数据库中的DN和CN

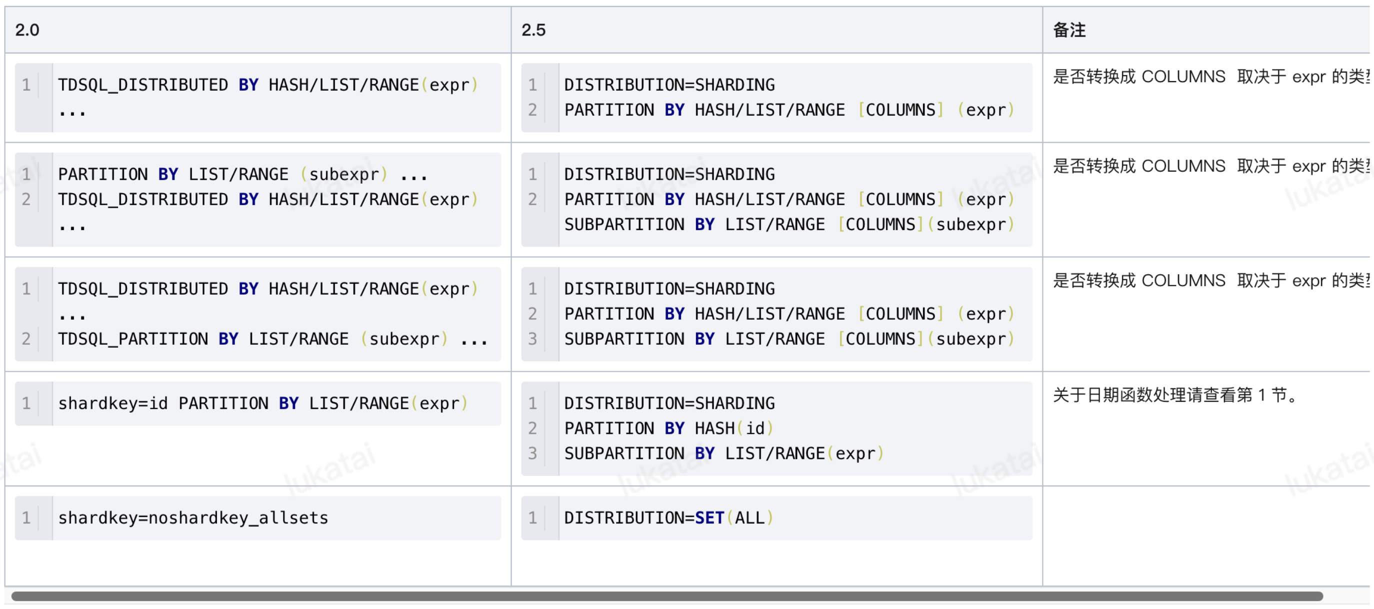
LOCALIZED('TXSQL')	下推 INSERT 到 DN 节点通过 DN 节点本地生成 ID
LOCALIZED('SQLENGINE')	通过 CN 节点本地生存 ID，节点之间可能重复(进阶可以设置不同 offset 和步长)
CENTRALIZED('TXSQL')	通过 DN 节中的发号表生成 ID

值得是？还未了解

1. 2.0 与 2.5 语法兼容

[2.0 mtr 迁移常见问题解决 - 腾讯iWiki (woa.com)](#)

[TDSQL2.5分布式表方案设计 - 腾讯iWiki (woa.com)](#)



2.0	2.5	备注

`TDSQL_DISTRIBUTED BY HASH/LIST/RANGE(expr) ...`	`DISTRIBUTION=SHARDING`
	`PARTITION BY HASH/LIST/RANGE [COLUMNS] (expr)`
		是否转换成 COLUMNS 取决于 expr 的类

`PARTITION BY LIST/RANGE (subexpr) ...`
`TDSQL_DISTRIBUTED BY HASH/LIST/RANGE(expr) ...`
	`DISTRIBUTION=SHARDING`
	`PARTITION BY HASH/LIST/RANGE [COLUMNS] (expr)`
	`SUBPARTITION BY LIST/RANGE [COLUMNS](subexpr)`
		是否转换成 COLUMNS 取决于 expr 的类

`TDSQL_DISTRIBUTED BY HASH/LIST/RANGE(expr) ...`
`TDSQL_PARTITION BY LIST/RANGE (subexpr) ...`
	`DISTRIBUTION=SHARDING`
	`PARTITION BY HASH/LIST/RANGE [COLUMNS] (expr)`
	`SUBPARTITION BY LIST/RANGE [COLUMNS](subexpr)`
		是否转换成 COLUMNS 取决于 expr 的类

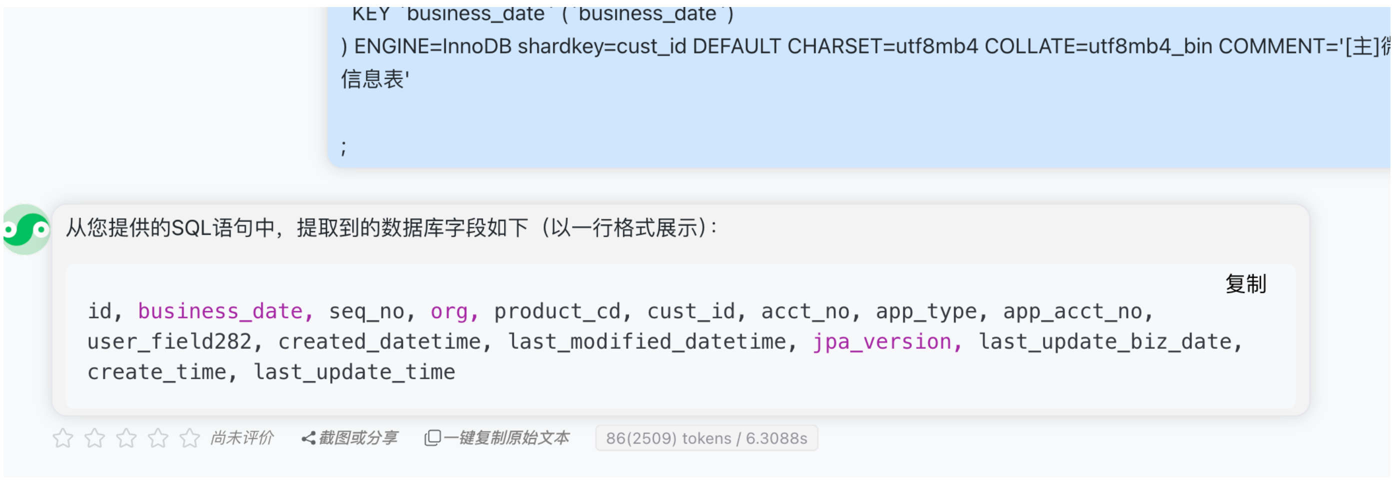
`shardkey=id PARTITION BY LIST/RANGE(expr)`	`DISTRIBUTION=SHARDING`
	`PARTITION BY HASH(id)`
	`SUBPARTITION BY LIST/RANGE(expr)`
		关于日期函数处理请查看第 1 节。

`shardkey=noshardkey_allsets`	`DISTRIBUTION=SET(ALL)`	

table_options 中去查看具体的分片键细节

解决分布式表insert数据必须指定字段问题：

使用GPT提取sql建表语句中的字段，然后插入到insert语句



```
  KEY `business_date` (`business_date`)
) ENGINE=InnoDB shardkey=cust_id DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_bin COMMENT='[主]
信息表'

;
```

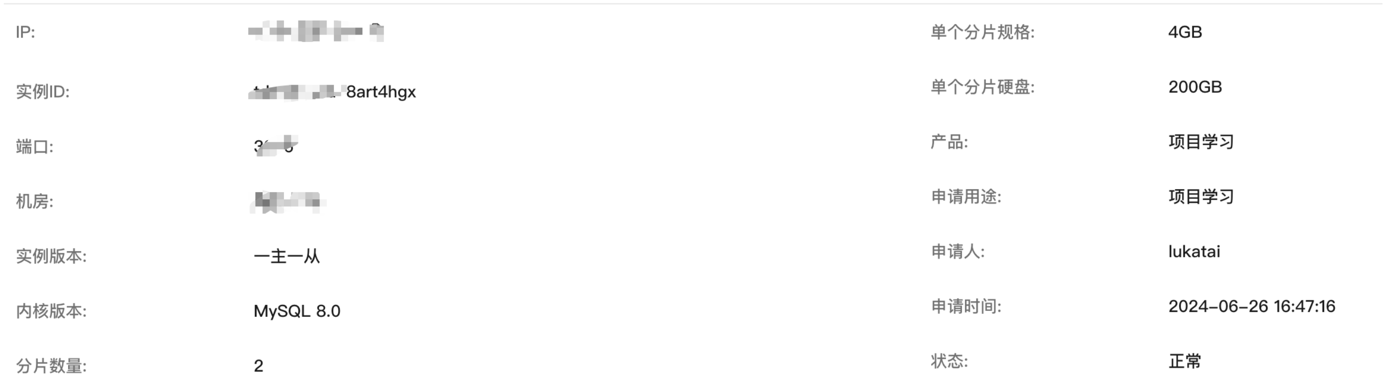
从您提供的SQL语句中，提取到的数据库字段如下（以一行格式展示）：

```
id, business_date, seq_no, org, product_cd, cust_id, acct_no, app_type, app_acct_no,
user_field282, created_datetime, last_modified_datetime, jpa_version, last_update_biz_date,
create_time, last_update_time
```

2. 数据库分片操作与验证

ref： [私有云文档中心 - 腾讯云 (tencent.com)]

申请的TDSQL配置



IP:	[redacted]	单个分片规格:	4GB
实例ID:	[redacted]8art4hgx	单个分片硬盘:	200GB
端口:	[redacted]	产品:	项目学习
机房:	[redacted]	申请用途:	项目学习
实例版本:	一主一从	申请人:	lukatai
内核版本:	MySQL 8.0	申请时间:	2024-06-26 16:47:16
分片数量:	2	状态:	正常

建立分片表

```
CREATE TABLE `t1` ( `a` int NOT NULL, `b` int DEFAULT NULL, PRIMARY KEY (`a`) )
ENGINE=InnoDB DEFAULT CHARSET=utf8mb3 TDSQL_DISTRIBUTED BY RANGE(a) (s1 values less than
('100'),s2 values less than ('200'))
```

插入数据

```
INSERT INTO t1(a,b) values(122,344);
INSERT INTO t1(a,b) values(12,34);
```

分片表的插入必须指定字段

查询

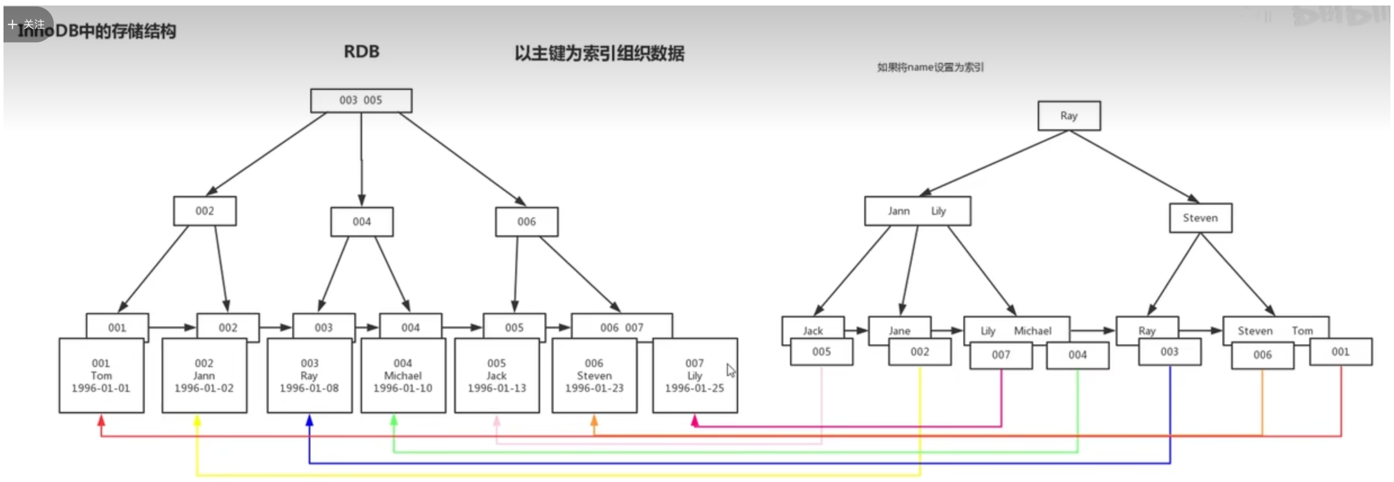
```
MySQL [chengde]> /*sets:allsets */ select count(*) from t1;
+----------+------------------+
| count(*) | info             |
+----------+------------------+
|        1 | set_1719391827_3 |
|        1 | set_1719391745_1 |
+----------+------------------+
2 rows in set (0.03 sec)

MySQL [chengde]> /*sets:set_1719391827_3*/ select * from t1;
+-----+------+------------------+
| a   | b    | info             |
+-----+------+------------------+
| 122 |  334 | set_1719391827_3 |
+-----+------+------------------+

MySQL [chengde]> /*proxy*/ show status;
+------------------------------+----------------------------------------------------------
----------+
| status_name                  | value
         |
+------------------------------+----------------------------------------------------------
----------+
| cluster                      | group_1719391636_6624519
          |
| set_1719391745_1:ip          |
11.10.178.136:4010;s1@11.63.17.80:4010@1@IDC_4_49_3109_M3104-N15@0 |
| set_1719391745_1:alias       | s1
          |
| set_1719391745_1:hash_range | 0---31
          |
| set_1719391827_3:ip          |
11.63.17.80:4389;s1@11.63.23.202:4389@1@IDC_4_49_3109_M3104-R16@0  |
| set_1719391827_3:alias       | s2
          |
| set_1719391827_3:hash_range | 32---63
         |
| set                          | set_1719391745_1,set_1719391827_3
         |
+------------------------------+----------------------------------------------------------
----------+
8 rows in set (0.03 sec)
```

3. 非主键索引在分布式数据库中的挑战

非主键索引不直接存储数据，而是存储主键，再通过主键去找到数据，示意图如下

面对分布式数据库数据物理分区的挑战，二级索引（非主键索引）间接指向的数据可能并不在同一个物理分片上，应该怎么办?

在数据表创建时，同时创建二级索引，用二级索引的结果（即主键）来分散索引数据



4. 查看binlog

ref：[mysql查看binlog日志 - 沧海一滴 - 博客园 (cnblogs.com)]()

1. 确认我们的日志是否打开与日志的记录模式--关乎我们的查看参数

```
MySQL [lukatai_jinzheng]> show variables like 'log_bin';
+---------------+-------+
| Variable_name | Value |
+---------------+-------+
| log_bin       | ON    |
+---------------+-------+
1 row in set (0.00 sec)

MySQL [lukatai_jinzheng]> SHOW VARIABLES LIKE 'binlog_format';
+---------------+-------+
| Variable_name | Value |
+---------------+-------+
| binlog_format | ROW   |
+----------------+-------+
1 row in set (0.00 sec)
```

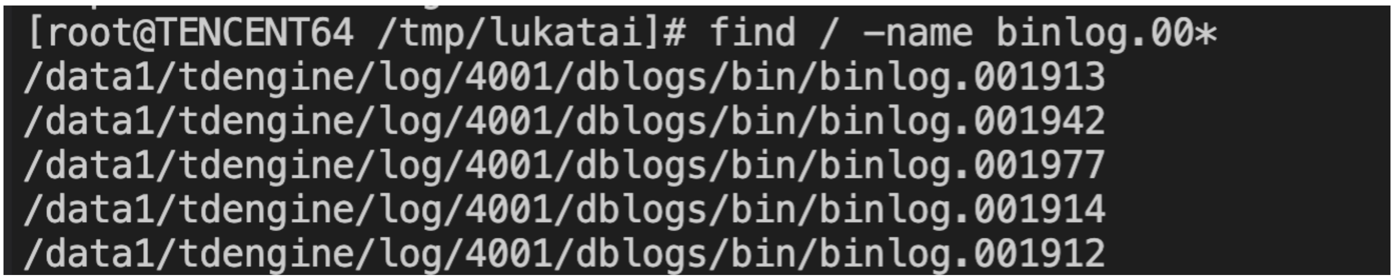
2. 查看log日志文件

```
mysql> show binlog events;   #只查看第一个binlog文件的内容
mysql> show binlog events in 'mysql-bin.000002';#查看指定binlog文件的内容
mysql> show binary logs;  #获取binlog文件列表
mysql> show master status； #查看当前正在写入的binlog文件
```

```
MySQL [lukatai_jinzheng]> show master status\G
*************************** 1. row ***************************
             File: binlog.002091
         Position: 120774562
     Binlog_Do_DB:
 Binlog_Ignore_DB:
Executed_Gtid_Set: b0d143f0-b9b8-11ee-ac25-30b037f922f2:1-287,
c2dbb2fd-b9b8-11ee-a9da-30b037f92376:1-36424288
1 row in set (0.00 sec)
```

binlog.002091为文件名

3. 因为我们是分布式系统，存在db机器与proxy机器，binlog是存在db机器上的。登录到db机器上



```
[root@TENCENT64 /tmp/lukatai]# find / -name binlog.00*
/data1/tdengine/log/4001/dblogs/bin/binlog.001913
/data1/tdengine/log/4001/dblogs/bin/binlog.001942
/data1/tdengine/log/4001/dblogs/bin/binlog.001977
/data1/tdengine/log/4001/dblogs/bin/binlog.001914
/data1/tdengine/log/4001/dblogs/bin/binlog.001912
```

4. 通过mysqlbinlog查看binlog

`binlog`本身是一类二进制文件。二进制文件更省空间，写入速度更快，是无法直接打开来查看的。
因此mysql提供了命令`mysqlbinlog`进行查看。
一般的`statement`格式的二进制文件，用下面命令就可以

```
mysqlbinlog mysql-bin.000001
```

如果是`row`格式，加上`-v`或者`-vv`参数就行，如

```
mysqlbinlog -vv mysql-bin.000001
```

亲测vv有效，v还会有二进制乱码

> 只连接了一个db，不是正在读写的binlog，凑合读一下

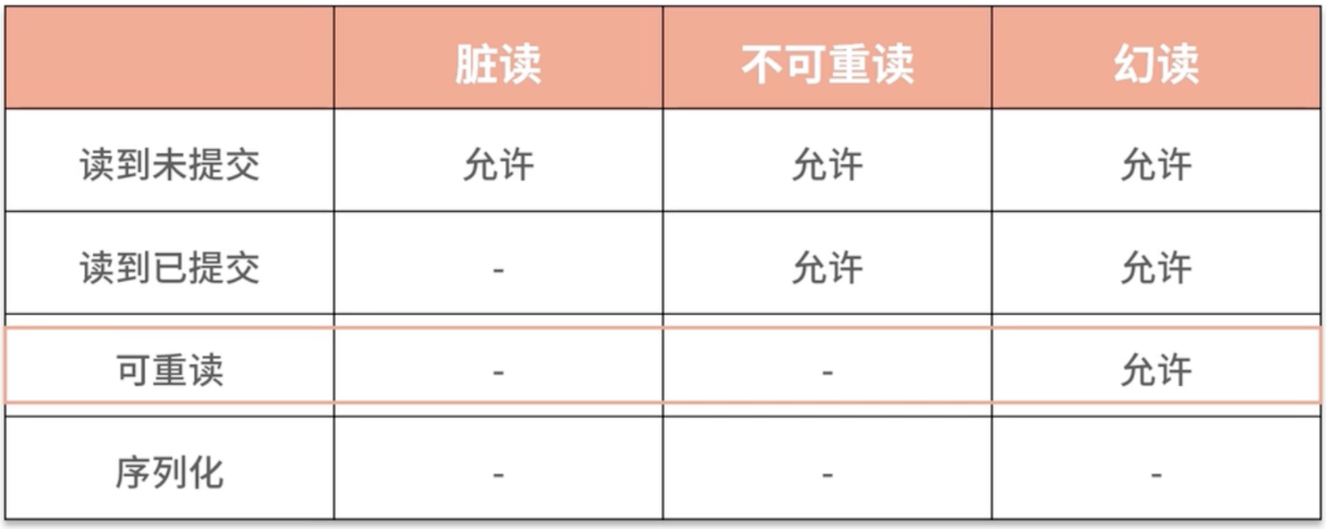
5. binlog解释

```
###   @1=836 /* LONGINT meta=0 nullable=0 is_null=0 */
###   @2=12 /* INT meta=0 nullable=0 is_null=0 */
###   @3='9.40.49.5' /* VARSTRING(240) meta=240 nullable=0 is_null=0 */
###   @4='' /* VARSTRING(240) meta=240 nullable=0 is_null=0 */
###   @5='isolate_port' /* VARSTRING(240) meta=240 nullable=0 is_null=0 */
###   @6='' /* VARSTRING(768) meta=768 nullable=0 is_null=0 */
###   @7=1703145440 /* TIMESTAMP(0) meta=0 nullable=0 is_null=0 */
###   @8=1720773727 /* TIMESTAMP(0) meta=0 nullable=0 is_null=0 */
### UPDATE `tdsqlpcloud_monitor`.`m_data_cur`
### WHERE
###   @1=837 /* LONGINT meta=0 nullable=0 is_null=0 */
###   @2=12 /* INT meta=0 nullable=0 is_null=0 */
###   @3='9.40.42.71' /* VARSTRING(240) meta=240 nullable=0 is_null=0 */
###   @4='' /* VARSTRING(240) meta=240 nullable=0 is_null=0 */
###   @5='reserve_log_disk' /* VARSTRING(240) meta=240 nullable=0 is_null=0 */
###   @6='140000' /* VARSTRING(768) meta=768 nullable=0 is_null=0 */
###   @7=1703145440 /* TIMESTAMP(0) meta=0 nullable=0 is_null=0 */
###   @8=1720773667 /* TIMESTAMP(0) meta=0 nullable=0 is_null=0 */
```

```
@<index>=<value>：表示列的索引和值。
/* <type> meta=<meta> nullable=<nullable> is_null=<is_null> */：注释部分，描述了列的数据类型、元数据、是否可为空等信息。

这个binlog片段记录了一次对表tdsqlpcloud_monitor.m_data_cur的UPDATE操作：

更新后的新值由SET部分描述。
更新条件由WHERE部分描述。

具体来说，这次UPDATE操作将表中满足以下条件的行：

id（第1列）为837
type（第2列）为12
ip（第3列）为'9.40.42.71'
port（第4列）为空字符串
name（第5列）为'reserve_log_disk'
value（第6列）为'140000'
created_at（第7列）为1703145440
updated_at（第8列）为1720773667
更新为：

id（第1列）为836
type（第2列）为12
ip（第3列）为'9.40.49.5'
```

```
port（第4列）为空字符串
name（第5列）为'isolate_port'
value（第6列）为空字符串
created_at（第7列）为1703145440
updated_at（第8列）为1720773727
```

5. 如何控制并发事务之隔离级别的理解



	脏读	不可重读	幻读
读到未提交	允许	允许	允许
读到已提交	-	允许	允许
可重读	-	-	允许
序列化	-	-	-

幻读：

幻读是指在一个事务内，相同的查询条件返回了不同的行集合，即在事务处理的过程中，有新的行插入到数据库中，导致在事务的不同阶段执行相同的查询时，返回的结果集不一致。

假设有一个银行转账的场景，两个账户A和B，初始余额分别为1000和2000。现在有两个事务T1和T2，分别执行以下操作：

- 事务T1：读取账户A的余额。
- 事务T2：向账户A转账100元。
- 事务T1：再次读取账户A的余额。

如果事务T1和T2并发执行，且事务隔离级别为可重复读，那么事务T1在第二次读取账户A的余额时可能会读到**事务T2新插入的记录**（即转账后的余额），从而产生幻读现象。

不可重读：

不可重复读是指在一个事务内，多次读取同一数据时，得到的结果不一致。

不可重复读和幻读的主要区别在于，不可重复读关注的是同一数据行的内容变化，而幻读关注的是数据行数量的变化，为什么这两者进行隔离级别的划分？因为**"保证同一条数据不变的难度远远低于多条"**

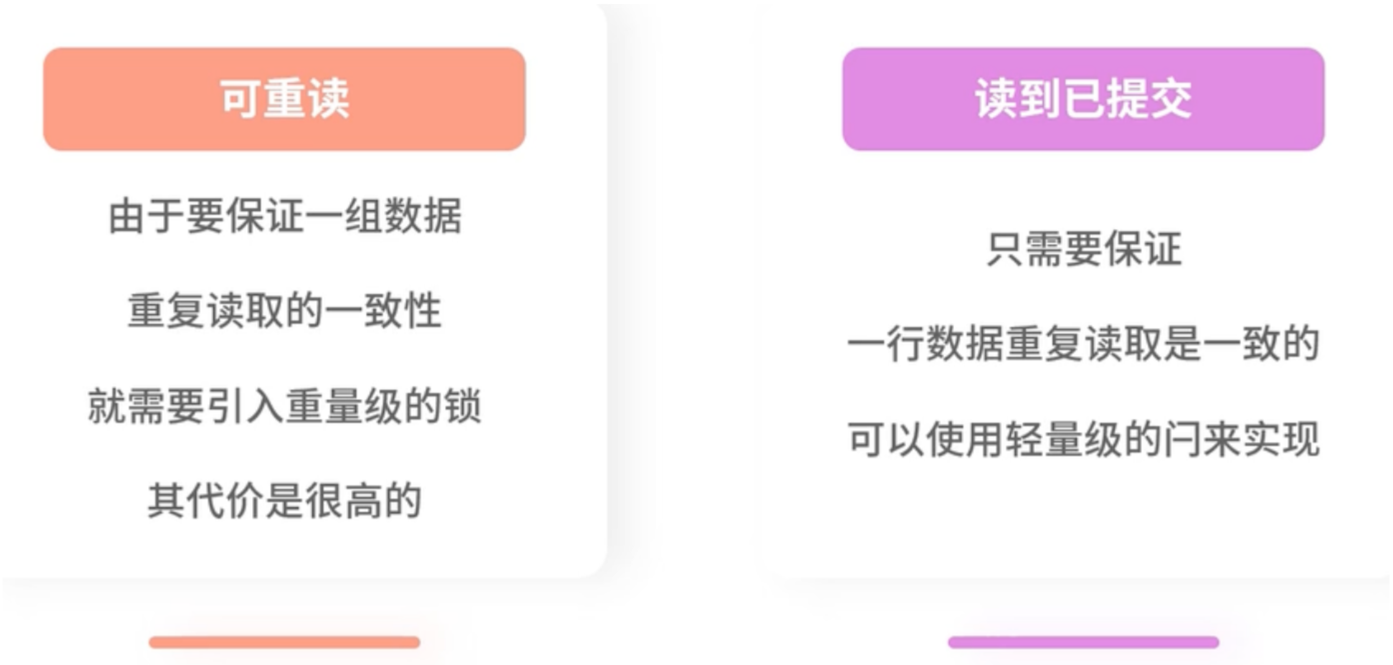
脏读：

可以读到其他事务未提交的数据

新增：快照隔离：

可以理解为可重读级别，但是不允许不可重读，可以解决丢失更新问题

其实就是遇到不可重读的情况，会立即中止当前事务，也就是在多并发场景下，只会有一个成立



可重读

由于要保证一组数据

重复读取的一致性

就需要引入重量级的锁

其代价是很高的

读到已提交

只需要保证

一行数据重复读取是一致的

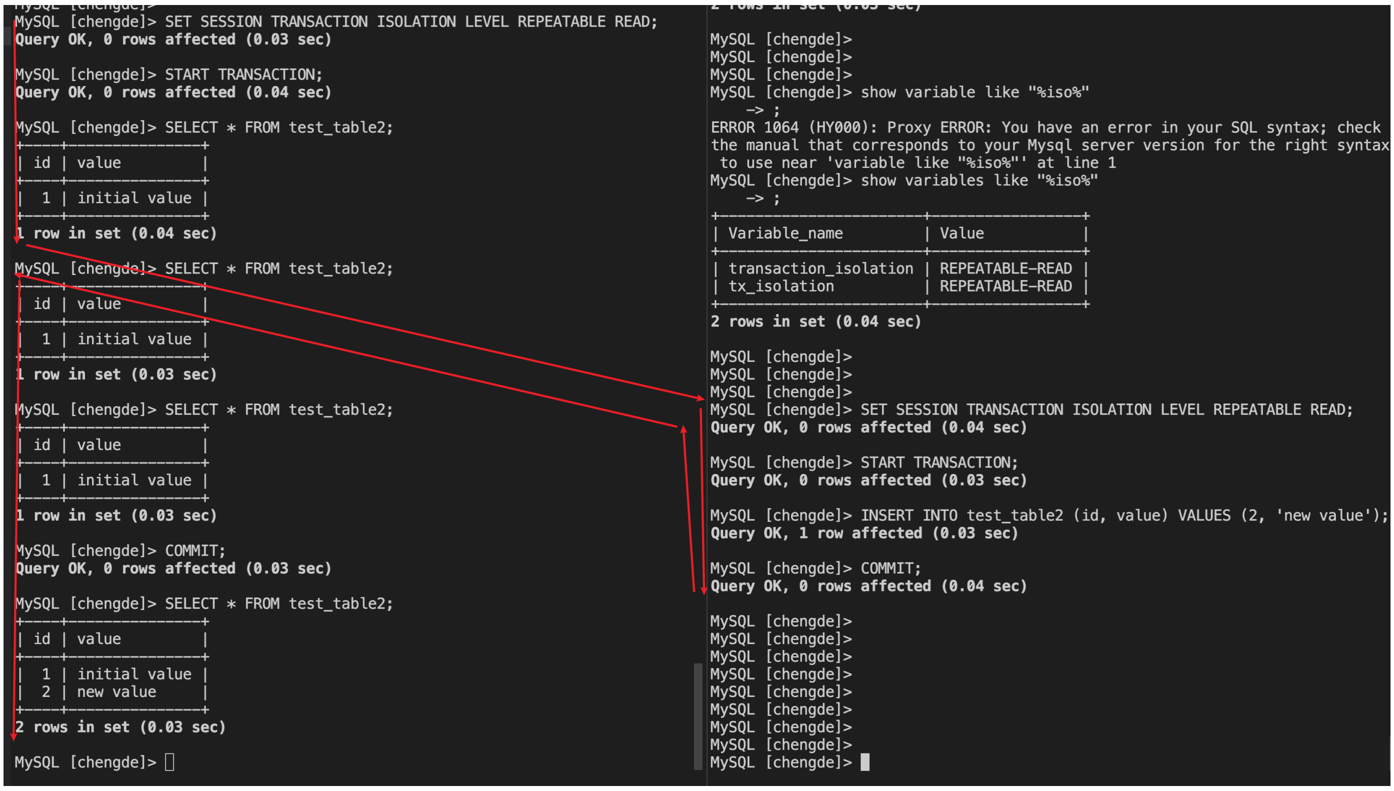
可以使用轻量级的闩来实现

查看隔离级别

```
MySQL [lukatai_jinzheng]> SHOW VARIABLES LIKE 'transaction_isolation';
+-----------------------+----------------+
| Variable_name         | Value          |
+-----------------------+----------------+
| transaction_isolation | READ-COMMITTED |
+-----------------------+----------------+
1 row in set (0.00 sec)
```

6. 如何复现一个幻读，不可重读，脏读场景?

幻读--未能复现？方法问题吗?



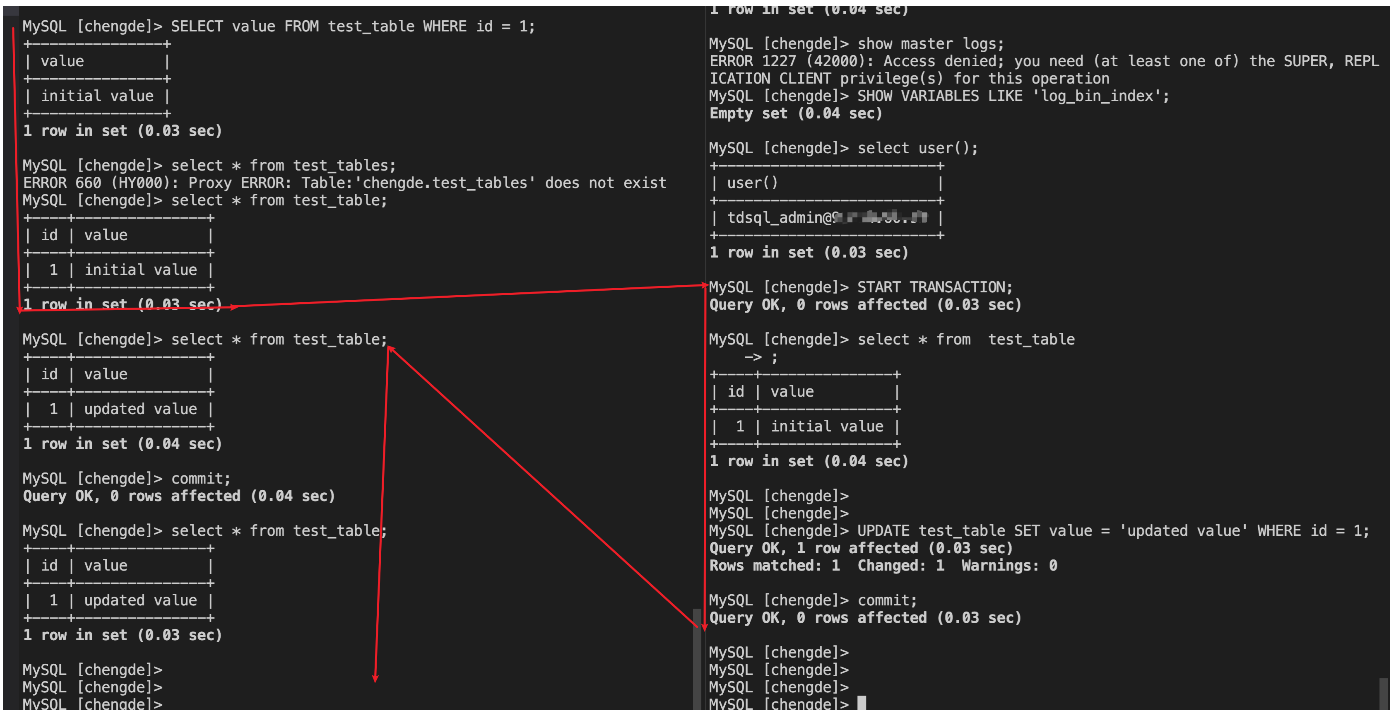
```
MySQL [chengde]> SET SESSION TRANSACTION ISOLATION LEVEL REPEATABLE READ;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> START TRANSACTION;
Query OK, 0 rows affected (0.04 sec)

MySQL [chengde]> SELECT * FROM test_table2;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | initial value |
+----+---------------+
1 row in set (0.04 sec)

MySQL [chengde]> SELECT * FROM test_table2;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | initial value |
+----+---------------+
1 row in set (0.03 sec)

MySQL [chengde]> SELECT * FROM test_table2;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | initial value |
+----+---------------+
1 row in set (0.03 sec)

MySQL [chengde]> COMMIT;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> SELECT * FROM test_table2;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | initial value |
|  2 | new value     |
+----+---------------+
2 rows in set (0.03 sec)

MySQL [chengde]> 
```

```
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]> show variable like "%iso%"
    -> ;
ERROR 1064 (HY000): Proxy ERROR: You have an error in your SQL syntax; check
the manual that corresponds to your Mysql server version for the right syntax
 to use near 'variable like "%iso%"' at line 1
MySQL [chengde]> show variables like "%iso%"
    -> ;
+-----------------------+-----------------+
| Variable_name         | Value           |
+-----------------------+-----------------+
| transaction_isolation | REPEATABLE-READ |
| tx_isolation          | REPEATABLE-READ |
+-----------------------+-----------------+
2 rows in set (0.04 sec)

MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]> SET SESSION TRANSACTION ISOLATION LEVEL REPEATABLE READ;
Query OK, 0 rows affected (0.04 sec)

MySQL [chengde]> START TRANSACTION;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> INSERT INTO test_table2 (id, value) VALUES (2, 'new value');
Query OK, 1 row affected (0.03 sec)

MySQL [chengde]> COMMIT;
Query OK, 0 rows affected (0.04 sec)

MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]> 
```

```sql
-- 准备数据
CREATE TABLE test_table2 (
    id INT PRIMARY KEY,
    value VARCHAR(100)
);

INSERT INTO test_table2 (id, value) VALUES (1, 'initial value');

-- 会话1
SET SESSION TRANSACTION ISOLATION LEVEL REPEATABLE READ;
START TRANSACTION;
SELECT * FROM test_table2;

-- 会话2
SET SESSION TRANSACTION ISOLATION LEVEL REPEATABLE READ;
START TRANSACTION;
INSERT INTO test_table2 (id, value) VALUES (2, 'new value');
COMMIT;

-- 会话1
SELECT * FROM test_table2;
COMMIT;
```

不可重读

已经设置 SET SESSION TRANSACTION ISOLATION LEVEL READ COMMITTED;

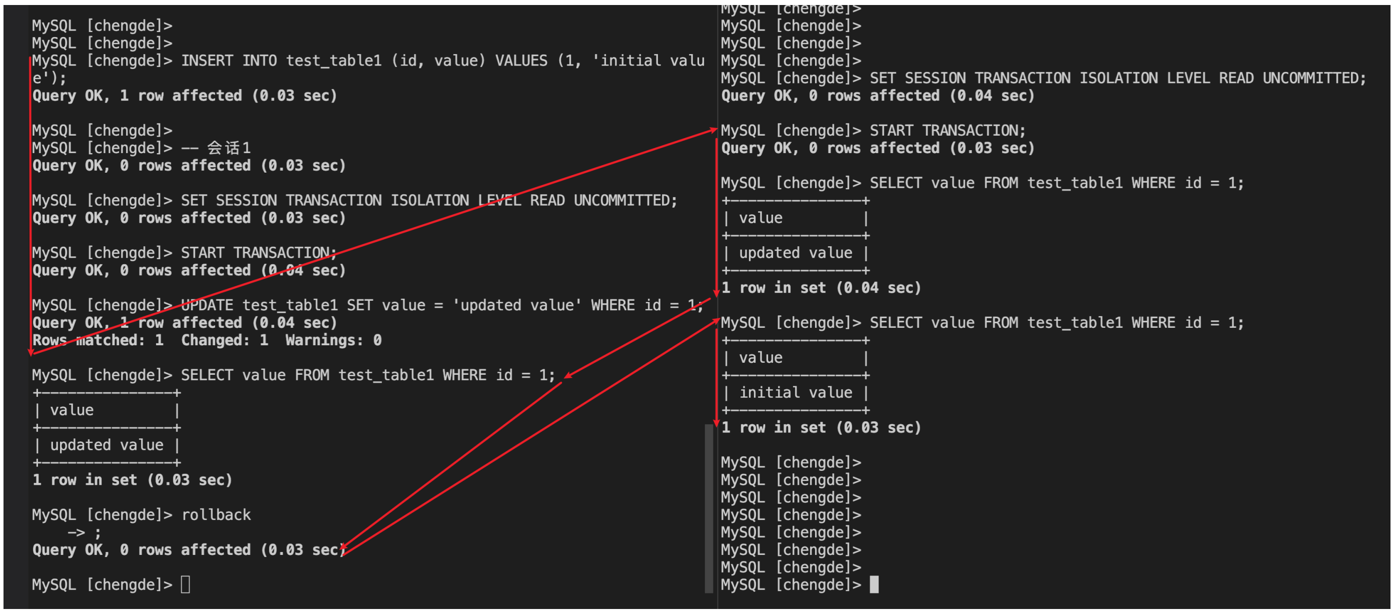


```
MySQL [chengde]> SELECT value FROM test_table WHERE id = 1;
+---------------+
| value         |
+---------------+
| initial value |
+---------------+
1 row in set (0.03 sec)

MySQL [chengde]> select * from test_tables;
ERROR 660 (HY000): Proxy ERROR: Table:'chengde.test_tables' does not exist
MySQL [chengde]> select * from test_table;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | initial value |
+----+---------------+
1 row in set (0.03 sec)

MySQL [chengde]> select * from test_table;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | updated value |
+----+---------------+
1 row in set (0.04 sec)

MySQL [chengde]> commit;
Query OK, 0 rows affected (0.04 sec)

MySQL [chengde]> select * from test_table;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | updated value |
+----+---------------+
1 row in set (0.03 sec)

MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
```

```
1 row in set (0.04 sec)

MySQL [chengde]> show master logs;
ERROR 1227 (42000): Access denied; you need (at least one of) the SUPER, REPL
ICATION CLIENT privilege(s) for this operation
MySQL [chengde]> SHOW VARIABLES LIKE 'log_bin_index';
Empty set (0.04 sec)

MySQL [chengde]> select user();
+------------------------+
| user()                 |
+------------------------+
| tdsql_admin@[redacted] |
+------------------------+
1 row in set (0.03 sec)

MySQL [chengde]> START TRANSACTION;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> select * from  test_table
    -> ;
+----+---------------+
| id | value         |
+----+---------------+
|  1 | initial value |
+----+---------------+
1 row in set (0.04 sec)

MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]> UPDATE test_table SET value = 'updated value' WHERE id = 1;
Query OK, 1 row affected (0.03 sec)
Rows matched: 1  Changed: 1  Warnings: 0

MySQL [chengde]> commit;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
```

```
-- 准备数据
CREATE TABLE test_table (
    id INT PRIMARY KEY,
    value VARCHAR(100)
);

INSERT INTO test_table (id, value) VALUES (1, 'initial value');

-- 会话1
SET SESSION TRANSACTION ISOLATION LEVEL READ COMMITTED;
START TRANSACTION;
SELECT value FROM test_table WHERE id = 1;

-- 会话2
SET SESSION TRANSACTION ISOLATION LEVEL READ COMMITTED;
START TRANSACTION;
UPDATE test_table SET value = 'updated value' WHERE id = 1;
COMMIT;

-- 会话1
SELECT value FROM test_table WHERE id = 1;
COMMIT;
```

脏读



```
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]> INSERT INTO test_table1 (id, value) VALUES (1, 'initial valu
e');
Query OK, 1 row affected (0.03 sec)

MySQL [chengde]>
MySQL [chengde]> -- 会话1
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> SET SESSION TRANSACTION ISOLATION LEVEL READ UNCOMMITTED;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> START TRANSACTION;
Query OK, 0 rows affected (0.04 sec)

MySQL [chengde]> UPDATE test_table1 SET value = 'updated value' WHERE id = 1;
Query OK, 1 row affected (0.04 sec)
Rows matched: 1  Changed: 1  Warnings: 0

MySQL [chengde]> SELECT value FROM test_table1 WHERE id = 1;
+---------------+
| value         |
+---------------+
| updated value |
+---------------+
1 row in set (0.03 sec)

MySQL [chengde]> rollback
    -> ;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> 
```

```
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]> SET SESSION TRANSACTION ISOLATION LEVEL READ UNCOMMITTED;
Query OK, 0 rows affected (0.04 sec)

MySQL [chengde]> START TRANSACTION;
Query OK, 0 rows affected (0.03 sec)

MySQL [chengde]> SELECT value FROM test_table1 WHERE id = 1;
+---------------+
| value         |
+---------------+
| updated value |
+---------------+
1 row in set (0.04 sec)

MySQL [chengde]> SELECT value FROM test_table1 WHERE id = 1;
+---------------+
| value         |
+---------------+
| initial value |
+---------------+
1 row in set (0.03 sec)

MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]>
MySQL [chengde]> 
```

```sql
-- 准备数据
CREATE TABLE test_table1 (
    id INT PRIMARY KEY,
    value VARCHAR(100)
);

INSERT INTO test_table1 (id, value) VALUES (1, 'initial value');

-- 会话1
SET SESSION TRANSACTION ISOLATION LEVEL READ UNCOMMITTED;
START TRANSACTION;
UPDATE test_table1 SET value = 'updated value' WHERE id = 1;

-- 会话2
SET SESSION TRANSACTION ISOLATION LEVEL READ UNCOMMITTED;
START TRANSACTION;
SELECT value FROM test_table1 WHERE id = 1;

-- 会话1
ROLLBACK;
```