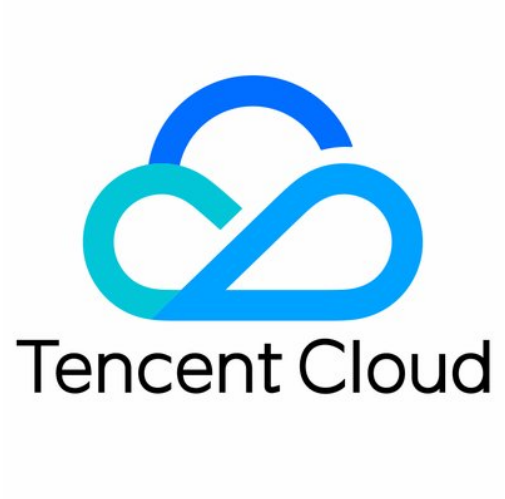
TencentDB for MySQL

White Paper

Product Documentation



©2013-2019 Tencent Cloud. All rights reserved.

Copyright Notice

©2013-2019 Tencent Cloud. All rights reserved.

Copyright in this document is exclusively owned by Tencent Cloud. You must not reproduce, modify, copy or distribute in any way, in whole or in part, the contents of this document without Tencent Cloud's the prior written consent.

Trademark Notice

Tencent Cloud

All trademarks associated with Tencent Cloud and its services are owned by Tencent Cloud Computing (Beijing) Company Limited and its affiliated companies. Trademarks of third parties referred to in this document are owned by their respective proprietors.

Service Statement

This document is intended to provide users with general information about Tencent Cloud's products and services only and does not form part of Tencent Cloud's terms and conditions. Tencent Cloud's products or services are subject to change. Specific products and services and the standards applicable to them are exclusively provided for in Tencent Cloud's applicable terms and conditions.

Contents

©2013-2019 Tencent Cloud. All rights reserved.

White Paper
Performance White Paper

Last updated : 2020-08-25 11:36:36

Testing Tool

Sysbench 0.5 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 four Select operations and one Update operation with the read/write ratio at 4:1.

Tool installation

Run the following code to install Sysbench 0.5:

```
git clone https://github.com/akopytov/sysbench.git
git checkout 0.5
yum -y install make automake libtool pkgconfig libaio-devel
yum -y install mariadb-devel
./autogen.sh
./configure
make -j
make install
```

Note :

The installation directions above apply to performance stress testing on a CentOS CVM instance. For directions on installing the tool on other operating systems, please see the official Sysbench documentation.

Testing Environment

Type	Description

©2013-2019 Tencent Cloud. All rights reserved.

Type	Description
Physical machine	High-availability 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: in the testing environment, it should be ensured that clients and database instances are in the same availability zone so as to prevent the testing result from being affected by network factors.

Test Method

1. Structure of testing database 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;
```

2. Format of testing data rows

©2013-2019 Tencent Cloud. All rights reserved.

```
id: 1
k: 20106885
c: 08566691963-88624912351-16662227201-46648573979-64646226163-77505759394-75470094713-41097360717-15161106334-50535565977
pad: 63188288836-92351140030-06390587585-66802097351-4928296184
```

3. Data preparations

```
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
```

Descriptions 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.

4. Command for stress testing

```
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
```

Descriptions of stress testing parameters:

- `--test=/root/sysbench_for_z3/sysbench/tests/db/oltp.lua` indicates to implement the OLTP test by calling the `/root/sysbench_for_z3/sysbench/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.
- `--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` .

©2013-2019 Tencent Cloud. All rights reserved.

- `--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.

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.

Test Parameters

Instance Specification	Storage Capacity	Number of Tables	Number of Rows	Data Set Size	Concurrence	Execution Time (Minutes)
1-core, 1 GB	200 GB	4	20 million	19 GB	128	30
1-core, 2 GB	200 GB	4	40 million	38 GB	128	30
2-core, 4 GB	200 GB	8	40 million	76 GB	128	30
4-core, 8 GB	200 GB	15	40 million	142 GB	128	30
4-core, 16 GB	400 GB	25	40 million	238 GB	128	30
8-core, 32 GB	700 GB	25	40 million	238 GB	128	30
16-core, 64GB	1 TB	40	40 million	378 GB	256	30
16-core, 96 GB	1.5 TB	40	40 million	378 GB	128	30

©2013-2019 Tencent Cloud. All rights reserved.

Instance Specification	Storage Capacity	Number of Tables	Number of Rows	Data Set Size	Concurrence	Execution Time (Minutes)
16-core, 128 GB	2 TB	40	40 million	378 GB	128	30
24-core, 244 GB	3 TB	60	40 million	567 GB	128	30
48-core, 488 GB	6 TB	60	40 million	567 GB	128	30
48-core, 488 GB (tuned)	6 TB	60	10 million	140 GB	128	30

Test Results

Instance Specification	Storage Capacity	Data Set	Number of Clients	Single-client Concurrence	QPS	TPS
1-core, 1 GB	200 GB	19 GB	1	128	1,757	97
1-core, 2 GB	200 GB	38 GB	1	128	3,016	167
2-core, 4 GB	200 GB	76 GB	1	128	4,082	816
4-core, 8 GB	200 GB	142 GB	1	128	6,551	1,310
4-core, 16 GB	400 GB	238 GB	1	128	11,098	2,219
8-core, 32 GB	700 GB	238 GB	2	128	20,484	3,768
16-core, 64 GB	1 TB	378 GB	2	128	36,395	7,279
16-core, 96 GB	1.5 TB	378 GB	3	128	56,464	11,292

©2013-2019 Tencent Cloud. All rights reserved.

Instance Specification	Storage Capacity	Data Set	Number of Clients	Single-client Concurrence	QPS	TPS
16-core, 128 GB	2 TB	378 GB	3	128	81,752	16,350
24-core, 244 GB	3 TB	567 GB	4	128	98,528	19,705
48-core, 488 GB	6 TB	567 GB	6	128	142,246	28,449
48-core, 488 GB (tuned)	6 TB	140 GB	6	128	245,509	46,304

©2013-2019 Tencent Cloud. All rights reserved.

Security White Paper Overview

Last updated : 2020-04-21 09:23:43

TencentDB for MySQL enables you to easily deploy and use scalable instances of MySQL database, the most popular open-source relational database in the world, in the cloud in a matter of minutes. It features high cost performance and elastic hardware scalability without downtime. As a complete database solution with various features such as backup, rollback, monitoring, fast scaling, and data transfer, it simplifies your IT OPS and allows you to focus more on business development.

TencentDB for MySQL provides diversified security reinforcement features to ensure the reliability and security of your data. In order to make your TencentDB for MySQL instances more secure, you are recommended to use the following security features based on your business needs:

- Network: security group, VPC, etc.
- Storage: data encryption, automatic backup, etc.
- Disaster recovery: intra-region disaster recovery, cross-region disaster recovery.

Relevant security features:
Attack protection, access control, network isolation, data storage encryption, backup and restoration, instance disaster recovery, data termination, version upgrade.

©2013-2019 Tencent Cloud. All rights reserved.

Attack protection

Last updated : 2020-04-21 09:23:44

DDoS Attack Prevention

When you use the public network to connect to and access a TencentDB for MySQL instance, you may suffer from DDoS attacks. To address this problem, Tencent Cloud provides traffic cleansing and blocking features that are automatically triggered and stopped by the system. When the Anti-DDoS system detects that your instance is under attacks, it will automatically enable traffic cleansing or block the traffic if the attacks cannot be resisted by cleansing or reach the blocking threshold.

> You are recommended to access your TencentDB for MySQL instances over the private network to avoid DDoS attacks.

Traffic cleansing

When the public network traffic of a TencentDB for MySQL instance exceeds the threshold, Anti-DDoS will automatically cleanse the inbound traffic to the instance. Policy-based routing will be used to redirect the traffic from the original network route to the DDoS cleansing devices of Anti-DDoS, which will identify the public network traffic, discard attack traffic, and forward normal traffic to the instance.

Blocking

When the attack traffic suffered by a TencentDB for MySQL instance exceeds the blocking threshold, Tencent Cloud will block all public network access requests to this instance through applicable ISP services to prevent other Tencent Cloud users from being affected. This means that when the bandwidth of the attack traffic suffered by your instance exceeds the maximum protection bandwidth, Tencent Cloud will block all public network access requests to it.

- When the following conditions are met, blocking will be triggered:
  - The bits per second (bps) value reaches 2 Gbps.
  - Traffic cleansing is not effective.
- When the following condition is met, blocking will be stopped:
  - 2 hours elapses after blocking starts.

©2013-2019 Tencent Cloud. All rights reserved.

Access control

Last updated : 2020-04-21 09:23:44

TencentDB for MySQL implements access control through database account management, access management, security group, and other means to ensure MySQL data security.

Database Account Management

You can create database accounts in the TencentDB for MySQL Console or through APIs. You can also grant management permissions at different levels to such accounts. You are recommended to authorize accounts based on the principle of least privilege so as to ensure the data security.

Cloud Access Management

Cloud Access Management (CAM) helps you securely manage and control access permissions to your Tencent Cloud resources. With CAM, you can create, manage, and terminate users (groups), and control the Tencent Cloud resources that can be used by the specified user through identity and policy management, which implements permission separation.

Security Group

Security group mainly helps you implement network access control for your TencentDB for MySQL instances. A security group is a stateful virtual firewall capable of filtering. As an important means for network security isolation provided by Tencent Cloud, it can be used to set network access controls for one or more TencentDB instances.

Instances with the same network security isolation requirements in the same region can be put into the same logical security group. Instances in a security group are matched based on rules. Modifying security group rules does not require restarting the TencentDB for MySQL instances, and the changes will take effect immediately.

©2013-2019 Tencent Cloud. All rights reserved.

Network isolation

Last updated : 2020-04-21 09:23:45

TencentDB for MySQL supports the use of VPC to achieve a higher degree of network isolation and control. Using security group and VPC together can greatly improve the security of access to TencentDB for MySQL instances.

A VPC is a logically isolated network space established for users in Tencent Cloud. In a VPC, you can freely define IP range segmentation, IP addresses, and routing policies to achieve resource-level network isolation.

TencentDB for MySQL instances deployed in a VPC can only be accessed by CVM instances in the same VPC by default. If the CVM and MySQL instances are in different VPCs, they can communicate after you apply for public network access. For the sake of network security, you are not recommended to access your databases over the public network. If you have to do so, please configure appropriate security groups to implement access control for clients.

©2013-2019 Tencent Cloud. All rights reserved.

Data storage encryption

Last updated : 2020-07-17 12:53:15

TencentDB for MySQL supports the[transparent data encryption] (TDE) feature developed by the Tencent Cloud database team. Transparent encryption means that the data encryption and decryption are imperceptible to you. When creating an encrypted table, you do not need to specify an encryption key, and the data will be encrypted during write to the disk and decrypted during read from the disk.

TDE uses the internationally popular AES algorithm and 256-bit encryption keys, which are managed in Tencent Cloud KMS. You need to be authorized to access KMS and can rotate keys in the KMS Console to further improve the system security.

©2013-2019 Tencent Cloud. All rights reserved.

Backup and Restore

Last updated : 2020-04-21 09:23:46

Backup

TencentDB for MySQL supports both automatic and manual backup to ensure data restorability that guarantees data integrity and reliability. It provides data backup and log backup features by default, where the frequency of automatic backup should be set to higher than twice a week. If you have other backup needs, you can initiate manual backup through the console or APIs at any time.

In addition, you can flexibly configure the retention period of backup files as needed, which is 7 days by default and can be up to 732 days. Backup files that exceed the retention period will be automatically deleted.

For more information on how to use this feature, please see Backup Mode.

Restoration

TencentDB for MySQL is capable of data restoration. You can use the rollback feature to restore data to any time point within the retention period as needed. As the time points available for data restoration are subject to the retention period, you should configure a reasonable backup retention policy based on your business needs to ensure data restorability.

For more information on how to use this feature, please see Database Rollback.

©2013-2019 Tencent Cloud. All rights reserved.

Example Disaster recovery

Last updated : 2020-06-09 11:19:14

For applications with high requirements for service continuity, data reliability, and compliance, TencentDB for MySQL provides a cross-AZ and cross-region disaster recovery solution to help enhance your capability to deliver continued services at low costs and improve data reliability.

Intra-Region Disaster Recovery

TencentDB for MySQL High-Availability Edition allows you to create multi-AZ instances. Physical servers of a multi-AZ instance are deployed in different AZs in the same region. When an AZ fails, the business traffic will be switched to another AZ swiftly, which is imperceptible to the business and requires no changes at the application layer, helping implement intra-region disaster recovery.

> As a multi-AZ instance is deployed across multiple AZs, there may be an additional network sync delay of 2–3 ms.

For more information on intra-region disaster recovery, please see High Availability (Multi-AZ Deployment).

Cross-Region Disaster Recovery

The intra-region disaster recovery capability of TencentDB for MySQL is limited to different AZs in the same region. To further improve the availability, TencentDB for MySQL also supports cross-region data disaster recovery.

You can asynchronously replicate data in a TencentDB for MySQL instance in region A to another instance (disaster recovery instance) in region B through DTS. The disaster recovery instance has an independent connection address, account, and permissions. If a major failure occurs in region A and cannot be fixed in a short time, you can perform failover whenever needed. Specifically, you can quickly forward application requests to the disaster recovery instance simply by modifying the database connection configuration in the application, thereby delivering a finance-grade database availability.

For more information on cross-region disaster recovery, please see Managing Disaster Recovery Instance.

©2013-2019 Tencent Cloud. All rights reserved.

Data Terminate

Last updated : 2020-04-21 09:23:48

When you terminate your TencentDB for MySQL instance, all data (including backup data) stored in it will be destroyed. Tencent Cloud will not retain the data or actively recover your instance.

For more information, please see Terminating Instances.

©2013-2019 Tencent Cloud. All rights reserved.

Version upgrade

Last updated : 2020-04-21 09:23:48

TencentDB for MySQL will provide you with the latest version of database services. When a severe bug or security vulnerability occurs in the system, your TencentDB for MySQL instances will be upgraded during your maintenance time window, and upgrade notifications will be pushed to you in advance. The version upgrade process may cause a momentary disconnection; therefore, please make sure that your business has a reconnection mechanism.

©2013-2019 Tencent Cloud. All rights reserved.