MARIADB PLATFORM X5 VS. MYSQL ENTERPRISE EDITION 8

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WHITEPAPER

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INTRODUCTION

MariaDB and MySQL are two of the most popular open source relational databases in the world. MariaDB was created as a fork of MySQL by the founder of MySQL itself, Michael "Monty" Widenius, in order to ensure open and transparent development after MySQL was acquired by Oracle. However, since then, MariaDB and MySQL have become separate databases with different features, and with similar features having different implementations.

MariaDB continues to be compatible with the MySQL protocol and MySQL clients, and has replaced MySQL in leading Linux distributions such as Debian, Ubuntu, Fedora, Red Hat Enterprise Linux/CentOS, SUSE Linux Enterprise Server/ openSUSE and OpenBSD/FreeBSD.

However, MariaDB and MySQL have different product strategies and visions. MariaDB embraces community participation and contributions, and while MySQL is focused on InnoDB as its primary storage engine, MariaDB continues to advance the pluggable storage engine architecture it shares with MySQL. MariaDB brings together multiple storage engines to support a broad set of use cases, with each engine optimized for a specific workload.

SOFTWARE

MariaDB and MySQL both have enterprise offerings: MariaDB Platform and MySQL Enterprise Edition. These enterprise offerings include software not available to the community, a combination of plugins and additional tools. This white paper compares the enterprise offerings of MariaDB and MySQL and covers the full suite of features and capabilities provided by them.

Components

	MariaDB	**MySQL**
Database	MariaDB Enterprise Server	MySQL
Database router/proxy	MariaDB MaxScale	MySQL Router*
Backup/restore tool	MariaDB Enterprise Backup	MySQL Enterprise Backup
Monitoring	SQL Diagnostic Manager	MySQL Monitor
SQL IDE	SQLyog	MySQL Workbench*

Plugins

	MariaDB	**MySQL**
Auditing	MariaDB Enterprise Audit	MariaDB Enterprise Audit
Clustering	MariaDB Enterprise Cluster	MySQL Group Replication*
Data masking	MariaDB MaxScale	MySQL Enterprise Data Masking
Database firewall	MariaDB MaxScale	MySQL Enterprise Firewall
Encryption functions	Yes*	MySQL Enterprise Encryption
Federation	MariaDB Enterprise Federation	N/A
HashiCorp Vault plugin	Yes*	Yes
PAM/LDAP authentication	Yes*	MySQL Enterprise Security
Thread pool	Yes*	MySQL Enterprise Thread Pool

*Available without an enterprise subscription.

COMPARISON

This white paper compares the latest enterprise versions of MariaDB and MySQL Enterprise 8. The comparison is made across five categories: development, scalability and performance, high availability, disaster recovery and security. It highlights some of the features and capabilities they have in common, but focuses on the differences. After a comparison of features in these standard enterprise categories, it covers the most notable unique features in each database.

Development

JSON

MariaDB and MySQL both support JSON, and implement many of the same JSON functions. However, whereas MySQL stores JSON documents as binary objects, MariaDB stores them as strings.

Note:
If MariaDB is configured to replicate from MySQL as part of the migration process, statement-based replication must be used if any of the MySQL tables being replicated contain JSON columns.

Standard functions

MariaDB and MySQL both support most of the nine (9) JSON functions defined in standard SQL (SQL:2016). JSON_TABLE is planned for the next major version of MariaDB. When it is released, MariaDB will have implemented all of the standard SQL functions for JSON.

Note:
SQL:2016 defines the IS JSON syntax for ensuring JSON columns contain valid JSON documents, but MariaDB and MySQL implemented JSON_VALID instead.

	MariaDB	MySQL
JSON_ARRAY	✓	✓
JSON_ARRAY_AGG	✓	✓
JSON_EXISTS	✓	✗
JSON_OBECT	✓	✓
JSON_OBJECT_AGG	✓	✓
JSON_QUERY	✓	✗
JSON_VALUE	✓	✓
JSON_TABLE	✗	✓
IS JSON	JSON_VALID	JSON_VALID

Common functions

In addition the standard SQL functions for JSON, MariaDB and MySQL both support many of the same utility functions for working with JSON documents.

- JSON_ARRAY_APPEND
- JSON_ARRAY_INSERT
- JSON_CONTAINS
- JSON_CONTAINS_PATH
- JSON_DEPTH
- JSON_EXTRACT
- JSON_INSERT
- JSON_KEYS
- JSON_LENGTH
- JSON_MERGE
- JSON_MERGE_PATCH
- JSON_MERGE_PRESERVE
- JSON_QUOTE
- JSON_REMOVE
- JSON_REPLACE
- JSON_SEARCH
- JSON_SET
- JSON_TYPE
- JSON_UNQUOTE
- JSON_VALID

Differentiating functions

However, there are some functions available in MariaDB that are not in MySQL and vice versa. MySQL 8, in particular, introduced several notable JSON functions, including two operators as aliases/shorthands for JSON_EXTRACT (with and without JSON_UNQUOTE) and two functions JSON Schema validation.

Note:
MariaDB's JSON_DETAILED function and MySQL's JSON_PRETTY function do the same thing, format JSON documents so they are easy to read.

	MariaDB	MySQL
->	✗	✓
->>	✗	✓
JSON_COMPACT	✓	✗
JSON_DETAILED	✓	JSON_PRETTY
JSON_LOOSE	✓	✗
JSON_OVERLAPS	✗	✓
JSON_PRETTY	JSON_DETAILED	✓
JSON_SCHEMA_VALID	✗	✓
JSON_SCHEMA_VALIDATION_REPORT	✗	✓
JSON_STORAGE_FREE	✗	✓
JSON_STORAGE_SIZE	✗	✓
MEMBER OF	✗	✓

SQL

MariaDB and MySQL both support standard SQL, but MariaDB has implemented much more.

Schema

In terms of database objects, MariaDB 10.3 introduced sequences, invisible columns and temporal tables – all of which are not available in MySQL.

	MariaDB	MySQL
Sequences	✓	✗
Generated columns	✓	✓
Invisible columns	✓	✗
Temporal tables	✓	✗
Views	✓	✓

Indexes

MariaDB and MySQL both support standard indexes, but MySQL 8 added support for descending, functional and invisible indexes as well.

	MariaDB	MySQL
Descending		✓
Functional	✗	✓
Invisible	✗	✓

Queries

MariaDB and MySQL both support a lot of standard SQL. MySQL 8 made progress catching up with MariaDB by adding common table expressions (CTEs) and window functions, but does not yet support the INTERSECT and EXCEPT set operators introduced in MariaDB 10.3

Further, they both provide extended support in different areas. MariaDB 10.5 improved its support for CTEs by adding support for CYCLE while MySQL 8 improved its support for roll ups by adding GROUPING and allowing WITH ROLLUP to be used with ORDER BY.

	MariaDB	MySQL
VALUES (table value constructors)	✓	✓
UNION [ALL|DISTINCT] (set operators)	✓	✓

	MariaDB	MySQL
INTERSECT [ALL|DISTINCT] (set operators)	✓	✓
EXCEPT [ALL|DISTINCT] (set operators)	✓	✗
WITH ROLLUP (rollups)	✓	✓
WITH ROLLUP ORDER BY (rollups)	✗	✓
GROUPING (rollups)	✗	✓
OVER and WINDOW (window functions)	✓	✓
LATERAL (lateral derived tables)	✗	✓
WITH [RECURSIVE] (common table expressions)	✓	✓
WITH [RECURSIVE] CYCLE (common table expressions)	✓	✗

Aggregate functions

MariaDB and MySQL both support many of the same out-of-the-box aggregate functions. However, MariaDB supports correlation and linear regression functions as well – MySQL does not.

Standard deviation and variance

	MariaDB	MySQL
STD	✓	✓
STDDEV	✓	✓
STDDEV_POP	✓	✓
STDDEV_SAMP	✓	✓
VARIANCE	✓	✓
VAR_POP	✓	✓
VAR_SAMP	✓	✓

Correlation and linear regression

	MariaDB	MySQL
CORR	✓	✗
COVAR_POP	✓	✗
COVAR_SAMP	✓	✗
REGR_AVGX	✓	✗
REGR_AVGY	✓	✗
REGR_COUNT	✓	✗
REGR_INTERCEPT	✓	✗
REGR_R2	✓	✗
REGR_SLOPE	✓	✗
REGR_SXX	✓	✗
REGR_SXY	✓	✗
REGR_SYY	✓	✗

Window functions

MariaDB and MySQL both support many of the same out-of-the-box windows functions. However, MariaDB supports inverse distribution functions as well – MySQL does not.

Value

	MariaDB	MySQL
FIRST_VALUE	✓	✓
LAG	✓	✓
LAST_VALUE	✓	✓
LEAD	✓	✓
NTH_VALUE	✓	✓

Ranking

	MariaDB	MySQL
CUME_DIST	✓	✓
DENSE_RANK	✓	✓
NTILE	✓	✓
PERCENT_RANK	✓	✓
RANK	✓	✓
ROW_NUMBER	✓	✓

Inverse distribution

	MariaDB	MySQL
MEDIAN	✓	✗
PERCENTILE_CONT	✓	✗
PERCENTILE_DISC	✓	✗

Scalability and performance

MariaDB and MySQL both support basic scalability and performance feature (e.g., table partitioning and compression). However, MariaDB has more advanced features via MaxScale (database proxy/query router) and the Spider (transparent sharding) and Xpand (distributed SQL) smart engines.

MaxScale performs transparent read/write splitting and adaptive load balancing, neither of which are available in MySQL Router. In addition, MaxScale can cache query results in Redis to reduce the workload on the database and improve query performance.

Spider enables transparent sharding and/or parallel query, giving MariaDB the ability to utilize multiple database instances and/or multiple CPU cores per database instance to execute queries with linear scalability.

Xpand provides MariaDB with fully distributed SQL, and is capable of scaling to millions of transactions per second with a shared-nothing architecture on commodity hardware, on premises or in the cloud. Further, Xpand is elastic, allowing database instances to be added or removed on demand.

	MariaDB	MySQL
Table/row compression	✓	✓
Column compression	✓	✗
Log compression	✓	✓
Partitioning	✓	✓
Parallel query	✓	✗
Query result caching via Redis	✓	✗
Read/write splitting	✓	✗
Casual reads	✓	✗
Sharding	✓	✗
Distributed SQL	✓	✗

High availability

MariaDB and MySQL both support replication (asynchronous and semi-synchronous), but whereas MariaDB includes automatic failover for high availability, MySQL does not. However, both MariaDB and MySQL can provide continuous availability with multi-master clustering and dynamic query routing.

MariaDB multi-master clustering is based on Galera Cluster, a robust, mature and proven solution that's been used in production for years. MySQL introduced group replication in the previous major release (MySQL 5.7), but it lacks advanced clustering features such as full state transfer for adding new database instances, automatic rejoin for recovered database instances and streaming replication for large transactions.

	MariaDB	MySQL
Replication (async and semi-sync)	✓	✓
Replication with automatic failover	✓	✗
Multi-master clustering	✓	✓
Connection migration	✓	✗
Session restore	✓	✗
Transaction replay	✓	✗

Disaster recovery

MariaDB and MySQL both support online backups and point-in-time restore. However, MariaDB supports point-in-time rollback (i.e., Flashback) as well, allowing DBAs to rewind the database by rolling back recent transactions rather than restoring from a backup.

	MariaDB	MySQL
Online backups	✓	✓
Full, incremental and partial backups	✓	✓
Online partial restore	✓	✓
Encrypted backups	✓	✓
Compressed backups	✓	✓
Point-in-time restore	✓	✓
Point-in-time rollback	✓	✗
Delayed replicas	✓	✓

Security

MariaDB and MySQL provide many of the same enterprise security features, but there are some differences in the implementations and MariaDB offers more advanced features for database and data protection.

Encryption

MariaDB and MySQL both support the same core encryption features, including HashiCorp Vault plugins for external key management.

	MariaDB	MySQL
Encrypted tables and logs	✓	✓
External key management	✓	✓
Encrypted connections	✓	✓
Reload SSL/TLS context	✓	✓

Authentication

MariaDB and MySQL both support the same core authentication features. However, MySQL 8 introduced password reuse policies. This feature is not yet available in MariaDB.

	MariaDB	MySQL
PAM/LDAP/Kerberos/NTLM authentication	✓	✓
User/group mapping	✓	✓
Password expiration	✓	✓
Password reuse policies	✗	✓
Password strength validation	✓	✓
Account locking	✓	✓

Authorization

MariaDB and MySQL both support the same core authorization features. However, MySQL 8 introduced partial revokes. This feature is planned for the next major version of MariaDB.

	MariaDB	MySQL
Roles	✓	✓
Privileges	✓	✓
Partial revokes	✗	✓
User resource limits	✓	✓

Auditing

MariaDB and MySQL both support auditing, but with some differences. MariaDB can write to a file or to the syslog. MySQL can only write to a file, but supports JSON and XML formats whereas MariaDB uses a CSV format. In addition, MySQL supports audit log compression and encryption.

	MariaDB	MySQL
File output – CSV format	✓	✗
File output – JSON format	✗	✓
File output – XML format	✗	✓
Syslog output	✓	✗
JSON filter/rule definitions	✓	✓
Custom events	✗	✓
Encryption	✗	✓
Compression	✗	✓

Database and data protection

MariaDB and MySQL both have database firewall, but MariaDB offers many more advanced database and data protection features, including dynamic data masking to hide sensitive and/or personally identifiable information in query results and both query throttling and query result limiting to protect the database from denial-of-service (DoS) attacks.

	MariaDB	MySQL
Dynamic data masking	✓	✗
Dynamic data obfuscation	✓	✗
Database firewall	✓	✓
Query throttling	✓	✗
Query result limiting	✓	✗

MYSQL UNIQUE FEATURES

MySQL Document Store

MySQL Document Store expands MySQL's JSON support with the MySQL X Protocol and X DevAPI. The X DevAPI allows developers to store JSON documents in collections rather than tables, and to read and write JSON documents via CRUD operations instead of SQL queries.

MARIADB UNIQUE FEATURES

Temporal tables

MariaDB supports all three types of temporal tables defined in the SQL standard: system-versioned tables, application-time period tables and bitemporal tables.

With system-versioned tables, the database creates a new row whenever its data is modified (i.e., updated or deleted), maintaining a complete version history of every row. It enables DBAs and/or applications to query table data from a previous point in time.

With application-time period tables, applications specify the start and end time for when a row is valid.

Oracle Database compatibility

MariaDB tables can be created using Oracle Database data types, and can execute stored procedures written in Oracle PL/SQL. Oracle Database compatibility simplifies migration to MariaDB, enabling DBAs to "lift and shift" Oracle Database tables, package and stored procedures. In addition, MariaDB supports Oracle Database syntax for sequences.

Federation

The MariaDB Enterprise Federation plugin can be used to access tables in other databases through MariaDB. Unlike similar plugins for MySQL, it is not limited to remote MariaDB databases. It access remote databases, open source or proprietary, using standard ODBC connections.

Columnar storage format

The MariaDB ColumnStore plugin provides MariaDB with a columnar storage format and massively parallel processing for interactive, ad hoc analytics on massive data sets, removing the need to use a separate data warehouse for analytics. However, MariaDB is not limited to using one storage format or the other. MariaDB schemas can have row tables for transaction processing and columnar tables for analytics, or store data in both row and columnar formats, enabling it to support applications requiring smart transactions (i.e., hybrid transactional/analytical processing).

Distributed SQL

The MariaDB Xpand plugin provides MariaDB with fully distributed SQL, enabling it to scale out to millions of transactions per second. Xpand tables and indexes are partitioned, with different partitions stored on different database instances, modified via distributed transactions and accessed via standard SQL. Further, Xpand is highly available, maintaining at least three (3) copies of a partition, and elastic, automatically rebalancing data when database instances are added and replacing lost partitions when database instances are removed.

SUMMARY

Benefits of MariaDB

- Temporal tables
- Oracle Database compatibility
- Federation
- Columnar storage format
- Distributed SQL
- Sequences
- Invisible columns
- INTERSECT/EXCEPT
- WITH [RECURSIVE] CYCLE
- Correlation and linear regression functions
- Inverse distribution functions
- Column compression
- Parallel query
- Query result caching via Redis
- Read/write splitting
- Casual reads
- Sharding
- Replication with automatic failover
- Connection migration
- Session restore
- Transaction replay
- Point-in-time rollback (i.e., Flashback)
- Dynamic data masking
- Query throttling
- Query result limiting

Benefits of MySQL

- MySQL Document Store
- JSON Schema validation
- Function, descending and invisible indexes
- Roll ups with grouping and ordering
- Lateral derived tables
- Password reuse policies
- Partial revokes
- JSON/XML audit log formats
- Audit log encryption and compression
- Custom audit events

CONCLUSION

MariaDB and MySQL started from the same place, but in recent years have become separate databases. MySQL 8 caught up to MariaDB in a number of ways, but MariaDB continues to innovate and release much faster than MySQL. And while MySQL has incrementally improved its transactional capabilities, MariaDB has expanded its own to support data warehousing/analytics and distributed SQL too.

For enterprise organizations looking to embrace open source and migrate off of proprietary databases such as Oracle Database, Microsoft SQL Server and IBM Db2, MariaDB provides the most powerful and most capable enterprise open source alternative, complete with Oracle Database compatibility, columnar storage for scalable, high-performance analytics and distributed SQL for scale out transaction processing.