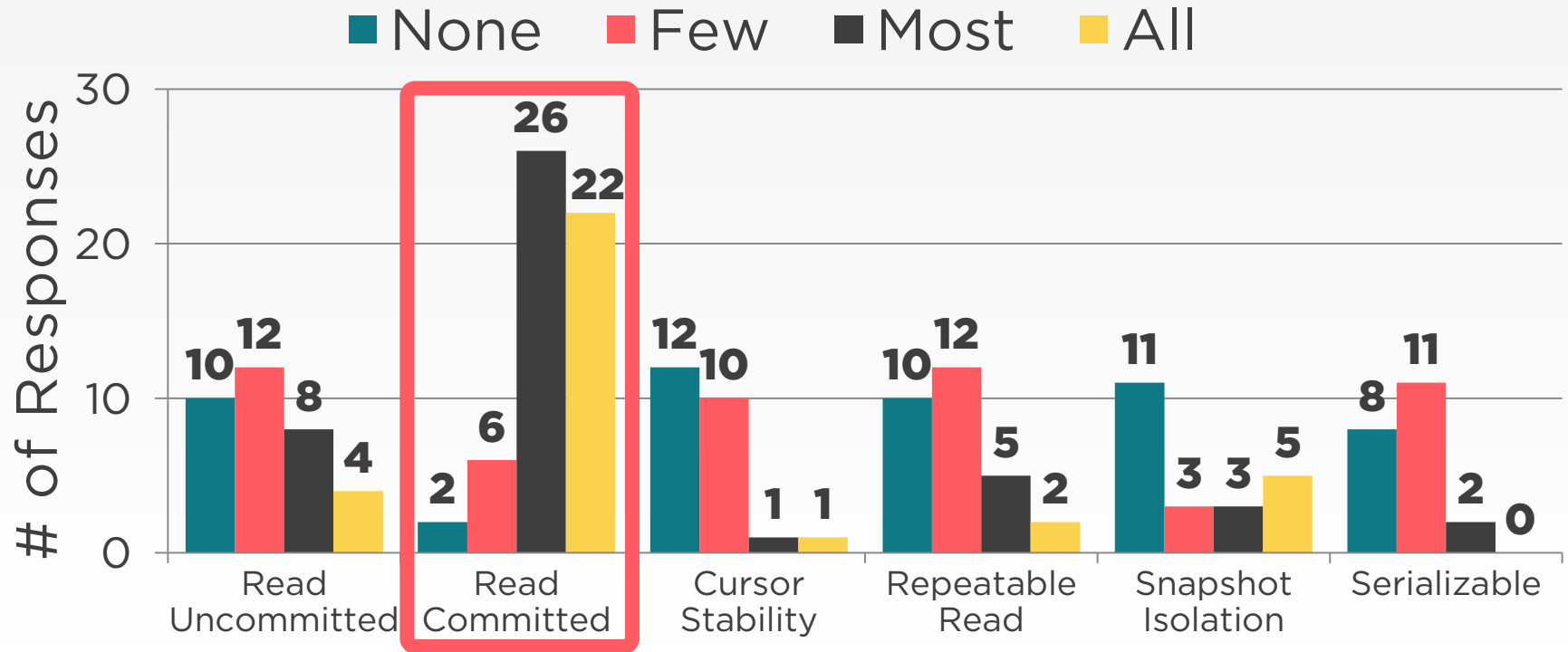




DATABASE ADMIN SURVEY

ISOLATION LEVEL

What isolation level do transactions execute at on this DBMS?





Stored Procedures

- Software engineering challenges.
- Don't want devs to update too often.

Serializable Isolation

- It was always done this way.
- Not worth the overhead.



Assuming that every txn executes as a stored procedure with serializable isolation changes the bottleneck.

You end up optimizing things that are not as important as you think...

Aren't I being hypocritical?



APPLY

FACULTY POSITIONS



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[Jessica Packer](#)

Research Interests:

#1 - My Wife

#2 - Databases



- **Examine Entire DBMS Architecture**
- **Communication Overhead**
- **Understand Lower Isolation Levels**



The DBMS's concurrency control protocol is not the only critical part of executing txns in a DBMS.



The
prot
exec

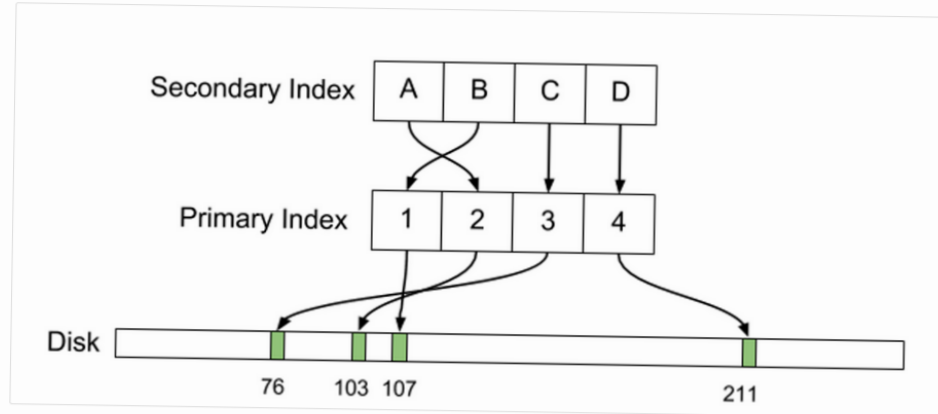
of

ARCHITECTURE

WHY UBER ENGINEERING SWITCHED FROM POSTGRES TO MYSQL

JULY 26, 2016

BY EVAN KLITZKE





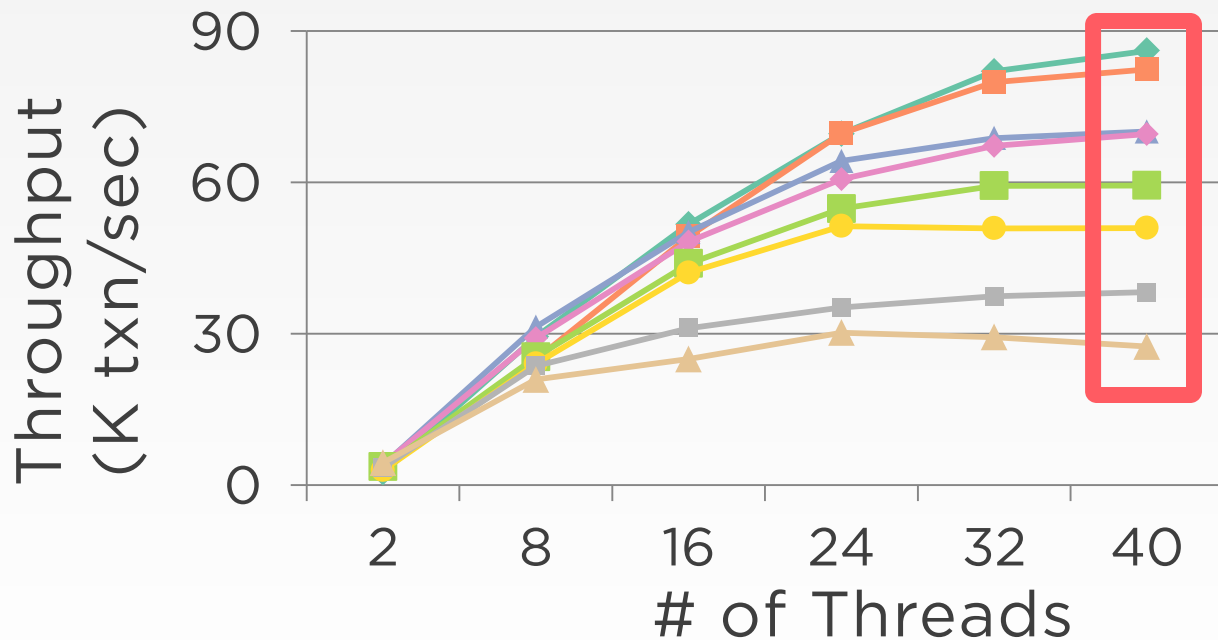
The DBMS's concurrency control protocol is not the only critical part of executing txns in a DBMS.

- **Secondary Indexes**
- **Version Storage / Ordering**
- **Garbage Collection**



IN-MEMORY MULTI-VERSION CONCURRENCY CONTROL STUDY

*Hybrid Workload
TPC-C + OLAP Query (40wh)*



MVCC Configurations

- ◆ Oracle/MySQL
- NuoDB
- ▲ HYRISE
- ◆ MemSQL
- HyPer
- SAP HANA
- Hekaton
- ▲ Postgres

2.5



Most applications are in the same data center as the DBMS machine.

Kernel bypass methods:

→ RDMA

→ Intel DPDK

Prefetching with machine learning.



We don't understand how applications are affected by lower isolation levels.

Maybe READ COMMITTED is good enough or maybe people don't know how dirty their data actually is...



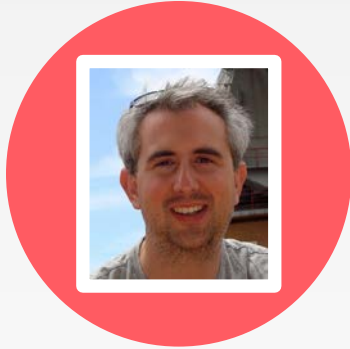
It is (still) an interesting time for database research. Let's make sure we work on the right problems.

We need a better way of collecting information about applications.

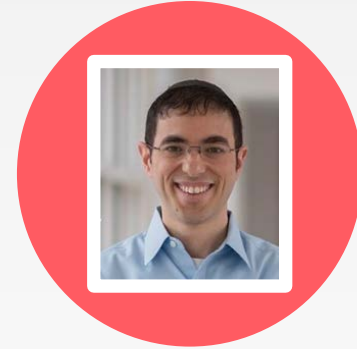


SOME PEOPLE DO CARE ABOUT OUR CONCURRENCY CONTROL RESEARCH

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**Serializable
Snapshot Isolation**
Michael Cahill

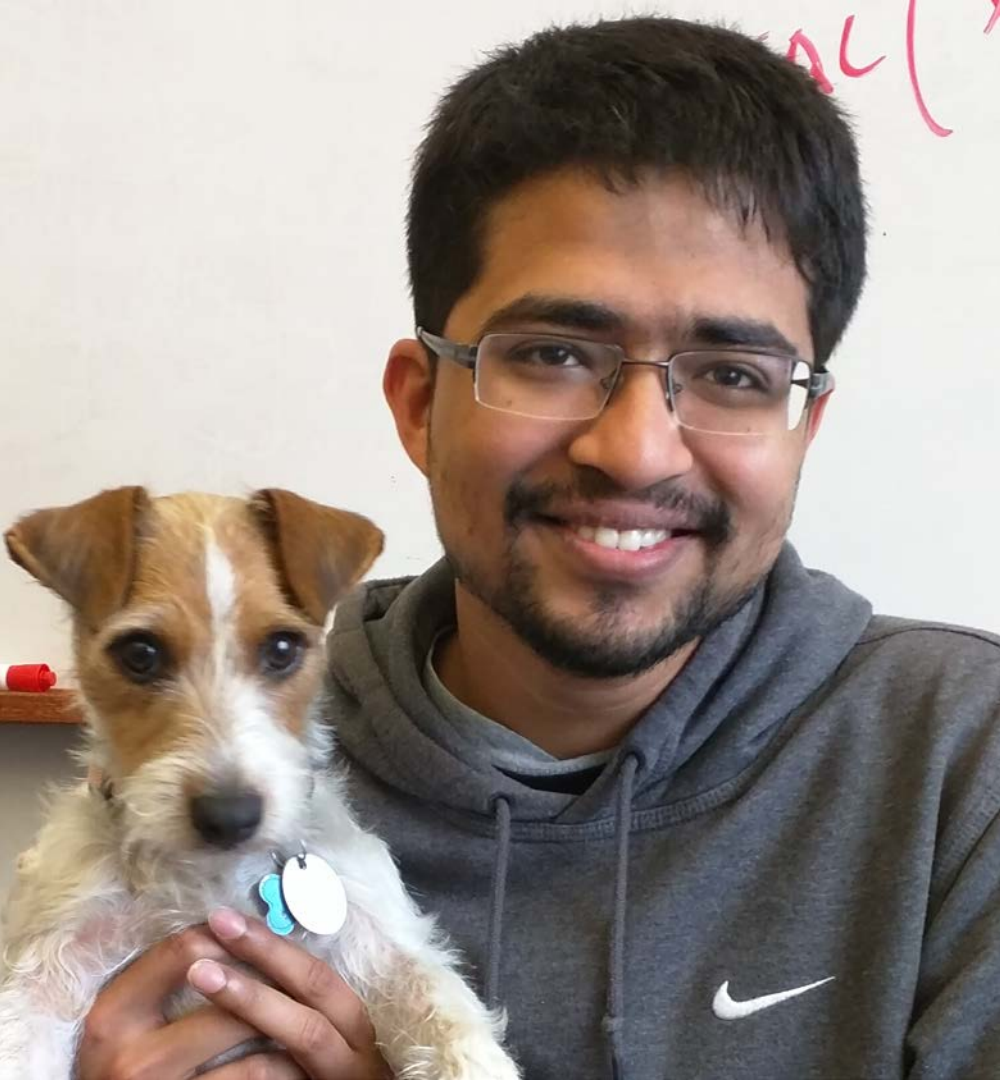


**Deterministic
Concurrency Control**
Dan Abadi



END

@andy_pavlo



Joy Arulraj

Winter 2018

