

# **TencentDB for MariaDB**

## **General References**

### **Product Documentation**



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# General References

## Standards and Certification

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TencentDB for MariaDB has earned many Chinese and international certifications on behalf of TencentDB, including but not limited to:

- Software Copyright
- ISO22301 Certification
- ISO27001 Certification
- ISO20000 Certification
- ISO9001 Certification
- Trusted Cloud Service Certification
- Cybersecurity Classified Protection Certification
- STAR Certification

Some features of TencentDB for MariaDB are designed based on the following standards:

- GBT 20273-2006 Information Security Technology - Security Techniques Requirement for Database Management System
- JRT 0072-2012 Testing and Evaluation Guide for Classified Protection of Information System of Financial Industry

# Main Specification Performance Description

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## 1. Testing Tool

sysbench v0.5 is the tool used to test the database benchmark performance.

Modifications to the tool:

The OTLP script that comes with sysbench was modified. Specifically, the read/write ratio was changed to 1:1 and controlled by the testing command parameters `oltp_point_selects` and `oltp_index_updates`. In this document, all test cases involve 4 Select operations and 1 Update operation with the read/write ratio at 4:1.

## 2. Testing Environment

Type	Description
Physical machine	High-IO edition where a single machine can support database instances with up to 488 GB memory and 6 TB disk
Instance specification	Currently purchasable mainstream specification (please see the test cases below)
Client configuration	4-core CPU and 8 GB memory
Number of clients	1-6 (more clients need to be added as the configuration is upgraded)
Network environment	Data center with 10-Gigabit connection and a network latency below 0.05 ms
Environment load	Load on the machine where MySQL is installed is above 70% (for non-exclusive instances)

- Note on client specification: high-spec client machines are used so as to ensure that the database instance performance can be measured through stress testing on a single client. For low-spec clients, it is recommended to use multiple clients for concurrent stress testing and aggregate the results.
- Note on network latency: it should be ensured that clients and database instances are in the same AZ so as to prevent the testing result from being affected by network factors.

## 3. Testing Method

### 3.1. Structure of testing tables

```
CREATE TABLE `sbtest1` (  
  `id` int(10) unsigned NOT NULL AUTO_INCREMENT,  
  `k` int(10) unsigned NOT NULL DEFAULT '0',  
  `c` char(120) NOT NULL DEFAULT '',  
  `pad` char(60) NOT NULL DEFAULT '',  
  PRIMARY KEY (`id`), KEY `k_1` (`k`)  
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

### 3.2. Format of testing data rows

```
id: 1  
k: 20106885  
c: 08566691963-88624912351-16662227201-46648573979-64646226163-77505759394-754700  
94713-41097360717-15161106334-50535565977  
pad: 63188288836-92351140030-06390587585-66802097351-4928296184
```

### 3.3. Data preparation

```
/root//sysbench/sysbench --mysql-host=xxxx --mysql-port=xxxx --mysql-user=xxx --mysql-password=xxx --mysql-db=test --mysql-table-engine=innodb --test=tests/db/oltp.lua --oltp_tables_count=20 --oltp-table-size=10000000 --rand-init=on prepare
```

Description of data preparation parameters:

`--test=tests/db/oltp.lua` indicates to implement the OLTP test by calling the tests/db/oltp.lua script.

`--oltp_tables_count=20` indicates that the number of tables for testing is 20.

`--oltp-table-size=10000000` indicates that each testing table is populated with 10 million rows of data.

`--rand-init=on` indicates that each testing table is populated with random data.

### 3.4. Commands for performance stress testing

```
/root//sysbench/sysbench --mysql-host=xxxx --mysql-port=xxx --mysql-user=xxx --mysql-password=xxx --mysql-db=test --test=/root/sysbench_for_z3/sysbench/tests/db/oltp.lua --oltp_tables_count=xx --oltp-table-size=xxxx --num-threads=xxx --oltp-read-only=off --rand-type=special --max-time=600 --max-requests=0 --percentile=99 --oltp-point-selects=4 run
```

Description of performance stress testing parameters:

`--test=/root/sysbench_for_z3/sysbench/tests/db/oltp.lua`

`--oltp_tables_count=20` indicates that the number of tables for testing is 20.

`--oltp-table-size=10000000` indicates that each testing table is populated with 10 million rows of data.

`--num-threads=128` indicates that the concurrent connections of clients for testing is 128.

`--oltp-read-only=off` indicates that the read-only testing model is disabled and the hybrid read/write model is used.

`--rand-type=special` indicates that the random model is specific.

`--max-time=1800` indicates the execution time of this test.

`--max-requests=0` indicates that no limit is imposed on the total number of requests and the test is executed according to `max-time`.

`--percentile=99` indicates the sampling rate. Here, 99 means discarding 1% long requests of all the requests and taking the maximum value among the remaining 99% requests. The default value is 95%.

`--oltp-point-selects=4` indicates that the number of Select operations in the SQL testing command in the OLTP script is 4. The default value is 1.

### 3.5. Scenario model

All test cases in this document adopt the scenario script `our_oltp.lua` which is modified to run four `Select` operations and one `Update` operation (index column) with the read/write ratio at 4:1.

For the maximum configuration, the parameter tuning model is added to the data scenario. For the test results, please see "Test Results" below.

## 4. Testing Parameters

Memory	Storage Capacity	Number of Tables	Number of Rows	Data Set Size	Concurrency	Execution Time (Min)
4 GB	200 GB	8	40 million	76 GB	128	30
8 GB	200 GB	15	40 million	142 GB	128	30
16 GB	400 GB	25	40 million	238 GB	128	30
32 GB	700 GB	25	40 million	238 GB	128	30
64 GB	1 TB	40	40 million	378 GB	256	30

Memory	Storage Capacity	Number of Tables	Number of Rows	Data Set Size	Concurrency	Execution Time (Min)
96 GB	1.5 TB	40	40 million	378 GB	128	30
128 GB	2 TB	40	40 million	378 GB	128	30
244 GB	3 TB	60	40 million	567 GB	128	30
488 GB	6 TB	60	40 million	567 GB	128	30
488 GB (tuned)	6 TB	60	10 million	140 GB	128	30

## 5. Test Results

Memory	Storage Capacity	Data Set	Number of Clients	Single-client Concurrency	QPS	TPS
4 GB	200 GB	76 GB	1	128	4,082	816
8 GB	200 GB	142 GB	1	128	6,551	1,310
16 GB	400 GB	238 GB	1	128	11,098	2,219
32 GB	700 GB	238 GB	2	128	20,484	3,768
64 GB	1 TB	378 GB	2	128	36,395	7,279
96 GB	1.5 TB	378 GB	3	128	56,465	11,292
128 GB	2 TB	378 GB	3	128	82,007	16,120
244 GB	3 TB	567 GB	4	128	99,868	19,505
488 GB	6 TB	567 GB	6	128	141,136	28,449



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Memory	Storage Capacity	Data Set	Number of Clients	Single-client Concurrency	QPS	TPS
488 GB (tuned)	6 TB	140 GB	6	128	245,408	47,201

# Performance Comparison Data for Strong Sync

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This document provides a comparison on the performance of TencentDB for MariaDB and open-source MySQL (unoptimized) for your reference.

## Testing Environment for Comparison

- **Hardware:** 24-core CPU; 128 GB memory; 1.8 TB SSD
- **Network environment:** LAN with an average network latency of 0.80 ms
- **Operating system:** CentOS 7.0
- **Data volume:** 10 tables. Each of them has 2,180,000 data rows of about 5.2 GB. InnoDB buffer: 30 GB
- **Open-source version:** MySQL 5.6 community edition (unoptimized; **async replication enabled**)
- **TencentDB for MariaDB sharding version:** MariaDB 10.1.10 (optimized kernel with **strong sync replication enabled**; thread pool enabled by default)

## Comparison Results

Based on the results, the strong sync performance of optimized TencentDB for MariaDB is slightly better than MySQL's async performance.

## Detailed Comparison Data

### Test operations

#### 1. Data initialization parameters

```
create database caccts ;
./sysbench --num-threads=500 --test=./tests/db/oltp.lua.bak --oltp-table-size=2180000 --oltp-tables-count=10 --oltp-point-selects=1 --oltp-simple-ranges=0 --oltp-sum-ranges=0 --oltp-order-ranges=0 --oltp-index-updates=1 --oltp-non-index-updates=0 --report-interval=1 --mysql-user=xxxxxxx --mysql-password=xxxxxxx --mysql-host=xxxxxxx --mysql-db=caccts --max-time=360000 --max-requests=2000000000 prepare
```

## 2. Non-index update (UPDATE)

```
./sysbench --num-threads=500 --test=./tests/db/update\_non\_index.lua --oltp-table-size=2180000 --oltp-tables-count=10 --percentile=99 --report-interval=1 --mysql-host=xxxx --mysql-user=xxx --mysql-password=xxx --mysql-db=caccts --max-time=360000 --max-requests=2000000000 --mysql-port=3306 run
```

## 3. Read-only (SELECT)

```
./sysbench --num-threads=500 --test=./tests/db/select.lua --oltp-table-size=2180000 --oltp-tables-count=10 --percentile=99 --report-interval=1 --mysql-host=xxxx --mysql-user=xxx --mysql-password=xxx --mysql-db=caccts --max-time=360000 --max-requests=2000000000 --mysql-port=3306 run
```

## 4. Hybrid test

```
./sysbench\_orig --num-threads=500 --test=./tests/db/oltp\_new.lua --oltp-read-only=off --oltp-table-size=2180000 --oltp-tables-count=10 --oltp-point-selects=1 --oltp-simple-ranges=0 --oltp-sum-ranges=0 --oltp-order-ranges=0 --oltp-distinct-ranges=0 --oltp-index-updates=1 --oltp-non-index-updates=0 --percentile=99 --report-interval=1 --mysql-host=xxxx --mysql-user=xxx --mysql-password=xxx --mysql-db=caccts --max-time=360000 --max-requests=2000000000 --mysql-port=3306 run
```

## Comparison results

### 1. Read request (READ)

Concurrence	Version	QPS	Average Response Time (ms)	99% Response Time (ms)
50	Open-source MySQL	306,512	0.16	0.26
50	TencentDB for MariaDB	310,695	0.15	0.24
100	Open-source MySQL	417,443	0.24	0.48
100	TencentDB for MariaDB	454,640	0.2	0.72
200	Open-source MySQL	423,419	0.57	1
200	TencentDB for MariaDB	488,224	0.56	1.22

Concurrence	Version	QPS	Average Response Time (ms)	99% Response Time (ms)
500	Open-source MySQL	438,512	1.16	2.42
500	TencentDB for MariaDB	490,678	1.21	2.61
1000	Open-source MySQL	412,723	2.3	6.3
1000	TencentDB for MariaDB	481,342	2.1	4.21

## 2. Write request (UPDATE)

Concurrence	Version	QPS	Average Response Time (ms)	99% Response Time (ms)
50	Open-source MySQL	24,816	2.37	2.82
50	TencentDB for MariaDB	28,925	2.33	2.55
100	Open-source MySQL	43,046	2.25	3.91
100	TencentDB for MariaDB	43,466	2.3	4
200	Open-source MySQL	54,690	3.92	7.86
200	TencentDB for MariaDB	54,045	3.7	7.27
500	Open-source MySQL	70,192	7.44	14.1
500	TencentDB for MariaDB	70,370	7.25	15.52
1000	Open-source MySQL	68,447	15.2	29.47
1000	TencentDB for MariaDB	69,890	14.35	30.73

## 3. Hybrid scenario (OLTP test)

Concurrence	Version	QPS	Average Response Time (ms)	99% Response Time (ms)
50	Open-source MySQL	154,806	2.7	4.13
50	TencentDB for MariaDB	162,883	1.84	3.45
100	Open-source MySQL	162,696	3.85	7.4
100	TencentDB for MariaDB	173,974	3.58	6.64
200	Open-source MySQL	204,550	5.64	12.92
200	TencentDB for MariaDB	208,128	5.76	11.9
500	Open-source MySQL	235,386	13.93	28.58
500	TencentDB for MariaDB	232,543	13.58	27.23
1000	Open-source MySQL	201,765	28.29	60.72
1000	TencentDB for MariaDB	226,130	27.76	54.38