

# **TDSQL for MySQL**

## **Security White Paper**

### **Product Documentation**



## Copyright Notice

©2013-2024 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



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

Security White Paper

Platform Security Design

Tenant Security Features

# Security White Paper

## Platform Security Design

Last updated : 2024-01-06 17:34:55

### Security Isolation

The networks of different regions are fully isolated from each other, and Tencent Cloud services in different regions cannot communicate with each other over the private network by default. In addition, security groups and VPCs are also used for network isolation.

**Security group:** it is a stateful virtual firewall capable of packet 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 Tencent Cloud services.

You can control the access permissions of a TDSQL for MySQL instance in the following ways:

Create multiple security groups and specify different rules for them.

Assign one or multiple security groups to the TDSQL for MySQL instance and use the security group rules to determine what traffic can access the instance and what resources can be accessed by the instance.

Configure a security group to allow only specified IP addresses to access the TDSQL for MySQL instance.

**VPC:** it is a logically isolated network space defined in Tencent Cloud. Even in the same region, different VPCs cannot communicate with each other over the private network by default.

### Authentication

**Cloud Access Management (CAM)** is a web-based Tencent Cloud service that helps you securely manage and control access permissions to your Tencent Cloud resources. Using 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.

When using CAM, you can associate a policy with a user or user group to allow or forbid them to use specified resources to complete specified tasks.

If you use multiple Tencent Cloud services such as CVM, VPC, and TencentDB that are managed by different users sharing your Tencent Cloud account key, you may face the following problems:

Your key is shared by multiple users, leading to high risk of compromise.

You cannot limit the access permissions of other users, which poses a security risk due to potential faulty operations.

You can allow different users to manage different services through sub-accounts so as to avoid the above problems.

By default, a sub-account does not have permission to use a Tencent Cloud service or related resources. Therefore,

you need to create a policy to grant the required permission to the sub-account.

## Transfer Encryption

The TDSQL for MySQL Console supports the HTTPS transfer protocol and standard network access protocols, guaranteeing your access security and meeting your needs for sensitive data encryption and transfer.

# Tenant Security Features

Last updated : 2024-01-06 17:34:56

This document describes tenant security features such as MAR, automatic failover, and data security encryption.

## Multi-thread Async Replication (MAR)

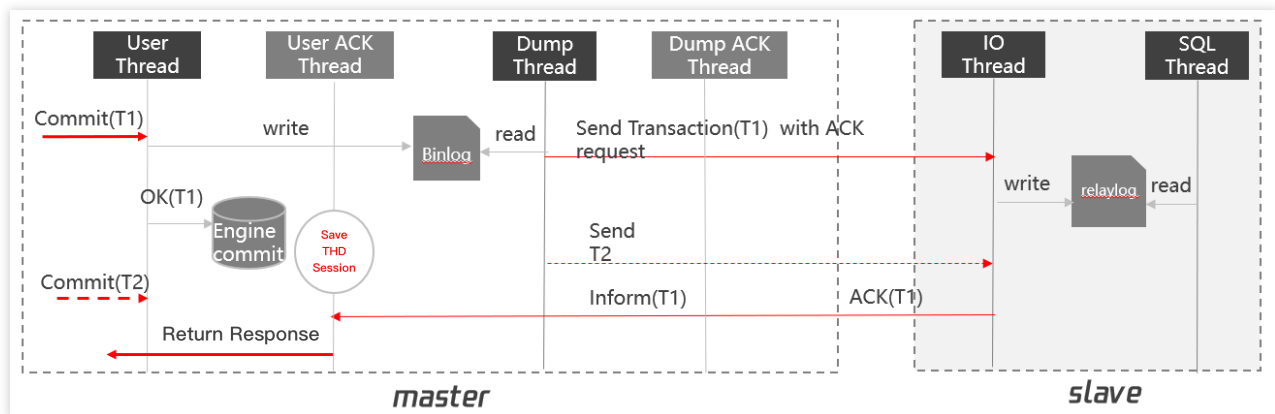
### Background

As a database records data in it, to switch between multiple databases, the data in them must be in sync. Therefore, data sync is the foundation of the database high availability solution.

Currently, the open-source MySQL database supports the async and semi-sync data replication modes. However, in both modes, if a node failure occurs, the data may be lost or become incorrect or messy. In addition, the replication mode is serial, which has a low performance.

### Solution

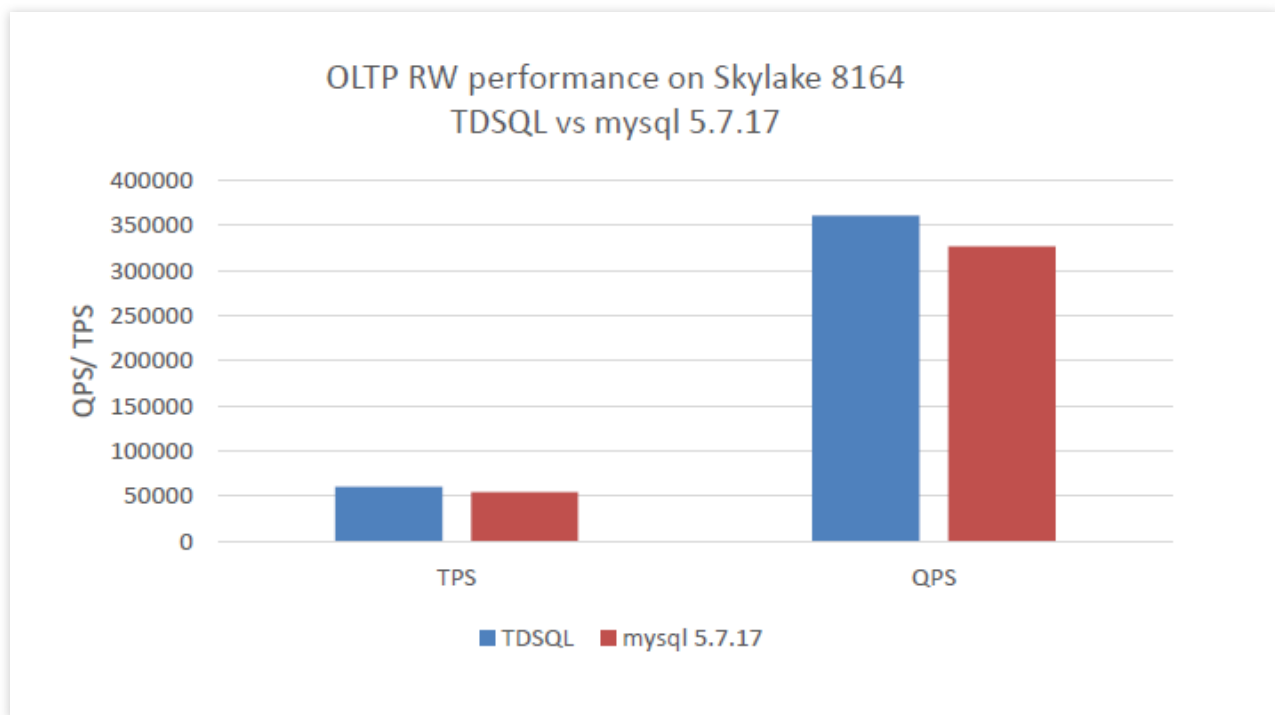
In Tencent Cloud's proprietary parallel multi-thread asynchronous replication (MAR, also known as strong sync) solution based on the MySQL protocol, when a request is initiated at the application layer, only after a replica node successfully returns a message can the source node respond to the application layer with a request success, ensuring that the source and replica nodes have the same data.



When you perform strong sync replication, the source database will be hanged if it is disconnected from the replica database or if the replica database fails. If there is only one source or replica database, the high-availability solution will be unavailable, because if only one single server is used, part of the data will be lost completely when a failure occurs, which does not meet the requirements for finance-level data security.

Therefore, based on MAR, TDSQL for MySQL provides a downgradable strong sync scheme, which is similar to the semi-sync technology of Google but has a different implementation scheme.

In addition, TDSQL for MySQL MAR parallelizes the serial sync threads and introduces the worker thread capabilities, which greatly improve the performance. In the same cross-AZ (IDC with a latency of around 10–20 ms) test, the technical performance of MAR is around 5 times that of semi-sync replication on MySQL 5.6 and 1.5 times that of MariaDB Galera Cluster. In OLTP RW (mix read/write in source/replica architecture), its performance is 1.2 times that of async replication on MySQL 5.7. The comparison of the specific performance tested by the Intel® technical team is as shown below:



## Automatic Failover and Recovery

In production systems, high availability solutions are often required to ensure uninterrupted system operations. As the core of system data storage and services, the availability requirement for the database is higher than that for computing service resources.

The high availability solution of TDSQL for MySQL works by allowing the collaboration of multiple database services. In this way, if a database fails, another server will immediately take over its tasks, so the service will not be interrupted or be interrupted only for a very short period of time. This solution is also called source/replica high availability. Based on the general source/replica high availability, TDSQL for MySQL further supports the following advanced features:

Automatic failover, cluster member control, and node removal from the cluster are supported. For instance-level source-replica switches, the virtual IP (VIP) will remain unchanged. The MAR policy ensures complete source/replica data consistency in case of source/replica failover, fully meeting the finance-level requirements for data consistency.

Automatic recovery is supported. When a physical node carrying shards fails, the scheduling system will automatically try to recover the node. If the node cannot be recovered, it will be automatically replaced within 30 minutes. A new node will be rebuilt from backups and automatically added to the cluster, ensuring the high-availability architecture of instances for the long term.

Each node contains a complete replica of the data and can be switched according to the needs specified on the database management page.

Do-not-switch configuration is supported. That is, failover will not be performed during the specified period of time. x86 PCs are supported, and there is no need to share storage devices.

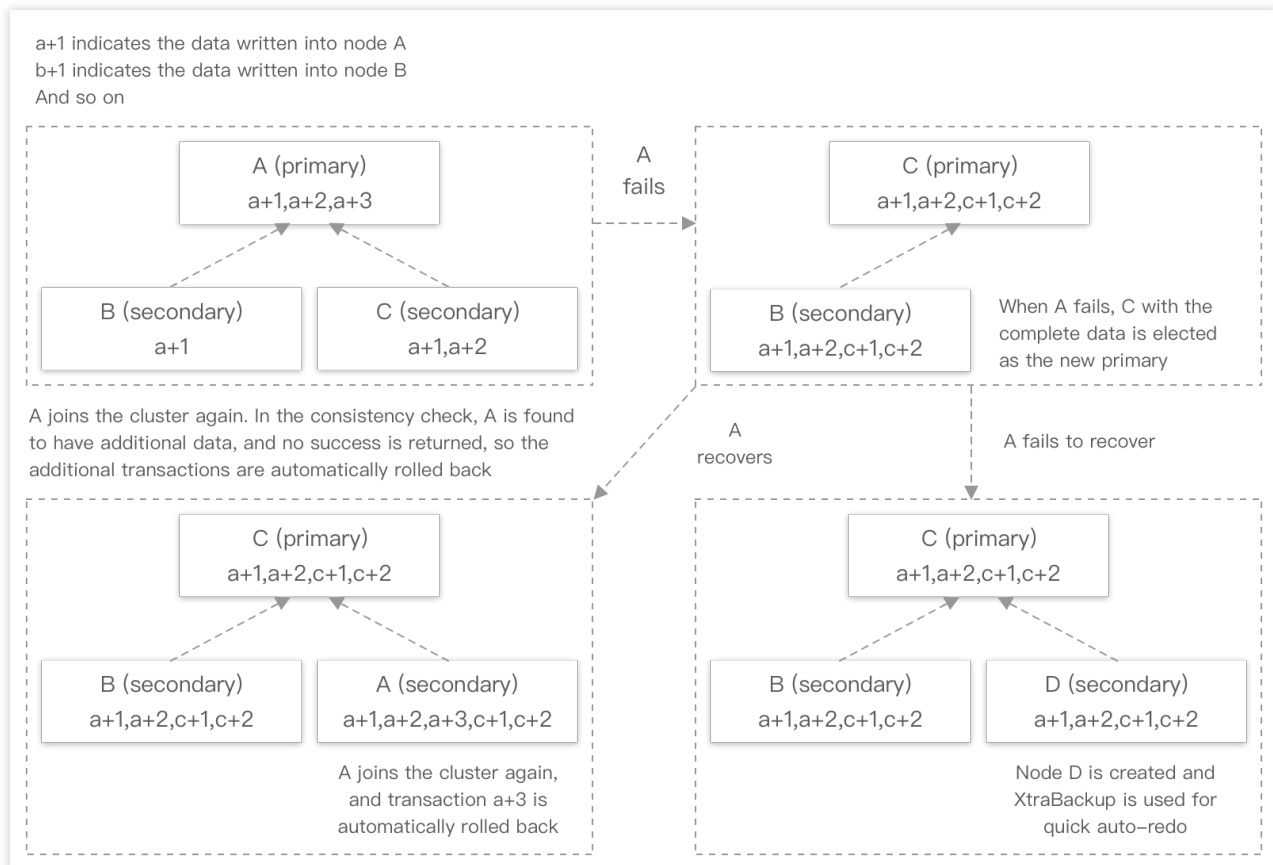
Cross-AZ deployment is supported. Even if the source and replica instances are in different data centers (regardless of whether they are in the same region), the data can be replicated through Direct Connect in real time. If the local node is the source and the remote node is the replica, the local node will be accessed first, and if it fails or becomes unreachable, the remote node will be accessed. In addition, with the help of Tencent Cloud VPC, an intra-region active-active architecture can be implemented. That is, the business system can directly read/write the database in both data centers.

This feature provides TDSQL for MySQL with multi-AZ disaster recovery capabilities, eliminating the operational risks with single-IDC deployment.

All TDSQL for MySQL shards support the MAR-based high availability scheme. If the source database fails, the system will automatically select the optimal replica database immediately to take over the tasks. The switch process is imperceptible to users, the access IP remains unchanged, and 24/7 continuous monitoring is provided for the databases and underlying physical devices.

If a failure occurs, the system will automatically restart the database and relevant processes. If a node crashes and cannot be recovered, it will be automatically rebuilt from its backup files, as shown below:





## Chinese and International Certifications

TDSQL for MySQL complies with applicable Chinese information security standards and has earned many Chinese and international certifications on behalf of TencentDB.

MariaDB Platinum member

ACMUG and China Computer Industry Association - Open Source Database Committee (CCIA-ODC) Presidium member

ISO 27001

ISO 27001:2013

ISO 20000

ISO 20000-1:2011

ISO 22301

ISO 9001

ISO 27018

PCI DSS Level 1 Service Provider Qualification

SOC Audit

ITSS Cloud Service Advanced Certification

Cybersecurity Classified Protection Level 3 Filing and Evaluation for Public Cloud

Cybersecurity Classified Protection Level 4 Filling and Evaluation for Finance Cloud

Trusted Cloud Database Service Certification

Trusted Cloud User Data Security Protection Capability Assessment

Trusted Cloud Gold Class Operations Special Assessment

ITSS Certification

CSA STAR Gold certification and dual certifications for information security management system from CNAS and UKAS

## Comprehensive Security Audit

Security audit is one of the most important tracing methods; therefore, China's Cybersecurity Classified Protection Certification (Level 3) stipulates that an information system should support auditing. TDSQL for MySQL provides audit capabilities at the following three layers to deliver complete security protection:

Security audit for the Ops system, which is implemented by the operation logs of the Chitu operation system.

Security audit for the database system, which is implemented by Tencent Cloud's proprietary database audit system.

Security audit for the server operating system, which is implemented by Tencent Cloud's proprietary Tiejiangjun system.

### Note:

In public cloud, all security audit features are configured by default.

In private cloud, system operation logging (Chitu system) is configured by default, while database SQL audit and server operation audit features are optional.

## Kernel-Level Security Policies

TDSQL for MySQL provides various open-source security solutions at the database kernel level, some of which have earned the recognition of the community. The following are some kernel security measures:

### Slow deletion

If you run the `drop table` or `alter table ... drop partition` command, the database will not delete the tablespace file immediately. Instead, it will rename the file, gradually shrink it on the backend, and finally delete it.

This feature can avoid system performance fluctuation caused by I/O load surges in the server's file system when a large tablespace file is deleted in one single request.

### Accidental metadata deletion prevention

Only authorized users can log in to the system and delete metadata tables, which helps prevent business unavailability due to faulty operations.

### **Banning of plugin installation by unauthorized users**

The database service provides standard APIs for users to implement custom features, but hackers usually exploit this vulnerability to launch attacks. Therefore, only specified admin users can mount plugins.

### **Banning of unauthorized user access to the physical server file system**

To prevent hackers from bypassing the security system by means such as file selection, file injection, and path detection, unauthorized users are blocked from accessing the directory structure and file system of the physical server.

## Data Termination

When you terminate your TDSQL instance, all data (including backup data) stored in it will be terminated. Tencent Cloud will not retain the data or actively restore your instance.

## Suggestions on 1-DC Disaster Recovery Deployment

When deploying 1-DC disaster recovery, you should prevent the following failures for your database cluster:

Single points of failures on devices such as data center switch, load balancer, and ENI.

Single points of failures on devices such as rack power, fan, and cooler.

Single points of failures on database server hardware.

Therefore, we recommend that you satisfy at least the following requirements for 1-DC disaster recovery deployment:

Deploy at least active-active disaster recovery for network devices such as switch and load balancer.

Deploy one source and two replicas for the database server and management and scheduling system.

Deploy different devices of the same module across racks.

Deploy a data backup module.

## Suggestions on 2-Region-3-DC Deployment

2-region-3-DC deployment is to add a disaster recovery center based on 1-region-2-DC deployment. The two disaster recovery instances are synced over a data communication network (DCN) to ensure data consistency.

