# EffectiveMySQL.com

#### Its all about Performance and Scalability

## Common MySQL Scalability Mistakes

Ronald Bradford http://ronaldbradford.com

2011.04

EffectiveMySQL.com - Its all about Performance and Scalability

## AUTHOR

2010 - Oracle ACE Director (first in MySQL)



- Co Author of Expert PHP & MySQL
- Top individual blog contributor to Planet MySQL
- 22 years of RDBMS experience, 12 years with MySQL
  - MySQL Inc (2006-2008), Oracle Corp (96-99)

Provide independent consulting/ Available NOW



ORACLE

ACE Director

EffectiveMySQL.com - Its all about Performance and Scalability



My website seems to freeze or responds randomly?



The default MyISAM storage engine uses exclusive table locks for DML.

EffectiveMySQL.com - Its all about Performance and Scalability

## SOLUTION

PROBLE

#### Optimize blocking query performance

EffectiveMySQL.com - Its all about Performance and Scalability

Use a transactional engine with MVCC and row based locking to address the LOCKING issue End user report that selects all customer, order, order lines and order history data and performs poor joins. This takes shared read locks blocking future write locks then future reads. MySQL is unique in that it offers different mechanisms for storing and retrieving data, each with strengths and weaknesses.

The DEFAULT is not always the best.

EffectiveMySQL.com - Its all about Performance and Scalability

# MySQL PROCESSLIST Blocked have State = Locked Blocker - Same table, larger Time

#### mysql> SHOW PROCESSLIST;

	db	Command	Time   State	Info
++   13   app1   localhost   14   app1   localhost   15   app1   localhost	odtug   odtug	Query   Query	<b>144</b>   User sleep   116   <b>Locked</b>	

#### EffectiveMySQL.com - Its all about Performance and Scalability

- Optimize Blocker
  - Indexes
  - Limit query
  - Summary table
  - Change storage engine



## HOW



## Why is my database so large?



Don't store large static objects in the database

EffectiveMySQL.com - Its all about Performance and Scalability

EffectiveMySQL.com - Its all about Performance and Scalability



- 80% of data is email content/ attachments
- 60% of data is PDF documents
- 30% of data is uncompressed large XML objects

Maximize memory usage for important data Reduce database recovery time



Compress large text data
 90% saving on XML data

Store static data in files

EffectiveMySQL.com - Its all about Performance and Scalability

Avoids DB handling overhead

#### Table Size per schema

# Schema	Table Usage
SELECT	<pre>table_schema,table_name,engine,row_format, table_rows, avg_row_length,</pre>
	(data_length+index_length)/1024/1024 as total_mb,
	(data_length)/1024/1024 as data_mb,
	(index_length)/1024/1024 as index_mb,
	CURDATE() AS today
FROM	information_schema.tables
WHERE	table_schema = DATABASE()
ORDER BY	7 DESC;

http://ronaldbradford.com/mysql-dba/

EffectiveMySQL.com - Its all about Performance and Scalability

## PROBLEM

#### I can't access my website?

EffectiveMySQL.com - Its all about Performance and Scalability



## HOW

## TRUE STORY

#### **Question:**

How do you know when your server is down or not accessible?

#### **Answer:**

The users will let us know.

## SOLUTION

Integrated monitoring including graphical interface, real time analysis and notification

EffectiveMySQL.com - Its all about Performance and Scalability

EffectiveMySQL.com - Its all about Performance and Scalability

#### Monitoring/Alerting

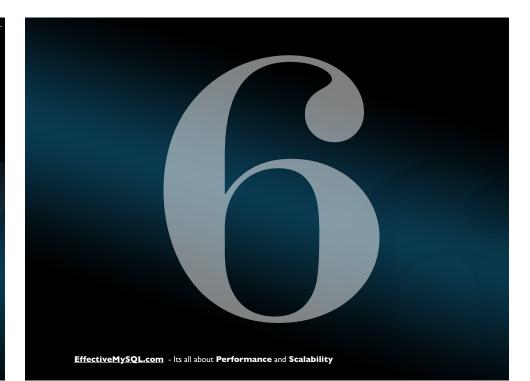
- Graphical
- Historical
- Necessary
- Generally missing/incomplete
- Useless for real-time analysis

- Dashboard
  - The state of NOW
  - Sampling at 1s/3s/5s
    - e.g. 0.1% of throughput

#### Instrumentation

- Important to business viability
  - e.g. orders per minute
  - page load time
- Seamless implementation
  - i.e. no code changes to view real-time
  - extensible

EffectiveMySQL.com - Its all about Performance and Scalability



## SOLUTION

# PROBLEM

# My replication slave can't keep up?

Know the weakest link(s) of MySQL replication and don't exceed that, or cheat. If replication can't catchup, slaves are useless. Backup & recovery may also suffer.

#### Master

- DML Statement
- Write Data/Redo Log
- Write Binary Log
- Return OK to client

EffectiveMySQL.com - Its all about Performance and Scalability

#### EffectiveMySQL.com - Its all about Performance and Scalability

#### Slave

- Detect master log change
- Retrieve binary log entry
- Write relay log (IO\_THREAD)
- Read relay log
- Apply DML (SQL\_THREAD)
- Write Data/redo log

#### Replication workarounds

- Restrict queries executed
  - --ignore
- Different storage engines
- Different index structures

### EXPERT TIP

Advanced workarounds

- RAID 0 (large number of slaves)
- Pre fetch thread

EffectiveMySQL.com - Its all about Performance and Scalability

## PROBLEM

My server has crashed with a hard drive failure



#### **Question:**

Have you ever performed a database recovery? **Answer:** No, why?

## TRUE STORY

#### **Consultant:**

Do you know that your daily backups only recover the data up to that time, e.g. 1am. You know you have lost all your sales and changes since then.

#### **Customer:**

No, I didn't know that.

EffectiveMySQL.com - Its all about Performance and Scalability

## SOLUTION

- Have a DR Plan
  - Documented
  - Tested
  - Timed
  - Verified End to End

EffectiveMySQL.com - Its all about Performance and Scalability

Do you pass the MySQL backup/ recovery quiz?

#### http://rb42.com/mysql-backup-quiz

- 1. Do you have MySQL backups in place?
- 2. Do you backup ALL your MySQL data?
- 3. Do you have consistent MySQL backups?
- 4. Do you have backups that include both static snapshot and point in time transactions?
- 5. Do you review your backup logs EVERY SINGLE day or have tested backup monitoring in place?
- 6. Do you perform a test recovery of your static backup?
- 7. Do you perform a test recovery to point in time?
- 8. Do you time your backup and recovery process and review over time?
- 9. Do you have off-site copies of your backups?
- 10. Do you backup your primary binary logs?

#### http://rb42.com/mysql-backup-quiz

## PROBLEM

Why is my database executing 1,200 qps for 50 users?

EffectiveMySQL.com - Its all about Performance and Scalability

## SOLUTION

Determine what queries are running and why they are running? Excessive SQL statements

Duplicate
Redundant
Cachable
Row at a time (RAT)

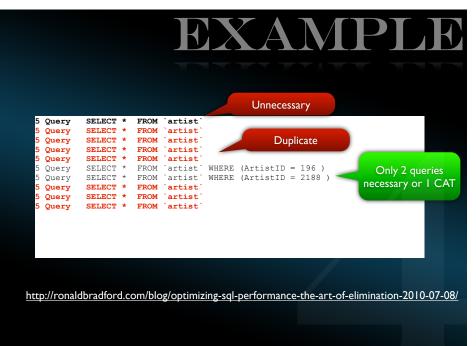


Reducing SQL load both improves performance now and provides greater capacity as you scale

								RAT
SELECT	* FROM a	activities_t	heme	WHERE	theme_	parent	id=0	
SELECT	* FROM a	activities_t	heme	WHERE	theme	parent	id=1	
SELECT	* FROM a	activities t	heme	WHERE	theme	parent	id=2	
SELECT	* FROM a	activities <sup>—</sup> t	heme	WHERE	theme	parent		1
SELECT	* FROM a	activities t	heme	WHERE	theme	parent		6
		_			_			
SELECT	*							
FROM	activiti	ies theme					CAT	
WHERE	theme pa	arent id in	(0,1	1,2,11,	16)			
	_	—						

http://ronaldbradford.com/blog/optimizing-sql-performance-the-art-of-elimination-2010-07-08/

EffectiveMySQL.com - Its all about Performance and Scalability



EXAMPLE

Unnecessary

SELECT pages\_id, pages\_livestats\_code, pages\_title, pages\_parent, pages\_exhibid, pages\_theme, pages\_accession\_num FROM pages WHERE pages id = 0

5 minutes

6000 executions

0 is out of bounds

http://ronaldbradford.com/blog/optimizing-sql-performance-the-art-of-elimination-2010-07-08/

EffectiveMySQL.com - Its all about Performance and Scalability

# Capture & Analyze DML is easy SELECT is harder

EffectiveMySQL.com - Its all about Performance and Scalability

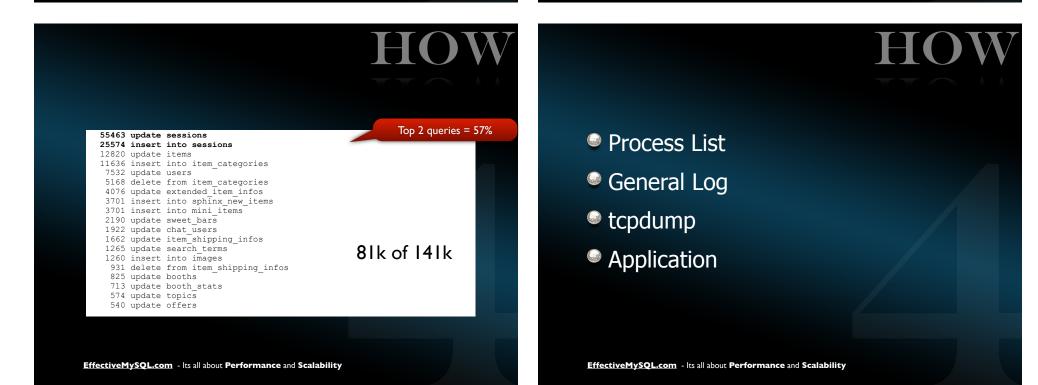
http://www.slideshare.net/ronaldbradford/capturing-analyzing-and-optimizing-mysql

## HOW

MySQL Binary Log (Archive Redo)

- mysqlbinlog
  - mk-query-digest
  - One Liner

http://ronaldbradford.com/blog/mysql-dml-stats-per-table-2009-09-09/



## HOW

## Capturing, Analyzing and Optimizing your SQL

http://www.slideshare.net/ronaldbradford/capturing-analyzing-and-optimizing-mysql

EffectiveMySQL.com - Its all about Performance and Scalability



/\* Comment your queries \*/

The more products you have, the more developers you have, the more time you spend in code identification before you can even determine a resolution

EffectiveMySQL.com - Its all about Performance and Scalability

## PROBLEM

The database is slow. My webpage takes five seconds to load.



Evaluate the time taken in the database and all stages in between

SOLUTI

EffectiveMySQL.com - Its all about Performance and Scalability

EXAMPLE

Client example showed a webpage taking 5 seconds to load. The html component was taking only 400 ms. Any MySQL performance improvement will only tune 8% of the total time.

EffectiveMySQL.com - Its all about Performance and Scalability

Performance is important to end user Performance is perception Firebug - http://getfirebug.com/

- Httpwatch <u>http://httpwatch.com/</u>
- Page speed http://code.google.com/speed/page-speed/
- Slow <u>http://developer.yahoo.com/yslow/</u>
- wget/curl
- Application code instrumentation

### EXPERT TIP

- <u>http://www.stevesouders.com/</u>
- <u>http://developer.yahoo.com/</u> <u>performance/rules.html</u>

EffectiveMySQL.com - Its all about Performance and Scalability

## PROBLEM

I want to add new H/W. How do I change my application to support this? Develop a seamless integration that requires no code changes, no downtime and very little additional physical resources.

## HOW

- Integrated monitoring and instrumentation
  - Deployed from Day 1

EffectiveMySQL.com - Its all about Performance and Scalability

- Seamless automated server deployment
  - Version Control
  - Build & Release
  - Runtime config management
  - Automated discovery

EffectiveMySQL.com - Its all about Performance and Scalability

#### Sec. API

- One code path for business functionality
- Implied business documentation
- Enforced data exchange standard
- Testability

- Different levels of data availability
  - Read & Write
  - Read Only
  - No Access
  - Cached



- Different principles for scalability
  - Read Scalability
  - Write Scalability
  - Caching

EffectiveMySQL.com - Its all about Performance and Scalability



#### Successful MySQL Scalability

- 1. Integrated monitoring & instrumentation
- 2. Seamless automated server deployment
- 3. Disaster is inevitable
- 4. Application Programming Interface
- 5. Support different levels of data availability
- 6. Support different scalability principles

http://ronaldbradford.com/blog/successful-mysql-scalability-presentation-2010-09-17/

EffectiveMySQL.com - Its all about Performance and Scalability

## PROBLEM

#### My website is slow?

## SOLUTION

#### Seek professional advice.

#### Hire for example Ronald Bradford.

- 22+ years of system architecture, database design and performance tuning.
- Employment as Consultant for Oracle Corporation (96-99)
- Employment as Senior Consultant for MySQL Inc (06-08)

EffectiveMySQL.com - Its all about Performance and Scalability

# EffectiveMySQL.com - Its all about Performance and Scalability

## RECAP

- Monitoring. Before, during and after NOW.
- You may not be able to predict the future but you can preempt the future.
- Choose the best product and features for you needs.
- The best SQL statement is the one you never have to execute.

#### 3 levels of real time data access.

- Read/Write, Read and no access
- 3 aspects of scalability.
  - Read, Write and Caching
- Operate below 90% capacity. That 10% is your insurance.

RECA



<u>http://ronaldbradford.com</u>
<u>me@ronaldbradford.com</u>

