MySQL vs MariaDB
HighLoad++ 2019

Alkin Tezuysal

HighLoad++

Профессиональная конференция
для разработчиков высоконагруженных
систем

Who am I?

@ask_dba - Alkin Tezuysal

Born to Sail, Forced to Work

- Open Source Database Evangelist
- Global Database Operations Expert
- Cloud Infrastructure Architect AWS
- Inspiring Technical and Strategic Leader
- Creative Team Builder
- Speaker, Mentor, and Coach

Agenda

- Installation
- Authentication
- Storage Engines
- Clustering Options
- Routing and Proxy
- Security and Encryption
- Backup and Recovery
- Performance and Benchmarks

Installation - MySQL 8

- Straight forward MySQL Yum repos
  - Oracle Linux, Red Hat Enterprise Linux, CentOS
  - Also available Debian packages
- Fedora provides RPM packages
  - MySQL server, client, MySQL Workbench, MySQL Utilities, MySQL Router, MySQL Shell, Connector/ODBC, Connector/Python

Installation - MySQL 8

```
$curl https://dev.mysql.com/get/mysql80-community-release-el7-3.noarch.rpm
$sudo yum localinstall mysql80-community-release-el7-3.noarch.rpm
$sudo yum install mysql-community-server
$sudo grep 'temporary password' /var/log/mysqld.log
$mysql -uroot -p
> ALTER USER 'root'@'localhost' IDENTIFIED BY 'MyNewPass4!';
```

Installation - MySQL 8 (Debian)

Download the repository package from:
https://dev.mysql.com/get/mysql-apt-config_0.8.14-1_all.deb

```
shell> sudo dpkg -i mysql-apt-config_0.8.14-1_all.deb
```

Set up the version you want to install

and

```
shell> sudo apt update
shell> sudo apt-get install mysql-community-server
```

Installation - MySQL 8

1. The server is initialized.
2. SSL certificate and key files are generated in the data directory.
3. ***validate_password*** policy is installed and enabled: The default password policy implemented by validate_password requires that passwords contain at least one upper case letter, one lower case letter, one digit, and one special character, and that the total password length is at least 8 characters.

Installation MariaDB 10.4

- Downloadable script to install

```
$curl -sS https://downloads.mariadb.com/MariaDB/mariadb_repo_setup | sudo
bash
$sudo yum install MariaDB-server MariaDB-client MariaDB-shared MariaDB-backup
MariaDB-common
$sudo systemctl start mariadb
$sudo journalctl -f -u mariadb
```

Installation MariaDB 10.4 (Debian)

- Downloadable script to install

```
sudo apt-get install software-properties-common dirmngr
sudo apt-key adv --recv-keys --keyserver keyserver.ubuntu.com
0xF1656F24C74CD1D8
sudo add-apt-repository 'deb [arch=amd64]
http://mirror.biznetgio.com/mariadb/repo/10.4/debian buster main'

sudo apt update
sudo apt install mariadb-server
```

Authentication - MySQL 8

- A superuser account 'root'@'localhost is created.
- A password for the superuser is set and stored in the error log file.
- Single authentication method per user

Authentication - MariaDB 10.4

- Multiple Authentication Methods per Account
  - The root user is created with both ***mysql_native_password*** and the ***unix_socket*** auth plugin.
  - ***unix_socket*** matches your OS uid with a mysql user.
  - ***mysql_native_password*** auth creates an “INVALID” password change with SET PASSWORD() classic approach.

Storage Engines - MySQL 8

- FEDERATED
- MEMORY
- **InnoDB**
- Performance_Schema
- MyISAM
- MRG_MYISAM
- BLACKHOLE
- CSV
- ARCHIVE

Storage Engines - MariaDB 10.4

Default Installation (8)

- CSV
- MRG_MyISAM
- MEMORY
- Aria
- MyISAM
- SEQUENCE
- InnoDB
- PERFORMANCE_SCHEMA

Plugins (6)

- TokuDB
- RocksDB
- Spider
- Connect
- OQGRAPH
- Mroonga

Clustering Options

MySQL 8

- InnoDB Cluster which consists of:
  - Group Replication (available as a plugin)
  - MySQL Shell
  - MySQL Router

MariaDB 10.4

- MariaDB Galera Cluster:
  - Galera 4 (available in a separate package)

Routing & Proxy

MySQL 8

- MySQL Router (GPLv2) [CE/EE]
- 3rd Party ProxySQL

MariaDB 10.4

- Maxscale (2.X versions are using the BSL licence)

Security and Encryption - MySQL 8

- (Data-at-Rest) Encryption
  - MySQL System Tablespace Encryption
  - General Tablespace Encryption
  - Undo log
  - Redo log
  - Binary and relay log encryption
  - Audit log
  - Keyring
    - keyring_file
    - keyring_encrypted_file [E]
    - keyring_okv [E]
    - keyring_aws [E]
    - HashiCorp Vault Keyring [E]

Security and Encryption - MariaDB 10.4

- (TDE) Transparent Data Encryption
  - Everything including all tables
  - Individual tables
  - Everything, excluding individual tables
- Key Management and Encryption Plugin
  - Data-at-rest with Encryption Key Management
  - File Key Management
  - AWS Key Management
  - Eperi Key Management
  - Plugin API

Security and Encryption - HC Vault

MySQL 8

- In MySQL 8.0.18 available as an Enterprise plugin
- 3rd Party
  - Percona Server 5.7 and 8.0

MariaDB 10.4

- MariaDB 10.4 has a feature request

Data Masking

MySQL 8

- MySQL Enterprise Data Masking and De-Identification [EE only feature]
- 3rd Party:
  - Inexpensive Datamasking for MySQL with ProxySQL [CE]

MariaDB 10.4

- Data masking by using MaxScale proxy

Auditing

MySQL 8

- MySQL Enterprise Audit [EE]
- 3rd Party
  - Percona Audit Log Plugin

MariaDB 10.4

- MariaDB Audit Plugin

Backup and Recovery

MySQL 8

- Mysqldump
- Mysqlpump
- MySQL Enterprise Backup [EE]
- The Clone Plugin (8.0.17)
- 3rd Party
  - Percona XtraBackup [CE]
  - Mydumper

MariaDB 10.4

- Mysqldump
- Mariabackup
- 3rd Party
  - Mydumper

Key Default Variables

MySQL 8	MariaDB 10.4
innodb_autoinc_lock_mode=2	innodb_autoinc_lock_mode=1
log_bin=ON	log_bin=OFF
max_allowed_packet=64M	max_allowed_packet=16M
open_files_limit=10000	open_files_limit=4186
Query cache removed: https://mysqlserverteam.com/mysql-8-0-retiring-support-for-the-query-cache/	query_cache_type=off But query_cache_limit=1M
table_open_cache_instances=16	table_open_cache_instances=8
table_open_cache=4000	table_open_cache=2000

Key Default Variables

MySQL 8	MariaDB 10.4
thread_cache_size=9	thread_cache_size=151
binlog_format=ROW	binlog_format=MIXED
binlog_group_commit_sync_delay	---
DEPRECATED	innodb_locks_unsafe_for_binlog
log_slave_updates=ON	log_slave_updates=OFF
sync_binlog=1	sync_binlog=0
sql_mode=ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES,NO_ZERO_IN_DATE,NO_ZERO_DATE,ERROR_FOR_DIVISION_BY_ZERO,NO_ENGINE_SUBSTITUTION	sql_mode=STRICT_TRANS_TABLES,ERROR_FOR_DIVISION_BY_ZERO,NO_AUTO_CREATE_USER,NO_ENGINE_SUBSTITUTION

Performance and Benchmarks

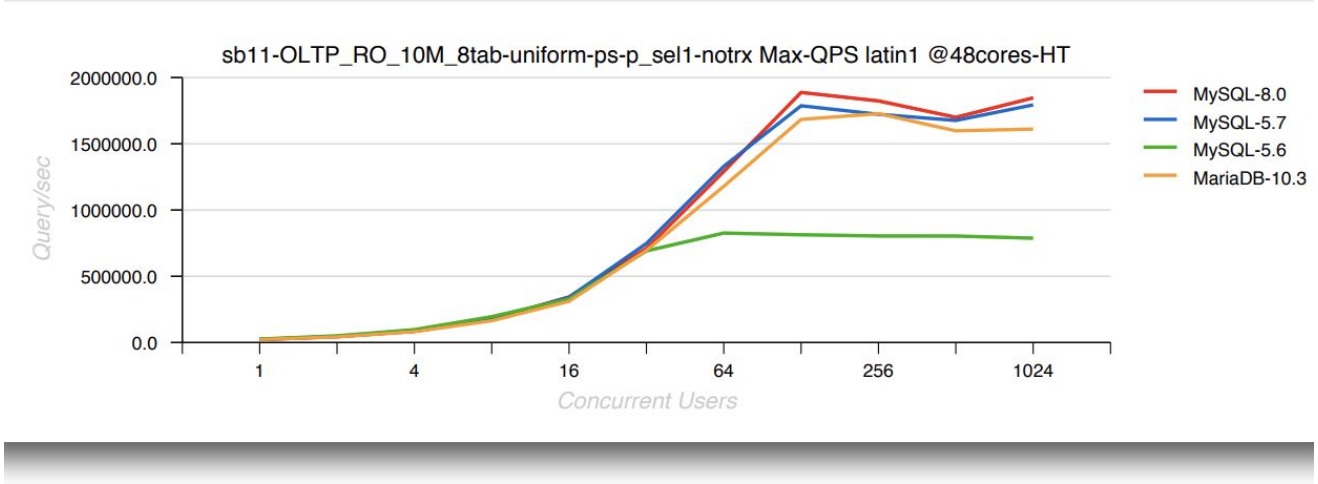
Thanks to Dimitri Kravchuk for providing

- Information on Benchmarks
  - Blog
  - Talks
  - Twitter

Benchmarks - MySQL

RO Point-Selects @MySQL 8.0 (Apr.2018)

- **1.8M+ (!!) QPS** Sysbench Point-Selects 10Mx8tab @2CPU Sockets
  - 2CPU Sockets **Skylake** Platinum : 48cores-HT
  - => currently our best results on 2S HW

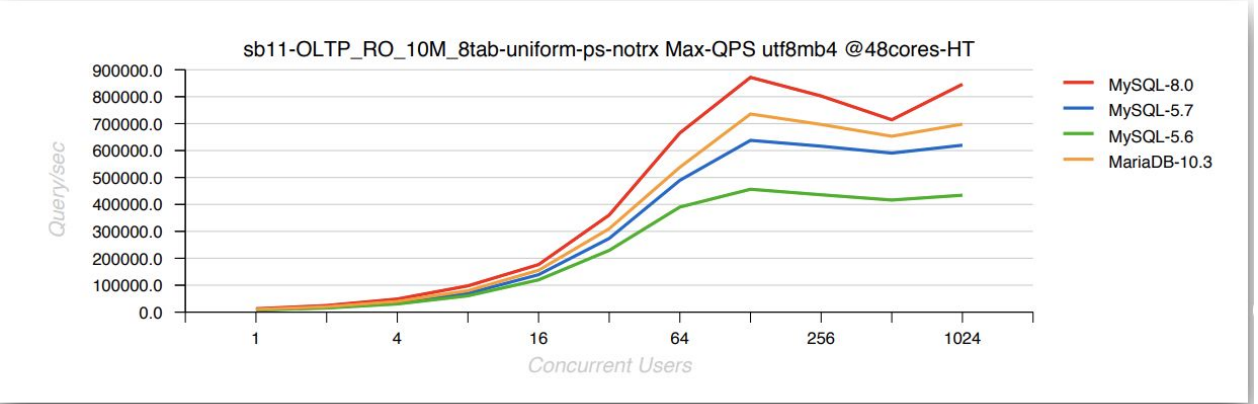


Ref:http://dimitrik.free.fr/Presentations/MySQL_Perf-PLIVE19-EU-dim.pdf

Benchmarks - MySQL

OLTP_RO UTF8mb4 @MySQL 8.0 (Apr.2018)

- **870K(!!) QPS** Sysbench OLTP_RO 10Mx8tab @2CPU Sockets
  - 2CPU Sockets **Skylake** Platinum : 48cores-HT
  - => up to 40% better than 5.7



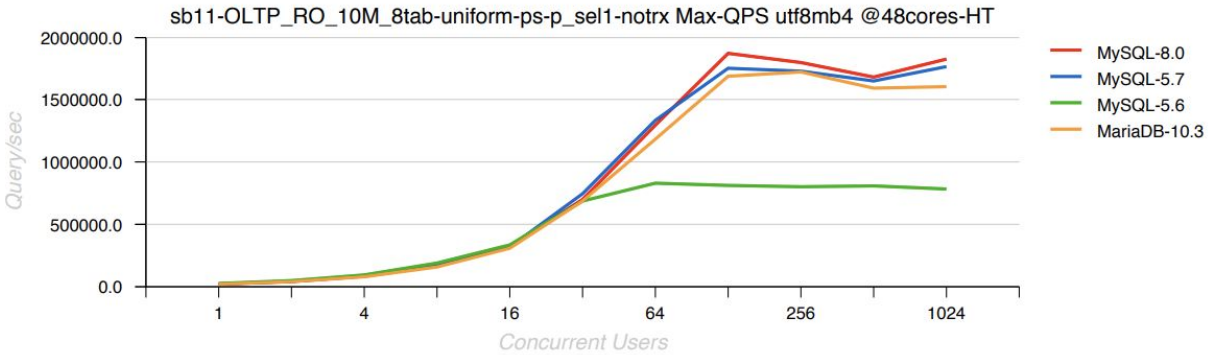
ORACLE

Ref:http://dimitrik.free.fr/Presentations/MySQL_Perf-PLIVE19-EU-dim.pdf

Benchmarks - MySQL

RO Point-Selects UTF8mb4 @MySQL 8.0 (Apr.2018)

- **Same QPS** Sysbench RO point-selects 10Mx8tab @2CPU Sockets
  - 2CPU Sockets **Skylake** Platinum : 48cores-HT
  - e.g. UTF8 mostly impacts when you have to compare data (order by / group by / etc.

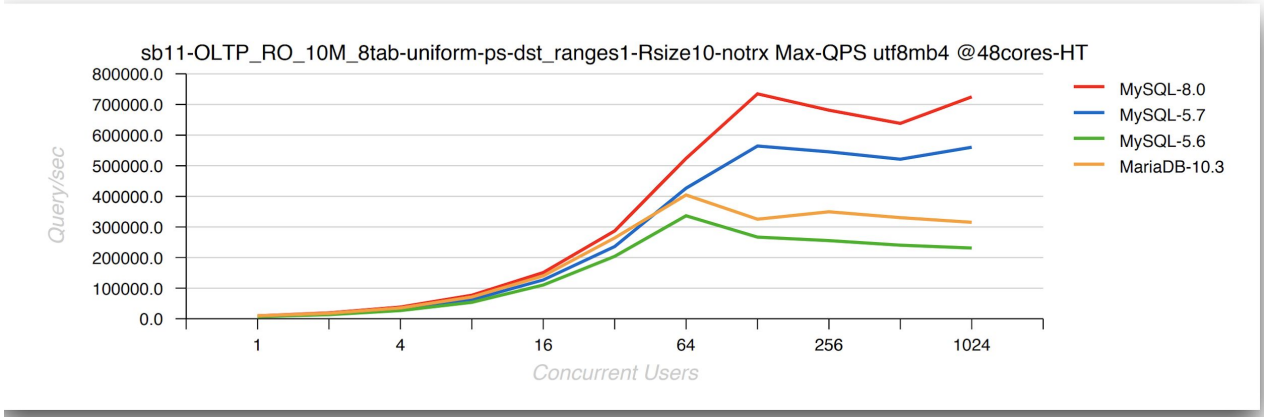


Ref:http://dimitrik.free.fr/Presentations/MySQL_Perf-PLIVE19-EU-dim.pdf

Benchmarks - MySQL

RO Distinct-Ranges UTF8mb4 @MySQL 8.0 (Apr.2018)

- **735K (!!) QPS** Sysbench RO dist-ranges 10Mx8tab @2CPU Sockets
  - 2CPU Sockets **Skylake** Platinum : 48cores-HT
  - => up to 30% better than 5.7

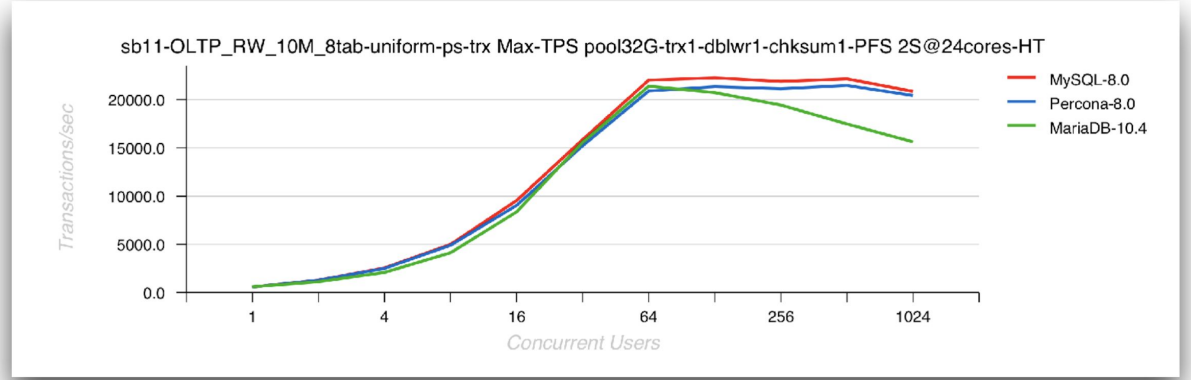


Ref:http://dimitrik.free.fr/Presentations/MySQL_Perf-PLIVE19-EU-dim.pdf

Benchmarks - MariaDB

OLTP_RW latin1 @MySQL 8.0 (Sep.2019)

- Sysbench OLTP_RW 10Mx8tab, trx_commit=1
  - 2S Dell 24cores-HT 2.6 Ghz

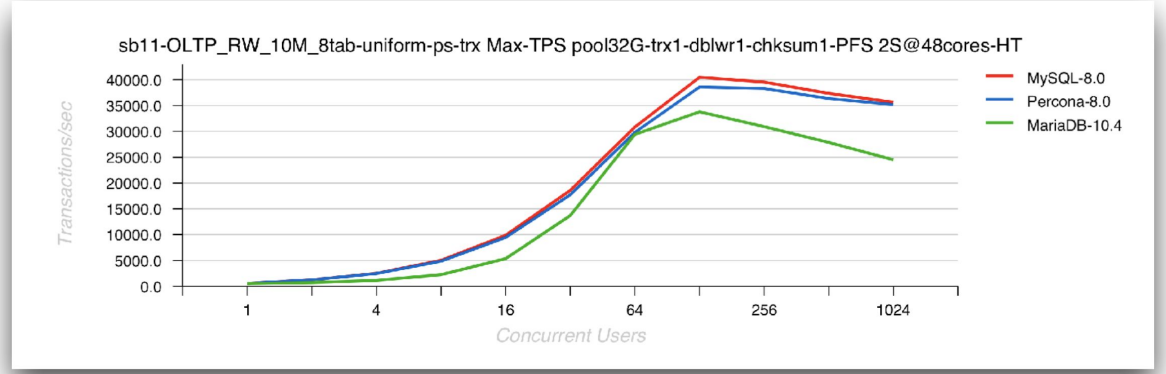


Ref:http://dimitrik.free.fr/Presentations/MySQL_Perf-PLIVE19-EU-dim.pdf

Benchmarks - MariaDB

OLTP_RW latin1 @MySQL 8.0 (Sep.2019)

- Sysbench OLTP_RW 10Mx8tab, trx_commit=1
  - 2S Intel 48cores-HT Cascade Lake 2.9 Ghz



Ref:http://dimitrik.free.fr/Presentations/MySQL_Perf-PLIVE19-EU-dim.pdf

Conclusion - MySQL 8

- 8.0.0 to 8.0.5 Several Bugs Fixed
- 8.0.11 Deprecates uft8mb3
- 8.0.12 Improves performance_schema defaults
- 8.0.13 Major deprecations InnoDB, Partitioning
- 8.0.14 Dual passwords, Lateral Derived Tables, Parallel Read of Index , GR Consistency Levels
- 8.0.15 Bugs Fixed
  - InnoDB: After a checkpoint operation persisted modifications to data dictionary metadata, there was potential for new metadata changes to be lost under certain circumstances. (Bug #29120297)
  - Group Replication was unable to function in the 8.0.14 release of MySQL Server if IPv6 support was disabled at the operating system level, even if the replication group did not use any IPv6 addresses. The issue is fixed by this release of MySQL Server, 8.0.15. (Bug #29249542, Bug #94004)
- If MySQL was running on the host system and within Docker, it was not possible to update or remove MySQL on the host system. (Bug #28244773, Bug #91405)8.0.0 to 8.0.11 several bug fixes
- 8.0.16 Account-management capabilities, deprecation of mysql_upgrade, Check Constraints, GR Auto Re-Join
- 8.0.17 Clone Plugin, JSON Array Indexes and Schema
- 8.0.18 Hash Join, Explain Analyze

Conclusion - MariaDB 10.4

- Authentication
  - The unix_socket authentication plugin is now default on Unix-like systems, which is a major change to authentication in MariaDB (MDEV-12484)
  - User password expiry (MDEV-7597)
  - Account Locking (MDEV-13095)
  - ...more
- InnoDB
  - Added instant DROP COLUMN and changing of the order of columns (MDEV-15562)
  - More Instant VARCHAR extension or ROW_FORMAT=DYNAMIC and ROW_FORMAT=COMPACT (MDEV-15563)
  - Reduced redo log volume for undo tablespace initialization (MDEV-17138)
  - Removed crash-upgrade support for pre-10.2.19 TRUNCATE TABLE (MDEV-13564)
- Optimizer
  - Implementation of the optimizer trace, one can enable the optimizer trace by enabling the system variable optimizer_trace (MDEV-6111)
- Galera
  - In MariaDB 10.4.2 and later, Galera has been upgraded from Galera 3 to Galera 4.

Ref:https://mariadb.com/kb/en/library/changes-improvements-in-mariadb-104/

Special Thanks to...

- Daniel Guzman Burgos
- Stephen Thorn
- Hrvoje Matijakovic
- Sveta Smirnova @svetsmirnova
- Engineering, Experts and Services Teams at Percona

Q&A

Credits & References

https://www.percona.com/doc/percona-server/8.0/feature_comparison.html
https://mariadb.com/kb/en/library/changes-improvements-in-mariadb-104/#new-features-in-galera-4