MySQL vs MariaDB
HighLoad++ 2019
Alkin Tezuysal
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
$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

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

<table>
<thead>
<tr>
<th>MySQL 8</th>
<th>MariaDB 10.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>❖ In MySQL 8.0.18 available as an Enterprise plugin</td>
<td>❖ MariaDB 10.4 has a feature request</td>
</tr>
<tr>
<td>❖ 3rd Party</td>
<td></td>
</tr>
<tr>
<td>➢ Percona Server 5.7 and 8.0</td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>MySQL 8</th>
<th>MariaDB 10.4</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>innodb_autoinc_lock_mode=2</code></td>
<td><code>innodb_autoinc_lock_mode=1</code></td>
</tr>
<tr>
<td><code>log_bin=ON</code></td>
<td><code>log_bin=OFF</code></td>
</tr>
<tr>
<td><code>max_allowed_packet=64M</code></td>
<td><code>max_allowed_packet=16M</code></td>
</tr>
<tr>
<td><code>open_files_limit=10000</code></td>
<td><code>open_files_limit=4186</code></td>
</tr>
<tr>
<td>Query cache removed:</td>
<td>query cache removed:</td>
</tr>
<tr>
<td><a href="https://mysqlserverteam.com/mysql-8-0-retiring-support-for-the-query-cache/">https://mysqlserverteam.com/mysql-8-0-retiring-support-for-the-query-cache/</a></td>
<td>query_cache_type=off</td>
</tr>
<tr>
<td></td>
<td>But</td>
</tr>
<tr>
<td></td>
<td>query_cache_limit=1M</td>
</tr>
<tr>
<td><code>table_open_cache_instances=16</code></td>
<td><code>table_open_cache_instances=8</code></td>
</tr>
<tr>
<td><code>table_open_cache=4000</code></td>
<td><code>table_open_cache=2000</code></td>
</tr>
</tbody>
</table>
### Key Default Variables

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<th>MySQL 8</th>
<th>MariaDB 10.4</th>
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</thead>
<tbody>
<tr>
<td>thread_cache_size=9</td>
<td>thread_cache_size=151</td>
</tr>
<tr>
<td>binlog_format=ROW</td>
<td>binlog_format=MIXED</td>
</tr>
<tr>
<td>binlog_group_commit_sync_delay</td>
<td>---</td>
</tr>
<tr>
<td>DEPRECATED</td>
<td>innodb_locks_unsafe_for_binlog</td>
</tr>
<tr>
<td>log_slave_updates=ON</td>
<td>log_slave_updates=OFF</td>
</tr>
<tr>
<td>sync_binlog=1</td>
<td>sync_binlog=0</td>
</tr>
<tr>
<td>sql_mode=ONLY_FULL_GROUP_BY,STRICT_TRANS_TABLES,NO_ZERO_IN_DATE,NO_ZERO_DATE,ERROR_FOR_DIVISION_BY_ZERO,NO_ENGINE_SUBSTITUTION</td>
<td>sql_mode=STRICT_TRANS_TABLES,ERROR_FOR_DIVISION_BY_ZERO,NO_AUTO_CREATE_USER,NO_ENGINE_SUBSTITUTION</td>
</tr>
</tbody>
</table>
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](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

Ref: [http://dimitrik.free.fr/Presentations/MySQL_Perf-PLIVE19-EU-dim.pdf](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](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](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, \texttt{trx\_commit=1}
  • 2S Intel 48cores-HT Cascade Lake 2.9 Ghz

Ref: \url{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 utf8mb3
  - **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)
- **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
- **8.0.19** Several bug fixes
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.

Special Thanks to...

- Daniel Guzman Burgos
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- Hrvoje Matijakovic
- Sveta Smirnova @svetsmirnova
- Engineering, Experts and Services Teams at Percona
Q&A
Credits & References