MySQL vs MongoDB

When to Use Which Technology

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In This Presentation

Very brief discussion on merits of MySQL and MongoDB

Why MySQL and MongoDB ?

Most Popular OpenSource SQL and NoSQL Engines

327 systems in ranking, May 2017

Rank			DBMS	Database Model	Score		
May 2017	Apr 2017	May 2016			May 2017	Apr 2017	May 2016
1.	1.	1.	Oracle	Relational DBMS	1354.31	-47.68	-107.71
2.	2.	2.	MySQL	Relational DBMS	1340.03	-24.59	-31.80
3.	3.	3.	Microsoft SQL Server	Relational DBMS	1213.80	+9.03	+70.98
4.	4.	↑ 5.	PostgreSQL	Relational DBMS	365.91	+4.14	+58.30
5.	5.	↓ 4.	MongoDB	Document store	331.58	+6.16	+11.36
6.	6.	6.	DB2	Relational DBMS	188.84	+2.18	+2.88
7.	7.	↑ 8.	Microsoft Access	Relational DBMS	129.87	+1.69	-1.70
8.	8.	↓ 7.	Cassandra	Wide column store	123.11	-3.07	-11.39
9.	9.	9.	Redis	Key-value store	117.45	+3.09	+9.21
10.	10.	10.	SQLite	Relational DBMS	116.07	+2.27	+8.81

Why MySQL and MongoDB ?

Two Technologies Percona Provides Solutions For

Full Disclosure

I know MySQL Much better than MongoDB… which will impact my bias

MySQL

Relational Database First and Foremost

Full SQL Support, Transactions, ACID

Designed for a Single Server first

Scale-Out as Afterthought

MongoDB

Designed for “Web Scale”

Scalability, Cloud, Multiple Machines

Replication and Sharding part of initial design

Only features which can scale

Q1: What do you know and love?

Both MySQL and MongoDB are very capable. Your experience and preference matter

Q2: Which data model fits better ?

Relational

- MySQL Obvious Choice

Document Based

- MongoDB Obvious choice
- MySQL has Document Store starting 5.7

Q3: How Data is Used

Data belongs to single application

- JSON model more expressive for application data structures
- Schema designed for specific access paths

Data shared by multiple applications

- Relational structure easier to share
- Can be more flexible in how data is accessed

Q4: Transactions

Need full Transactions

- MySQL can be better choice
- One of the main benefits of MySQL Document Store

Do not need Transactions

- MongoDB can be great choice
- Can do Atomic Document Updates

Q5: JOINs

Advanced JOINs and other SQL features

- MySQL much more powerful
- $lookup and $graphLookup features in MongoDB aggregation framework

Mainly simple lookups with filters/sorting

- MongoDB and MySQL both do these very well

Q6: Scale

Single Server is Good Enough

- MySQL works great
- Well optimized for Many cores; large memory; fast storage

Need Massive Scale out

- Automated shading in MongoDB is much better
- Replication in MongoDB is easier to use
- Solutions like Vitess try to make it less painful for MySQL

Q7: Large Scale Aggregation

MongoDB

- has built in aggregation framework for parallel processing
- BI Connector and ToroDB for SQL access
- Replicate to Hadoop

MySQL

- Executes every query single threaded
- MariaDB ColumnStore (InfiniDB reborn)
- ClickHouse
- Replicate to Hadoop

MySQL and MongoDB compared

Courtesy of Alexander Rubin

From MySQL to mongoDB

MySQL	*MongoDB*
mysql> select * from zips limit 1\G *************************** 1. row *************************** country_code: US postal_code: 34050 place_name: FPO admin_name1: admin_code1: AA admin_name2: Erie admin_code2: 029 admin_name3: admin_code3: latitude: 41.03750000 longitude: -111.67890000 accuracy: 1 row in set (0.00 sec)	MongoDB shell version: 3.0.8 connecting to: zips > db.zips.find().limit(1).pretty() { "_id" : "01001", "city" : "AGAWAM", "loc" : [-72.622739, 42.070206], "pop" : 15338, "state" : "MA" }

Where is my *SQL*?

SQL to MongoDB Mapping Chart

https://docs.mongodb.org/manual/reference/sql-comparison/

MySQL	*MongoDB*
CREATE TABLE users (id MEDIUMINT **NOT NULL** AUTO_INCREMENT, user_id Varchar(30), age Number, status char(1), **PRIMARY KEY** (id))	db.users.insert({ user_id: "abc123", age: 55, status: "A" }) (no schema)

Where is my *SQL*?

SQL to MongoDB Mapping Chart

https://docs.mongodb.org/manual/reference/sql-comparison/

MySQL	*MongoDB*
SELECT * **FROM** users **WHERE** status = "A" **AND** age = 50	db.users.find({ status: "A", age: 50 })

Where is my */etc/my.cnf*?

MySQL	*MongoDB*
/etc/my.cnf	/etc/mongod.conf # Where and how to store data. storage: dbPath: /datawt journal: enabled: true engine: wiredTiger ... /usr/bin/**mongod** -f /etc/**mongod**.conf

Where are my *databases/tables*?

MySQL	*MongoDB*
Databases `mysql> show databases;` `+--------------------+` `| Database |` `+--------------------+` `| information_schema |` `...` `mysql> use zips` `Database changed` **Tables** `mysql> show tables;` `+----------------+` `| Tables_in_zips |` `+----------------+` `| zips |` `+----------------+`	**Databases** `> show dbs;` `admin 0.000GB` `local 0.000GB` `osm 13.528GB` `test 0.000GB` `zips 0.002GB` `> use zips` `switched to db zips` **Collections** `> show collections` `zips` `> show tables // same` `zips`

Where is my *InnoDB*?

MySQL	*MongoDB*
MyISAM	MMAPv1 memory mapped stored engine,
InnoDB	WiredTiger transactional, with compression, btree
TokuDB	Percona Memory Engine
MyRocks (RocksDB)*	MongoRocks (RocksDB)

Where is my *Processlist*?

```
mysql> show processlist\G
*************************** 1. row ***************************
           Id: 137259
         User: root
         Host: localhost
           db: geonames
      Command: Query
         Time: 0
        State: init
         Info: show processlist
    Rows_sent: 0
Rows_examined: 0
1 row in set (0.00 sec)
```

```
> db.currentOp()
{
        "inprog" : [
                {
                        "desc" : "conn28",
                        "threadId" : "0x19b85260",
                        "connectionId" : 28,
                        "opid" : 27394208,
                        "active" : true,
                        "secs_running" : 3,
                        "microsecs_running" :
                              NumberLong(3210539),
                        "op" : "query",
                        "ns" : "osm.points3",
                        "query" : {
                                "name" : "Durham"
                        },
                        "planSummary" : "COLLSCAN",
                        "client" : "127.0.0.1:58835",
                        "numYields" : 24905,
                        "locks" : {
                                "Global" : "r",
                                "Database" : "r",
                                "Collection" : "r"
                        },
                        "waitingForLock" : false,
  ...
}
```

Where are my *Grants*?

```
mysql> grant all on *.* to
user@localhost identified by ‘pass’;
```

```
> use products
db.createUser(
   {
     user: "accountUser",
     pwd: "password",
     roles: [ "readWrite",
"dbAdmin" ]
   }
)
```

Where is my *Index*?

MySQL	*MongoDB*
mysql> show keys from zips\G *************************** 1. row *************************** Table: zips Non_unique: 0 Key_name: PRIMARY Seq_in_index: 1 Column_name: id Collation: A Cardinality: 0 Sub_part: NULL Packed: NULL Null: Index_type: BTREE Comment: Index_comment: *************************** 2. row *************************** Table: zips Non_unique: 1 Key_name: postal_code Seq_in_index: 1	> db.zips.getIndexes() [{ "v" : 1, "key" : { "_id" : 1 }, "name" : "_id_", "ns" : "zips.zips" }]

Where is my *add index*?

```
mysql> alter table zips add key
(postal_code);
Query OK, 0 rows affected (0.10
sec)
Records: 0  Duplicates: 0
Warnings: 0
```

```
> db.zips.createIndex({ state : 1 } )
{
        "createdCollectionAutomatically" :
false,
        "numIndexesBefore" : 1,
        "numIndexesAfter" : 2,
        "ok" : 1
}

// Index can be sorted:

> db.zips.createIndex({ state : -1 } )
{
        "createdCollectionAutomatically" :
false,
        "numIndexesBefore" : 2,
        "numIndexesAfter" : 3,
        "ok" : 1
}
```

Where is my *Slow Query Log*?

MySQL

```
mysql> set global long_query_time = 0.1;
Query OK, 0 rows affected (0.02 sec)

mysql> set global slow_query_log = 1;
Query OK, 0 rows affected (0.02 sec)

mysql> show global variables like
'slow_query_log_file';
+---------------------+-----------------------------+
| Variable_name       | Value                       |
+---------------------+-----------------------------+
| slow_query_log_file | /var/lib/mysql/thor-slow.log |
+---------------------+-----------------------------+
1 row in set (0.00 sec)
```

MongoDB

db.setProfilingLevel(level, slowms)

Level: 0 for no profiling, 1 for only slow operations, or 2 for all operations.

Slowms = long_query_time but in milliseconds

```
> db.setProfilingLevel(2, 100);
{ "was" : 0, "slowms" : 100, "ok" : 1 }

> db.system.profile.find( { millis : { $gt : 100 } }
).pretty()
{
        "op" : "query",
        "ns" : "zips.zips",
        "query" : {
                "city" : "DURHAM"
        },
        "ntoreturn" : 0,
..
```

From  to 

Export from MySQL 5.7:

```
mysql> SELECT JSON_OBJECT('name', replace(name, '"', ''), 'other_tags',
replace(other_tags, '"', ''), 'geometry', st_asgeojson(shape)) as j
       FROM `points` INTO OUTFILE '/var/lib/mysql-files/points.json';
Query OK, 13660667 rows affected (4 min 1.35 sec)
```

From MySQL to mongoDB

Load to MongoDB (parallel):

```
mongoimport --db osm --collection points -j 24 --file /var/lib/mysql-files/points.json
2016-04-11T22:38:10.029+0000    connected to: localhost
2016-04-11T22:38:13.026+0000    [........................] osm.points  31.8 MB/2.2 GB (1.4%)
2016-04-11T22:38:16.026+0000    [........................] osm.points  31.8 MB/2.2 GB (1.4%)
2016-04-11T22:38:19.026+0000    [........................] osm.points  31.8 MB/2.2 GB (1.4%)
…
2016-04-11T23:12:13.447+0000    [########################] osm.points  2.2 GB/2.2 GB (100.0%)
2016-04-11T23:12:15.614+0000    imported 13660667 documents
```

Thinking about using MongoDB ?

Consider trying out Percona Server for MongoDB

PERCONA
Server for MongoDB

Percona Server for MongoDB 3.4

100% Compatible with MongoDB 3.4 Community Edition

Open Source with Alternatives to many MongoDB Enterprise Features

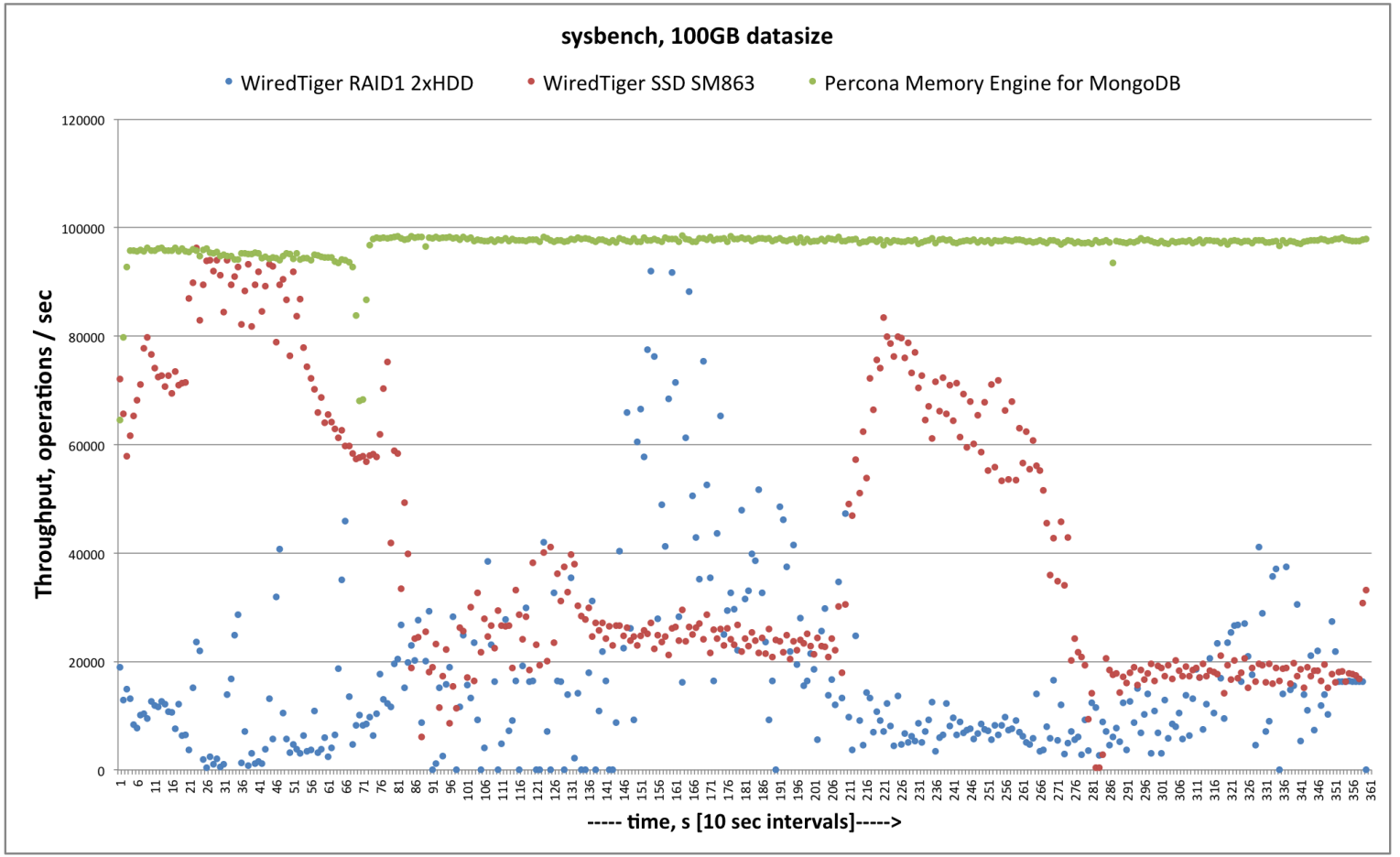
MongoRocks (RocksDB) and Percona Memory Engine

New: Sensitive Data Masking

New: Query Sampling

New: Hot Backup for WiredTiger and MongoRocks

Percona Memory Engine for MongoDB Benchmarks



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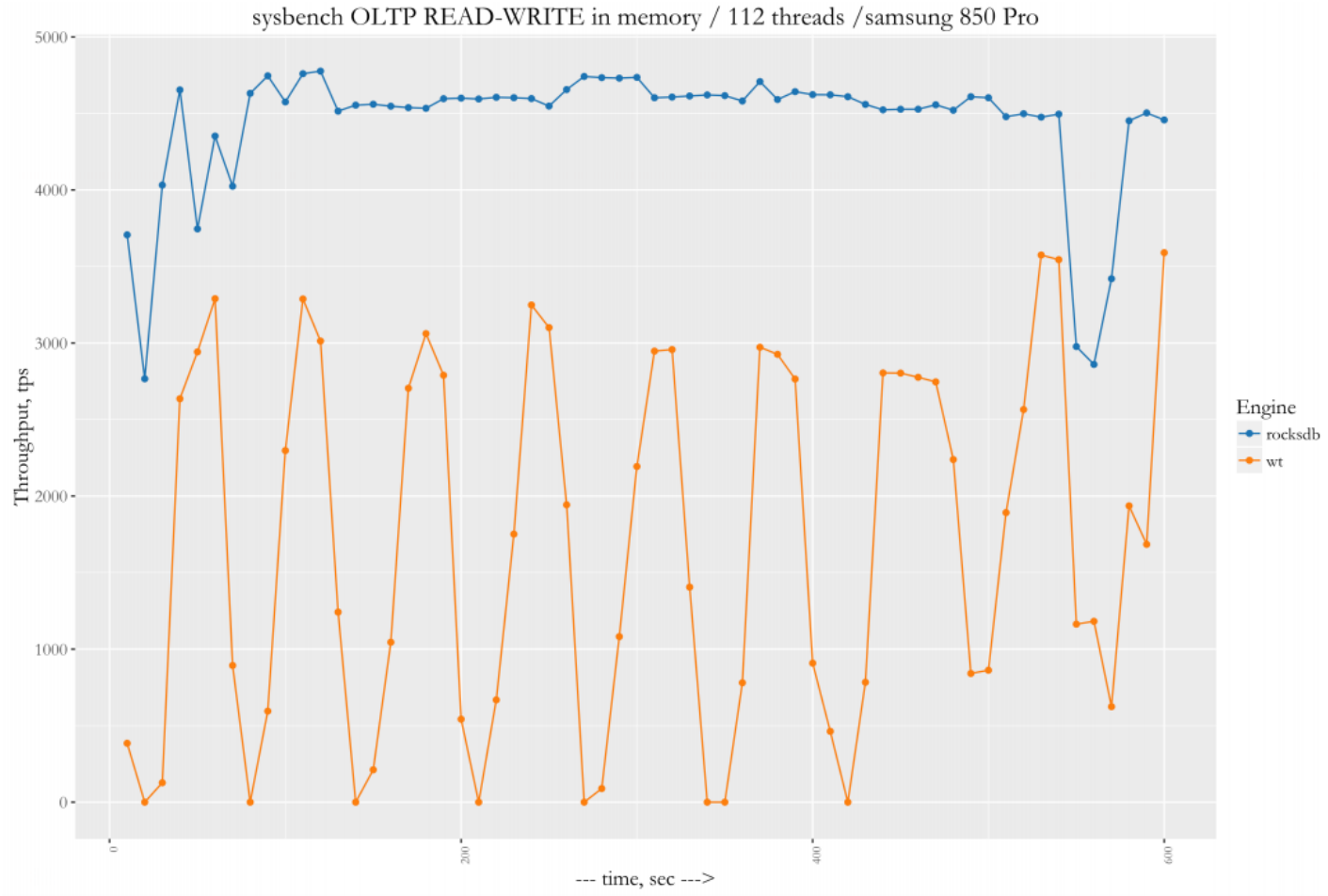
WiredTiger vs MongoRocks – write intensive



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Database Performance Matters