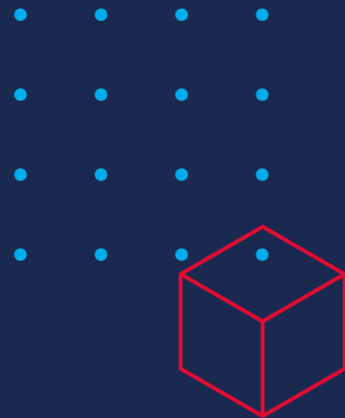


TiDB Kits for Developers



Mini demos on TiDB Cloud and TiUP Sandbox by PingCAP Training and Certification (2022091401)



Disclaimer

- All sample codes in this material are for demo and study purpose only
- Do NOT use them in production without evaluation

Prepare the Dojo: TiDB Cloud or TiUP Playground

- Clone the demo repository
 - `$ git clone https://github.com/pingcap/tidb-course-201-lab.git`
- [A]. Choose TiDB Cloud
 - [Create Developer Tier cluster by following the Exercise 1 in TiDB Cloud Kickstart Workshop](#)
 - Set environment variables for TiDB Cloud:
 - `$ export TIDB_CLOUD_HOST=<hostname>`
 - `$ export TIDB_CLOUD_USERNAME=<username>`
 - `$ export TIDB_CLOUD_PASSWORD=<password>`
 - `$ export TIDB_CLOUD_PORT=<port>`
- [B]. Or choose **TiUP Playground** on local machine (for **Linux** or **macOS**)
 - Download and install **TiUP** utility
 - `$ curl --proto 'https' --tlsv1.2 -sSf https://tiup-mirrors.pingcap.com/install.sh | sh`
 - Add command **tiup** to **PATH**: `$ source ~/.bash_profile`
 - Start a local sandbox **Playground** TiDB cluster
 - `$ git clone https://github.com/pingcap/tidb-course-201-lab.git`
 - `$ cd tidb-course-201-lab/scripts && ./playground-start.sh`
 - Keep the terminal open and check the **Playground** status in another terminal
 - `$ cd tidb-course-201-lab/scripts && ./playground-check.sh`

Mini Demo Manifest

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B1: JDBC Batch Insert

- Environment: **Java SDK**
- Sample code:
 - [DemoJdbcBatchInsert.java](#)
- Mini demo story:
 - Run script to insert **10000** rows into one table with **rewriteBatchedStatements** set to **true**
 - Then, the script will do it again with **rewriteBatchedStatements** set to **false**
 - Observe the differences on elapsed times
- Use parameter **[cloud|local]** to run the demo against TiDB Cloud or local Playground respectively

```
// 1. Go to working directory: tidb-course-201-lab/scripts
```

```
$ cd tidb-course-201-lab/scripts
```

```
// 2. Run demo script
```

```
$ ./10-demo-jdbc-batch-insert-01-show.sh cloud|local
```

B1: JDBC Batch Insert (Output)

- Following output example is from TiUP playground
- If the client and TiDB Cloud are not in the same **Region**, the **elapsed time** gap between two executions will be quite large
 - In case you cannot wait for the `rewriteBatchedStatements=false` run to complete, feel free to hit `ctrl-c`

```
$ ./10-demo-jdbc-batch-insert-01-show.sh local
TiDB Endpoint:127.0.0.1
TiDB Username:root
Connection established.
>>> Begin insert 10000 rows.
>>> End batch insert,rewriteBatchedStatements=true,elapsed: 285 (ms).
Connection established.
>>> Begin insert 10000 rows.
>>> End batch insert,rewriteBatchedStatements=false,elapsed: 11226 (ms).

/* Executing query: select count(*), max(name) from test.t1_batchtest; */
  Row#, count(*), max(name)
  1) 10000, 9999
Turn on autocommit.
Connection closed.
```

B2: Python Batch Insert

- Environment: **Python 3.9**
- Sample code:
 - [demo-batch-insert.py](#)
- Mini demo story:
 - Run script to insert **10000** rows into one table with batch style **INSERT INTO ... VALUES (),(),(),...**
 - Then, the script will do it again with a loop, and inserting one row at a time
 - Observe the differences on elapsed times
- Use parameter **[cloud|local]** to run the demo against TiDB Cloud or local Playground respectively

```
// 1. Go to working directory: tidb-course-201-lab/scripts  
$ cd tidb-course-201-lab/scripts
```

```
// 2. Run demo script  
$ ./10-demo-python-batch-insert-01-show.sh cloud|local
```

B2: Python Batch Insert (Output)

- Following output example is from **TiUP playground**
- If the client and TiDB Cloud are not in the same region, the **elapsed time** gap between two executions will be quite large
 - In case you cannot wait for the second non-batch style run to complete, feel free to hit **ctrl-c**

```
$ ./10-demo-python-batch-insert-01-show.sh local
...
Connected to TiDB: root@127.0.0.1:4000
Batch Inserting 10000 rows in 104.645751953125 (ms).
Total rows in t1_batchtest table: 10000.
Non-Batch Inserting 10000 rows in 5803.891845703125 (ms).
Total rows in t1_batchtest table: 10000.
```


K1: Maximum Length for Common Data Types

- Environment: **Python 3.9**
- Sample code:
 - [demo-data-type-maxlength.py](#)
- Mini demo story:
 - Assume the character set is **utf8mb4**
 - Insert rows with the maximum length data into example tables, then show the result
 - **TIMESTAMP** data type queried value is timezone dependent
 - The following data type maximum sizes are constrained by following settings combined:
 - TiDB: **txn-entry-size-limit** and **txn-total-size-limit**
 - TiKV: **raft-entry-max-size**
 - **MEDIUMTEXT, LONGTEXT, MEDIUMBLOB, LONGBLOB, JSON**

```
// 1. Go to working directory: tidb-course-201-lab/scripts
$ cd tidb-course-201-lab/scripts

// 2. Run demo script
$ ./03-demo-data-type-maxlength-01-show.sh cloud|local
```

K1: Maximum Length for Common Data Types (Output)

```
$ ./03-demo-data-type-maxlength-01-show.sh cloud
Connected to TiDB: 2v████████████████████7K.root@██████████████████.us-west-2.prod.aws.tidbcloud.com:4██████
...
BINARY(255): 255 Bytes
CHAR(255): 1020 Bytes [255 Chars]
VARCHAR(16383): 65532 Bytes [16383 Chars]
TINYTEXT: 255 Bytes
TEXT: 65535 Bytes
MEDIUMTEXT: 6291405 Bytes + a few Bytes
LONGTEXT: 6291407 Bytes + a few Bytes
TINYBLOB: 255 Bytes
BLOB: 65535 Bytes
MEDIUMBLOB: 6291405 Bytes + a few Bytes
LONGBLOB: 6291407 Bytes + a few Bytes
JSON: 6291391 Bytes + a few Bytes
YEAR_MIN: 0
YEAR_MAX: 2155
DATE_MIN: 0001-01-01
DATE_MAX: 9999-12-31
TIME_MIN: -34 days, 15:59:59.999999
TIME_MAX: 34 days, 15:59:59.999999
DATETIME_MIN: 0001-01-01 00:00:01
DATETIME_MAX: 9999-12-31 23:59:59.999999
TIMESTAMP_MIN: 1970-01-01 08:00:01
TIMESTAMP_MAX: 2038-01-19 11:14:07.999999
...
```

K2: Character Set (UTF8MB4 and GBK)

- Environment: `mysql-client`
- Sample code:
 - [03-demo-charset-01-show.sql](#)
- Mini demo story:
 - Test UTF8MB4 and GBK with CAST function

```
// 1. Go to working directory: tidb-course-201-lab/scripts
```

```
$ cd tidb-course-201-lab/scripts
```

```
// 2. Connect to TiDB
```

```
// Connect to TiDB Cloud
```

```
$ ./connect-cloud.sh
```

```
// Connect to local Playground
```

```
$ ./connect-4000.sh
```

```
// 3. Call the demo script
```

```
tidb> source 03-demo-charset-01-show.sql
```

K2: Character Set (UTF8MB4 and GBK) (Output)

```
$ ./connect-4000.sh
tidb> source 03-demo-charset-01-show.sql
***** 1. row *****
    Byte_Length: 5
    Char_Length: 5
      English: Hello
    GBK_ENCODED: Hello
    UTF8MB4_ENCODED: Hello
      GBK_BINARY: 0x48656C6C6F
    UTF8MB4_BINARY: 0x48656C6C6F
1 row in set (0.00 sec)

***** 1. row *****
    Byte_Length: 15
    Char_Length: 5
      Japanese: こんにちは
    GBK_ENCODED: こんにちは
    UTF8MB4_ENCODED: こんにちは
      GBK_BINARY: 0xA4B3A4F3A4CBA4C1A4CF
    UTF8MB4_BINARY: 0xE38193E38293E381ABE381A1E381AF
1 row in set (0.00 sec)

***** 1. row *****
    Byte_Length: 6
    Char_Length: 2
      Chinese: 你好
    GBK_ENCODED: 你好
    UTF8MB4_ENCODED: 你好
      GBK_BINARY: 0xC4E3BAC3
    UTF8MB4_BINARY: 0xE4BDA0E5A5BD
1 row in set (0.00 sec)
```

K3: AUTO_INCREMENT

- Environment: `mysql-client`, `TiUP Playground`
- Sample code:
 - [07-demo-auto-increment-01-setup.sql](#)
 - [07-demo-auto-increment-03-show.sh](#)
- Mini demo story:
 - This demo is `TiUP Playground` ONLY
 - Create a table with `AUTO_INCREMENT` and `AUTO_ID_CACHE 300`
 - Insert new rows from 2 TiDB server instances, observe the result

```
// 1. Go to working directory: tidb-course-201-lab/scripts
```

```
$ cd tidb-course-201-lab/scripts
```

```
// 2. Run demo scripts
```

```
$ ./07-demo-auto-increment-01-setup.sh
```

```
$ ./07-demo-auto-increment-03-show.sh
```

K3: AUTO_INCREMENT (Output)

```
$ ./07-demo-auto-increment-01-setup.sh
```

```
$ ./07-demo-auto-increment-03-show.sh
```

```
INSERT via TiDB server 4000
```

```
INSERT via TiDB server 4001
```

id	from_port
----	-----------

1	4000
---	------

2	4000
---	------

301	4001
-----	------

302	4001
-----	------

K4: AUTO_RANDOM

- Environment: `mysql-client`
- Sample code:
 - [07-demo-auto-random-01-show.sql](#)
- Mini demo story:
 - Create a table with `AUTO_RANDOM(4)` attribute, insert some rows, then check the result
 - The last query should return `n` rows and `n` is close to 2^4 which is `16`, why?

```
// 1. Go to working directory: tidb-course-201-lab/scripts
$ cd tidb-course-201-lab/scripts
```

```
// 2. Connect to TiDB
```

```
// Connect to TiDB Cloud
$ ./connect-cloud.sh
```

```
// Connect to local Playground
$ ./connect-4000.sh
```

```
// 3. Call the demo script
tidb> source 07-demo-auto-random-01-show.sql
```

K4: AUTO_RANDOM (Output)

```
./connect-4000.sh  
tidb> source 07-demo-auto-random-01-show.sql  
...
```

```
+-----+-----+  
| TIDB_ROW_ID_SHARDING_INFO | TIDB_PK_TYPE |  
+-----+-----+  
| PK_AUTO_RANDOM_BITS=4   | CLUSTERED    |  
+-----+-----+  
1 row in set (0.01 sec)
```

```
+-----+-----+  
| id_prefix | approx_rows_in_shard |  
+-----+-----+  
| 11        | 11                    |  
| 17        | 6                     |  
| 23        | 5                     |  
| 28        | 7                     |  
| 34        | 9                     |  
| 40        | 5                     |  
| 46        | 8                     |  
| 51        | 6                     |  
| 57        | 15                    |  
| 63        | 10                    |  
| 69        | 6                     |  
| 74        | 5                     |  
| 80        | 3                     |  
| 86        | 6                     |  
+-----+-----+  
14 rows in set (0.00 sec)
```


K5: Java TLS Connection without Server and Client Verification

- Environment: **Java SDK**
- Sample code:
 - [Sample TiDB for auto-tls: tls.toml](#)
 - [DemoJdbcConnectionSecured.java](#)
- Mini demo story:
 - Create a playground with **auto-tls** enabled (skip in TiDB Cloud case)
 - Connect to TiDB server instance with several **sslMode** settings and observe the difference

```
// 1. Stop the default Playground you started previously in Terminal 1 - Skip this step if you are testing on TiDB Cloud
$ <ctrl-c>
```

```
// 2. Start a TLS enabled Playground in Terminal 1 - Skip this step if you are testing on TiDB Cloud
$ ./playground-start-with-tls.sh
```

```
// 3. In another terminal, Go to working directory: tidb-course-201-lab/scripts
$ cd tidb-course-201-lab/scripts
```

```
// 4. Run demo script
$ ./12-demo-jdbc-connection-secured-01-show.sh cloud|local
```

```
// 5. Stop the TLS enabled Playground by pressing ctrl-c, wait until the command prompt returns
$ <ctr-c>
```

```
// 6. Clean up the environment and restart the default Playground in Terminal 1 - Skip this step if you are testing on TiDB Cloud
$ ./playground-clean-classroom-tls.sh
$ ./playground-start.sh
```

K5: Java TLS Connection without Server and Client Verification (Output)

```
$ ./12-demo-jdbc-connection-secured-01-show.sh cloud
TiDB endpoint: ██████████.us-west-2.prod.aws.tidbcloud.com
TiDB username: 2v██████████████████7K.root
Default TiDB server port: 4████
...
### Trying with sslMode=DISABLED ###
...
    1) Ssl_cipher,
...
### Trying with sslMode=REQUIRED ###
...
    1) Ssl_cipher, TLS_AES_128_GCM_SHA256
...
### Trying with sslMode=PREFERRED ###
...
    1) Ssl_cipher, TLS_AES_128_GCM_SHA256
...
### Trying with sslMode=VERIFY_CA ###
Error: com.mysql.cj.jdbc.exceptions.CommunicationsException: Communications link failure
...
### Trying with sslMode=VERIFY_IDENTITY ###
Error: com.mysql.cj.jdbc.exceptions.CommunicationsException: Communications link failure
...
```

K6: Clustered and Non-Clustered Primary Key

- Environment: `mysql-client`
- Sample code:
 - [07-demo-compare-clustered-and-nonclustered-pk.sql](#)
- Mini demo story:
 - Create table 1 with **Clustered** PK
 - Create table 2 with **Non-Clustered** PK, copy data from table 1
 - Both tables have the same data - around 2 million rows
 - Compare their TiKV regions count and physical execution plans on PK predicts

```
// 1. Go to working directory: tidb-course-201-lab/scripts
$ cd tidb-course-201-lab/scripts
```

```
// 2. Connect to TiDB
```

```
// Connect to TiDB Cloud
$ ./connect-cloud.sh
```

```
// Connect to local Playground
$ ./connect-4000.sh
```

```
// 3. Call the demo script
tidb> source 07-demo-compare-clustered-and-nonclustered-pk.sql
```

K6: Clustered and Non-Clustered Primary Key (Output)

```
$ ./connect-cloud.sh
tidb> source 07-demo-compare-clustered-and-nonclustered-pk.sql
```

```
...
```

Clustered # of TiKV Regions	Non-Clustered # of TiKV Regions
3	6

```
1 row in set (0.02 sec)
```

```
Clustered
SELECT varname FROM test.auto_increment_t2_clustered WHERE id between 10 and 100;
```

id	estRows	task	access object	operator info
Projection_4	88.93	root		test.auto_increment_t2_clustered.varname
└─TableReader_6	88.93	root		data:TableRangeScan_5
└─┬─TableRangeScan_5	88.93	cop[tikv]	table:auto_increment_t2_clustered	range:[10,100], keep order:false

```
Non-Clustered
SELECT varname FROM test.bigint_t3_nonclustered WHERE id between 10 and 100;
```

id	estRows	task	access object	operator info
Projection_4	92.93	root		test.bigint_t3_nonclustered.varname
└─IndexLookUp_10	92.93	root		
└─┬─IndexRangeScan_8(Build)	92.93	cop[tikv]	table:bigint_t3_nonclustered, index:PRIMARY(id)	range:[10,100], keep order:false
└─┬─TableRowIDScan_9(Probe)	92.93	cop[tikv]	table:bigint_t3_nonclustered	keep order:false

```
4 rows in set (0.00 sec)
```

K7: Optimistic Transaction Lock

- Environment: **Java SDK**
- Sample code:
 - [DemoJdbcTxOptimisticLock.java](#)
- Mini demo story:
 - In **optimistic mode**, two transactions update the same row at the same time might cause conflict
 - The script provides two options, run it to observe the difference results:
 - **no-retry**: transaction auto rolled back in front of **ErrorCode 9007**
 - **retry**: Wait and retry the failed DML if you encounter **ErrorCode 9007**

```
// 1. Go to working directory: tidb-course-201-lab/scripts
$ cd tidb-course-201-lab/scripts
```

```
// 2. Call the demo script twice with no-retry and retry options
$ ./09-demo-jdbc-tx-optimistic-01-show.sh cloud|local no-retry
$ ./09-demo-jdbc-tx-optimistic-01-show.sh cloud|local retry
```

K7: Optimistic Transaction Lock (Output) - No-retry

```
$ ./09-demo-jdbc-tx-optimistic-01-show.sh cloud no-retry
TiDB endpoint: ██████████.us-west-2.prod.aws.tidbcloud.com
TiDB username: 2v██████████████████7K.root
Default TiDB server port: 4████
Connection established.
Connection A session started
Connection B session started
Connection A session: BEGIN OPTIMISTIC
Connection A session: UPDATE test_tx_optimistic SET name = 'Connection A' WHERE id = 864691128455135233
Connection B session: BEGIN OPTIMISTIC
Connection B session: UPDATE test_tx_optimistic SET name = 'Connection B' WHERE id = 864691128455135233
Connection B session: Commit
Connection B session: Checking result

/* Executing query: select id, name from test_tx_optimistic; */
  Row#, id, name
  1) 864691128455135233, Connection B

Connection A session: Commit
Connection A ErrorCode: 9007
Connection A SQLState: HY000
Connection A Error: java.sql.SQLException: Write conflict, txnStartTS=434395274207297539, conflictStartTS=434395274469441537, conflictCommitTS=434395274993729538,
key={tableID=5836, handle=864691128455135233} primary={tableID=5836, handle=864691128455135233} [try again later]
< Session in Connection A RAISED THE EXCEPTION !!! >
Connection A session: Checking result

/* Executing query: select id, name from test_tx_optimistic; */
  Row#, id, name
  1) 864691128455135233, Connection B
```



K7: Optimistic Transaction Lock (Output) - Retry

```
$ ./09-demo-jdbc-tx-optimistic-01-show.sh cloud retry
TiDB endpoint: ██████████.us-west-2.prod.aws.tidbcloud.com
TiDB username: 2v██████████████████7K.root
Default TiDB server port: 4████
Connection established.
Connection B session started
Connection A session started
Connection A session: BEGIN OPTIMISTIC
Connection A session: UPDATE test_tx_optimistic SET name = 'Connection A' WHERE id = 5188146770730811393
Connection B session: BEGIN OPTIMISTIC
Connection B session: UPDATE test_tx_optimistic SET name = 'Connection B' WHERE id = 5188146770730811393
Connection B session: Commit
Connection B session: Checking result

/* Executing query: select id, name from test_tx_optimistic; */
  Row#, id, name
  1) 5188146770730811393, Connection B

Connection A session: Commit
Connection A ErrorCode: 9007
Connection A SQLState: HY000
Connection A Error: java.sql.SQLException: Write conflict, txnStartTS=434395314905415681, conflictStartTS=434395315167559681, conflictCommitTS=434395315691847682,
key={tableID=5839, handle=5188146770730811393} primary={tableID=5839, handle=5188146770730811393} [try again later]
< Session in Connection A RAISED THE EXCEPTION !!! >
Connection A session: Commit
Connection A session: Checking result

/* Executing query: select id, name from test_tx_optimistic; */
  Row#, id, name
  1) 5188146770730811393, Connection A
```

K8: Pessimistic Transaction Lock

- Environment: **Java SDK**
- Sample code:
 - [DemoJdbcPessimisticLock.java](#)
- Mini demo story:
 - In **pessimistic mode**, two transactions update the same row at the same time cannot cause conflict
 - The blocked session will wait for the transaction lock to be released
 - **NO Errorcode 9007**

```
// 1. Go to working directory: tidb-course-201-lab/scripts
```

```
$ cd tidb-course-201-lab/scripts
```

```
// 2. Run demo script
```

```
$ ./09-demo-jdbc-tx-pessimistic-01-show.sh cloud|local
```


K8: Pessimistic Transaction Lock (Output)

```
$ ./09-demo-jdbc-tx-pessimistic-01-show.sh cloud
TiDB endpoint: ██████████.us-west-2.prod.aws.tidbcloud.com
TiDB username: 2v██████████████████7K.root
Default TiDB server port: 4████
Connection established.
Connection B session started
Connection A session started
Connection A session: BEGIN PESSIMISTIC
Connection A session: UPDATE test_tx_optimistic SET name = 'Connection A' WHERE id = 1729382256910270465
Connection B session: BEGIN PESSIMISTIC
Connection B session: UPDATE test_tx_optimistic SET name = 'Connection B' WHERE id = 1729382256910270465
Connection A session: Commit
Connection A session: Checking result

/* Executing query: select id, name from test_tx_optimistic; */
  Row#, id, name
  1) 1729382256910270465, Connection A

Connection B session: Commit
Connection B session: Checking result

/* Executing query: select id, name from test_tx_optimistic; */
  Row#, id, name
  1) 1729382256910270465, Connection B
```

K9: Feeds Database Changes to Kafka Via TiCDC

- Environment: **TiUP Playground**, **Kafka**, **mysql-client**
- Preparation:
 - [Download Kafka distribution](#)
- Mini demo story:
 - This demo is **TiUP Playground ONLY**
 - Start the local **Kafka** service and consumer
 - Create a **TiCDC** change capture feed task using **open-protocol** (other protocols available)
 - Execute **DDL**, **DML** as you wish, and observe the captured change events from **Kafka** consumer side

K9: Feeds Database Changes to Kafka Via TiCDC (Demo Steps)

```
// 1. Stop the default Playground you started previously on terminal 1
$ <ctrl-c>

// 2. Start Zookeeper: On terminal 1 - under the folder you downloaded the Kafka TAR ball, e.g: version 2.13-3.2.0
$ tar -xzf kafka_2.13-3.2.0.tgz
$ cd kafka_2.13-3.2.0
$ bin/zookeeper-server-start.sh config/zookeeper.properties

// 3. Start Kafka Service: On terminal 2 - under the folder you installed the Kafka binary
$ bin/kafka-server-start.sh config/server.properties

// 4. Create a Kafka Topic: On terminal 3 - under the folder you installed the Kafka binary
$ bin/kafka-topics.sh --create --topic cdc-example-topic --bootstrap-server localhost:9092

// 5. Start Kafka Console Consumer: On terminal 3 - under the folder you installed the Kafka binary
$ bin/kafka-console-consumer.sh --topic cdc-example-topic --from-beginning --bootstrap-server localhost:9092

// 6. Start Playground: On terminal 4
$ tiup playground v6.1.0 --tag cdc-example --db 2 --pd 3 --kv 3 --ticdc 1 --tiflash 1

// 7. Create a TiCDC Change Feed Task: terminal 5
$ git clone https://github.com/pingcap/tidb-course-201-lab.git && cd tidb-course-201-lab/scripts
$ ./13-demo-cdc-create-changefeed-01.sh

// 8. Do Any Changes by Executing DDL/DML in terminal 5, and observe the captured changes on terminal 4
$ mysql -h 127.0.0.1 -P 4000 -u root
mysql> create table test.t10 (id bigint primary key);
mysql> insert into test.t10 values (100);
mysql> ...

// 9. Clean up the environment
    // Tear Down: On terminal 4, 3, 2, 1
    $ Press <ctrl-c> in terminal 4, 3, 2, 1 in order
    $ tiup clean cdc-example

// 10. Restart the default Playground on terminal 1
$ ./playground-start.sh
```

K9: Feeds Database Changes to Kafka Via TiCDC (Sample Output)

- Terminal 5 is connected to **TiDB**
- Terminal 3 is attached to **Kafka Topic Consumer**

// On terminal 5, execute CREATE/INSERT/UPDATE/DELETE in order

```
mysql> create table test.t10 (id bigint primary key);  
Query OK, 0 rows affected (0.25 sec)
```

```
mysql> insert into test.t10 values (100);  
Query OK, 1 row affected (0.01 sec)
```

```
mysql> update test.t10 set id=200 where id=100;  
Query OK, 1 row affected (0.02 sec)  
Rows matched: 1  Changed: 1  Warnings: 0
```

```
mysql> delete from test.t10;  
Query OK, 1 row affected (0.02 sec)
```

// On terminal 3, you can see four events for DDL, INSERT, UPDATE and finally the DELETE

```
$ bin/kafka-console-consumer.sh --topic cdc-example-topic --from-beginning --bootstrap-server localhost:9092
```

```
A{"q":"CREATE TABLE `test`.`t10` (`id` BIGINT PRIMARY KEY)","t":3}  
,{"u":{"id":{"t":8,"h":true,"f":11,"v":100}}}  
,{"d":{"id":{"t":8,"h":true,"f":11,"v":100}}},{"u":{"id":{"t":8,"h":true,"f":11,"v":200}}}  
,{"d":{"id":{"t":8,"h":true,"f":11,"v":200}}}
```

K10: Raw KV Example

- Environment: **Python 3.x**
- Sample code:
 - [demo-simple-put-get-rawkv.py](#)
- Mini demo story:
 - This demo is **TiUP Playground ONLY**
 - Accesss TiKV as a KV store via experimental Python API

```
// 1. Go to working directory: tidb-course-201-lab/scripts
```

```
$ cd tidb-course-201-lab/scripts
```

```
// 2. Run demo script
```

```
$ ./01-demo-simple-raw-kv.sh
```

K10: Raw KV Example (Output)

```
$ ./01-demo-simple-raw-kv.sh
...
put(b'Key1',b'Value1')
Jul 14 09:54:26.997 INFO connect to tikv endpoint: "127.0.0.1:20161"
get(b'Key1'): b'Value1'
get(b'Key0'): None
```

K11: Online Schema Change

- Environment: **Java SDK, mysql-client**
- Sample code:
 - [DemoJdbcPreparedStatement8028.java](#)
 - [07-demo-online-ddl-add-column-02.sql](#)
- Mini demo story:
 - Session A runs a workload to insert rows, 192000 rows in total.
 - Workload script: **11-demo-jdbc-prepared-statement-online-ddl-01-show.sh**
 - Session B executes a DDL to add a new column for the table which session A is inserting rows into.
 - Note: DML does not block DDL in TiDB, and vice versa
 - In 1st demo run, execute the workload without the error code hint to observe the result that how online DDL affects the DML for session A.
 - In 2nd demo run, execute the workload with **8028** as the second parameter to tell the program to re-execute the transaction when encountering error code 8028.
 - Error code 8028: **Information schema is changed during the execution of the statement**
- Use parameter **[cloud|local]** to run the demo against TiDB Cloud or local Playground respectively
- Detail demo run steps listed in next slide ...

K11: Online Schema Change

```
// 1. Go to working directory: tidb-course-201-lab/scripts
$ cd tidb-course-201-lab/scripts

// 2. FIRST demo run - ErrorCode: 8028 is NOT handled

// On terminal 1, call script to run the inserting workload without error handling hint
$ ./11-demo-jdbc-prepared-statement-online-ddl-01-show.sh cloud|local

// When terminal 1 begin to inserting rows, in terminal 2, connect to TiDB with mysql-client
// Connect to TiDB Cloud
$ ./connect-cloud.sh

// Or, connect to local Playground
$ ./connect-4000.sh

// On terminal 2, call script to trigger an Online DDL on the workload table
tidb> source 07-demo-online-ddl-add-column-02.sql

// Observe what happened in terminal 1, how many rows had been inserted?

// 3. SECOND demo run - ErrorCode: 8028 is handled for once

// On terminal 1, call script to run the inserting workload with error handling hint this time
$ ./11-demo-jdbc-prepared-statement-online-ddl-01-show.sh cloud|local 8028

// When terminal 1 begin to inserting rows, in terminal 2, connect to TiDB with mysql-client
// Connect to TiDB Cloud
$ ./connect-cloud.sh

// Or, connect to local Playground
$ ./connect-4000.sh

// On terminal 2, call script to trigger an Online DDL on the workload table
tidb> source 07-demo-online-ddl-add-column-02.sql

// Observe what happened in terminal 1, how many rows had been inserted?
```


K11: First Demo Run (Output)

```
// On terminal 1
$ ./11-demo-jdbc-prepared-statement-online-ddl-01-show.sh local
TiDB endpoint: 127.0.0.1
TiDB username: root
Default TiDB server port: 4000
Connection established.
preparing
...
populating
...
/* Executing query: SELECT name1 as "|NAME1|", count(*) as "|BEFORE-DDL-GOAL: 192000|" FROM test.target_table GROUP BY name1 ORDER BY 1; */
  Row#, name1, |BEFORE-DDL-GOAL: 192000|
    1) BEFORE-DDL, 960
...
Error: java.sql.SQLException: Information schema is changed during the execution of the statement(for example, table definition may be updated
by other DDL ran in parallel). If you see this error often, try increasing `tidb_max_delta_schema_count`. [try again later]
SQLState: HY000
ErrorCode: 8028
...
Connection closed.
```

K11: Second Demo Run (Output)

```
// On terminal 1
$ ./11-demo-jdbc-prepared-statement-online-ddl-01-show.sh local 8028
TiDB endpoint: 127.0.0.1
TiDB username: root
Default TiDB server port: 4000
Connection established.
preparing
...
populating
...
/* Executing query: SELECT name1 as "|NAME1|", count(*) as "|BEFORE-DDL-GOAL: 192000|" FROM test.target_table GROUP BY name1 ORDER BY 1; */
  Row#, name1, |BEFORE-DDL-GOAL: 192000|
  1) BEFORE-DDL, 960
...
Error: java.sql.SQLException: Information schema is changed during the execution of the statement(for example, table definition may be updated
by other DDL ran in parallel). If you see this error often, try increasing `tidb_max_delta_schema_count`. [try again later]
SQLState: HY000
ErrorCode: 8028
...
8028 (schema mutation) encountered, backoff...
DO anything in reaction to error, in this example we continue our workload.
...
/* Executing query: SELECT name1 as "|NAME1|", count(*) as "|BEFORE-DDL-GOAL: 192000|" FROM test.target_table GROUP BY name1 ORDER BY 1; */
  Row#, name1, |BEFORE-DDL-GOAL: 192000|
  1) BEFORE-DDL, 192000
I: 199
Turn on autocommit.
Connection closed.
```

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- [TiDB Document](#)
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Thanks



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