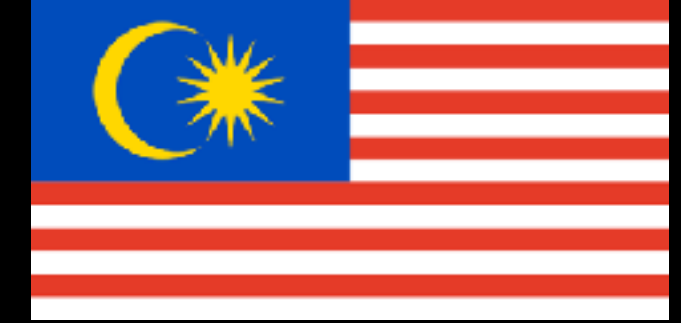


Differences between MariaDB and MySQL

Colin Charles, Chief Evangelist, Percona Inc.
colin.charles@percona.com / byte@bytebot.net
<http://bytebot.net/blog/> | @bytebot on Twitter

Percona Webminar
12 September 2017

whoami



- Chief Evangelist, Percona Inc
- Founding team of MariaDB Server (2009-2016), previously at Monty Program Ab, merged with SkySQL Ab, now MariaDB Corporation
- Formerly MySQL AB (exit: Sun Microsystems)
- Past: Fedora Project (FESCO), OpenOffice.org
- MySQL Community Contributor of the Year Award winner 2014

Agenda

Define: compatibility (OED)

- A state in which two things are able to exist or occur together without problems or conflict.

1.2 *Computing* The ability of one computer, piece of software, etc. to work with another.
'software compatibility is another important factor to consider'

Why this matters

- MariaDB Server is the “default” MySQL in pretty much every Linux distribution except Ubuntu
- It isn't MySQL - there are also many cloud providers that have an option for MariaDB
- There are incompatibilities with connectors
 - <https://github.com/brianmario/mysql2/issues/878>
 - MariaDB Connector/C for MySQL and MariaDB Server. It is libmysqlclient API compatible. LGPL. OpenSSL/GnuTLS/schannel (no more yaSSL/wolfSSL)
 - header change in MariaDB 10.2.6 and mysqlclient python binding - <https://lists.launchpad.net/maria-developers/msg10726.html>

Commitments

- Verbal commitments: **“MySQL 5.6, should be comparable to MariaDB Server 10.1. And for 10.2 it should be compatible with MySQL 5.7”** — Michael “Monty” Widenius, CTO of MariaDB Corporation and MariaDB Foundation, 7 October 2016, MariaDB Developer’s Meeting, Amsterdam
- <http://mariadb.org/about/>
 - “It is an enhanced, drop-in replacement for MySQL.”

Licensing

- MariaDB Server: GPLv2 only
- MariaDB MaxScale: Business Source License
- MariaDB ColumnStore: GPLv2 only
- MySQL has Community and Enterprise releases

Support

- What is the support ecosystem and landscape like?
- Training?
- MySQL Certification (recently MariaDB has started this at m17)

Community Contributions

- Oracle Contributor Agreement (OCA)
- MariaDB Contributor Agreement (MCA)
- BSD New
- Who maintains the code? What is the state of community contributed bits?

Governance

- MariaDB Corporation
- MariaDB Foundation
- Is there vendor lock-in in open source?
- How many users are there, really?

Funding Rounds (8) - \$71.41M

UPDATE

Date	Amount / Round	Valuation	Lead Investor	Investors
May, 2017	€25M / Venture	—	European Investment Bank (EIB)	1
Apr, 2016	\$3M / Series B	—	—	1
Jan, 2016	\$9M / Series B	—	—	2
Feb, 2015	€3M / Series B	—	—	1
Oct, 2013	\$20M / Series B	—	Intel Capital	5
May, 2012	\$2.5M / Series A	—	—	1
Apr, 2012	\$4M / Series A	—	OnCorps, Inc.	3
Sep, 2010	\$2M / Venture	—	—	1

Releases

MariaDB	MySQL
5.1: 1 Feb 2010	5.1: 14 Nov 2008
5.2: 10 Nov 2010	
5.3: 29 Feb 2012	
5.5: 11 Apr 2012	5.5: 3 Dec 2010
	5.6: 5 Feb 2013
10.0: 31 Mar 2014	
10.1: 17 Oct 2015	
	5.7: 21 Oct 2015
10.2: 23 May 2017	

What's documented?

- <https://mariadb.com/kb/en/the-mariadb-library/mariadb-vs-mysql-compatibility/>
- Tracker bug: <https://jira.mariadb.org/browse/MDEV-10392>
- <https://mariadb.com/kb/en/library/system-variable-differences-between-mariadb-and-mysql/>

Replication

Replication Compatibility

Slave↓ Master→	MariaDB- 5.5	MariaDB- 10.0	MariaDB- 10.1	MariaDB- 10.2	MySQL- 5.6	MySQL- 5.7	MySQL-8.0
MariaDB-5.5	Ok	No	No	No	No	No	No
MariaDB-10.0	Ok	Ok			Ok		
MariaDB-10.1	Ok	Ok	Ok		Ok		
MariaDB-10.2	Ok	Ok	Ok	Ok	Ok	Ok	
MySQL-5.6					X	X	X
MySQL-5.7					X	X	X
MySQL-8.0					X	X	X

Note X: Refer to MySQL documentation

Note: When replication from MySQL in GTID mode, MariaDB will remove the MySQL GTID events and replace them with MariaDB GTID events.

GTID variances

```
MariaDB [(none)]> show global variables like '%gtid%';
```

Variable_name	Value
gtid_binlog_pos	0-1-9
gtid_binlog_state	0-1-9
gtid_current_pos	0-1-9
gtid_domain_id	0
gtid_ignore_duplicates	OFF
gtid_slave_pos	
gtid_strict_mode	OFF
wsrep_gtid_domain_id	0
wsrep_gtid_mode	OFF

9 rows in set (0.00 sec)

```
mysql> show global variables like '%gtid%';
```

Variable_name	Value
binlog_gtid_simple_recovery	ON
enforce_gtid_consistency	OFF
gtid_executed	
gtid_executed_compression_period	1000
gtid_mode	OFF
gtid_owned	
gtid_purged	
session_track_gtids	OFF

8 rows in set (0.01 sec)

- <https://mariadb.com/kb/en/library/gtid/#the-domain-id>

Replication

- Default binlog format is now MIXED
- Default replicate_annotate_row_events is ON
- Binlog event compression
- Time delayed replication arrives
- read_binlog_speed_limit - restricting the speed at which the slave reads the binlog from the master
- DML only Flashback - rollback instances/databases/tables to an older snapshot (via Alibaba!)
- Continuous streaming binary log backup added to mysqlbinlog

5.1/5.2

- `mysqld` reads `[mariadb]` part of `my.cnf` for MariaDB Server only options
- Binary-only storage engines won't work without recompilation due to different THD structure (e.g. commercial engines like ScaleDB)
- Extended slow query log statistics (microslow patch from Percona)
- More memory utilised: Aria used to handle internal temporary tables, needs configuration
- MariaDB only: table elimination

5.3

- Error numbers for MariaDB are at 1900+; MySQL has to deal: <https://bugs.mysql.com/bug.php?id=72062>
- Microseconds arrived; but got *fixed* in MariaDB 10.1 to follow the MySQL 5.6 format
- SHOW PROCESSLIST with progress reporting
- New features: dynamic columns, virtual columns (5.7), HandlerSocket plugin, Cassandra storage engine (now deprecated)
- Huge changes in optimiser + replication
 - <https://mariadb.com/kb/en/library/optimizer-feature-comparison-matrix/>

```

MariaDB [(none)]> select * from INFORMATION_SCHEMA.processlist\G
***** 1. row *****
      ID: 13
     USER: root
    HOST: localhost
      DB: NULL
  COMMAND: Query
      TIME: 0
    STATE: Filling schema table
     INFO: select * from INFORMATION_SCHEMA.processlist
    TIME_MS: 0.468
     STAGE: 0
    MAX_STAGE: 0
   PROGRESS: 0.000
 MEMORY_USED: 85096
EXAMINED_ROWS: 0
   QUERY_ID: 28
  INFO_BINARY: select * from INFORMATION_SCHEMA.processlist
      TID: 19574

```

```

mysql> select * from INFORMATION_SCHEMA.processlist\G
***** 1. row *****
      ID: 39296
     USER: root
    HOST: localhost
      DB: NULL
  COMMAND: Query
      TIME: 0
    STATE: executing
     INFO: select * from INFORMATION_SCHEMA.processlist
    TIME_MS: 0
   ROWS_SENT: 0
ROWS_EXAMINED: 0
1 row in set (0.00 sec)

```

```

      Info: NULL
    Progress: 0.000
***** 6. row *****
      Id: 13
     User: root
    Host: localhost
      db: NULL
  Command: Query
      Time: 0
    State: init
     Info: show processlist
    Progress: 0.000
6 rows in set (0.00 sec)

```

```

mysql> show processlist\G
***** 1. row *****
      Id: 39296
     User: root
    Host: localhost
      db: NULL
  Command: Query
      Time: 0
    State: starting
     Info: show processlist
    Rows_sent: 0
   Rows_examined: 0
1 row in set (0.00 sec)

```


10.0

Incompatibilities between MariaDB 10.0 and MySQL 5.6

- MySQL does not support MariaDB's [Spider Storage Engine](#).
- All MySQL binaries (`mysqld` , [myisamchk](#) etc.) give a warning if one uses a prefix of an option (such as `--big-table` instead of `--big-tables`). MariaDB binaries work in the same way as most other Unix commands and don't give warnings when using unique prefixes.
- MariaDB GTID is not compatible with MySQL 5.6. This means that one can't have MySQL 5.6 as a slave for [MariaDB 10.0](#). However [MariaDB 10.0](#) can be a slave of MySQL 5.6 or any earlier MySQL/MariaDB version. Note that MariaDB and MySQL also have different [GTID system variables](#), so these need to be adjusted when migrating.
- [MariaDB 10.0 multi-source replication](#) is not supported in MySQL 5.6.
- To make `CREATE TABLE ... SELECT` work the same way in statement based and row based replication it's by default executed as [CREATE OR REPLACE TABLE](#) on the slave. One benefit of this is that if the slave dies in the middle of `CREATE ... SELECT` it will be able to continue.
 - One can use the [slave-ddl-exec-mode](#) variable to specify how `CREATE TABLE` and `DROP TABLE` is replicated.
- See also a detailed breakdown of [System variable differences between MariaDB 10.0 and MySQL 5.6](#).
- MySQL 5.6 has [performance schema](#) enabled by default. For performance reasons [MariaDB 10.0](#) has it disabled by default. You can enable it by starting `mysqld` with the option `--performance-schema` .
- [MariaDB 10.0](#) does not support the MySQL Memcached plugin. However, data stored using memcached can be retrieved because the data is stored as InnoDB tables. MariaDB is able to start successfully with an error message of not being able to find `libmemcached.so` library.
- Users created with MySQL's SHA256 password algorithm cannot be used in [MariaDB 10.0](#).
- [MariaDB 10.0](#) does not support delayed replication - [MDEV-7145](#).
- Also see a detailed breakdown of [System variable differences between MariaDB 10.0 and MySQL 5.6](#).
- The low-level temporal format used by `TIME`, `DATETIME` and `TIMESTAMP` is different in MySQL 5.6 and [MariaDB 10.0](#). (In [MariaDB 10.1](#), the MySQL implementation is used by default - see [mysql56_temporal_format](#).)

10.1/10.2

Incompatibilities between **MariaDB 10.1** and MySQL 5.7

- [MariaDB 10.1](#) does not support MySQL 5.7's JSON.
- [MariaDB 10.1](#)'s InnoDB encryption is implemented differently than MySQL 5.7's InnoDB encryption.
- [MariaDB 10.1](#) does not support the ngram and MeCab full-text parser plugins - [MDEV-10267](#), [MDEV-10268](#).
- [MariaDB 10.1](#) does not support multiple triggers for a table - [MDEV-6112](#).
- [MariaDB 10.1](#) does not support `CREATE TABLESPACE` for InnoDB.
- Also see Incompatibilities between [MariaDB 10.0](#) and MySQL 5.6.
- Also see a detailed breakdown of [System variable differences between MariaDB 10.1 and MySQL 5.7](#).
- MariaDB does not support MySQL 5.7's X protocol.

Incompatibilities between **MariaDB 10.2** and MySQL 5.7

- [System variable differences between MariaDB 10.2 and MySQL 5.7](#).
- [Function differences between MariaDB 10.2 and MySQL 5.7](#).
- Note : Multiple triggers per table was added in 10.2
- The ROWS and RECURSIVE keywords are [reserved words](#) in [MariaDB 10.2](#), but not in MySQL 5.7.
- MariaDB InnoDB encryption is implemented differently than MySQL 5.7's InnoDB encryption.
- MariaDB stores [JSON](#) as true text, not in binary format as MySQL. The reason is that our JSON functions are much faster than MySQL's so we didn't need to see a need for storing things in binary format as it adds a lot of complexity when manipulating JSON objects.
- For the same reason, MariaDB's [JSON data type](#) is an alias for [LONGTEXT](#).
- [MariaDB 10.2](#) does not support MySQL's JSON operators (`->` and `->>`).
- [MariaDB 10.2](#) does not support the ngram and MeCab full-text parser plugins - [MDEV-10267](#), [MDEV-10268](#).
- [MariaDB 10.2](#) does not support the [MySQL X plugin](#).
- [MariaDB 10.2](#) does not support the [MySQL general table spaces](#).
- Also see Incompatibilities between [MariaDB 10.1](#) and MySQL 5.7.

JSON

- 5.7 has a binary data type, MariaDB chooses not to implement it this way, choosing to not “violate the SQL standard” - <https://jira.mariadb.org/browse/MDEV-9144>
- claims it is as fast, but there are no benchmarks - <https://jira.mariadb.org/browse/MDEV-13777>

X Protocol

- MariaDB Server has **no** support for the MySQL X Protocol
- This means you cannot use `mysqlsh` to access MariaDB Server either

Encryption

- MySQL 5.7 and MariaDB Server 10.1+ implement encryption differently (one is fully tablespace encryption, the other is based on the Google patch for tablespace encryption in addition to having table encryption)
- One does not encrypt logs, the other does
- MySQL requires `innodb_file_per_table`
- MySQL implementation works fully with Percona XtraDB Cluster
 - MariaDB Galera Cluster gcache is unencrypted - <https://jira.mariadb.org/browse/MDEV-9639>
- mysqlbinlog cannot read encrypted binary logs - <https://jira.mariadb.org/browse/MDEV-8813>

CJK language support

- Add “ngram” support to MariaDB Server: <https://jira.mariadb.org/browse/MDEV-10267>
- Add “MeCab” support to MariaDB Server: <https://jira.mariadb.org/browse/MDEV-10268>
- gb18030 support: <https://jira.mariadb.org/browse/MDEV-7495>

PERFORMANCE_SCHEMA

- No sys schema - <https://jira.mariadb.org/browse/MDEV-9077>
- No new PERFORMANCE_SCHEMA instrumentation from 5.7 - <https://jira.mariadb.org/browse/MDEV-6114>
- e.g. 52 rows in set (0.00 sec) vs. 87 rows in set (0.00 sec)

Security

- MySQL: sha256_password
- MariaDB: ed25519 password plugin
- Needless to say the above are **incompatible** with each other
- `validate_password` is on by default in MySQL 5.7 (not in MariaDB)

Other bits

- MariaDB: SHOW EXPLAIN FOR <thread_id>
- MySQL: EXPLAIN FOR CONNECTION <thread_id>
 - <https://jira.mariadb.org/browse/MDEV-10000>
- MySQL has SUPER READONLY, missing in MariaDB - <https://jira.mariadb.org/browse/MDEV-9458>
- Optimiser trace: <https://jira.mariadb.org/browse/MDEV-6111>
- Replication crash-safety for non-GTID slaves - <https://jira.mariadb.org/browse/MDEV-8946>
- Minimal/NOBLOB Binlog Row Image replication fails when tables from master have different PK in slave - <https://jira.mariadb.org/browse/MDEV-8398>

Installation...

- MySQL: <https://dev.mysql.com/downloads/repo/yum/> - grab a package — e.g. mysql57-community-release-el7-9.noarch.rpm
- MariaDB Server: <https://downloads.mariadb.org/mariadb/repositories/> - copy/paste, edit a file, then install
- Percona Server: https://www.percona.com/doc/percona-server/5.7/installation/yum_repo.html - yum install Percona-Server-server-57

Starting up

- MySQL / Percona Server
 - `service mysqld start`
 - `grep 'temporary password' /var/log/mysqld.log`
 - `ALTER USER 'root'@'localhost' IDENTIFIED BY 'rootme0K!';`
- MariaDB Server? `mysql -uroot` “just works”

mysql.user table changes

- MariaDB Server and MySQL differ here (not just by addition of roles) -
mysql.user.password is just
mysql.user.authentication_string
- Password expiry is coming? <https://jira.mariadb.org/browse/MDEV-7597>
- Password last changed? Lifetime?
- ACCOUNT LOCK/UNLOCK
- VALIDATE_PASSWORD_STRENGTH() SQL function doesn't work in MariaDB Server

max_questions: 10
max_updates: 20
max_connections: 30
max_user_connections: 1
plugin:
authentication_string:
password_expired: N
is_role: N
default_role:
max_statement_time: 0.000000

max_questions: 10
max_updates: 20
max_connections: 30
max_user_connections: 1
plugin: mysql_native_password
authentication_string:
password_expired: N
password_last_changed: 2017-06-05 04:58:04
password_lifetime: NULL
account_locked: N

More 5.7

- Optimizer hints (and the cost based optimizer itself?) - <https://jira.mariadb.org/browse/MDEV-9078>
- RENAME INDEX - <https://jira.mariadb.org/browse/MDEV-7318>
- Query rewriting? - <https://jira.mariadb.org/browse/MDEV-5561>
- GIS: GeoJSON functions? Geohash functions?
 - `SELECT ST_AsGeoJSON(ST_GeomFromText('POINT(11.11111 12.22222)'),2);`
 - `SELECT ST_GeoHash(180,0,10), ST_GeoHash(-180,-90,15);`

Tools

- including new tools like `mysql_ssl_rsa_setup` ? `mysqlpump`?
- why will xtrabackup not work with MariaDB Server encryption or compression?
<https://jira.mariadb.org/browse/MDEV-10367>
 - answer: fork xtrabackup to call it MariaDB Backup
- When merging XtraDB, why isn't it complete, with backup locks? <https://jira.mariadb.org/browse/MDEV-5336>
- tools that require MySQL GTID don't work with MariaDB Server (e.g. `mysqlfailover`, `mysqlrpladmin`, MHA, MySQL Router, etc.)
- vitess, started life on just MariaDB Server, but note they support 5.6/5.7 and only 10.0

Contributions?

- SPIDER
 - SPIDER works better if its recompiled (doesn't matter if its included, it isn't "feature complete")
 - Open since March 2015. Priority provided since May 2016.
 - <https://jira.mariadb.org/browse/MDEV-7698>
- Are people still using HandlerSocket?

Storage Engines

- InnoDB 5.7 is now included in MariaDB Server 10.2 (there is no longer Percona XtraDB for the first time)
 - you need to remove XtraDB related options in my.cnf or the server won't start
 - <https://lists.launchpad.net/maria-discuss/msg04708.html>
- Is InnoDB fully tested? Test cases still need merging - <https://jira.mariadb.org/browse/MDEV-13626>
- BLACKHOLE, FEDERATED (now FederatedX) require you to actually load the plugins
 - was a “surprise” - <https://jira.mariadb.org/browse/MDEV-11942>
- Status of other engines: OQGRAPH, SphinxSE? Cassandra deprecated

Open ended...


- How often are the 5.6/5.7 myqltest's run on MariaDB Server?
- How often are upgrades from 5.6/5.7 tested?

Testing and QA matters

✓  **Kenny** added a comment - 2015-11-25 10:19

If MariaDB intended to implement this and set metadata locks, I wonder what the real use case is here and maybe that should be updated in the documentation

- It is doing an 'offline' OPTIMIZE TABLE in a very very very slow manner, which does not interfere with workload to other tables, but the practical use is none IMO.
- The only real benefit here is that you can reduce/remove fragmentation on a table without having to create a new tablespace and need a lot of free disk space, but as it's so slow, it's not practical at all.

✓  **Sergei Golubchik** added a comment - 2016-05-02 20:35

This is a complex issue. OPTIMIZE always used to take rather strong locks because of MyISAM —MyISAM cannot allow any other connection accessing the table that is being optimized. InnoDB does not have this limitation. But we need to open the table to know whether it's MyISAM or InnoDB table. And we need to take metadata locks before the table is opened (because the table's engine is also part of metadata, we cannot read it without the metadata lock).

We'll fix it nevertheless. But may be this fix won't make it into 10.1.14

- <https://jira.mariadb.org/browse/MDEV-9155>
- <https://lists.launchpad.net/maria-developers/msg10832.html>

Today we already see this...

```
|-----| Configuring mariadb-server-5.5 |-----|
|
| MariaDB is a drop-in replacement for MySQL. It will use your current
| configuration file (my.cnf) and current databases.
|
| Note that MariaDB has some enhanced features, which do not exist in MySQL
| and thus migration back to MySQL might not always work, at least not as
| automatically as migrating from MySQL to MariaDB.
|
| Really migrate to MariaDB?
|
|      <Yes>                                <No>
|
```

When to use MariaDB Server?

- MyRocks storage engine
- TokuDB storage engine
- MyISAM user? Segmented key caches will help
- CONNECT storage engine
- Threadpool
- PAM authentication
- GSSAPI authentication (Kerberos, Active Directory)
- Window functions
- PCRE Regular Expressions
- Optimistic parallel replication
- ANALYZE <statement>
- cracklib_password_check
- SQL Roles

The future

- MySQL 8 brings roles, CTEs, window functions, transactional data dictionary, histograms, SDIs (instead of FRMs), etc.
 - <http://mysqlserverteam.com/the-mysql-8-0-0-milestone-release-is-available/>
- MySQL 5.7 features are amazing: <http://www.thecompletelistoffeatures.com/>
- Will MariaDB Server 10.3 aim to be compatible with MySQL 8? Or just Oracle?
 - <https://jira.mariadb.org/browse/MDEV-10137>
 - <https://jira.mariadb.org/browse/MDEV-11070>
 - <https://mariadb.com/kb/en/library/changes-improvements-in-mariadb-103/>

Thank You!

Colin Charles

colin.charles@percona.com / byte@bytebot.net
<http://www.bytebot.net/blog/> | @bytebot on Twitter
slides: slideshare.net/bytebot

Get Your Tickets for Percona Live Europe!

Championing Open Source Databases

- MySQL, MongoDB, Open Source Databases
- Time Series Databases, PostgreSQL, RocksDB
- Developers, Business/Case Studies, Operations
- September 25-27th, 2017
- Radisson Blu Royal Hotel, Dublin, Ireland



Last Year's Conference Sold Out!

[Reserve your spot ASAP.](#)

Talk to Percona Experts at AWS Re:Invent!

Database Performance for Cloud Deployments

- Percona Support and Managed Services
 - *Amazon RDS, Aurora, Roll Your Own*
 - *MySQL/MariaDB/MongoDB*
 - *Reduce costs and optimize performance*
- Percona Monitoring and Management Demos
 - *Point-in-time visibility and historical trending of database performance*
 - *Detailed query analytics*
- Booth #1138

