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MySQL performance tuning 101 for Zabbix

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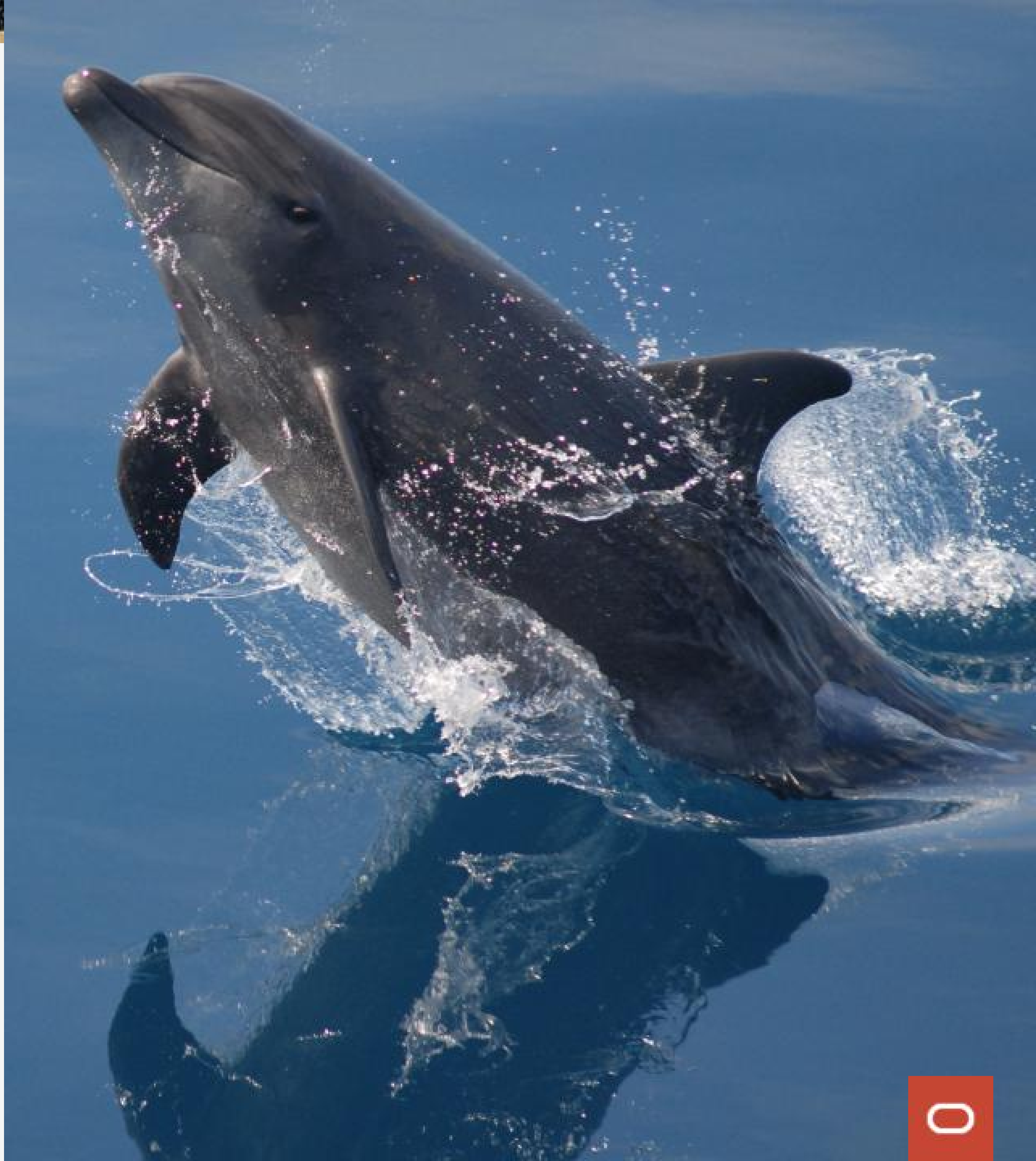


whoami

- Linux and MySQL user since ≈ 2006
- Working at Oracle/MySQL since 2017
  (lot of travel => lot of fun!)
- Regularly speaking at conferences
- Previously working in the Security and Digital Transformation (API) space

- From Italy but based in Warsaw
- Love movies, travelling, cooking…

Agenda

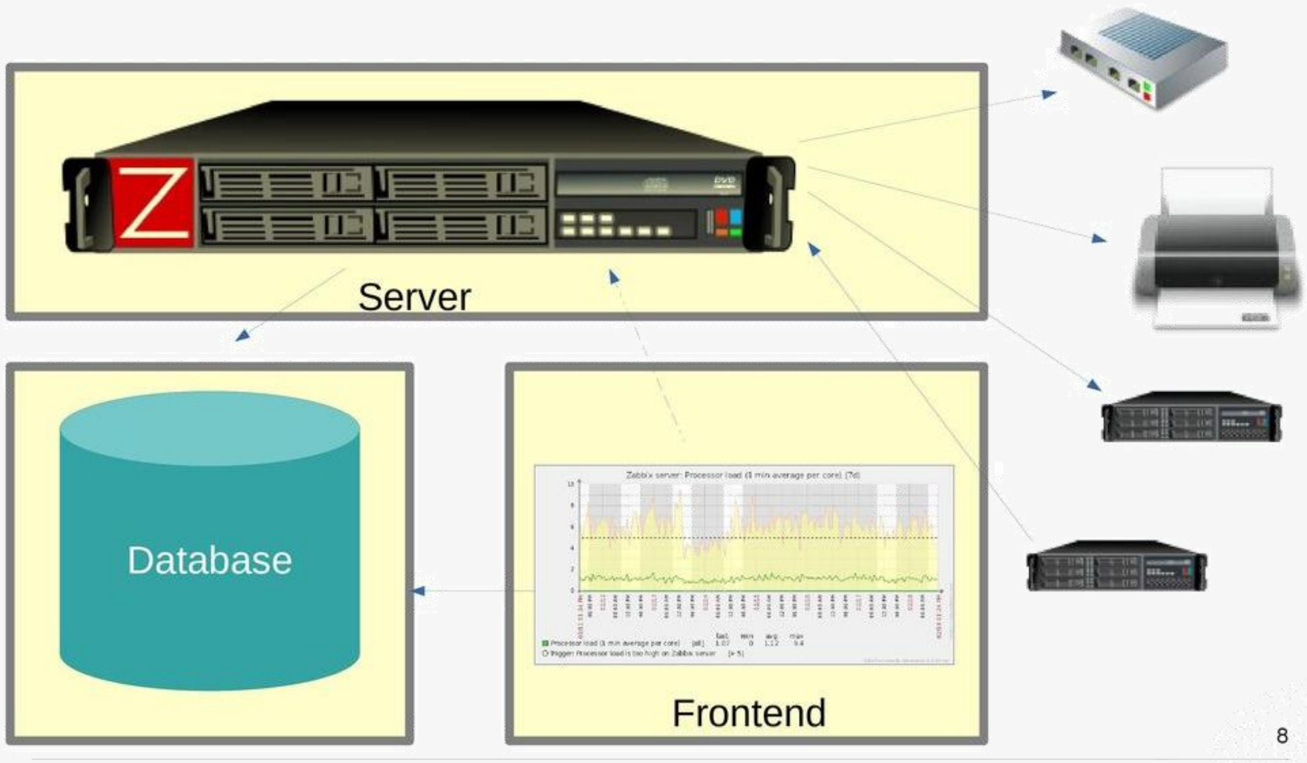
1 Zabbix and MySQL

2 Optimizing MySQL for Zabbix

3 What’s next?

Zabbix and MySQL

Zabbix and MySQL



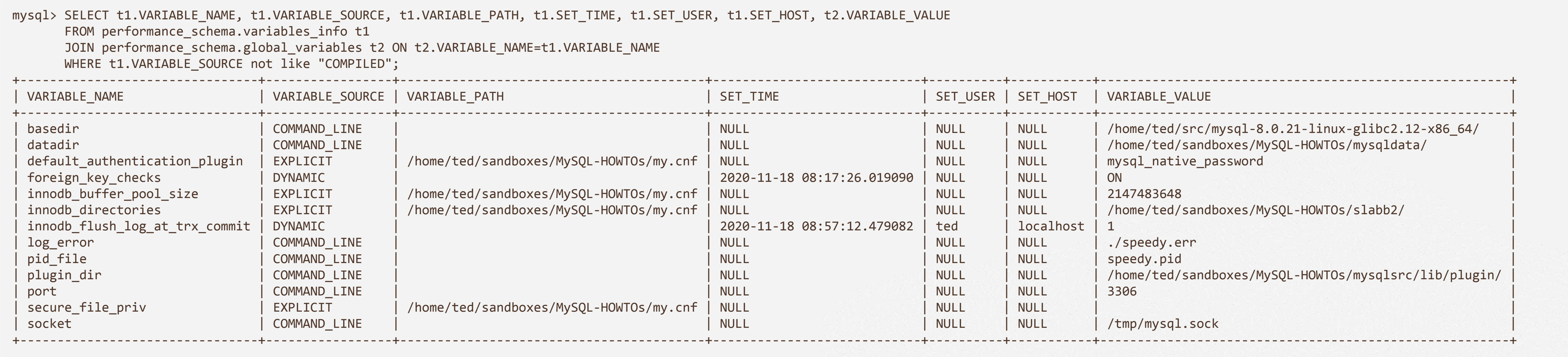
Optimizing MySQL for Zabbix

Balance the load on several disks

- datadir
  - Default location
- datadir innodb_data_file_path
  - size, and attributes of InnoDB system tablespace data files
- innodb_undo_directory
  - path to the InnoDB undo tablespaces
- innodb_log_group_home_dir
  - path to the InnoDB redo log files
- log-bin
  - dual functionality: enable binary logging and set path/file name prefix
- tmpdir (Random, SSD, tmpfs)

How to view your MySQL configuration

- When was the configuration changed and by who?
  - SELECT t1.*, VARIABLE_VALUE FROM performance_schema.variables_info t1 JOIN performance_schema.global_variables t2 ON t2.VARIABLE_NAME=t1.VARIABLE_NAME WHERE t1.VARIABLE_SOURCE not like "COMPILED";



```
mysql> SELECT t1.VARIABLE_NAME, t1.VARIABLE_SOURCE, t1.VARIABLE_PATH, t1.SET_TIME, t1.SET_USER, t1.SET_HOST, t2.VARIABLE_VALUE
       FROM performance_schema.variables_info t1
       JOIN performance_schema.global_variables t2 ON t2.VARIABLE_NAME=t1.VARIABLE_NAME
       WHERE t1.VARIABLE_SOURCE not like "COMPILED";
+--------------------------------+-----------------+-----------------------------------------+----------------------------+----------+-----------+-------------------------------------------------------+
| VARIABLE_NAME                  | VARIABLE_SOURCE | VARIABLE_PATH                           | SET_TIME                   | SET_USER | SET_HOST  | VARIABLE_VALUE                                        |
+--------------------------------+-----------------+-----------------------------------------+----------------------------+----------+-----------+-------------------------------------------------------+
| basedir                        | COMMAND_LINE    |                                         | NULL                       | NULL     | NULL      | /home/ted/src/mysql-8.0.21-linux-glibc2.12-x86_64/    |
| datadir                        | COMMAND_LINE    |                                         | NULL                       | NULL     | NULL      | /home/ted/sandboxes/MySQL-HOWTOs/mysqldata/           |
| default_authentication_plugin  | EXPLICIT        | /home/ted/sandboxes/MySQL-HOWTOs/my.cnf | NULL                       | NULL     | NULL      | mysql_native_password                                 |
| foreign_key_checks             | DYNAMIC         |                                         | 2020-11-18 08:17:26.019090 | NULL     | NULL      | ON                                                    |
| innodb_buffer_pool_size        | EXPLICIT        | /home/ted/sandboxes/MySQL-HOWTOs/my.cnf | NULL                       | NULL     | NULL      | 2147483648                                            |
| innodb_directories             | EXPLICIT        | /home/ted/sandboxes/MySQL-HOWTOs/my.cnf | NULL                       | NULL     | NULL      | /home/ted/sandboxes/MySQL-HOWTOs/slabb2/              |
| innodb_flush_log_at_trx_commit | DYNAMIC         |                                         | 2020-11-18 08:57:12.479082 | ted      | localhost | 1                                                     |
| log_error                      | COMMAND_LINE    |                                         | NULL                       | NULL     | NULL      | ./speedy.err                                          |
| pid_file                       | COMMAND_LINE    |                                         | NULL                       | NULL     | NULL      | speedy.pid                                            |
| plugin_dir                     | COMMAND_LINE    |                                         | NULL                       | NULL     | NULL      | /home/ted/sandboxes/MySQL-HOWTOs/mysqlsrc/lib/plugin/ |
| port                           | COMMAND_LINE    |                                         | NULL                       | NULL     | NULL      | 3306                                                  |
| secure_file_priv               | EXPLICIT        | /home/ted/sandboxes/MySQL-HOWTOs/my.cnf | NULL                       | NULL     | NULL      |                                                       |
| socket                         | COMMAND_LINE    |                                         | NULL                       | NULL     | NULL      | /tmp/mysql.sock                                       |
+--------------------------------+-----------------+-----------------------------------------+----------------------------+----------+-----------+-------------------------------------------------------+
```

InnoDB buffer pool

- innodb_buffer_pool_size
  - Amount of memory for storing db pages in memory.
  - Default value is to log, for production 50-75% of available memory on dedicated database server.
  - Since MySQL 5.7, innodb_buffer_pool_size can be changed dynamically.

How to check InnoDB Buffer Pool usage (in %):

```
SELECT CONCAT(FORMAT(DataPages*100.0/TotalPages,2),' %') BufferPoolDataPercentage
FROM (SELECT variable_value DataPages FROM information_schema.global_status
WHERE variable_name = 'Innodb_buffer_pool_pages_data') A,
(SELECT variable_value TotalPages FROM information_schema.global_status
WHERE variable_name = 'Innodb_buffer_pool_pages_total') B;
```

Binary logs

- Contains events that describe changes
- Provides data changes to be sent to Replicas
- Used for data recovery operations

How to control binary logs:

- log_bin, max_binlog_size, binlog_expire_logs_seconds, etc.
- Delete: PURGE BINARY LOGS TO|BEFORE
- Consider using GTID for replication

InnoDB redo logs

- innodb_log_file_size
  - Size of redo logs. Will impact write speed vs time to recover.
  - Default value is too low, for production min 512MB is suggested.
  - Total redo log capacity decided by innodb_log_files_in_group (default value 2).

Related Parameters:

- innodb_log_file_size
- innodb_log_files_in_group

Trading performance over consistency (ACID)

- When should InnoDB flush/sync committed truncations.
- innodb_flush_log_at_trx_commit:
  - 0 Transaction are written to redo logs once per second.
  - 1 (Default value) Fully ACID compliance. Redo-logs are written and flushed to disk at transaction commit.
  - 2 Transactions are written to redo logs at commit, redo logs are flushed ~ once per second.
- I always recommend using default (1 for consistency) setting unless:
  - You are bulk loading data, set session variable to 2 during load or if you are on latest mysql 8.0 versions you can also disable redo-logging completely.
  - You are experiencing a unforeseen peak in workload (hitting your disk-system) and need to survive until you can solve problem.
  - It's okay to loose some data….

table_open_cache and max_connections

Both parameters affect the maximum number of files the server keeps opened:

- table_open_cache: default 2000
- max_connections: default 151
- if you increase both TOO MUCH, you may run out of memory

N. of opened tables = N. of connections x N (max number of tables per join)

Control table_open_cache:

- SHOW GLOBAL STATUS LIKE 'Opened_tables';
- if too close to table_open_cache_maybe increase

- Additionally check open_files_limit in MySQL and ulimits in the OS

Other buffers that are per client connections

- Some buffers are per connection (max_connections):
  - read_buffer_size
  - read_rnd_buffer_size
  - join_buffer_size
  - sort_buffer_size
  - binlog_cache_size (if binary logging is enabled)
  - net_buffer_length
- Make sure you reserve some memory for these buffers if you have many connections.

Enabling Automatic Configuration for a Dedicated MySQL Server

- Setting innodb_dedicated_server, InnoDB automatically configures the following variables:
  - innodb_buffer_pool_size
  - innodb_log_file_size
  - innodb_log_files_in_group
  - innodb_flush_method
- Enabling innodb_dedicated_server is not recommended if the MySQL instance shares system resources with other applications.

What’s next?

Performance Tuning Dos

- **Think!!!**
- Consider the whole stack
- Test
- Work methodically:
  1. Define what you are trying to solve.
  2. Argue why the proposed change will work.
  3. Create action plan.
  4. Verify the change worked.

Performance Tuning Don’ts

- Micro manage
- Premature optimization
- Big bang
- Take “best practices” as gospel truth

Thank you

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