MySQL基于binlog数据恢复方案笔记

概述

DBA或开发人员，有时会误删或者误更新数据，如果是线上环境并且影响较大，就需要能快速回滚。传统恢复方法是利用备份重搭实例，再应用去除错误sql后的binlog来恢复数据。此法费时费力，甚至需要停机维护，并不适合快速回滚。也有团队利用LVM快照来缩短恢复时间，但快照的缺点是会影响mysql的性能。

可以通过解析MySQL的binlog来生成反向SQL来实现数据回滚

binlog

概述

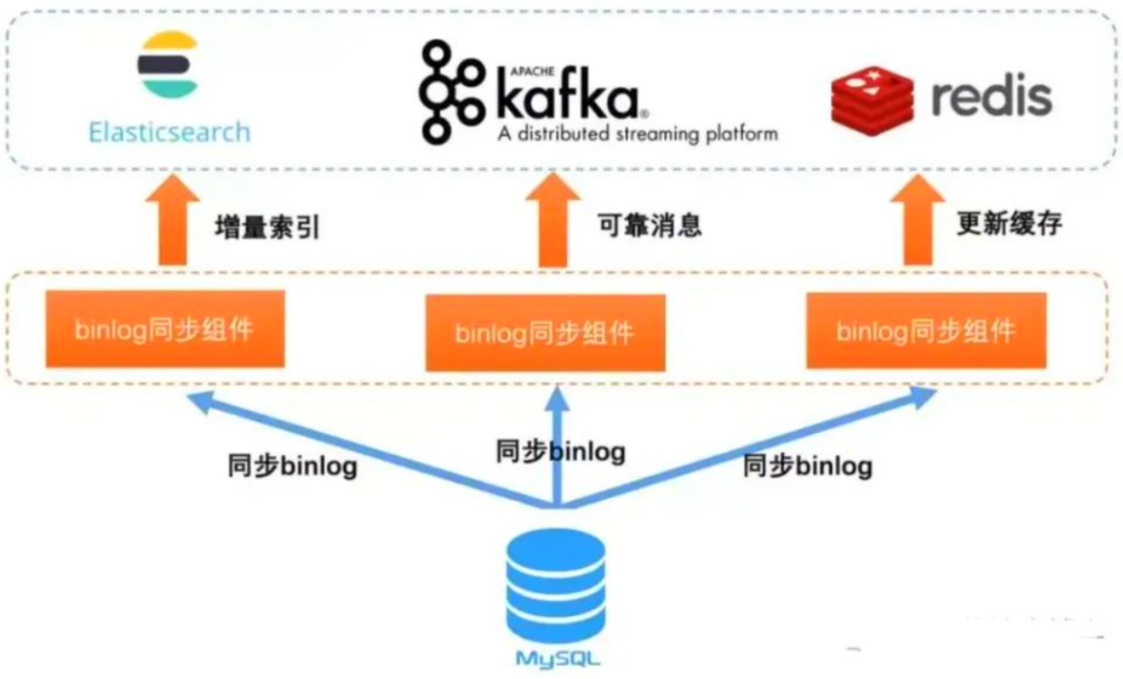
Mysql的Binlog是二进制格式的日志文件，Binlog是用来记录Mysql内部对数据库的改动（只记录对数据的修改操作），主要用于数据库的主从复制以及增量恢复

binlog 是 MySQL 的逻辑日志，由 Server 层记录，使用任何存储引擎都会记录binlog日志

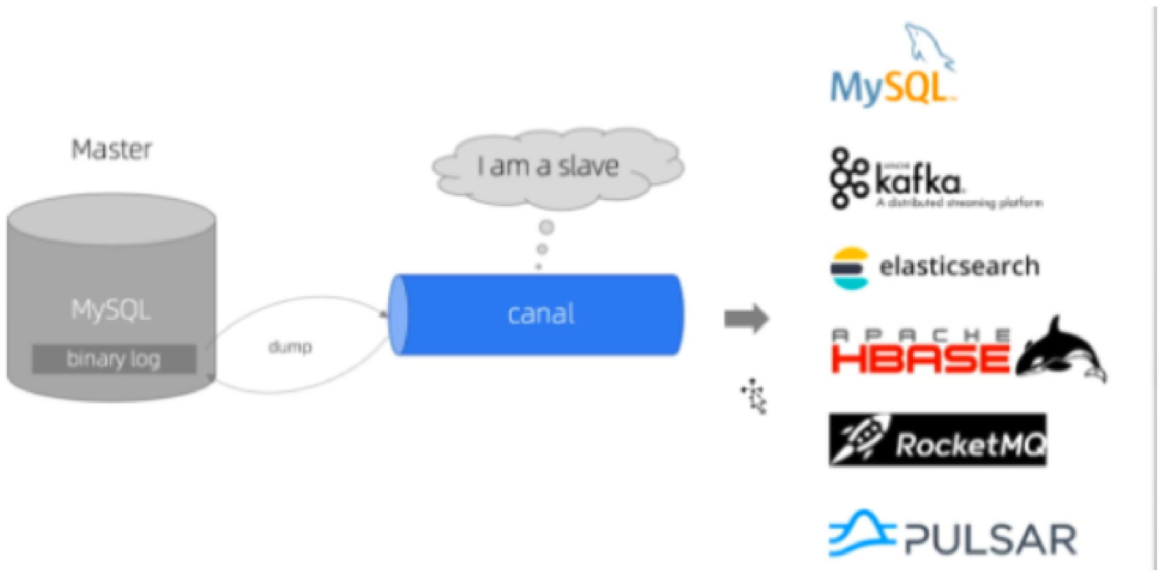
作用

MySQL的作用类似于Oracle的归档日志，可以用来查看数据库的变更历史（具体的时间点所有的SQL操作）、数据库增量备份和恢复（增量备份和基于时间点的恢复）、Mysql的复制（主主数据库的复制、主从数据库的复制）

binlog 通过追加的方式写入，可以通过 `max_binlog_size` 参数配置binlog文件的大小，当文件大小达到给定的定值后，会生成新的文件来保存日志



可以使用阿里巴巴的Canal中间件来实现binLog日志监听



刷盘机制

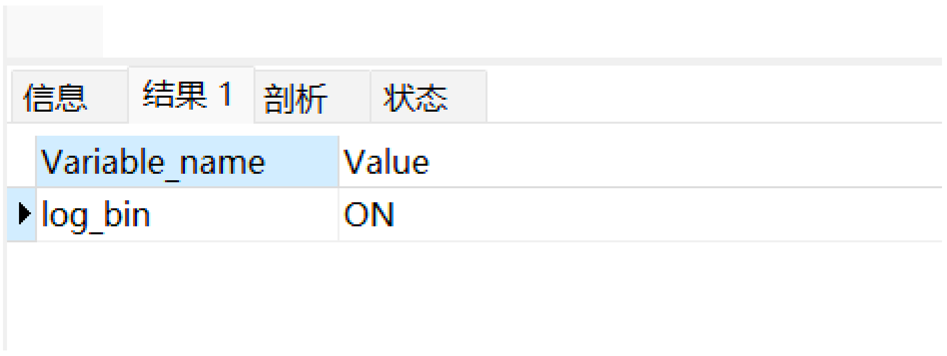
对于 InnoDB 存储引擎，在事务提交后，才会记录 binlog 日志，此时日志在内存中，通过参数 sync_binlog 控制刷盘时间，sync_binlog 值有以下几种：

- 0：事务提交，不刷盘，由操作系统自行判断何时写入磁盘
- 1：每次事务提交的时候，都将 binlog 写入磁盘
- N：每 N 个事务提交，才会将 binlog 写入磁盘

开启binlog

首先查看mysql是否开启binlog同步功能

```
show variables like 'log_bin';
```



Variable_name	Value
log_bin	ON

如果为on，则为开启，默认是关闭的

如果没有开启，就要编辑mysql的配置文件`my.cnf`，linux一般是在etc目录下

```
vi /etc/my.cnf
```

```
# 开启binlog
log-bin = mysql-bin
```

也可以通过 `SET SQL_LOG_BIN=1` 命令来启用 binlog，通过 `SET SQL_LOG_BIN=0` 命令停用 binlog

重启MySQL才能生效

相关常用命令

是否启用binlog日志

```
show variables like 'log_bin';
```

查看详细的binlog日志配置信息

```
show global variables like '%log%';
```

```
mysql> show global variables like '%log%';
+-------------------------------------------------+--------------------------
--------------------------------------+
| Variable_name                                   | Value
                                     |
+-------------------------------------------------+--------------------------
--------------------------------------+
| activate_all_roles_on_login                     | OFF
                                     |
| back_log                                        | 151
                                     |
| binlog_cache_size                               | 32768
                                     |
| binlog_checksum                                 | CRC32
                                     |
| binlog_direct_non_transactional_updates         | OFF
                                     |
| binlog_encryption                               | OFF
                                     |
| binlog_error_action                             | ABORT_SERVER
                                      |
| binlog_expire_logs_auto_purge                   | ON
                                      |
| binlog_expire_logs_seconds                      | 2592000
                                     |
| binlog_format                                   | ROW
                                     |
| binlog_group_commit_sync_delay                  | 0
                                     |
| binlog_group_commit_sync_no_delay_count         | 0
                                     |
| binlog_gtid_simple_recovery                     | ON
                                      |
| binlog_max_flush_queue_time                     | 0
                                     |
| binlog_order_commits                            | ON
                                      |
| binlog_rotate_encryption_master_key_at_startup | OFF
                                     |
| binlog_row_event_max_size                       | 8192
                                      |
| binlog_row_image                                | FULL
                                      |
| binlog_row_metadata                             | MINIMAL
                                     |
| binlog_row_value_options                        |
                                     |
| binlog_rows_query_log_events                    | OFF
                                |
| binlog_stmt_cache_size                          | 32768
                                |
| binlog_transaction_compression                  | OFF
                                |
| binlog_transaction_compression_level_zstd       | 3
                                |
| binlog_transaction_dependency_history_size      | 25000
                                |
| binlog_transaction_dependency_tracking          | COMMIT_ORDER
                                 |
| expire_logs_days                                | 0
                                |
| general_log                                     | OFF
                                |
| general_log_file                                | MAO.log
                                |
| innodb_api_enable_binlog                        | OFF
                                |
| innodb_flush_log_at_timeout                     | 1
                                |
| innodb_flush_log_at_trx_commit                  | 1
                                |
| innodb_log_buffer_size                          | 16777216
                                 |
| innodb_log_checksums                            | ON
                                 |
| innodb_log_compressed_pages                     | ON
                                 |
| innodb_log_file_size                            | 50331648
                                 |
| innodb_log_files_in_group                       | 2
                                |
| innodb_log_group_home_dir                       | .\
                                 |
| innodb_log_spin_cpu_abs_lwm                     | 80
                                 |
| innodb_log_spin_cpu_pct_hwm                     | 50
                                 |
| innodb_log_wait_for_flush_spin_hwm              | 400
                                |
| innodb_log_write_ahead_size                     | 8192
                                |
| innodb_log_writer_threads                       | ON
                                 |
| innodb_max_undo_log_size                        | 1073741824
                                 |
| innodb_online_alter_log_max_size                | 134217728
                                |
| innodb_print_ddl_logs                           | OFF
                                |
| innodb_redo_log_archive_dirs                    |
                                |
| innodb_redo_log_capacity                         | 104857600
                                        |
| innodb_redo_log_encrypt                          | OFF
                                        |
| innodb_undo_log_encrypt                          | OFF
                                        |
| innodb_undo_log_truncate                         | ON
                                         |
| log_bin                                          | ON
                                         |
| log_bin_basename                                 |
C:\ProgramData\MySQL\MySQL Server 8.0\Data\MAO-bin              |
| log_bin_index                                    |
C:\ProgramData\MySQL\MySQL Server 8.0\Data\MAO-bin.index        |
| log_bin_trust_function_creators                  | OFF
                                        |
| log_bin_use_v1_row_events                        | OFF
                                        |
| log_error                                        | .\MAO.err
                                        |
| log_error_services                               | log_filter_internal;
log_sink_internal                            |
| log_error_suppression_list                       |
                                        |
| log_error_verbosity                              | 2
                                        |
| log_output                                       | FILE
                                         |
| log_queries_not_using_indexes                    | OFF
                                        |
| log_raw                                          | OFF
                                        |
| log_replica_updates                              | ON
                                         |
| log_slave_updates                                | ON
                                         |
| log_slow_admin_statements                        | OFF
                                        |
| log_slow_extra                                   | OFF
                                        |
| log_slow_replica_statements                      | OFF
                                        |
| log_slow_slave_statements                        | OFF
                                        |
| log_statements_unsafe_for_binlog                 | ON
                                         |
| log_throttle_queries_not_using_indexes           | 0
                                        |
| log_timestamps                                   | UTC
                                        |
| max_binlog_cache_size                            | 18446744073709547520
                                         |
| max_binlog_size                                  | 1073741824
                                         |
| max_binlog_stmt_cache_size                      | 18446744073709547520                             |
| max_relay_log_size                              | 0                                                |
| relay_log                                       | mao-relay-bin                                    |
| relay_log_basename                              | C:\ProgramData\MySQL\MySQL Server 8.0\Data\mao-relay-bin       |
| relay_log_index                                 | C:\ProgramData\MySQL\MySQL Server 8.0\Data\mao-relay-bin.index |
| relay_log_info_file                             | relay-log.info                                   |
| relay_log_info_repository                       | TABLE                                            |
| relay_log_purge                                 | ON                                               |
| relay_log_recovery                              | OFF                                              |
| relay_log_space_limit                           | 0                                                |
| slow_query_log                                  | ON                                               |
| slow_query_log_file                             | MAO-slow.log                                     |
| sql_log_off                                     | OFF                                              |
| sync_binlog                                     | 1                                                |
| sync_relay_log                                  | 10000                                            |
| sync_relay_log_info                             | 10000                                            |
| terminology_use_previous                        | NONE                                             |
+-------------------------------------------------+--------------------------------------------------------------+
91 rows in set, 1 warning (0.00 sec)

mysql>
```

查看binlog的目录

```
show global variables like "%log_bin%";
```

```
mysql> show global variables like "%log_bin%";
+----------------------------------+----------------------------------------------------------+
| Variable_name                    | Value                                                    |
+----------------------------------+----------------------------------------------------------+
| log_bin                          | ON                                                       |
| log_bin_basename                 | C:\ProgramData\MySQL\MySQL Server 8.0\Data\MAO-bin       |
| log_bin_index                    | C:\ProgramData\MySQL\MySQL Server 8.0\Data\MAO-bin.index |
| log_bin_trust_function_creators  | OFF                                                      |
| log_bin_use_v1_row_events        | OFF                                                      |
+----------------------------------+----------------------------------------------------------+
5 rows in set, 1 warning (0.00 sec)

mysql>
```

查看binlog文件日志列表

```
show binary logs;
```

```
mysql> show binary logs;
+----------------+-----------+-----------+
| Log_name       | File_size | Encrypted |
+----------------+-----------+-----------+
| MAO-bin.000650 | 170403208 | No        |
| MAO-bin.000651 |       180 | No        |
| MAO-bin.000652 |       180 | No        |
| MAO-bin.000653 |       180 | No        |
| MAO-bin.000654 |       180 | No        |
| MAO-bin.000655 |       180 | No        |
| MAO-bin.000656 |       368 | No        |
| MAO-bin.000657 |  21002124 | No        |
| MAO-bin.000658 |       180 | No        |
| MAO-bin.000659 |       180 | No        |
| MAO-bin.000660 |   7909038 | No        |
| MAO-bin.000661 |  25635575 | No        |
| MAO-bin.000662 |   1839935 | No        |
| MAO-bin.000663 |     13990 | No        |
| MAO-bin.000664 | 914604165 | No        |
+----------------+-----------+-----------+
15 rows in set (0.03 sec)
```

```

mysql>
```

查看最新一个binlog日志文件名称和Position

```
show master status;
```

```
mysql> show master status;
+----------------+-----------+--------------+------------------+-------------------+
| File           | Position  | Binlog_Do_DB | Binlog_Ignore_DB | Executed_Gtid_Set |
+----------------+-----------+--------------+------------------+-------------------+
| MAO-bin.000664 | 914604165 |              |                  |                   |
+----------------+-----------+--------------+------------------+-------------------+
1 row in set (0.00 sec)

mysql>
```

刷新log日志

自此刻开始产生一个新编号的binlog日志文件，每当mysqld服务重启时，会自动执行此命令，刷新binlog日志；在mysqldump备份数据时加 -F 选项也会刷新binlog日志

```
flush logs;
```

查看第一个binlog文件内容

```
show binlog events;
```

内容太多，不展示

查看具体一个binlog文件的内容

```
show binlog events in 'xxx.00000x';
```

清空所有binlog日志

```
reset master;
```

删除slave的中继日志

```
reset slave;
```

删除指定日期前的日志索引中binlog日志文件

```
purge master logs before 'yyyy-MM-dd HH:mm:ss';
```

删除指定日志文件

```
purge master logs to 'master.000001';
```

找到binlog日志

使用`show global variables like '%log%';`命令，根据`log_bin_basename`参数的值来寻找binlog日志的位置

```
PS C:\ProgramData\MySQL\MySQL Server 8.0\Data> pwd

Path
----
C:\ProgramData\MySQL\MySQL Server 8.0\Data

```

```

PS C:\ProgramData\MySQL\MySQL Server 8.0\Data> ls


    目录: C:\ProgramData\MySQL\MySQL Server 8.0\Data


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----         2023/9/28      9:04                #innodb_redo
d-----         2023/9/26     22:25                #innodb_temp
d-----          2023/9/9     21:11                activiti
d-----         2023/2/14     22:48                aggregate_pay_log
d-----         2023/2/14     22:48
aggregate_pay_merchant_service
d-----         2023/5/19     23:13
aggregate_pay_merchant_service1
d-----         2023/2/14     22:48                aggregate_pay_transaction
d-----         2023/5/19     23:13                aggregate_pay_transaction1
d-----         2023/2/14     22:48                aggregate_pay_uaa
d-----         2023/2/14     22:48                aggregate_pay_user
d-----         2023/5/19     20:08                authority
d-----         2023/4/13     13:13                chat_room
d-----         2023/2/14     22:48                cloud_order
d-----         2023/2/14     22:48                cloud_user
d-----         2023/9/11     14:54                datart
d-----         2023/4/14     21:10                epms
d-----         2023/9/28      8:59                gzepi
d-----         2023/9/28     17:34                gzepi_wdst
d-----         2023/2/14     22:48                hotel
d-----         2023/8/28     10:26                jxstar_cloud
d-----         2023/8/28     13:09                jxstar_cloud1
d-----         2023/4/19     20:38                library_seat_selection
d-----         2023/2/15     22:07                mysql
d-----          2023/5/3     23:49                nacos
d-----         2023/2/15     22:07                performance_schema
d-----         2023/2/14     22:48                sakila
d-----         2023/2/14     22:48                seata
d-----         2023/2/14     22:48                seata_demo
d-----          2023/5/3     23:56                shop
d-----         2023/5/20     21:32                sms
d-----         2023/5/20     21:34                sms1
d-----         2023/2/14     22:48                spring_cloud_security
d-----         2023/2/26     14:46                ssmf51qm
d-----         2023/2/14     22:48                student
d-----          2023/5/3     23:57                student1
d-----         2023/2/14     22:48                student_test
d-----         2023/2/14     22:48                sys
d-----          2023/4/9     23:37                test
d-----          2023/9/6     15:04                test2
d-----          2023/9/5     10:07                test3
d-----          2023/5/8     22:24                tmalldemodb
d-----         2023/2/14     22:48                tx
d-----         2023/2/14     22:48                world
-a----         2023/9/29     19:48         196608 #ib_16384_0.dblwr
```

```
-a----         2023/9/28      9:04        8585216 #ib_16384_1.dblwr
-a----        2021/11/24     16:56             56 auto.cnf
-a----        2021/11/24     16:56           1680 ca-key.pem
-a----        2021/11/24     16:56           1112 ca.pem
-a----        2021/11/24     16:56           1112 client-cert.pem
-a----        2021/11/24     16:56           1680 client-key.pem
-a----         2023/9/29     19:46       12582912 ibdata1
-a----         2023/9/26     22:26       12582912 ibtmp1
-a----         2023/9/26     22:24           5916 ib_buffer_pool
-a----         2023/8/29      8:50      170403208 MAO-bin.000650
-a----         2023/8/30     16:25            180 MAO-bin.000651
-a----         2023/8/30     19:53            180 MAO-bin.000652
-a----         2023/8/30     19:55            180 MAO-bin.000653
-a----         2023/8/30     19:57            180 MAO-bin.000654
-a----          2023/9/5      8:54            180 MAO-bin.000655
-a----          2023/9/5     16:38            368 MAO-bin.000656
-a----         2023/9/13     17:42       21002124 MAO-bin.000657
-a----         2023/9/14      9:01            180 MAO-bin.000658
-a----         2023/9/14      9:04            180 MAO-bin.000659
-a----         2023/9/14     15:13        7909038 MAO-bin.000660
-a----         2023/9/15     21:18       25635575 MAO-bin.000661
-a----         2023/9/17     16:33        1839935 MAO-bin.000662
-a----         2023/9/26     22:24          13990 MAO-bin.000663
-a----         2023/9/28     17:34      914604165 MAO-bin.000664
-a----         2023/9/26     22:25            255 MAO-bin.index
-a----         2023/9/26     22:25         131062 MAO-slow.log
-a----         2023/9/28     17:09        1346649 MAO.err
-a----         2023/9/26     22:25              5 mao.pid
-a----         2023/9/29     19:46       50331648 mysql.ibd
-a----         2023/2/15     22:07              6 mysql_upgrade_info
-a----        2021/11/24     16:56           1676 private_key.pem
-a----        2021/11/24     16:56            452 public_key.pem
-a----        2021/11/24     16:56           1112 server-cert.pem
-a----        2021/11/24     16:56           1676 server-key.pem
-a----         2023/9/29     19:43       16777216 undo_001
-a----         2023/9/29     19:48      100663296 undo_002


PS C:\ProgramData\MySQL\MySQL Server 8.0\Data>
```

```
PS C:\ProgramData\MySQL\MySQL Server 8.0\Data> cat .\MAO-bin.index
.\MAO-bin.000650
.\MAO-bin.000651
.\MAO-bin.000652
.\MAO-bin.000653
.\MAO-bin.000654
.\MAO-bin.000655
.\MAO-bin.000656
.\MAO-bin.000657
.\MAO-bin.000658
.\MAO-bin.000659
.\MAO-bin.000660
.\MAO-bin.000661
```

```
.\MAO-bin.000662
.\MAO-bin.000663
.\MAO-bin.000664
PS C:\ProgramData\MySQL\MySQL Server 8.0\Data>
```

解析binlog日志

binlog是二进制文件，普通文件查看器cat more vi等都无法打开，必须使用官方自带的 mysqlbinlog 命令查看

参数如下：

```
Usage: C:\Program Files\MySQL\MySQL Server 8.0\bin\mysqlbinlog.exe [options] log-files
  -?, --help          Display this help and exit.
  --base64-output=name
                      Determine when the output statements should be
                      base64-encoded BINLOG statements: 'never' disables it and
                      works only for binlogs without row-based events;
                      'decode-rows' decodes row events into commented
                      pseudo-SQL statements if the --verbose option is also
                      given; 'auto' prints base64 only when necessary (i.e.,
                      for row-based events and format description events). If
                      no --base64-output[=name] option is given at all, the
                      default is 'auto'.
  --bind-address=name IP address to bind to.
  --character-sets-dir=name
                      Directory for character set files.
  -d, --database=name List entries for just this database (local log only).
  --rewrite-db=name   Rewrite the row event to point so that it can be applied
                      to a new database
  -#, --debug[=#]     This is a non-debug version. Catch this and exit.
  --debug-check       This is a non-debug version. Catch this and exit.
  --debug-info        This is a non-debug version. Catch this and exit.
  --default-auth=name Default authentication client-side plugin to use.
  -D, --disable-log-bin
                      Disable binary log. This is useful, if you enabled
                      --to-last-log and are sending the output to the same
                      MySQL server. This way you could avoid an endless loop.
                      You would also like to use it when restoring after a
                      crash to avoid duplication of the statements you already
                      have. NOTE: you will need a SUPER privilege to use this
                      option.
  -F, --force-if-open Force if binlog was not closed properly.
                      (Defaults to on; use --skip-force-if-open to disable.)
  -f, --force-read    Force reading unknown binlog events.
  -H, --hexdump       Augment output with hexadecimal and ASCII event dump.
  -h, --host=name     Get the binlog from server.
  -i, --idempotent    Notify the server to use idempotent mode before applying
                      Row Events
  -l, --local-load=name
                      Prepare local temporary files for LOAD DATA INFILE in the
                      specified directory.
  -o, --offset=#      Skip the first N entries.
  -p, --password[=name]
                      Password to connect to remote server.
  --plugin-dir=name   Directory for client-side plugins.
  -P, --port=#        Port number to use for connection or 0 for default to, in
                      order of preference, my.cnf, $MYSQL_TCP_PORT,
                      /etc/services, built-in default (3306).
  --protocol=name     The protocol to use for connection (tcp, socket, pipe,
                      memory).
  -R, --read-from-remote-server
                      Read binary logs from a MySQL server. This is an alias
                      for read-from-remote-source=BINLOG-DUMP-NON-GTIDS.
  --read-from-remote-master=name
                      This option is deprecated and will be removed in a future
                      version. Use read-from-remote-source instead.
  --read-from-remote-source=name
                      Read binary logs from a MySQL server through the
                      COM_BINLOG_DUMP or COM_BINLOG_DUMP_GTID commands by
                      setting the option to either BINLOG-DUMP-NON-GTIDS or
                      BINLOG-DUMP-GTIDS, respectively. If
                      --read-from-remote-source=BINLOG-DUMP-GTIDS is combined
                      with --exclude-gtids, transactions are filtered out on
                      the source, to avoid unnecessary network traffic.
  --raw               Requires -R. Output raw binlog data instead of SQL
                      statements, output is to log files.
  -r, --result-file=name
                      Direct output to a given file. With --raw this is a
                      prefix for the file names.
  --server-id=#       Extract only binlog entries created by the server having
                      the given id.
  --server-id-bits=#  Set number of significant bits in server-id
  --set-charset=name  Add 'SET NAMES character_set' to the output.
  --shared-memory-base-name=name
                      Base name of shared memory.
  -s, --short-form    Just show regular queries: no extra info and no row-based
                      events. This is for testing only, and should not be used
                      in production systems. If you want to suppress
                      base64-output, consider using --base64-output=never
                      instead.
  -S, --socket=name   The socket file to use for connection.
  --server-public-key-path=name
                      File path to the server public RSA key in PEM format.
  --get-server-public-key
                      Get server public key
  --ssl-mode=name     SSL connection mode.
  --ssl-ca=name       CA file in PEM format.
  --ssl-capath=name   CA directory.
  --ssl-cert=name     X509 cert in PEM format.
  --ssl-cipher=name   SSL cipher to use.
  --ssl-key=name      X509 key in PEM format.
  --ssl-crl=name      Certificate revocation list.
  --ssl-crlpath=name  Certificate revocation list path.
  --tls-version=name  TLS version to use, permitted values are: TLSv1.2,
                      TLSv1.3
  --ssl-fips-mode=name
                      SSL FIPS mode (applies only for OpenSSL); permitted
                      values are: OFF, ON, STRICT
  --tls-ciphersuites=name
                      TLS v1.3 cipher to use.
  --ssl-session-data=name
                      Session data file to use to enable ssl session reuse
  --ssl-session-data-continue-on-failed-reuse
                      If set to ON, this option will allow connection to
                      succeed even if session data cannot be reused.
  --start-datetime=name
                      Start reading the binlog at first event having a datetime
                      equal or posterior to the argument; the argument must be
                      a date and time in the local time zone, in any format
                      accepted by the MySQL server for DATETIME and TIMESTAMP
                      types, for example: 2004-12-25 11:25:56 (you should
                      probably use quotes for your shell to set it properly).
  -j, --start-position=#
                      Start reading the binlog at position N. Applies to the
                      first binlog passed on the command line.
  --stop-datetime=name
                      Stop reading the binlog at first event having a datetime
                      equal or posterior to the argument; the argument must be
                      a date and time in the local time zone, in any format
                      accepted by the MySQL server for DATETIME and TIMESTAMP
                      types, for example: 2004-12-25 11:25:56 (you should
                      probably use quotes for your shell to set it properly).
  --stop-never        Wait for more data from the server instead of stopping at
                      the end of the last log. Implicitly sets --to-last-log
                      but instead of stopping at the end of the last log it
                      continues to wait till the server disconnects.
  --stop-never-slave-server-id=#
                      The server_id that is reported when connecting to a
                      source server when using --read-from-remote-server
                      --stop-never. This option is deprecated and will be
                      removed in a future version. Use connection-server-id
                      instead.
  --connection-server-id=#
                      The server_id that will be reported when connecting to a
                      source server when using --read-from-remote-server. This
                      option cannot be used together with
                      stop-never-slave-server-id.
  --stop-position=#   Stop reading the binlog at position N. Applies to the
                      last binlog passed on the command line.
  -t, --to-last-log   Requires -R. Will not stop at the end of the requested
                      binlog but rather continue printing until the end of the
                      last binlog of the MySQL server. If you send the output
                      to the same MySQL server, that may lead to an endless
                      loop.
  -u, --user=name     Connect to the remote server as username.
  -v, --verbose       Reconstruct pseudo-SQL statements out of row events. -v
                      -v adds comments on column data types.
  -V, --version       Print version and exit.
  --open-files-limit=#
                      Used to reserve file descriptors for use by this program.
  -c, --verify-binlog-checksum
                      Verify checksum binlog events.
  --binlog-row-event-max-size=#
                      The maximum size of a row-based binary log event in
                      bytes. Rows will be grouped into events smaller than this
                      size if possible. This value must be a multiple of 256.
  --skip-gtids        Do not preserve Global Transaction Identifiers; instead
                      make the server execute the transactions as if they were
                      new.
  --include-gtids=name
                      Print events whose Global Transaction Identifiers
were
                      provided.
  --exclude-gtids=name
                      Print all events but those whose Global Transaction
                      Identifiers were provided.
  --print-table-metadata
                      Print metadata stored in Table_map_log_event
  -C, --compress      Use compression in server/client protocol.
  --compression-algorithms=name
                      Use compression algorithm in server/client protocol.
                      Valid values are any combination of
                      'zstd','zlib','uncompressed'.
  --zstd-compression-level=#
                      Use this compression level in the client/server
protocol,
                      in case --compression-algorithms=zstd. Valid range is
                      between 1 and 22, inclusive. Default is 3.
  --require-row-format
                      Fail when printing an event that was not logged using
row
                      format or other forbidden events like Load
instructions
                      or the creation/deletion of temporary tables.

Default options are read from the following files in the given order:
C:\Windows\my.ini C:\Windows\my.cnf C:\my.ini C:\my.cnf C:\Program
Files\MySQL\MySQL Server 8.0\my.ini C:\Program Files\MySQL\MySQL Server
8.0\my.cnf
The following groups are read: mysqlbinlog client
The following options may be given as the first argument:
--print-defaults        Print the program argument list and exit.
--no-defaults           Don't read default options from any option file,
                        except for login file.
--defaults-file=#       Only read default options from the given file #.
--defaults-extra-file=# Read this file after the global files are read.
--defaults-group-suffix=#
                        Also read groups with concat(group, suffix)
--login-path=#          Read this path from the login file.
```

命令：

```
mysqlbinlog --no-defaults --base64-output=DECODE-ROWS -v ./MAO-bin.000664
>000664.txt
```

备份内容参考：

```
### INSERT INTO `test`.`test`
### SET
###   @1=1 /* INT meta=0 nullable=0 is_null=0 */
###   @2=501885 /* INT meta=0 nullable=0 is_null=0 */
###   @3='08566691963-88624912351-16662227201-46648573979-64646226163-77505759394-75470094713-41097360717-15161106334-50535565977' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='63188288836-92351140030-06390587585-66802097351-49282961843' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=2 /* INT meta=0 nullable=0 is_null=0 */
###   @2=495688 /* INT meta=0 nullable=0 is_null=0 */
###   @3='95969429576-20587925969-20202408199-67602281819-18293380360-38184587501-73192830026-41693404212-56705243222-89212376805' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='09512147864-77936258834-40901700703-13541171421-15205431759' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=3 /* INT meta=0 nullable=0 is_null=0 */
###   @2=514246 /* INT meta=0 nullable=0 is_null=0 */
###   @3='26283585383-48610978532-72166636310-67148386979-89643583984-06169170732-23477134062-17788128188-73465768032-24619558652' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='21979564480-87492594656-60524686334-78820761788-57684966682' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=4 /* INT meta=0 nullable=0 is_null=0 */
###   @2=393975 /* INT meta=0 nullable=0 is_null=0 */
###   @3='57481185690-89398636500-16888148413-67987678267-15604944838-94210794401-18107184012-91338377776-83386272438-09451188763' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='35227182905-15234265621-59793845249-15413569710-23749555118' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=5 /* INT meta=0 nullable=0 is_null=0 */
###   @2=500775 /* INT meta=0 nullable=0 is_null=0 */
###   @3='93482034638-51911042233-95872637268-17943401357-38175578085-45788017606-44041118775-54344399763-72128807465-92228972632' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='27590239742-20204899609-34345212327-79811525340-24267764271' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=6 /* INT meta=0 nullable=0 is_null=0 */
###   @2=498573 /* INT meta=0 nullable=0 is_null=0 */
###   @3='24310225777-93998284033-46606859421-56148834010-17759122961-78348472702-44986564036-71625391482-12661762212-64721022134' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='43131080328-59298106536-35954612339-97546855884-75769514803' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=7 /* INT meta=0 nullable=0 is_null=0 */
###   @2=504353 /* INT meta=0 nullable=0 is_null=0 */
###   @3='70862277183-86122137003-79729847560-50337161750-15964469011-48879357028-22541966759-10928901419-99400098250-19200948263' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='00505722282-72931248925-57037623248-81117963809-88658076981' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=8 /* INT meta=0 nullable=0 is_null=0 */
###   @2=497896 /* INT meta=0 nullable=0 is_null=0 */
###   @3='82571936845-31830426410-85662298479-28456275464-64339136268-26186841165-94168712814-56389105006-66969794071-60071049942' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='13152283289-69561545685-52868757241-04245213425-69280254356' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=9 /* INT meta=0 nullable=0 is_null=0 */
###   @2=503666 /* INT meta=0 nullable=0 is_null=0 */
###   @3='30259457399-49455699717-43210898264-46300466148-34254750860-44098710066-38295952016-90196077385-22332519290-06484158548' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='40929980986-33813039690-13155419391-97985458477-39771362212' /* STRING(240) meta=65264 nullable=0 is_null=0 */
### INSERT INTO `test`.`test`
### SET
###   @1=10 /* INT meta=0 nullable=0 is_null=0 */
###   @2=503330 /* INT meta=0 nullable=0 is_null=0 */
###   @3='48090103407-09222928184-34050945574-85418069333-36966673537-23363106719-15284068881-04674238815-26203696337-24037044694' /* STRING(480) meta=61152 nullable=0 is_null=0 */
###   @4='01495266405-82925129145-92643983850-90243995398-18709399387' /* STRING(240) meta=65264 nullable=0 is_null=0 */
```

格式

binlog 有三种格式，分为 STATEMENT，ROW 和 MIXED：

- **statement**：基于SQL语句的模式，binlog数据量小，但是某些语句和函数在复制过程可能导致数据不一致甚至出错
- **row**：基于行的模式，记录的是行的完整变化。很安全，但是binlog会比其他两种模式大很多
- **mixed**：混合模式，根据语句来选用是statement还是row模式

statement

Statement 模式只记录执行的 SQL，不需要记录每一行数据的变化，因此极大的减少了 binlog 的日志量，避免了大量的 IO 操作，提升了系统的性能

但是，正是由于 Statement 模式只记录 SQL，而如果一些 SQL 中 包含了函数，那么可能会出现执行结果不一致的情况。比如说 uuid() 函数，每次执行的时候都会生成一个随机字符串，在 master 中记录了 uuid，当同步到 slave 之后，再次执行，就得到另外一个结果了

所以使用 Statement 格式会出现一些数据一致性问题

row

从 MySQL5.1.5 版本开始，binlog 引入了 Row 格式

Row 格式的日志内容会非常清楚地记录下每一行数据修改的细节，这样就不会出现 Statement 中存在的那种数据无法被正常复制的情况

mixed

从 MySQL5.1.8 版开始，MySQL 又推出了 Mixed 格式，这种格式实际上就是 Statement 与 Row 的结合

在 Mixed 模式下，系统会自动判断该用 Statement 还是 Row

Mixed 模式中，MySQL 会根据执行的每一条具体的 SQL 语句来区别对待记录的日志格式，也就是在 Statement 和 Row 之间选择一种

一般的语句修改使用 Statement 格式保存 binlog；对于一些 Statement 无法准确完成主从复制的操作，则采用 Row 格式保存 binlog

statement优缺点

- 优点：不需要记录每一行的变化，减少了 binlog 日志量，节约IO，从而提高性能。
- 缺点：在某些情况下会导致主从数据不一致，比如执行 sysdate()，slepp()

row优缺点

- 优点：不会出现某些特定情况下的存储过程、或function、或trigger的调用和触发无法被正确复制的问题
- 缺点：会产生大量的日志

binlog_row_image

binlog_row_image是一个很重要但又容易被忽略的参数。binlog_row_image参数，决定了binlog是如何记录前镜像和后镜像的，这也就会直接影响到数据闪回、主从复制等

binlog_row_image参数，只在row模式下生效

前镜像和后镜像

- 前镜像(before image)：记录修改前的内容
- 后镜像(after image)：记录修改后的内容

取值

它有三个取值：`FULL`、`MINIMAL`和`NOBLOB`，默认取值是`FULL`

- binlog_row_image为`FULL`时，表无论有没有主键约束或者唯一约束binlog都会记录所有前后镜像
- binlog_row_image为`MINIMAL`时，如果表有主键或唯一索引，前镜像只保留主键列，后镜像只保留修改列；如果表没有主键或唯一索引，前镜像全保留，后镜像只保留修改列
- binlog_row_image为NOBLOB时，如果表有主键或唯一索引，修改列为text/blob列，前镜像忽略text/blob列，后镜像包含被修改的text/blob列；如果表有主键或唯一索引，修改列不是text/blob列，前后镜像忽略text/blob列。如果表没有主键或唯一索引，修改列为text/blob列 ，前后镜像全保留；如果表没有主键或唯一索引，修改列不是text/blob列，前镜像全保留，后镜像忽略text/blob列

binlog的区别

三者取值不同，binlog会有一定的区别

FULL

有主键约束

```sql
CREATE TABLE 'test1' (
    'id' int(11) NOT NULL,
    'name' varchar(10) DEFAULT NULL,
    primary key('id')
);

INSERT into test1 values(1,'jack'),(2,'mary');

UPDATE test1 SET name='bob' WHERE id=2;
```

使用mysqlbinlog解析binlog，得到的记录镜像信息如下：

```
### UPDATE 'test1','test1'
### WHERE
###   @1=2
###   @2='mary'
### SET
###   @1=2
###   @2='bob'
```

更新记录的前后镜像所有字段都记录了

无主键约束

```
CREATE TABLE 'test2' (
    'id' int(11) DEFAULT NULL,
    'name' varchar(10) DEFAULT NULL
);

INSERT into test2 values(1,'bob'),(2,'chang');

UPDATE test2 SET name='jack' WHERE id=2;
```

```
### UPDATE 'test','test2'
### WHERE
###   @1=2
###   @2='chang'
### SET
###   @1=2
###   @2='jack'
```

更新记录的前后镜像所有字段都记录了

MINIMAL

有主键约束

```
CREATE TABLE 'test1' (
    'id' int(11) NOT NULL,
    'name' varchar(10) DEFAULT NULL,
    primary key('id')
);

INSERT into test1 values(1,'jack'),(2,'mary');

UPDATE test1 SET name='bob' WHERE id=2;
```

```
### UPDATE 'test','test1'
### WHERE
###   @1=2
### SET
###   @2='bob'
```

如果表有主键或唯一索引，前镜像只保留主键列，后镜像只保留修改列

无主键约束

```
CREATE TABLE 'test2' (
    'id' int(11) DEFAULT NULL,
    'name' varchar(10) DEFAULT NULL
);

INSERT into test2 values(1,'bob'),(2,'chang');

UPDATE test2 SET name='jack' WHERE id=2;
```

```
### UPDATE 'test','test2'
### WHERE
###   @1=1
###   @2='chang'
### SET
###   @2='jack'
```

如果表没有主键或唯一索引，前镜像全保留，后镜像只保留修改列

NOBLOB

有主键约束并更新text/blob列

```sql
CREATE TABLE 'test1' (
    'id' int(11) NOT NULL,
    'name' text,
    'address' varchar(20) DEFAULT NULL,
    PRIMARY kEY ('id')
);

INSERT into test1 values(1,'jack','Japen'),(2,'bob','China');

UPDATE test1 SET name='mary' WHERE id=1;
```

```
### UPDATE 'test','test1'
### WHERE
###   @1=1
###   @3='Japen'
### SET
###   @1=1
###   @2='mary'
###   @3='Japen'
```

如果表有主键或唯一索引，修改列为text/blob列，前镜像忽略text/blob列，后镜像包含被修改的text/blob列

有主键约束并更新非text/blob列

```sql
UPDATE test1 SET address='Japen2' WHERE id=1;
```

```
### UPDATE 'test','test1'
### WHERE
###   @1=1
###   @3='Japen'
### SET
###   @1=1
###   @3='Japen2'
```

如果表没有主键或唯一索引，修改的列不是text/blob列，则前后镜像都忽略text/blob列

无主键约束并更新text/blob列

```
CREATE TABLE 'test2' (
    'id' int(11) NOT NULL,
    'name' text DEFAULT NULL,
    'address' varchar(20) DEFAULT NULL
);

INSERT into test2 values(1,'jack','Japen'),(2,'bob','China');

UPDATE test2 SET name='mary' WHERE id=1;
```

```
### UPDATE 'test','test1'
### WHERE
###   @1=1
###   @2='jack'
###   @3='Japen'
### SET
###   @1=1
###   @2='mary'
###   @3='Japen'
```

如果表没有主键或唯一索引，修改列为text/blob列，前后镜像全都保留

无主键约束并更新非text/blob列

```
UPDATE test2 SET address='Japen2' WHERE id=1;
```

```
### UPDATE 'test','test2'
### WHERE
###   @1=1
###   @2='mary'
###   @3='Japen'
### SET
###   @1=1
###   @3='Japen2'
```

如果表没有主键或唯一索引，修改列不是text/blob列，则前镜像全保留，后镜像忽略text/blob列

数据闪回

概述

闪回技术是一种在数据库中进行异常数据恢复的高级技术，它可以将数据库还原到之前的某个时间点，从而消除误操作、错误数据或系统故障所引起的问题。闪回技术不仅简单易用，而且具有高效性和可靠性，成为数据库管理员（DBA）的得力助手

如果在Oracle中误删除了数据，特定场景下可以通过闪回，进行数据的恢复，操作上是比较直观的，而且有很多粒度，例如闪回查询、闪回表、闪回事务、闪回数据库

MySQL中同样支持闪回，但是和Oracle略有区别

MySQL中，binlog文件主要用于主从同步二进制数据日志。当主服务器数据发生变更时，会把变动明细持久化到binlog文件中，此时从服务器通过拉取并解析binlog文件，实现数据的同步。正是由于binlog文件中记录了数据变更的信息，因此MySQL的闪回是基于binlog文件来实现的

要求

如果要在MySQL中实现闪回，则必须要求binlog文件日志格式是`binlog_format=row`，并且`binlog_row_image=full`。通过指定binlog文件的日志格式，就能在binlog中完整记录数据变化的轨迹和具体的操作行为（增删改）的前后差异。

原理

基于上述前提，我们可以解析并处理binlog文件中的事件，然后反序遍历。同时对增删改进行反转逆操作，即插入映射成删除、删除映射成插入、更新交换新旧数据区间。最后输出对应数据回滚的binlog文件，将其再次导入mysql，即完成对增删改数据的回滚还原

对于delete操作，我们从binlog提取出delete信息，生成的回滚语句是insert：

```
原始：DELETE FROM `test`.`user` WHERE `id`=1 AND `name`='小赵';
回滚：INSERT INTO `test`.`user`(`id`, `name`) VALUES (1, '小赵');
```

对于insert操作，回滚SQL是delete：

```
原始：INSERT INTO `test`.`user`(`id`, `name`) VALUES (2, '小钱');
回滚：DELETE FROM `test`.`user` WHERE `id`=2 AND `name`='小钱';
```

对于update操作，回滚sql应该交换SET和WHERE的值：

```
原始：UPDATE `test`.`user` SET `id`=3, `name`='小李' WHERE `id`=3 AND `name`='小孙';
回滚：UPDATE `test`.`user` SET `id`=3, `name`='小孙' WHERE `id`=3 AND `name`='小李';
```

局限性

- binlog_format=row
- binlog_row_image=full
- 只能支持DML语句(增删改)

如果误操作是DDL的话，是无法利用binlog做快速回滚的，因为即使在row模式下，binlog对于DDL操作也不会记录每行数据的变化。要实现DDL快速回滚，必须修改MySQL源码，使得在执行DDL前先备份老数据。目前有多个mysql定制版本实现了DDL闪回特性

闪回工具

分类

闪回工具按实现方式分成了三类

集成mysqlbinlog

第一类是以patch形式集成到官方工具mysqlbinlog中

优点：

- 上手成本低。mysqlbinlog原有的选项都能直接利用，只是多加了一个闪回选项
- 支持离线解析

缺点：

- 兼容性差、项目活跃度不高。由于binlog格式的变动，如果闪回工具作者不及时对补丁升级，则闪回工具将无法使用。目前已有多位人员分别针对mysql5.5，5.6，5.7开发了patch，部分项目代码公开，但总体上活跃度都不高

- 难以添加新功能，实战效果欠佳。在实战中，经常会遇到现有patch不满足需求的情况，比如要加个表过滤，很简单的一个需求，代码改动也不会大，但对大部分DBA来说，改mysql源码还是很困难的事
- 安装稍显麻烦。需要对mysql源码打补丁再编译生成

独立工具

第二类是独立工具，通过伪装成slave拉取binlog来进行处理，或者直接解析binlog日志

优点：

- 兼容性好。伪装成slave拉binlog这项技术在业界应用的非常广泛，多个开发语言都有这样的活跃项目，MySQL版本的兼容性由这些项目搞定，闪回工具的兼容问题不再突出
- 添加新功能的难度小。更容易被改造成DBA自己喜欢的形式
- 安装和使用简单

缺点：

- 必须开启MySQL server，并且连接上MySQL服务，因为仔细观察binlog日志，就会发现，**binlog只是记录的表里的第几个字段被更改成什么值，这时候还并不知道这个字段叫什么名称，需要连接数据库来查询表的元数据信息，第一个字段叫什么名字，第二个字段叫什么名字......所以账号至少要给对应表的读取元数据的权限**

简单脚本

第三类是简单脚本。先用mysqlbinlog解析出文本格式的binlog，再根据回滚原理用正则进行匹配并替换

优点：

- 脚本写起来方便，往往能快速搞定某个特定问题
- 安装和使用简单
- 支持离线解析

缺点：

- 通用性不好
- 可靠性不好

常用工具

- **binlog2sql**：Python 编写，用于生成回滚/前滚 SQL 进行数据恢复/补偿
- **MyFlash**：C 语言编写，用于生成反向 binlog 文件（二进制）进行数据恢复
- **my2sql**：Go 语言编写，除了闪回，还提供了前滚和事务分析的功能

这3个工具都是第二类闪回工具

性能对比

	my2sql	binlog2sql
1.1G binlog生成回滚SQL	1分40秒	65分钟
1.1G binlog生成原始SQL	1分30秒	50分钟
1.1G binlog生成表DML统计信息、以及事务统计信息	40秒	不支持

闪回大致流程

1. **误删MySQL某张表的数据**
2. **立即记录当前时间（不记录当前时间也可以，但是要解析整个binlog文件）**
3. **立即使用命令查看当前MySQL服务实例的binlog日志在哪个文件**
4. **连接MySQL所在的Linux服务器，找到对应的目录，拷贝对应的binlog日志文件到本机上，必要时可以拷贝上一个日志文件**
5. **连接MySQL服务，导出表结构，如果不过滤表，那么需要导出所有的表结构，如果指定了表，那么只需要导出对应的表结构就行了**
6. **将导出的表结构放到本地MySQL服务里执行，注意库名和表名必须要和Linux服务器上的一样**
7. **使用第二类闪回工具连接本地MySQL，解析binlog文件，生成回滚SQL**
8. **检查生成的回滚SQL**
9. **将生成的回滚SQL选择性的导入到本地MySQL库里，检查语法是否错误**
10. **再次检查数据的正确性**
11. **从本地库导出对应的SQL，到生产库里执行**

注意：

- **大部分独立工具直接伪装成MySQL的从节点来直接实现数据闪回功能，但是在生产环境中并不推荐，有些业务做了读写分离，伪装成slave节点可能会影响业务的正常使用**
- **如果没有拿到Linux的访问权限，或者没有MySQL binlog日志文件的读权限，但是有MySQL比较高的账号权限，那么只能用伪装成slave节点的方式了，或者叫有权限的管理员拷贝**

- **生成的回滚SQL一定要检查一遍，避免出现更大的生产事故**
- **无误删数据时，binlog要及时拷贝出来，过了一段时间binlog日志会被覆盖或者清除**
- **如果误删的数据所对应的功能没有正式上线到还好，如果正式上线了，会有经济损失的，有些比较重要的表，如果误删数据，10分钟可能就高达100万的损失，闪回工具的目的只是为了恢复误删的数据，删除之前一定要检查SQL语句的正确性**

my2sql

概述

go版MySQL binlog解析工具，通过解析MySQL binlog ，可以生成原始SQL、回滚SQL、去除主键的INSERT SQL等，也可以生成DML统计信息

优点：

- 功能丰富，不仅支持回滚操作，还有其他实用功能
- 基于golang实现，速度快，全量解析1.1G 的binlog日志只需要1分30秒左右，当前其他类似开源工具一般要几十分钟

开源地址：https://github.com/liuhr/my2sql

用途：

- 数据快速回滚(闪回)
- 主从切换后新master丢数据的修复
- 从binlog生成标准SQL，带来的衍生功能
- 生成DML统计信息，可以找到哪些表更新的比较频繁
- IO高TPS高， 查出哪些表在频繁更新
- 找出某个时间点数据库是否有大事务或者长事务
- 主从延迟，分析主库执行的SQL语句
- 除了支持常规数据类型，对大部分工具不支持的数据类型做了支持，比如json、blob、text、emoji等数据类型sql生成

环境部署

项目是用go语言写的，需要go语言环境，拉取代码需要git

go语言环境

介绍

Go（又称 Golang）是 Google 的 Robert Griesemer，Rob Pike 及 Ken Thompson 开发的一种静态强类型、编译型语言。Go 语言语法与 C 相近，但功能上有：

- **内存安全**：将一切并发化固然是好，但带来的问题同样很多。如何实现高并发下的内存分配和管理就是个难题。好在 Go 选择了 tcmalloc，它本就是为并发而设计的高性能内存分配组件。内存分配器是运行时三大组件里变化最少的部分。刨去因配合垃圾回收器而修改的内容，内存分配器完整保留了 tcmalloc 的原始架构。使用 cache 为当前执行线程提供无锁分配，多个 central 在不同线程间平衡内存单元复用。在更高层次里，heap 则管理着大块内存，用以切分成不同等级的复用内存块。快速分配和二级内存平衡机制，让内存分配器能优秀地完成高压力下的内存管理任务。在最近几个版本中，编译器优化卓有成效。它会竭力将对象分配在栈上，以降低垃圾回收压力，减少管理消耗，提升执行性能。
- **GC（垃圾回收）**：垃圾回收一直是个难题。早年间，Java 就因垃圾回收低效被嘲笑了许久，后来 Sun 连续收纳了好多人和技术才发展到今天。可即便如此，在 Hadoop 等大内存应用场景下，垃圾回收依旧捉襟见肘、步履维艰。相比 Java，Go 面临的困难要更多。因指针的存在，所以回收内存不能做收缩处理。幸好，指针运算被阻止，否则要做到精确回收都难。每次升级，垃圾回收器必然是核心组件里修改最多的部分。从并发清理，到降低 STW 时间，直到 Go 的 1.5 版本实现并发标记，逐步引入三色标记和写屏障等等，都是为了能让垃圾回收在不影响用户逻辑的情况下更好地工作。尽管有了努力，当前版本的垃圾回收算法也只能说堪用，离好用尚有不少距离。
- **结构形态**：Go 刚发布时，静态链接被当作优点宣传。只须编译后的一个可执行文件，无须附加任何东西就能部署。这似乎很不错，只是后来风气变了。连着几个版本，编译器都在完善动态库 buildmode 功能，场面一时变得有些尴尬。静态编译的好处显而易见。将运行时、依赖库直接打包到可执行文件内部，简化了部署和发布操作，无须事先安装运行环境和下载诸多第三方库。这种简单方式对于编写系统软件有着极大好处，因为库依赖一直都是个麻烦。Go 标准库虽称不得完全覆盖，但也算极为丰富。其中值得称道的是 net/http，仅须简单几条语句就能实现一个高性能 Web Server，这从来都是宣传的亮点。更何况大批基于此的优秀第三方 Framework 更是将 Go 推到 Web/Microservice 开发标准之一的位置。
- **CSP-style 并发计算**：时至今日，并发编程已成为程序员的基本技能，在各个技术社区都能看到诸多与之相关的讨论主题。在这种情况下Go语言却一反常态做了件极大胆的事，从根本上将一切都并发化，运行时用 Goroutine 运行所有的一切，包括 main.main 入口函数。可以说，Goroutine 是 Go 最显著的特征。它用类协程的方式来处理并发单元，却又在运行时层面做了更深度的优化处理。这使得语法上的并发编程变得极为容易，无须处理回调，无须关注线程切换，仅一个关键字，简单而自然。搭配 channel，实现 CSP 模型。将并发单元间的数据耦合拆解开来，各司其职，这对所有纠结于内存共享、锁粒度的开发人员都是一个可期盼的解脱。若说有所不足，那就是应该有个更大的计划，将通信从进程内拓展到进程外，实现真正意义上的分布式。

Go语言是编程语言设计的又一次尝试，是对类C语言的重大改进，它不但能让你访问底层操作系统，还提供了强大的网络编程和并发编程支持。Go语言的用途众多，可以进行网络编程、系统编程、并发编程、分布式编程

Go语言的推出，旨在不损失应用程序性能的情况下降低代码的复杂性，具有“部署简单、并发性好、语言设计良好、执行性能好”等优势，目前国内诸多 IT 公司均已采用Go语言开发项目

Go语言有时候被描述为“C 类似语言”，或者是“21 世纪的C语言”。Go 从C语言继承了相似的表达式语法、控制流结构、基础数据类型、调用参数传值、指针等很多思想，还有C语言一直所看中的编译后机器码的运行效率以及和现有操作系统的无缝适配

因为Go语言没有类和继承的概念，所以它和 Java 或 C++ 看起来并不相同。但是它通过接口（interface）的概念来实现多态性。Go语言有一个清晰易懂的轻量级类型系统，在类型之间也没有层级之说。因此可以说Go语言是一门混合型的语言

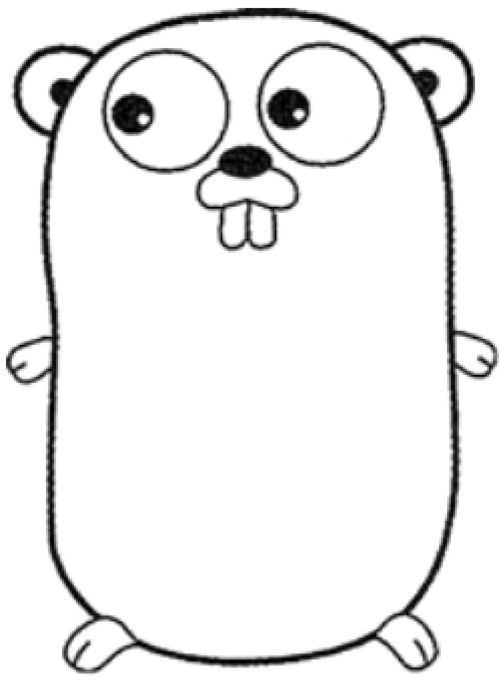
此外，很多重要的开源项目都是使用Go语言开发的，其中包括 Docker、Go-Ethereum、Thrraform 和 Kubernetes

Go 使用编译器来编译代码。编译器将源代码编译成二进制（或字节码）格式；在编译代码时，编译器检查错误、优化性能并输出可在不同平台上运行的二进制文件。要创建并运行 Go 程序，程序员必须执行如下步骤：

1. 使用文本编辑器创建 Go 程序
2. 保存文件
3. 编译程序
4. 运行编译得到的可执行文件

Go语言支持交叉编译，比如说你可以在运行 Linux 系统的计算机上开发可以在 Windows 上运行的应用程序

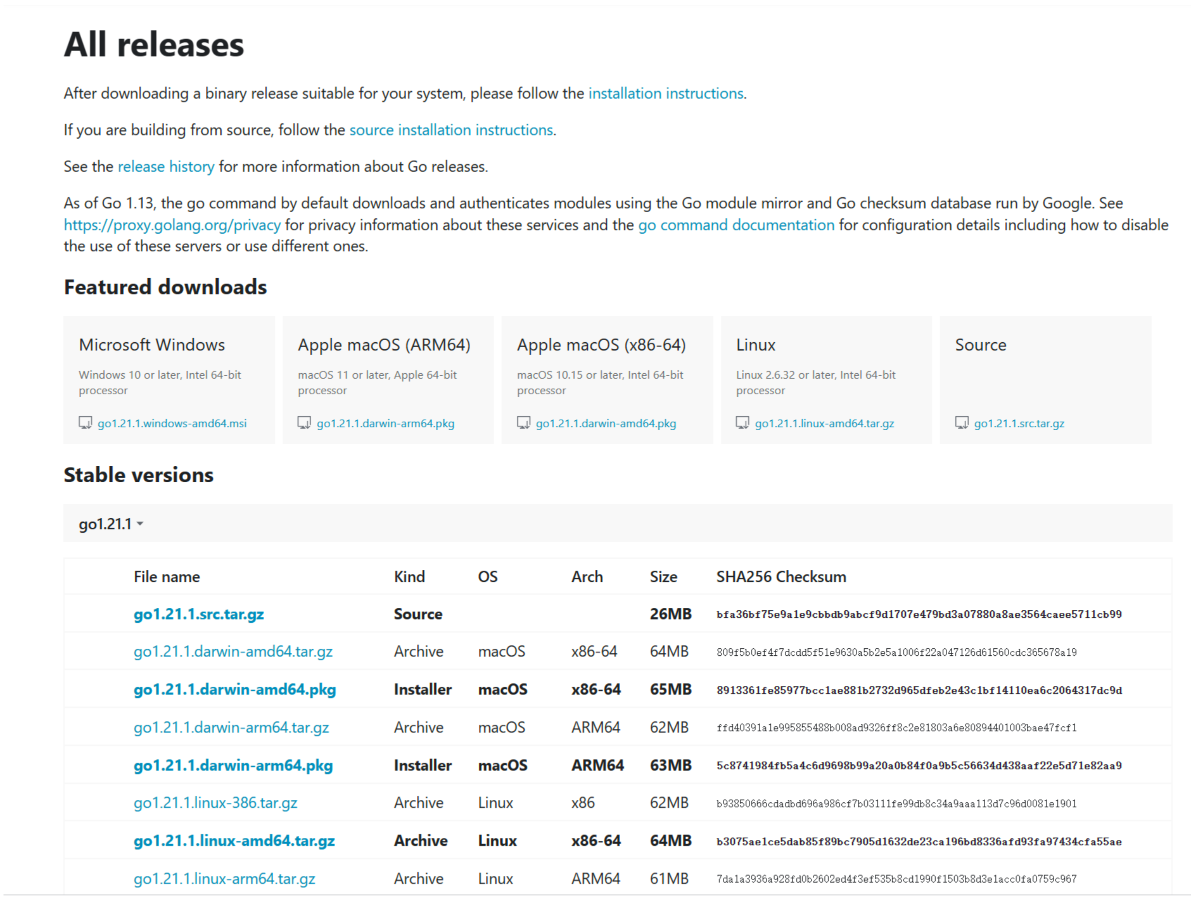
go语言跨平台的，但是生成的可执行文件不是跨平台的



下载

在Go语言官网下载 Windows 系统下的Go语言开发包

打开官网



All releases

After downloading a binary release suitable for your system, please follow the installation instructions.

If you are building from source, follow the source installation instructions.

See the release history for more information about Go releases.

As of Go 1.13, the go command by default downloads and authenticates modules using the Go module mirror and Go checksum database run by Google. See https://proxy.golang.org/privacy for privacy information about these services and the go command documentation for configuration details including how to disable the use of these servers or use different ones.

Featured downloads

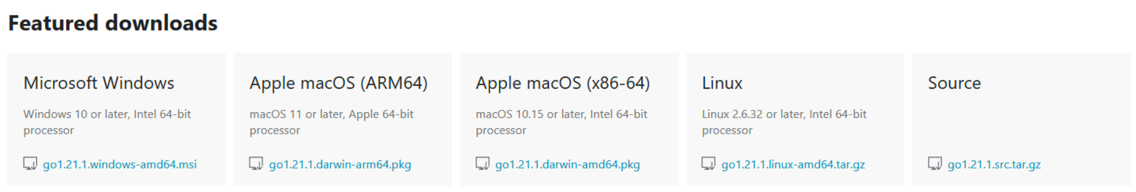
Microsoft Windows	Apple macOS (ARM64)	Apple macOS (x86-64)	Linux	Source
Windows 10 or later, Intel 64-bit processor	macOS 11 or later, Apple 64-bit processor	macOS 10.15 or later, Intel 64-bit processor	Linux 2.6.32 or later, Intel 64-bit processor	
go1.21.1.windows-amd64.msi	go1.21.1.darwin-arm64.pkg	go1.21.1.darwin-amd64.pkg	go1.21.1.linux-amd64.tar.gz	go1.21.1.src.tar.gz

Stable versions

go1.21.1 ▾

File name	Kind	OS	Arch	Size	SHA256 Checksum
go1.21.1.src.tar.gz	**Source**			**26MB**	**bfa36bf75e9a1e9cbbdb9abcf9d1707e479bd3a07880a8ae3564caee5711cb99**
go1.21.1.darwin-amd64.tar.gz	Archive	macOS	x86-64	64MB	809f5b0ef4f7dcdd5f51e9630a5b2e5a1006f22a047126d61560cdc365678a19
go1.21.1.darwin-amd64.pkg	**Installer**	**macOS**	**x86-64**	**65MB**	**8913361fe85977bcc1ae881b2732d965dfeb2e43c1bf14110ea6c2064317dc9d**
go1.21.1.darwin-arm64.tar.gz	Archive	macOS	ARM64	62MB	ffd40391a1e995855488b008ad9326ff8c2e81803a6e80894401003bae47fcf1
go1.21.1.darwin-arm64.pkg	**Installer**	**macOS**	**ARM64**	**63MB**	**5c8741984fb5a4c6d9698b99a20a0b84f0a9b5c56634d438aaf22e5d71e82aa9**
go1.21.1.linux-386.tar.gz	Archive	Linux	x86	62MB	b93850666cdadbd696a986cf7b03111fe99db8c34a9aaa113d7c96d0081e1901
go1.21.1.linux-amd64.tar.gz	**Archive**	**Linux**	**x86-64**	**64MB**	**b3075ae1ce5dab85f89bc7905d1632de23ca196bd8336afd93fa97434cfa55ae**
go1.21.1.linux-arm64.tar.gz	Archive	Linux	ARM64	61MB	7da1a3936a928fd0b2602ed4f3ef535b8cd1990f1503b8d3e1acc0fa0759c967

选择对应的版本



Featured downloads

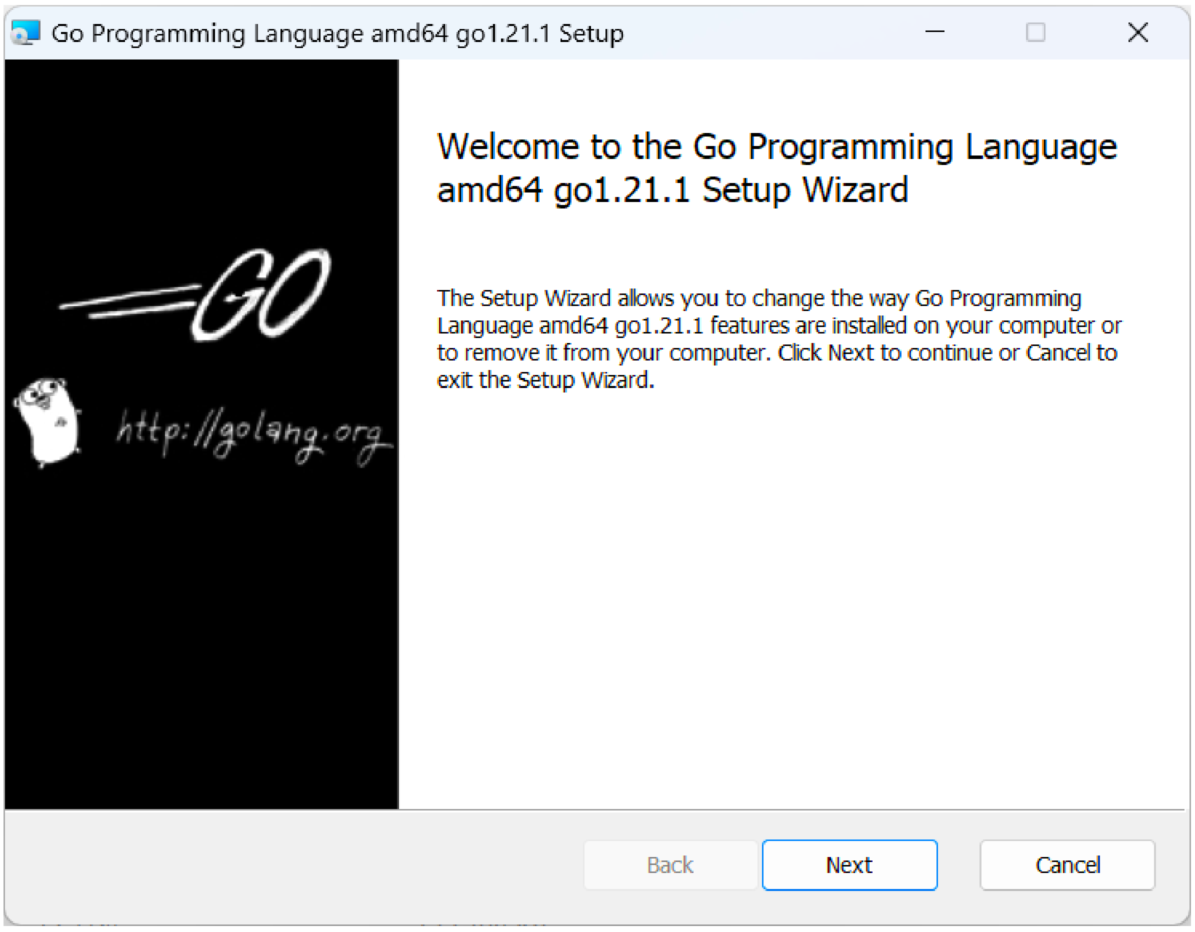
Microsoft Windows	Apple macOS (ARM64)	Apple macOS (x86-64)	Linux	Source
Windows 10 or later, Intel 64-bit processor	macOS 11 or later, Apple 64-bit processor	macOS 10.15 or later, Intel 64-bit processor	Linux 2.6.32 or later, Intel 64-bit processor	
go1.21.1.windows-amd64.msi	go1.21.1.darwin-arm64.pkg	go1.21.1.darwin-amd64.pkg	go1.21.1.linux-amd64.tar.gz	go1.21.1.src.tar.gz

或者直接下载：

- Windows：https://golang.google.cn/dl/go1.21.1.windows-amd64.msi
- Linux：https://golang.google.cn/dl/go1.21.1.linux-amd64.tar.gz

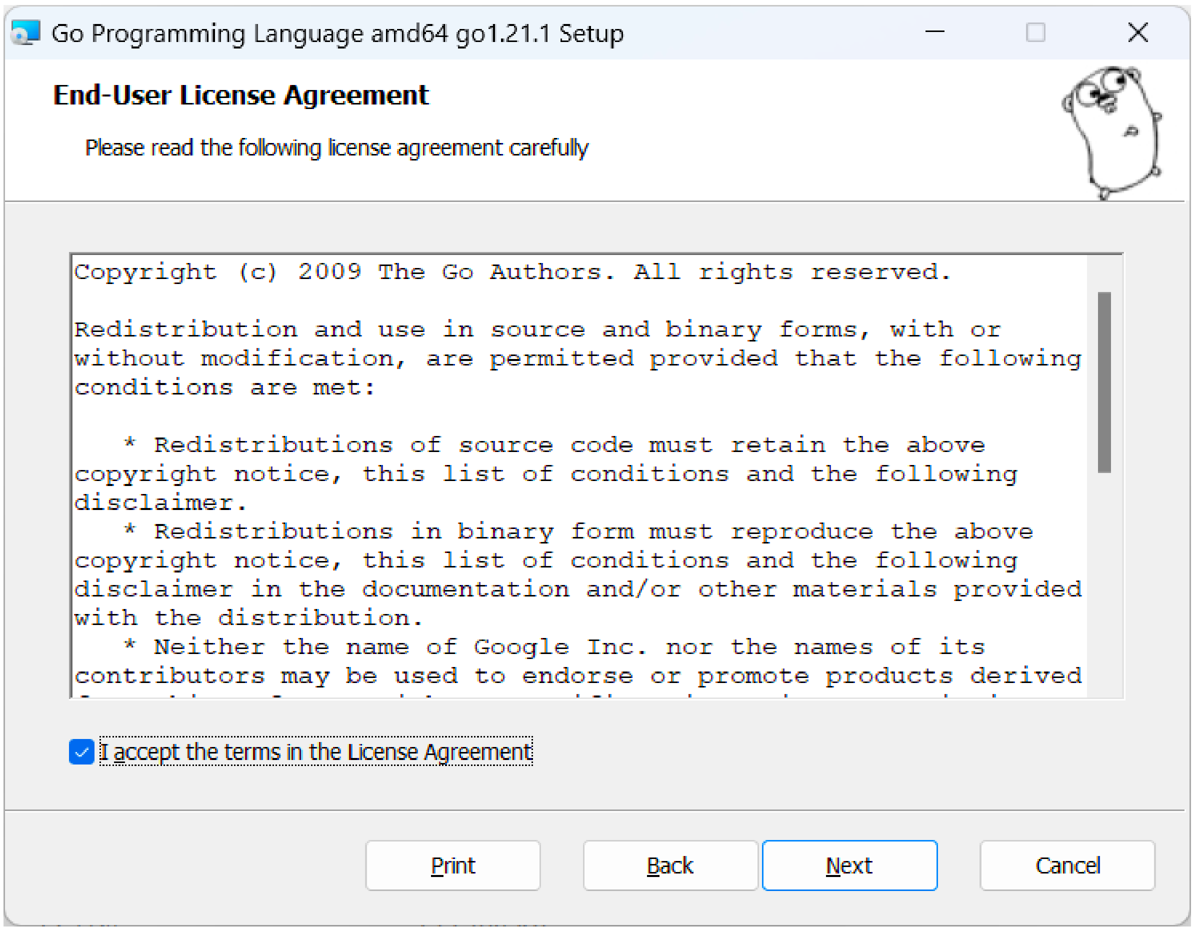
安装

以Windows为例，双击运行下载好的安装包


Go Programming Language amd64 go1.21.1 Setup

Welcome to the Go Programming Language amd64 go1.21.1 Setup Wizard

The Setup Wizard allows you to change the way Go Programming Language amd64 go1.21.1 features are installed on your computer or to remove it from your computer. Click Next to continue or Cancel to exit the Setup Wizard.


Go Programming Language amd64 go1.21.1 Setup

End-User License Agreement

Please read the following license agreement carefully

```
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copyright notice, this list of conditions and the following
disclaimer in the documentation and/or other materials provided
with the distribution.
   * Neither the name of Google Inc. nor the names of its
contributors may be used to endorse or promote products derived
```
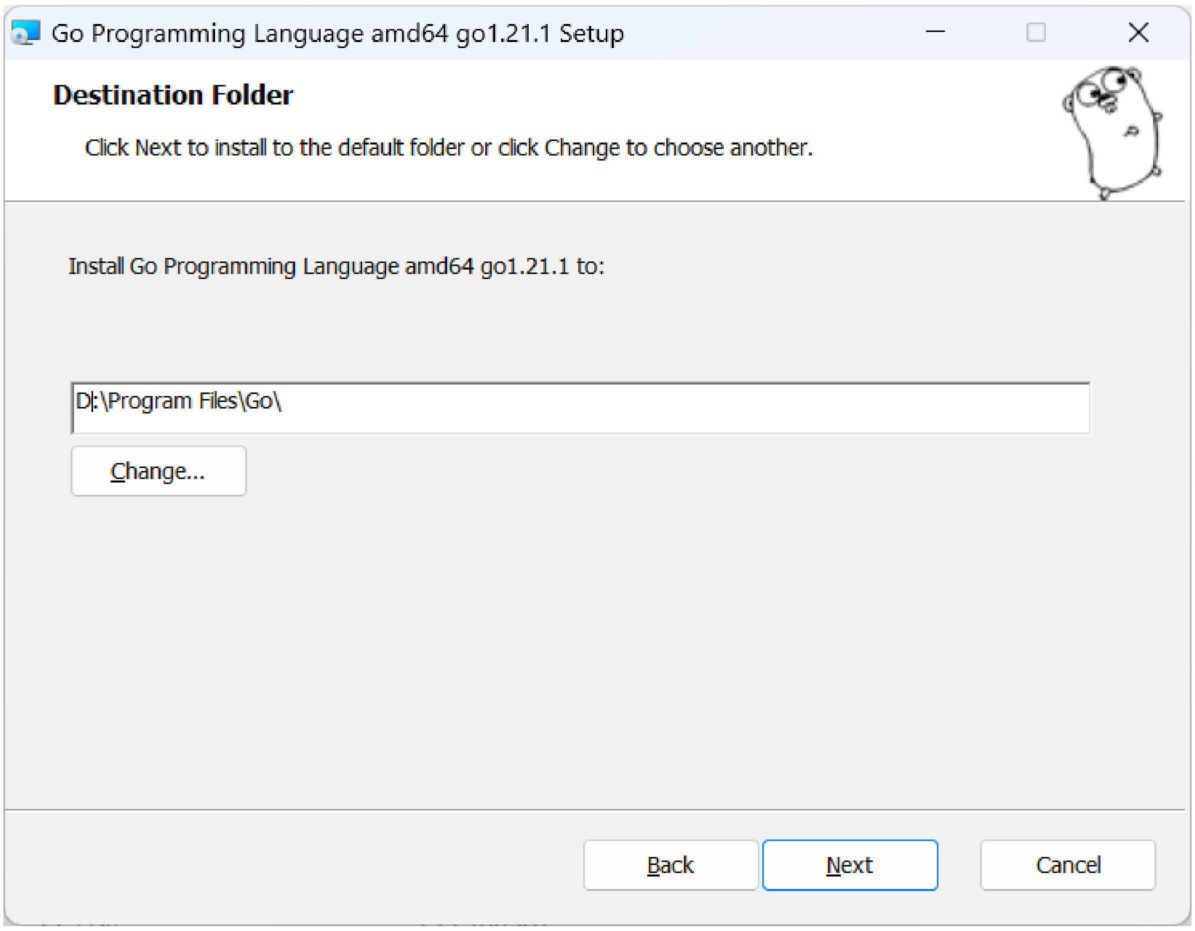

[✓] I accept the terms in the License Agreement

选择安装位置

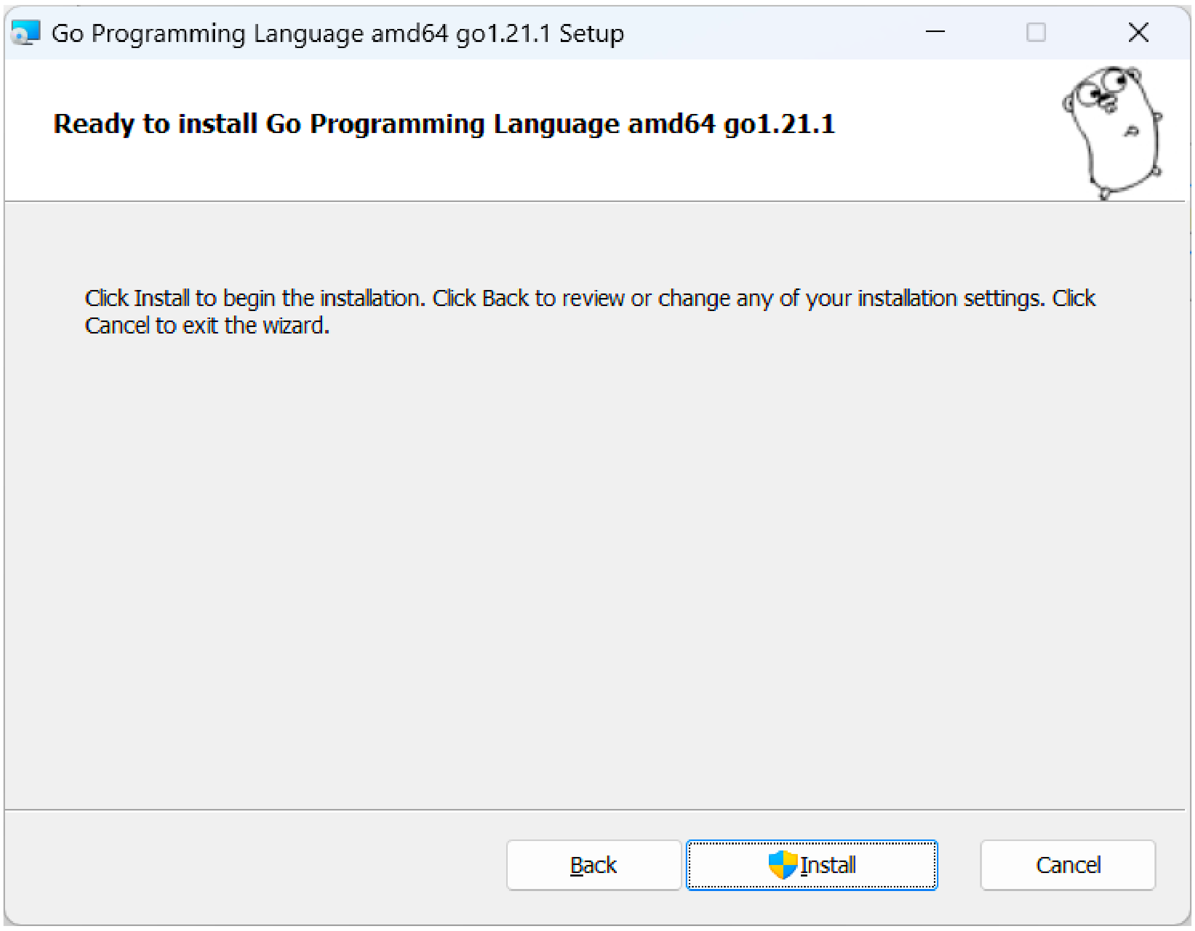

Go Programming Language amd64 go1.21.1 Setup

Destination Folder

Click Next to install to the default folder or click Change to choose another.

Install Go Programming Language amd64 go1.21.1 to:

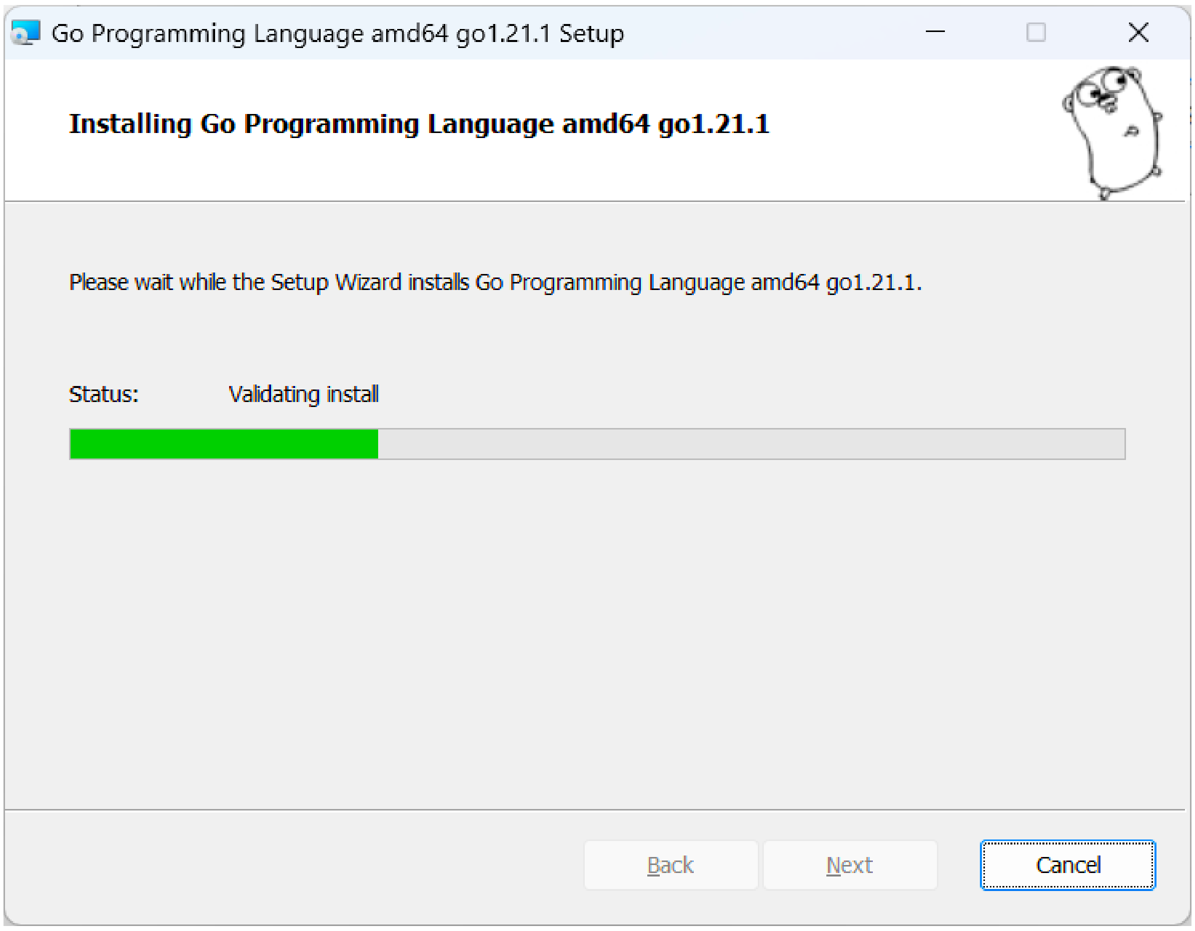
D:\Program Files\Go\


Go Programming Language amd64 go1.21.1 Setup

Ready to install Go Programming Language amd64 go1.21.1

Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.

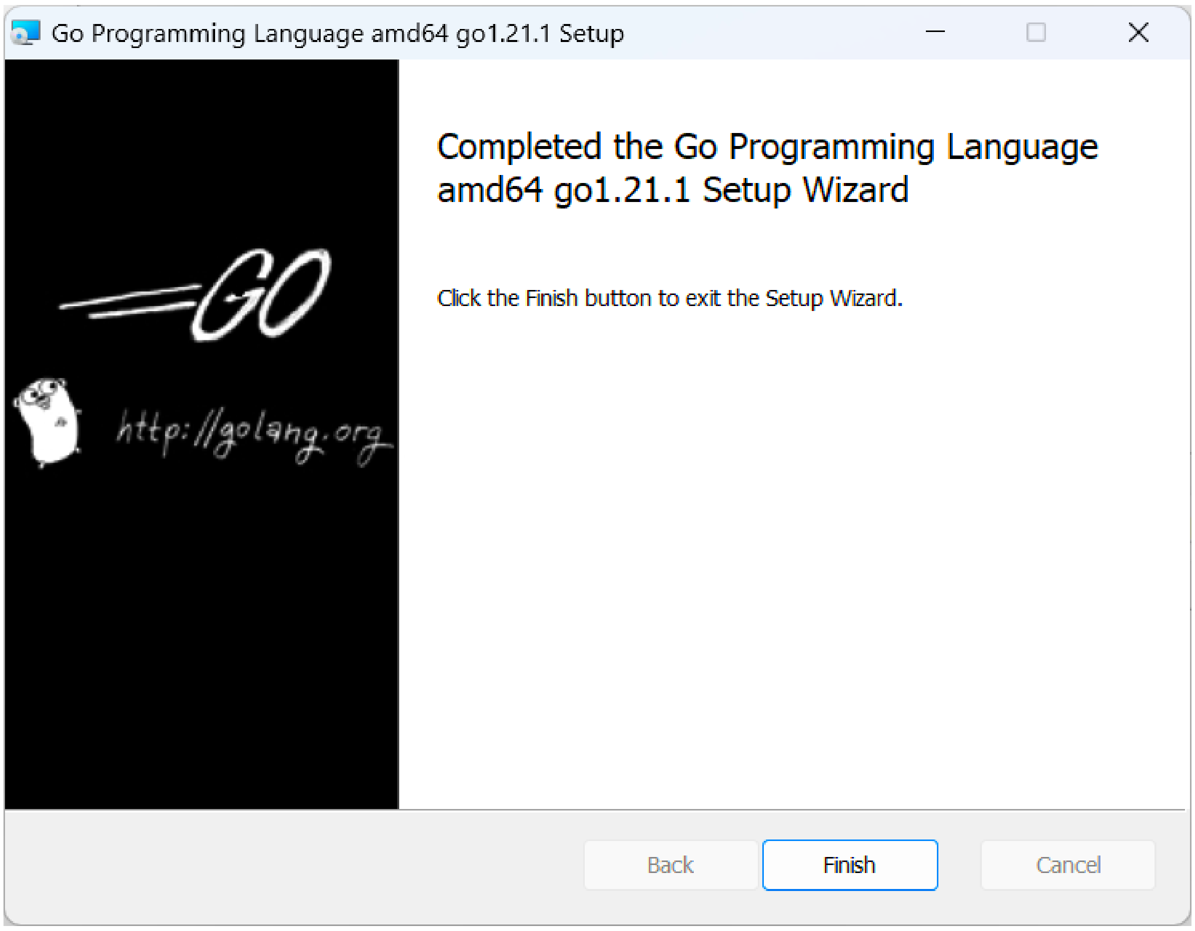
等待安装完成


Go Programming Language amd64 go1.21.1 Setup

Installing Go Programming Language amd64 go1.21.1

Please wait while the Setup Wizard installs Go Programming Language amd64 go1.21.1.

Status: Validating install


Go Programming Language amd64 go1.21.1 Setup

Completed the Go Programming Language amd64 go1.21.1 Setup Wizard

Click the Finish button to exit the Setup Wizard.

常用命令

命令如下：

```
PS C:\Users\mao> go help
Go is a tool for managing Go source code.

Usage:

        go <command> [arguments]

The commands are:

        bug         start a bug report
        build       compile packages and dependencies
        clean       remove object files and cached files
        doc         show documentation for package or symbol
        env         print Go environment information
        fix         update packages to use new APIs
        fmt         gofmt (reformat) package sources
        generate    generate Go files by processing source
        get         add dependencies to current module and install them
        install     compile and install packages and dependencies
        list        list packages or modules
        mod         module maintenance
        work        workspace maintenance
        run         compile and run Go program
        test        test packages
        tool        run specified go tool
        version     print Go version
        vet         report likely mistakes in packages

Use "go help <command>" for more information about a command.

Additional help topics:

        buildconstraint build constraints
        buildmode       build modes
        c               calling between Go and C
        cache           build and test caching
        environment     environment variables
        filetype        file types
        go.mod          the go.mod file
        gopath          GOPATH environment variable
        gopath-get      legacy GOPATH go get
        goproxy         module proxy protocol
        importpath      import path syntax
        modules         modules, module versions, and more
        module-get      module-aware go get
        module-auth     module authentication using go.sum
        packages        package lists and patterns
        private         configuration for downloading non-public code
        testflag        testing flags
        testfunc        testing functions
        vcs             controlling version control with GOVCS

Use "go help <topic>" for more information about that topic.

PS C:\Users\mao>
```

构建相关(go build):

```
PS C:\Users\mao> go help build
usage: go build [-o output] [build flags] [packages]

Build compiles the packages named by the import paths,
along with their dependencies, but it does not install the results.

If the arguments to build are a list of .go files from a single directory,
build treats them as a list of source files specifying a single package.

When compiling packages, build ignores files that end in '_test.go'.

When compiling a single main package, build writes
the resulting executable to an output file named after
the first source file ('go build ed.go rx.go' writes 'ed' or 'ed.exe')
or the source code directory ('go build unix/sam' writes 'sam' or 'sam.exe').
The '.exe' suffix is added when writing a Windows executable.

When compiling multiple packages or a single non-main package,
build compiles the packages but discards the resulting object,
serving only as a check that the packages can be built.

The -o flag forces build to write the resulting executable or object
to the named output file or directory, instead of the default behavior described
in the last two paragraphs. If the named output is an existing directory or
ends with a slash or backslash, then any resulting executables
will be written to that directory.

The build flags are shared by the build, clean, get, install, list, run,
and test commands:

        -C dir
                Change to dir before running the command.
                Any files named on the command line are interpreted after
                changing directories.
                If used, this flag must be the first one in the command line.
        -a
                force rebuilding of packages that are already up-to-date.
        -n
```

```
                print the commands but do not run them.
        -p n
                the number of programs, such as build commands or
                test binaries, that can be run in parallel.
                The default is GOMAXPROCS, normally the number of CPUs available.
        -race
                enable data race detection.
                Supported only on linux/amd64, freebsd/amd64, darwin/amd64, darwin/arm64, windows/amd64,
                linux/ppc64le and linux/arm64 (only for 48-bit VMA).
        -msan
                enable interoperation with memory sanitizer.
                Supported only on linux/amd64, linux/arm64, freebsd/amd64
                and only with Clang/LLVM as the host C compiler.
                PIE build mode will be used on all platforms except linux/amd64.
        -asan
                enable interoperation with address sanitizer.
                Supported only on linux/arm64, linux/amd64.
                Supported only on linux/amd64 or linux/arm64 and only with GCC 7 and higher
                or Clang/LLVM 9 and higher.
        -cover
                enable code coverage instrumentation.
        -covermode set,count,atomic
                set the mode for coverage analysis.
                The default is "set" unless -race is enabled,
                in which case it is "atomic".
                The values:
                set: bool: does this statement run?
                count: int: how many times does this statement run?
                atomic: int: count, but correct in multithreaded tests;
                        significantly more expensive.
                Sets -cover.
        -coverpkg pattern1,pattern2,pattern3
                For a build that targets package 'main' (e.g. building a Go
                executable), apply coverage analysis to each package matching
                the patterns. The default is to apply coverage analysis to
                packages in the main Go module. See 'go help packages' for a
                description of package patterns.  Sets -cover.
        -v
                print the names of packages as they are compiled.
        -work
                print the name of the temporary work directory and
                do not delete it when exiting.
        -x
                print the commands.
        -asmflags '[pattern=]arg list'
                arguments to pass on each go tool asm invocation.
        -buildmode mode
                build mode to use. See 'go help buildmode' for more.
        -buildvcs
```

```
                Whether to stamp binaries with version control information
                ("true", "false", or "auto"). By default ("auto"), version control
                information is stamped into a binary if the main package, the main module
                containing it, and the current directory are all in the same repository.
                Use -buildvcs=false to always omit version control information, or
                -buildvcs=true to error out if version control information is available but
                cannot be included due to a missing tool or ambiguous directory structure.
        -compiler name
                name of compiler to use, as in runtime.Compiler (gccgo or gc).
        -gccgoflags '[pattern=]arg list'
                arguments to pass on each gccgo compiler/linker invocation.
        -gcflags '[pattern=]arg list'
                arguments to pass on each go tool compile invocation.
        -installsuffix suffix
                a suffix to use in the name of the package installation directory,
                in order to keep output separate from default builds.
                If using the -race flag, the install suffix is automatically set to race
                or, if set explicitly, has _race appended to it. Likewise for the -msan
                and -asan flags. Using a -buildmode option that requires non-default compile
                flags has a similar effect.
        -ldflags '[pattern=]arg list'
                arguments to pass on each go tool link invocation.
        -linkshared
                build code that will be linked against shared libraries previously
                created with -buildmode=shared.
        -mod mode
                module download mode to use: readonly, vendor, or mod.
                By default, if a vendor directory is present and the go version in go.mod
                is 1.14 or higher, the go command acts as if -mod=vendor were set.
                Otherwise, the go command acts as if -mod=readonly were set.
                See https://golang.org/ref/mod#build-commands for details.
        -modcacherw
                leave newly-created directories in the module cache read-write
                instead of making them read-only.
        -modfile file
                in module aware mode, read (and possibly write) an alternate go.mod
                file instead of the one in the module root directory. A file named
                "go.mod" must still be present in order to determine the module root
                directory, but it is not accessed. When -modfile is specified, an
                alternate go.sum file is also used: its path is derived from the
                -modfile flag by trimming the ".mod" extension and appending ".sum".
        -overlay file
                read a JSON config file that provides an overlay for build operations.
                The file is a JSON struct with a single field, named 'Replace', that
                maps each disk file path (a string) to its backing file path, so that
                a build will run as if the disk file path exists with the contents
                given by the backing file paths, or as if the disk file path does not
                exist if its backing file path is empty. Support for the -overlay flag
                has some limitations: importantly, cgo files included from outside the
                include path must be in the same directory as the Go package they are
                included from, and overlays will not appear when binaries and tests are
                run through go run and go test respectively.
        -pgo file
                specify the file path of a profile for profile-guided optimization (PGO).
                When the special name "auto" is specified, for each main package in the
                build, the go command selects a file named "default.pgo" in the package's
                directory if that file exists, and applies it to the (transitive)
                dependencies of the main package (other packages are not affected).
                Special name "off" turns off PGO. The default is "auto".
        -pkgdir dir
                install and load all packages from dir instead of the usual locations.
                For example, when building with a non-standard configuration,
                use -pkgdir to keep generated packages in a separate location.
        -tags tag,list
                a comma-separated list of additional build tags to consider satisfied
                during the build. For more information about build tags, see
                'go help buildconstraint'. (Earlier versions of Go used a
                space-separated list, and that form is deprecated but still recognized.)
        -trimpath
                remove all file system paths from the resulting executable.
                Instead of absolute file system paths, the recorded file
names
                will begin either a module path@version (when using
modules),
                or a plain import path (when using the standard library, or
GOPATH).
        -toolexec 'cmd args'
                a program to use to invoke toolchain programs like vet and
asm.
                For example, instead of running asm, the go command will
run
                'cmd args /path/to/asm <arguments for asm>'.
                The TOOLEXEC_IMPORTPATH environment variable will be set,
                matching 'go list -f {{.ImportPath}}' for the package being
built.

The -asmflags, -gccgoflags, -gcflags, and -ldflags flags accept a
space-separated list of arguments to pass to an underlying tool
during the build. To embed spaces in an element in the list, surround
it with either single or double quotes. The argument list may be
preceded by a package pattern and an equal sign, which restricts
the use of that argument list to the building of packages matching
that pattern (see 'go help packages' for a description of package
patterns). Without a pattern, the argument list applies only to the
packages named on the command line. The flags may be repeated
with different patterns in order to specify different arguments for
different sets of packages. If a package matches patterns given in
multiple flags, the latest match on the command line wins.
For example, 'go build -gcflags=-S fmt' prints the disassembly
only for package fmt, while 'go build -gcflags=all=-S fmt'
prints the disassembly for fmt and all its dependencies.

For more about specifying packages, see 'go help packages'.
For more about where packages and binaries are installed,
run 'go help gopath'.
For more about calling between Go and C/C++, run 'go help c'.

Note: Build adheres to certain conventions such as those described
by 'go help gopath'. Not all projects can follow these conventions,
however. Installations that have their own conventions or that use
a separate software build system may choose to use lower-level
invocations such as 'go tool compile' and 'go tool link' to avoid
some of the overheads and design decisions of the build tool.

See also: go install, go get, go clean.
PS C:\Users\mao>
```

git版本控制系统

介绍

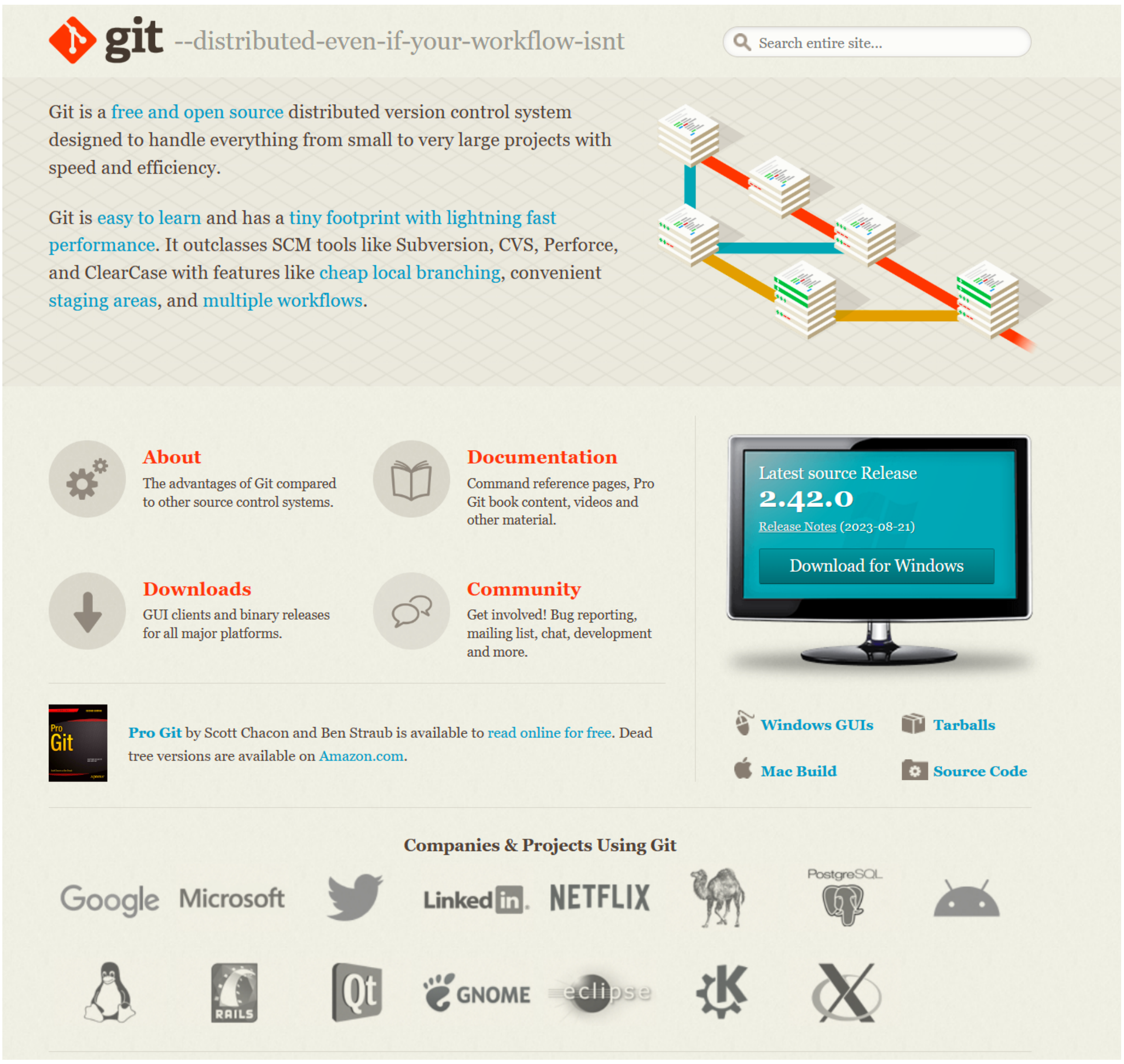
Git 是一个免费和开源 的分布式版本控制系统，旨在以速度和效率处理从小型到大型项目的所有内容

Git易于学习，占用空间小，性能快如闪电。它优于 SCM 工具，如 Subversion, CVS, Perforce, 和 ClearCase 具有的本地分支, 方便的暂存区域，和多个工作流等功能

关于git，这里不做过多介绍

下载

官网地址：https://git-scm.com/



git --distributed-even-if-your-workflow-isnt

Search entire site...

Git is a free and open source distributed version control system designed to handle everything from small to very large projects with speed and efficiency.

Git is easy to learn and has a tiny footprint with lightning fast performance. It outclasses SCM tools like Subversion, CVS, Perforce, and ClearCase with features like cheap local branching, convenient staging areas, and multiple workflows.

About
The advantages of Git compared to other source control systems.

Documentation
Command reference pages, Pro Git book content, videos and other material.

Downloads
GUI clients and binary releases for all major platforms.

Community
Get involved! Bug reporting, mailing list, chat, development and more.

Pro Git by Scott Chacon and Ben Straub is available to read online for free. Dead tree versions are available on Amazon.com.

Latest source Release
2.42.0
Release Notes (2023-08-21)
Download for Windows

Windows GUIs
Tarballs
Mac Build
Source Code

Companies & Projects Using Git

点击下载：

或者直接使用以下链接：

- https://git-scm.com/download/win

安装

自行百度

常用命令

```
PS C:\Users\mao> git
usage: git [-v | --version] [-h | --help] [-C <path>] [-c <name>=<value>]
           [--exec-path[=<path>]] [--html-path] [--man-path] [--info-path]
           [-p | --paginate | -P | --no-pager] [--no-replace-objects] [--bare]
           [--git-dir=<path>] [--work-tree=<path>] [--namespace=<name>]
           [--super-prefix=<path>] [--config-env=<name>=<envvar>]
           <command> [<args>]

These are common Git commands used in various situations:

start a working area (see also: git help tutorial)
   clone     Clone a repository into a new directory
   init      Create an empty Git repository or reinitialize an existing one

work on the current change (see also: git help everyday)
```

```
   add        Add file contents to the index
   mv         Move or rename a file, a directory, or a symlink
   restore    Restore working tree files
   rm         Remove files from the working tree and from the index

examine the history and state (see also: git help revisions)
   bisect     Use binary search to find the commit that introduced a bug
   diff       Show changes between commits, commit and working tree, etc
   grep       Print lines matching a pattern
   log        Show commit logs
   show       Show various types of objects
   status     Show the working tree status

grow, mark and tweak your common history
   branch     List, create, or delete branches
   commit     Record changes to the repository
   merge      Join two or more development histories together
   rebase     Reapply commits on top of another base tip
   reset      Reset current HEAD to the specified state
   switch     Switch branches
   tag        Create, list, delete or verify a tag object signed with GPG

collaborate (see also: git help workflows)
   fetch      Download objects and refs from another repository
   pull       Fetch from and integrate with another repository or a local
branch
   push       Update remote refs along with associated objects

'git help -a' and 'git help -g' list available subcommands and some
concept guides. See 'git help <command>' or 'git help <concept>'
to read about a specific subcommand or concept.
See 'git help git' for an overview of the system.
PS C:\Users\mao>
```

克隆：

```
git clone <url>
```

常用命令不止这一个，这里只用到了这个命令，常用命令可以自行百度

项目部署和编译

克隆项目

命令：

```
git clone https://github.com/liuhr/my2sql
```

如果出现超时等问题，这是正常的，github就是这样，多试几次

克隆成功后，项目内容如下：

```
PS D:\opensoft\my2sql> ls


    目录: D:\opensoft\my2sql


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----         2023/9/29     20:23                base
d-----         2023/9/29     20:23                constvar
d-----         2023/9/29     20:23                dsql
d-----         2023/9/29     20:23                ehand
d-----         2023/9/29     20:23                misc
d-----         2023/9/29     20:23                releases
d-----         2023/9/29     20:23                sqlbuilder
d-----         2023/9/29     20:23                sqltypes
d-----         2023/9/29     20:23                toolkits
d-----         2023/9/29     20:23                vendor
-a----         2023/9/28      0:46             74 .gitignore
-a----         2023/9/28      0:46              8 .go-version
-a----         2023/9/28      0:46            860 go.mod
-a----         2023/9/28      0:46          12425 go.sum
-a----         2023/9/28      0:46           1065 LICENSE
-a----         2023/9/28      0:46           1267 main.go
-a----         2023/9/28      0:46           9881 README.md


PS D:\opensoft\my2sql>
```

编译项目

命令：

```
go build ./
```

生成可执行文件`my2sql.exe`：

```
PS D:\opensoft\my2sql> ls


    目录: D:\opensoft\my2sql


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----         2023/9/29     20:23                base
d-----         2023/9/29     20:23                constvar
d-----         2023/9/29     20:23                dsql
d-----         2023/9/29     20:23                ehand
d-----         2023/9/29     20:23                misc
d-----         2023/9/29     20:23                releases
d-----         2023/9/29     20:23                sqlbuilder
d-----         2023/9/29     20:23                sqltypes
d-----         2023/9/29     20:23                toolkits
d-----         2023/9/29     20:23                vendor
-a----         2023/9/28      0:46             74 .gitignore
-a----         2023/9/28      0:46              8 .go-version
-a----         2023/9/28      0:46            860 go.mod
-a----         2023/9/28      0:46          12425 go.sum
-a----         2023/9/28      0:46           1065 LICENSE
-a----         2023/9/28      0:46           1267 main.go
-a----         2023/10/2     19:34        7973376 my2sql.exe
-a----         2023/9/28      0:46           9881 README.md


PS D:\opensoft\my2sql>
```

常用参数

```
PS D:\opensoft\my2sql> .\my2sql.exe --help
my2sql V2.0
  -U    prefer to use unique key instead of primary key to build where condition for delete/update sql
  -add-extraInfo
        Works with -work-type=2sql|rollback. Print database/table/datetime/binlogposition...info on the line before sql, default false
  -big-trx-row-limit int
        transaction with affected rows greater or equal to this value is considerated as big transaction. Valid values range from 1 to 30000, default 10 (default 10)
  -databases string
        only parse these databases, comma seperated, default all.
  -do-not-add-prifixDb
```

```
        Prefix table name witch database name in sql,ex: insert into db1.tb1 (x1, x1) values (y1, y1).
  -file-per-table
        One file for one table if true, else one file for all tables. default false. Attention, always one file for one binlog
  -full-columns
        For update sql, include unchanged columns. for update and delete, use all columns to build where condition.
        default false, this is, use changed columns to build set part, use primary/unique key to build where condition
  -host string
        mysql host, default 127.0.0.1 . (default "127.0.0.1")
  -ignore-databases string
        ignore parse these databases, comma seperated, default null
  -ignore-primaryKey-forInsert
        for insert statement when -workType=2sql, ignore primary key
  -ignore-tables string
        ignore parse these tables, comma seperated, default null
  -local-binlog-file string
        local binlog files to process, It works with -mode=file
  -long-trx-seconds int
        transaction with duration greater or equal to this value is considerated as long transaction. Valid values range from 0 to 3600, default 1 (default 1)
  -mode string
        valid options are:  repl,file. repl: as a slave to get binlogs from master. file: get binlogs from local filesystem. default repl (default "repl")
  -mysql-type string
        valid options are:  mysql,mariadb. server of binlog, mysql or mariadb, default mysql (default "mysql")
  -output-dir string
        result output dir, default current work dir. Attension, result files could be large, set it to a dir with large free space
  -output-toScreen
        Just output to screen,do not write to file
  -password string
        mysql user password.
  -port uint
        mysql port, default 3306. (default 3306)
  -print-interval int
        works with -w='stats', print stats info each PrintInterval. Valid values range from 1 to 600, default 30 (default 30)
  -server-id uint
        this program replicates from mysql as slave to read binlogs. Must set this server id unique from other slaves, default 1113306 (default 1113306)
  -sql string
        valid options are:  insert,update,delete. only parse these types of sql, comma seperated, valid types are: insert, update, delete; default is all(insert,update,delete)
  -start-datetime string
        Start reading the binlog at first event having a datetime equal or posterior to the argument, it should be like this: "2020-01-01 01:00:00"
  -start-file string
```

```
        binlog file to start reading
  -start-pos uint
        start reading the binlog at position (default 4)
  -stop-datetime string
        Stop reading the binlog at first event having a datetime equal or posterior to the argument, it should be like this: "2020-12-30 01:00:00"
  -stop-file string
        binlog file to stop reading
  -stop-pos uint
        Stop reading the binlog at position (default 4)
  -tables string
        only parse these tables, comma seperated, DONOT prefix with schema, default all.
  -threads uint
        Works with -workType=2sql|rollback. threads to run (default 2)
  -tl string
        time location to parse timestamp/datetime column in binlog, such as Asia/Shanghai. default Local (default "Local")
  -user string
        mysql user.
  -v    print version
  -work-type string
        valid options are:  2sql,rollback,stats. 2sql: convert binlog to sqls, rollback: generate rollback sqls, stats: analyze transactions. default: 2sql (default "2sql")
PS D:\opensoft\my2sql>
```

-U

```
优先使用unique key作为where条件，默认false
```

-mode

```
repl: 伪装成从库解析binlog文件，file: 离线解析binlog文件, 默认repl
```

-local-binlog-file

```
当指定-mode=file 参数时，需要指定-local-binlog-file binlog文件相对路径或绝对路径,可以连续解析多个binlog文件，只需要指定起始文件名，程序会自动持续解析下个文件
```

-add-extraInfo

```
是否把database/table/datetime/binlogposition...信息以注释的方式加入生成的每条sql前，默认false
```

```
# datetime=2020-07-16_10:44:09 database=orchestrator table=cluster_domain_name binlog=mysql-bin.011519 startpos=15552 stoppos=15773
UPDATE `orchestrator`.`cluster_domain_name` SET `last_registered`='2020-07-16 10:44:09' WHERE `cluster_name`='192.168.1.1:3306'
```

-big-trx-row-limit n

```
transaction with affected rows greater or equal to this value is considerated as big transaction
找出满足n条sql的事务，默认500条
```

-databases 、 -tables

```
库及表条件过滤, 以逗号分隔
```

-sql

```
要解析的sql类型，可选参数insert、update、delete，默认全部解析
```

-doNotAddPrifixDb

```
Prefix table name witch database name in sql,ex: insert into db1.tb1 (x1, x1) values (y1, y1)
默认生成insert into db1.tb1 (x1, x1) values (y1, y1)类sql，也可以生成不带库名的sql
```

-file-per-table

```
为每个表生成一个sql文件
```

-full-columns

```
For update sql, include unchanged columns. for update and delete, use all columns to build where condition.
default false, this is, use changed columns to build set part, use primary/unique key to build where condition
生成的sql是否带全列信息，默认false
```

-ignorePrimaryKeyForInsert

```
生成的insert语句是否去掉主键，默认false
```

-output-dir

```
将生成的结果存放到制定目录
```

-output-toScreen

```
将生成的结果打印到屏幕，默认写到文件
```

-threads

```
线程数，默认8个
```

-work-type

```
2sql：生成原始sql，rollback：生成回滚sql，stats：只统计DML、事务信息
```

示例

解析出标准SQL

根据时间点解析出标准SQL

```
#伪装成从库解析binlog
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode repl -work-type 2sql  -start-file mysql-bin.011259  -start-datetime "2020-07-16 10:20:00" -stop-datetime "2020-07-16 11:00:00" -output-dir ./tmpdir
#直接读取binlog文件解析
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode file -local-binlog-file ./mysql-bin.011259  -work-type 2sql  -start-file mysql-bin.011259  -start-datetime "2020-07-16 10:20:00" -stop-datetime "2020-07-16 11:00:00" -output-dir ./tmpdir
```

根据pos点解析出标准SQL

```
#伪装成从库解析binlog
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode repl -work-type 2sql  -start-file mysql-bin.011259  -start-pos 4 -stop-file mysql-bin.011259 -stop-pos 583918266  -output-dir ./tmpdir
#直接读取binlog文件解析
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306  -mode file -local-binlog-file ./mysql-bin.011259  -work-type 2sql  -start-file mysql-bin.011259  -start-pos 4 -stop-file mysql-bin.011259 -stop-pos 583918266  -output-dir ./tmpdir
```

解析出回滚SQL

根据时间点解析出回滚SQL

```
#伪装成从库解析binlog
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode repl -work-type rollback  -start-file mysql-bin.011259  -start-datetime "2020-07-16 10:20:00" -stop-datetime "2020-07-16 11:00:00" -output-dir ./tmpdir
#直接读取binlog文件解析
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306  -mode file -local-binlog-file ./mysql-bin.011259 -work-type rollback  -start-file mysql-bin.011259  -start-datetime "2020-07-16 10:20:00" -stop-datetime "2020-07-16 11:00:00" -output-dir ./tmpdir
```

根据pos点解析出回滚SQL

```
#伪装成从库解析binlog
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode repl -work-type rollback  -start-file mysql-bin.011259  -start-pos 4 -stop-file mysql-bin.011259 -stop-pos 583918266  -output-dir ./tmpdir
#直接读取binlog文件解析
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306   -mode file -local-binlog-file ./mysql-bin.011259  -work-type rollback  -start-file mysql-bin.011259  -start-pos 4 -stop-file mysql-bin.011259 -stop-pos 583918266  -output-dir ./tmpdir

```

统计DML以及大事务

统计时间范围各个表的DML操作数量，统计一个事务大于500条、时间大于300秒的事务

```
#伪装成从库解析binlog
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306  -mode repl -work-type stats  -start-file mysql-bin.011259  -start-datetime "2020-07-16 10:20:00" -stop-datetime "2020-07-16 11:00:00"  -big-trx-row-limit 500 -long-trx-seconds 300   -output-dir ./tmpdir
#直接读取binlog文件解析
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode file -local-binlog-file ./mysql-bin.011259   -work-type stats  -start-file mysql-bin.011259  -start-datetime "2020-07-16 10:20:00" -stop-datetime "2020-07-16 11:00:00"  -big-trx-row-limit 500 -long-trx-seconds 300   -output-dir ./tmpdir
```

统计一段pos点范围各个表的DML操作数量，统计一个事务大于500条、时间大于300秒的事务

```
#伪装成从库解析binlog
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306  -mode repl -work-type stats  -start-file mysql-bin.011259  -start-pos 4 -stop-file mysql-bin.011259 -stop-pos 583918266  -big-trx-row-limit 500 -long-trx-seconds 300   -output-dir ./tmpdir
#直接读取binlog文件解析
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode file -local-binlog-file ./mysql-bin.011259  -work-type stats  -start-file mysql-bin.011259  -start-pos 4 -stop-file mysql-bin.011259 -stop-pos 583918266  -big-trx-row-limit 500 -long-trx-seconds 300   -output-dir ./tmpdir
```

从某一个pos点解析出标准SQL，并且持续打印到屏幕

```
#伪装成从库解析binlog
./my2sql  -user root -password xxxx -host 127.0.0.1   -port 3306 -mode repl
-work-type 2sql  -start-file mysql-bin.011259  -start-pos 4   -output-
toScreen
```

限制

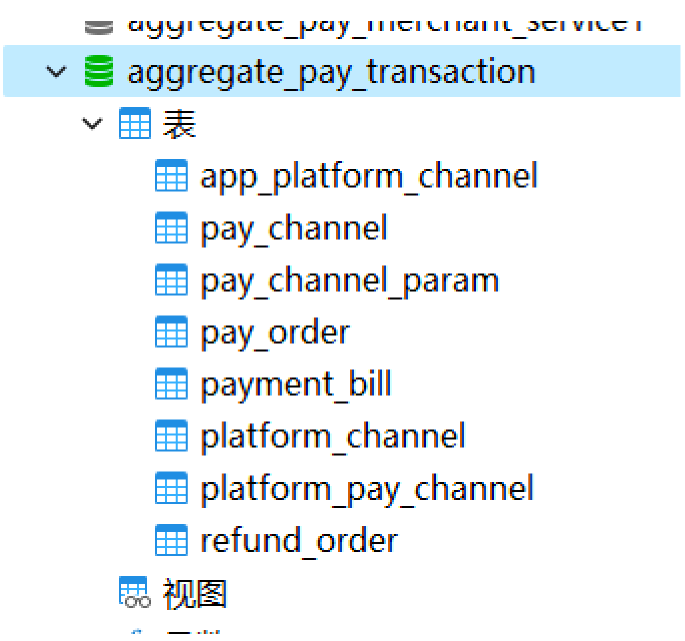
- 使用回滚/闪回功能时，binlog格式必须为row,且binlog_row_image=full， DML统计以及大事务分析不受影响
- 只能回滚DML， 不能回滚DDL
- 使用rollback功能时，要解析的binlog段，表结构要保持一致（例如：解析mysql-bin.000001文件，此binlog文件的的表有add column或drop column操作，则执行rollback可能会执行异常）
- 支持指定-tl时区来解释binlog中time/datetime字段的内容。开始时间-start-datetime与结束时间-stop-datetime也会使用此指定的时区，
  但注意此开始与结束时间针对的是binlog event header中保存的unix timestamp。结果中的额外的datetime时间信息都是binlog event header中的unix
  timestamp
- 此工具是伪装成从库拉取binlog，需要连接数据库的用户有SELECT, REPLICATION SLAVE, REPLICATION CLIENT权限
- MySQL8.0版本需要在配置文件中加入default_authentication_plugin
  =mysql_native_password，用户密码认证必须是mysql_native_password才能解析

实战

环境准备

现有以下数据库`aggregate_pay_transaction`

交易服务有以下表：


aggregate_pay_transaction

表

app_platform_channel

pay_channel

pay_channel_param

pay_order

payment_bill

platform_channel

platform_pay_channel

refund_order

视图

现只模拟删除`pay_order`表

表结构如下：

```
CREATE TABLE `pay_order` (
  `ID` bigint NOT NULL,
  `TRADE_NO` varchar(50) NOT NULL COMMENT '聚合支付订单号',
  `MERCHANT_ID` bigint NOT NULL COMMENT '所属商户',
  `STORE_ID` bigint DEFAULT NULL COMMENT '商户下门店',
  `APP_ID` varchar(50) NOT NULL COMMENT '所属应用',
  `PAY_CHANNEL` varchar(50) DEFAULT NULL COMMENT '原始支付渠道编码',
  `PAY_CHANNEL_MCH_ID` varchar(50) DEFAULT NULL COMMENT '原始渠道商户id',
  `PAY_CHANNEL_MCH_APP_ID` varchar(50) DEFAULT NULL COMMENT '原始渠道商户应用id',
  `PAY_CHANNEL_TRADE_NO` varchar(50) DEFAULT NULL COMMENT '原始渠道订单号',
  `CHANNEL` varchar(50) DEFAULT NULL COMMENT '聚合支付的渠道',
  `OUT_TRADE_NO` varchar(50) DEFAULT NULL COMMENT '商户订单号',
  `SUBJECT` varchar(50) DEFAULT NULL COMMENT '商品标题',
  `BODY` varchar(256) DEFAULT NULL COMMENT '订单描述',
  `CURRENCY` varchar(50) DEFAULT NULL COMMENT '币种CNY',
  `TOTAL_AMOUNT` int DEFAULT NULL COMMENT '订单总金额，单位为分',
  `OPTIONAL` varchar(256) DEFAULT NULL COMMENT '用户自定义的参数,商户自定义数据',
  `ANALYSIS` varchar(256) DEFAULT NULL COMMENT '用于统计分析的数据,用户自定义',
  `EXTRA` varchar(512) DEFAULT NULL COMMENT '特定渠道发起时额外参数',
  `TRADE_STATE` varchar(50) DEFAULT NULL COMMENT '交易状态支付状态,0-订单生成,1-支付中(目前未使用),2-支付成功,3-业务处理完成,4-关闭',
  `ERROR_CODE` varchar(50) DEFAULT NULL COMMENT '渠道支付错误码',
  `ERROR_MSG` varchar(256) DEFAULT NULL COMMENT '渠道支付错误信息',
  `DEVICE` varchar(50) DEFAULT NULL COMMENT '设备',
  `CLIENT_IP` varchar(50) DEFAULT NULL COMMENT '客户端IP',
  `CREATE_TIME` datetime DEFAULT NULL COMMENT '创建时间',
  `UPDATE_TIME` datetime DEFAULT NULL COMMENT '更新时间',
  `EXPIRE_TIME` datetime DEFAULT NULL COMMENT '订单过期时间',
  `PAY_SUCCESS_TIME` datetime DEFAULT NULL COMMENT '支付成功时间',
  PRIMARY KEY (`ID`) USING BTREE,
```

```sql
  UNIQUE KEY `unique_TRADE_NO` (`TRADE_NO`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_0900_ai_ci
ROW_FORMAT=DYNAMIC
```

数据如下：

```sql
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(132845620162461889, 'SJ1621041245177462784', 1296065510684754 25,
1296065511733330 57, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY',
600, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02
15:02:05', NULL, '2023-02-02 15:32:05', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(132847277134839841, 'SJ1621042901350236160', 1296065510684754 25,
1296065511733330 57, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY',
700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02
15:08:40', NULL, '2023-02-02 15:38:40', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(132848579776610337, 'SJ1621044203864121344', 1296065510684754 25,
1296065511733330 57, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY',
700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02
15:13:50', NULL, '2023-02-02 15:43:50', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(132855976121335841, 'SJ1621051600292663296', 1296065510684754 25,
1296065511733330 57, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY',
700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02
15:43:14', NULL, '2023-02-02 16:13:14', NULL);
```

```sql
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132858194446778401, 'SJ1621053818621575168', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 800, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 15:52:03', NULL, '2023-02-02 16:22:03', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132860671053266977, 'SJ1621056295234891776', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 600, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:01:53', NULL, '2023-02-02 16:31:53', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132861679020015649, 'SJ1621057303196467200', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:05:54', NULL, '2023-02-02 16:35:54', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132862905442893857, 'SJ1621058529620348928', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:10:46', NULL, '2023-02-02 16:40:46', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132865240214798369, 'SJ1621060863772745728', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 800, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:20:02', NULL, '2023-02-02 16:50:02', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132865891451797537, 'SJ1621061515658956800', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:22:38', NULL, '2023-02-02 16:52:38', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132865996292620353, 'SJ1621061621313474560', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:23:03', NULL, '2023-02-02 16:53:03', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132866127196848225, 'SJ1621061752217702400', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:23:34', NULL, '2023-02-02 16:53:34', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132866163632767105, 'SJ1621061788653621248', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:23:43', NULL, '2023-02-02 16:53:43', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132867237198430369, 'SJ1621062862219284480', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:27:59', NULL, '2023-02-02 16:57:59', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132867298129084609, 'SJ1621062923149938688', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:28:13', NULL, '2023-02-02 16:58:13', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132867347085000929, 'SJ1621062972110049280', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:28:25', NULL, '2023-02-02 16:58:25', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132869468702375969, 'SJ1621065092885917696', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:36:51', NULL, '2023-02-02 17:06:51', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132869525757493313, 'SJ1621065150775701504', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:37:05', NULL, '2023-02-02 17:07:05', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132869710797602913, 'SJ1621065335815811072', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:37:49', NULL, '2023-02-02 17:07:49', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132870166936551553, 'SJ1621065791954759680', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 9999900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:39:37', NULL, '2023-02-02 17:09:37', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132870379923308705, 'SJ1621066004941516800', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 9999900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 16:40:28', NULL, '2023-02-02 17:10:28', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132957428210728993, 'SJ1621153052278829056', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 999900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 22:26:22', NULL, '2023-02-02 22:56:22', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132957431809441857, 'SJ1621153056829648896', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 999900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 22:26:23', NULL, '2023-02-02 22:56:23', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132957735665795169, 'SJ1621153360686002176', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 22:27:35', NULL, '2023-02-02 22:57:35', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132957778242175105, 'SJ1621153403266576384', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 22:27:46', NULL, '2023-02-02 22:57:46', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132959566227832993, 'SJ1621155191252234240', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 9700, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 22:34:52', NULL, '2023-02-02 23:04:52', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132965799492059329, 'SJ1621161424499683328', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '华硕笔记本电脑', 'CNY', 900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 22:59:38', NULL, '2023-02-02 23:29:38', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132975102760321057, 'SJ1621170726790451200', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '华硕ROG电脑32G 1T英特尔13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 23:36:36', NULL, '2023-02-03 00:06:36', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (132975466976903233, 'SJ1621171091996889088', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '华硕ROG电脑32G 1T英特尔13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-02 23:38:03', NULL, '2023-02-03 00:08:03', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(132979792038330465, 'SJ1621175417049927680', 129606551068475425,
129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '华硕官方商城商品', '华硕ROG电脑32G 1T英特
尔13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '0', NULL, NULL, NULL,
'192.168.3.48', '2023-02-02 23:55:14', NULL, '2023-02-03 00:25:14', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(132980662331244673, 'SJ1621176287351230464', 129606551068475425,
129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '华硕ROG电脑32G 1T英特尔
13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '0', NULL, NULL, NULL,
'192.168.3.48', '2023-02-02 23:58:42', NULL, '2023-02-03 00:28:42', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(133205823374491681, 'SJ1621401447535312896', 129606551068475425,
129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '华硕官方商城商品', '华硕ROG电脑32G 2T英特
尔13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '0', NULL, NULL, NULL,
'192.168.3.48', '2023-02-03 14:53:24', NULL, '2023-02-03 15:23:24', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(133217034275127329, 'SJ1621412658321846272', 129606551068475425,
129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY',
1000, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-03
15:37:57', NULL, '2023-02-03 16:07:57', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`,
`MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`,
`PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`,
`SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`,
`EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`,
`CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES
(133219045666193441, 'SJ1621414669792731136', 129606551068475425,
129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL,
NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', 'hello', 'CNY', 3268,
NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-03
15:45:56', NULL, '2023-02-03 16:15:56', NULL);
```

```sql
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (133219433026945089, 'SJ1621415058046869504', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 600, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-03 15:47:29', NULL, '2023-02-03 16:17:29', NULL);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (133680531463208993, 'SJ1621876155526918144', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, '2023020422001447960502095966', 'aggregate_pay_c2b', NULL, '测试企业商品', '华硕ROG电脑32G 1T英特尔13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '2', NULL, NULL, NULL, '192.168.3.48', '2023-02-04 22:19:43', NULL, '2023-02-04 22:49:43', '2023-02-04 22:43:10');
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (133683328971702305, 'SJ1621878953102323712', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, '2023020422001447960502096119', 'aggregate_pay_c2b', NULL, '测试企业商品', '华硕ROG电脑32G 1T英特尔13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '2', NULL, NULL, NULL, '192.168.3.48', '2023-02-04 22:30:50', NULL, '2023-02-04 23:00:50', '2023-02-04 22:46:55');
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (133686017235353665, 'SJ1621881642255167488', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, '2023020422001447960502095967', 'aggregate_pay_c2b', NULL, '测试企业商品', '华硕ROG电脑32G 1T英特尔13代i9 4090显卡', 'CNY', 3299900, NULL, NULL, NULL, '2', NULL, NULL, NULL, '192.168.3.48', '2023-02-04 22:41:31', NULL, '2023-02-04 23:11:31', '2023-02-04 22:43:55');
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`, `TRADE_NO`, `MERCHANT_ID`, `STORE_ID`, `APP_ID`, `PAY_CHANNEL`, `PAY_CHANNEL_MCH_ID`, `PAY_CHANNEL_MCH_APP_ID`, `PAY_CHANNEL_TRADE_NO`, `CHANNEL`, `OUT_TRADE_NO`, `SUBJECT`, `BODY`, `CURRENCY`, `TOTAL_AMOUNT`, `OPTIONAL`, `ANALYSIS`, `EXTRA`, `TRADE_STATE`, `ERROR_CODE`, `ERROR_MSG`, `DEVICE`, `CLIENT_IP`, `CREATE_TIME`, `UPDATE_TIME`, `EXPIRE_TIME`, `PAY_SUCCESS_TIME`) VALUES (134026636319260769, 'SJ1622222261312925696', 129606551068475425, 129606551173333057, 'a838b36dcbe940328ef523d7ceaca7c9', 'ALIPAY_WAP', NULL, NULL, NULL, 'aggregate_pay_c2b', NULL, '测试企业商品', '向测试企业付款', 'CNY', 600, NULL, NULL, NULL, '0', NULL, NULL, NULL, '192.168.3.48', '2023-02-05 21:15:01', NULL, '2023-02-05 21:45:01', NULL);
```

测试删除

```
delete from pay_order;
```

```
mysql> delete from pay_order;
Query OK, 39 rows affected (0.01 sec)

mysql>
```

再次查询：

```
mysql> select * from pay_order;
Empty set (0.00 sec)

mysql>
```

发现为空

数据恢复

使用客户端工具连接生成环境的MySQL服务器，这里为了方便，使用本地环境演示

查看binlog的目录：

```
show global variables like "%log_bin%";
```

```
mysql> show global variables like "%log_bin%";
+---------------------------------+----------------------------------------------------------+
| Variable_name                   | Value                                                    |
+---------------------------------+----------------------------------------------------------+
| log_bin                         | ON                                                       |
| log_bin_basename                | C:\ProgramData\MySQL\MySQL Server 8.0\Data\MAO-bin       |
| log_bin_index                   | C:\ProgramData\MySQL\MySQL Server 8.0\Data\MAO-bin.index |
| log_bin_trust_function_creators | OFF                                                      |
| log_bin_use_v1_row_events       | OFF                                                      |
+---------------------------------+----------------------------------------------------------+
5 rows in set, 1 warning (0.00 sec)

mysql>
```

可以得出文件在`C:\ProgramData\MySQL\MySQL Server 8.0\Data\MAO-bin`

查看binlog文件日志列表

```
show binary logs;
```

```
mysql> show binary logs;
+----------------+-----------+-----------+
| Log_name       | File_size | Encrypted |
+----------------+-----------+-----------+
| MAO-bin.000650 | 170403208 | No        |
| MAO-bin.000651 |       180 | No        |
| MAO-bin.000652 |       180 | No        |
| MAO-bin.000653 |       180 | No        |
| MAO-bin.000654 |       180 | No        |
| MAO-bin.000655 |       180 | No        |
| MAO-bin.000656 |       368 | No        |
| MAO-bin.000657 |  21002124 | No        |
| MAO-bin.000658 |       180 | No        |
| MAO-bin.000659 |       180 | No        |
| MAO-bin.000660 |   7909038 | No        |
| MAO-bin.000661 |  25635575 | No        |
| MAO-bin.000662 |   1839935 | No          |
| MAO-bin.000663 |     13990 | No          |
| MAO-bin.000664 | 914612168 | No          |
+----------------+-----------+-----------+
15 rows in set (0.03 sec)

mysql>
```

可以得出最后一个文件是`MAO-bin.000664`

拷贝表结构到本地库（在本地库建一个库名称和表名称都和生产库一样的库和表，表里可以没有任何数据）

使用xshell或者finalshell连接数据库所在的服务器，下载binlog文件到本机中，并拷贝binlog文件到my2sql根目录下，为了以防万一，还可以拷贝上一个文件`MAO-bin.000663`

怎么使用xshell或者finalshell拷贝文件请百度

现my2sql根目录如下：

```
PS D:\opensoft\my2sql> ls


    目录: D:\opensoft\my2sql


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----         2023/9/29     20:23                base
d-----         2023/9/29     20:23                constvar
d-----         2023/9/29     20:23                dsql
d-----         2023/9/29     20:23                ehand
d-----         2023/9/29     20:23                misc
d-----         2023/9/29     20:23                releases
d-----         2023/9/29     20:23                sqlbuilder
d-----         2023/9/29     20:23                sqltypes
d-----         2023/9/29     20:23                toolkits
d-----         2023/9/29     20:23                vendor
-a----         2023/9/28      0:46             74 .gitignore
-a----         2023/9/28      0:46              8 .go-version
-a----         2023/9/28      0:46            860 go.mod
-a----         2023/9/28      0:46          12425 go.sum
-a----         2023/9/28      0:46           1065 LICENSE
-a----         2023/9/28      0:46           1267 main.go
-a----         2023/10/2     20:20      914612168 MAO-bin.000664
-a----         2023/10/2     19:34        7973376 my2sql.exe
-a----         2023/9/28      0:46           9881 README.md


```

```
PS D:\opensoft\my2sql>
```

使用my2sql工具解析binlog，生成回滚SQL

回滚命令：

```
./my2sql.exe -user root -password xxxxxx -host 127.0.0.1 -databases aggregate_pay_transaction -tables pay_order -port 3306 -mode file -local-binlog-file ./MAO-bin.000664 -work-type rollback -add-extraInfo -start-file MAO-bin.000664
```

```
PS D:\opensoft\my2sql> ./my2sql.exe -user root -password xxxxxx -host 127.0.0.1 -databases aggregate_pay_transaction -tables pay_order -port 3306 -mode file -local-binlog-file ./MAO-bin.000664 -work-type rollback -add-extraInfo -start-file MAO-bin.000664
[2023/10/02 20:29:54] [info] file.go:32 start to parse binlog from local files
[2023/10/02 20:29:54] [info] file.go:35 start to parse MAO-bin.000664 4
[2023/10/02 20:29:54] [info] file.go:44 start to parse MAO-bin.000664 4
[2023/10/02 20:29:54] [info] stats_process.go:166 start thread to analyze statistics from binlog
[2023/10/02 20:29:54] [info] events.go:221 start thread to write redo/rollback sql into file
[2023/10/02 20:29:54] [info] events.go:61 start thread 1 to generate redo/rollback sql
[2023/10/02 20:29:54] [info] events.go:61 start thread 2 to generate redo/rollback sql
[2023/10/02 20:30:00] [info] file.go:71 finish parsing binlog from local files
[2023/10/02 20:30:00] [info] stats_process.go:266 exit thread to analyze statistics from binlog
[2023/10/02 20:30:00] [info] events.go:196 exit thread 2 to generate redo/rollback sql
[2023/10/02 20:30:00] [info] events.go:196 exit thread 1 to generate redo/rollback sql
[2023/10/02 20:30:00] [info] events.go:255 finish processing MAO-bin.000664 914612137
[2023/10/02 20:30:00] [info] events.go:270 finish writing rollback sql into tmp files, start to revert content order of tmp files
[2023/10/02 20:30:00] [info] rollback_process.go:15 start thread 1 to revert rollback sql files
[2023/10/02 20:30:00] [info] rollback_process.go:41 start to revert tmp file D:\opensoft\my2sql\.rollback.664.sql into D:\opensoft\my2sql\rollback.664.sql
[2023/10/02 20:30:00] [info] rollback_process.go:156 finish reverting tmp file D:\opensoft\my2sql\.rollback.664.sql into D:\opensoft\my2sql\rollback.664.sql
[2023/10/02 20:30:00] [info] rollback_process.go:25 exit thread 1 to revert rollback sql files
```

```
[2023/10/02 20:30:00] [info] events.go:283 finish reverting content order of tmp files
[2023/10/02 20:30:00] [info] events.go:288 exit thread to write redo/rollback sql into file
PS D:\opensoft\my2sql>
```

执行完毕后，在根目录生成`rollback.664.sql`文件

```
PS D:\opensoft\my2sql> ls


    目录: D:\opensoft\my2sql


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----         2023/9/29     20:23                base
d-----         2023/9/29     20:23                constvar
d-----         2023/9/29     20:23                dsql
d-----         2023/9/29     20:23                ehand
d-----         2023/9/29     20:23                misc
d-----         2023/9/29     20:23                releases
d-----         2023/9/29     20:23                sqlbuilder
d-----         2023/9/29     20:23                sqltypes
d-----         2023/9/29     20:23                tmpdir
d-----         2023/9/29     20:23                toolkits
d-----         2023/9/29     20:23                vendor
-a----         2023/9/28      0:46             74 .gitignore
-a----         2023/9/28      0:46              8 .go-version
-a----         2023/9/28     17:08        7974400 app.exe
-a----         2023/10/2     20:30            279 biglong_trx.txt
-a----         2023/9/29     20:07      288433710 binlog.7z
-a----         2023/10/2     20:30            298 binlog_status.txt
-a----         2023/9/28      0:46            860 go.mod
-a----         2023/9/28      0:46          12425 go.sum
-a----         2023/9/28      0:46           1065 LICENSE
-a----         2023/9/28      0:46           1267 main.go
-a----         2023/10/2     20:20      914612168 MAO-bin.000664
-a----         2023/10/2     19:34        7973376 my2sql.exe
-a----         2023/9/28      0:46           9881 README.md
-a----         2023/10/2     20:30          29508 rollback.664.sql


PS D:\opensoft\my2sql>
PS D:\opensoft\my2sql> cat .\binlog_status.txt
binlog            starttime           stoptime            startpos   stoppos    inserts  updates  deletes  database        table
MAO-bin.000664    2023-10-02_20:20:57 2023-10-02_20:20:57 914604340  914612137  0        0        39       aggregate_pay_transaction pay_order

PS D:\opensoft\my2sql> cat .\biglong_trx.txt
binlog            starttime           stoptime            startpos   stoppos    rows     duration   tables
MAO-bin.000664    2023-10-02_20:20:57 2023-10-02_20:20:57 914604244  914612168  39       0          [aggregate_pay_transaction.pay_order(inserts=0, updates=0, deletes=39)]
PS D:\opensoft\my2sql>
```

使用记事本打开rollback.664.sql，生成的反向sql如下：

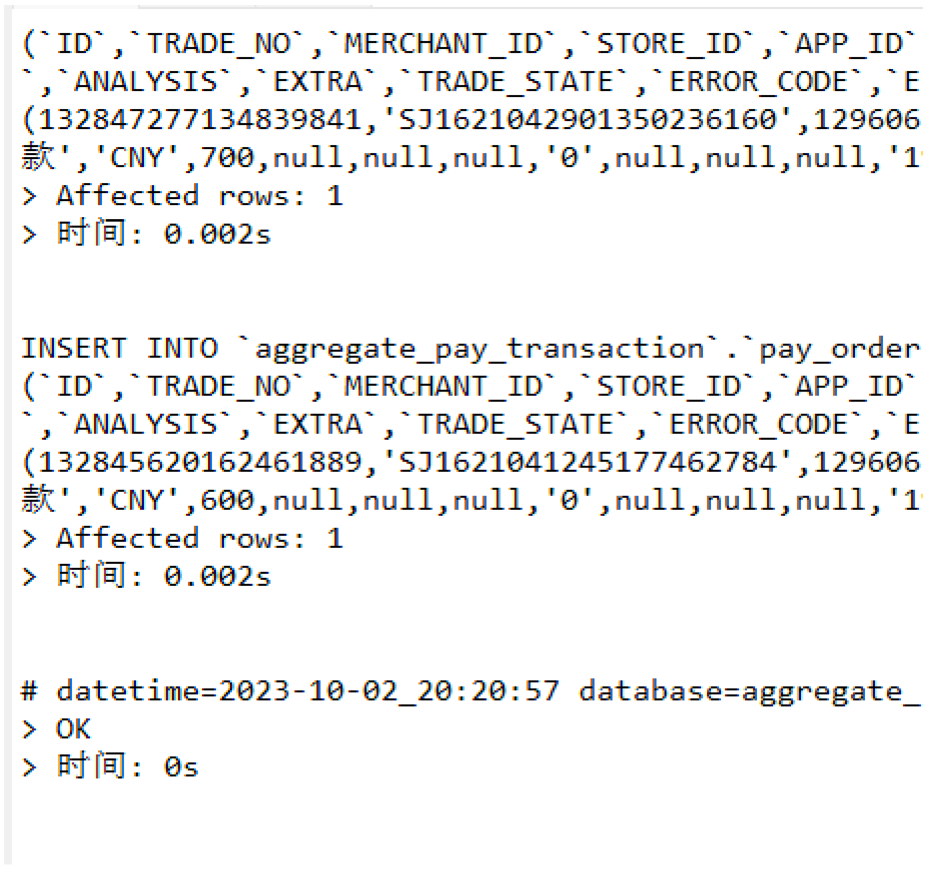
```
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (1340266363192607769,'SJ1622222261312925696',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',600,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-05 21:15:01',null,'2023-02-05 21:45:01',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (1336860172353536665,'SJ1621881642255167488',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,'2023020422001447960502095967','aggregate_pay_c2b',null,'测试企业商品','华硕ROG电脑32G 1T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'2',null,null,null,'192.168.3.48','2023-02-04 22:41:31',null,'2023-02-04 23:11:31','2023-02-04 22:43:55');
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (1336833289717023 05,'SJ1621878953102323712',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,'2023020422001447960502096119','aggregate_pay_c2b',null,'测试企业商品','华硕ROG电脑32G 1T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'2',null,null,null,'192.168.3.48','2023-02-04 22:30:50',null,'2023-02-04 23:00:50','2023-02-04 22:46:55');
```

```sql
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (133680531463208993,'SJ1621876155526918144',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,'2023020422001447960502095966','aggregate_pay_c2b',null,'测试企业商品','华硕ROG电脑32G 1T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'2',null,null,null,'192.168.3.48','2023-02-04 22:19:43',null,'2023-02-04 22:49:43','2023-02-04 22:43:10');
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (133219433026945089,'SJ1621415058046869504',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',600,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-03 15:47:29',null,'2023-02-03 16:17:29',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (133219045666193441,'SJ1621414669792731136',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','hello','CNY',3268,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-03 15:45:56',null,'2023-02-03 16:15:56',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (133217034275127329,'SJ1621412658321846272',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',1000,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-03 15:37:57',null,'2023-02-03 16:07:57',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (133205823374491681,'SJ1621401447535312896',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'华硕官方商城商品','华硕ROG电脑32G 2T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-03 14:53:24',null,'2023-02-03 15:23:24',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132980662331244673,'SJ1621176287351230464',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','华硕ROG电脑32G 1T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 23:58:42',null,'2023-02-03 00:28:42',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132979792038330465,'SJ1621175417049927680',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'华硕官方商城商品','华硕ROG电脑32G 1T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 23:55:14',null,'2023-02-03 00:25:14',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132975466976903233,'SJ1621171091996889088',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','华硕ROG电脑32G 1T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 23:38:03',null,'2023-02-03 00:08:03',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132975102760321057,'SJ1621170726790451200',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','华硕ROG电脑32G 1T英特尔13代i9 4090显卡','CNY',3299900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 23:36:36',null,'2023-02-03 00:06:36',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132965799492059329,'SJ1621161424499683328',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','华硕笔记本电脑','CNY',900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 22:59:38',null,'2023-02-02 23:29:38',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132959566227832993,'SJ1621155191252234240',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',9700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 22:34:52',null,'2023-02-02 23:04:52',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132957778242175105,'SJ1621153403266576384',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 22:27:46',null,'2023-02-02 22:57:46',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132957735665795169,'SJ1621153360686002176',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 22:27:35',null,'2023-02-02 22:57:35',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132957431809441857,'SJ1621153056829648896',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',999900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 22:26:23',null,'2023-02-02 22:56:23',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132957428210728993,'SJ1621153052278829056',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',999900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 22:26:22',null,'2023-02-02 22:56:22',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132870379923308705,'SJ1621066004941516800',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',9999900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:40:28',null,'2023-02-02 17:10:28',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132870166936551553,'SJ1621065791954759680',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',9999900,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:39:37',null,'2023-02-02 17:09:37',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132869710797602913,'SJ1621065335815811072',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:37:49',null,'2023-02-02 17:07:49',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132869525757493313,'SJ1621065150775701504',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:37:05',null,'2023-02-02 17:07:05',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132869468702375969,'SJ1621065092885917696',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:36:51',null,'2023-02-02 17:06:51',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132867347085000929,'SJ1621062972110049280',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:28:25',null,'2023-02-02 16:58:25',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132867298129084609,'SJ1621062923149938688',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:28:13',null,'2023-02-02 16:58:13',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132867237198430369,'SJ1621062862219284480',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:27:59',null,'2023-02-02 16:57:59',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132866163632767105,'SJ1621061788653621248',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:23:43',null,'2023-02-02 16:53:43',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132866127196848225,'SJ1621061752217702400',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:23:34',null,'2023-02-02 16:53:34',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132865996292620353,'SJ1621061621313474560',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:23:03',null,'2023-02-02 16:53:03',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132865891451797537,'SJ1621061515658956800',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:22:38',null,'2023-02-02 16:52:38',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132865240214798369,'SJ1621060863772745728',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',800,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:20:02',null,'2023-02-02 16:50:02',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132862905442893857,'SJ1621058529620348928',1296065510684754 25,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:10:46',null,'2023-02-02 16:40:46',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132861679020015649,'SJ1621057303196467200',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:05:54',null,'2023-02-02 16:35:54',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132860671053266977,'SJ1621056295234891776',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',600,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 16:01:53',null,'2023-02-02 16:31:53',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132858194446778401,'SJ1621053818621575168',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',800,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 15:52:03',null,'2023-02-02 16:22:03',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132855976121335841,'SJ1621051600292663296',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 15:43:14',null,'2023-02-02 16:13:14',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132848579776610337,'SJ1621044203864121344',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 15:13:50',null,'2023-02-02 15:43:50',null);
```

```sql
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132847277134839841,'SJ1621042901350236160',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',700,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 15:08:40',null,'2023-02-02 15:38:40',null);
INSERT INTO `aggregate_pay_transaction`.`pay_order` (`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`,`PAY_CHANNEL`,`PAY_CHANNEL_MCH_ID`,`PAY_CHANNEL_MCH_APP_ID`,`PAY_CHANNEL_TRADE_NO`,`CHANNEL`,`OUT_TRADE_NO`,`SUBJECT`,`BODY`,`CURRENCY`,`TOTAL_AMOUNT`,`OPTIONAL`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`ERROR_MSG`,`DEVICE`,`CLIENT_IP`,`CREATE_TIME`,`UPDATE_TIME`,`EXPIRE_TIME`,`PAY_SUCCESS_TIME`) VALUES (132845620162461889,'SJ1621041245177462784',129606551068475425,129606551173333057,'a838b36dcbe940328ef523d7ceaca7c9','ALIPAY_WAP',null,null,null,'aggregate_pay_c2b',null,'测试企业商品','向测试企业付款','CNY',600,null,null,null,'0',null,null,null,'192.168.3.48','2023-02-02 15:02:05',null,'2023-02-02 15:32:05',null);
# datetime=2023-10-02_20:20:57 database=aggregate_pay_transaction table=pay_order binlog=MAO-bin.000664 startpos=914604340 stoppos=914612137
```

检查SQL，执行到本地库中

千万记得要检查，如果插入语句中里面包含其它语句，就完了



```
(`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`
`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`E
(1328472771348398441,'SJ1621042901350236160',129606
款','CNY',700,null,null,null,'0',null,null,null,'1
> Affected rows: 1
> 时间: 0.002s


INSERT INTO `aggregate_pay_transaction`.`pay_order
(`ID`,`TRADE_NO`,`MERCHANT_ID`,`STORE_ID`,`APP_ID`
`,`ANALYSIS`,`EXTRA`,`TRADE_STATE`,`ERROR_CODE`,`E
(1328456201624618889,'SJ1621041245177462784',129606
款','CNY',600,null,null,null,'0',null,null,null,'1
> Affected rows: 1
> 时间: 0.002s


# datetime=2023-10-02_20:20:57 database=aggregate_
> OK
> 时间: 0s
```

执行完之后，查询本地库

```
mysql> select count(*) from pay_order;
+----------+
| count(*) |
+----------+
|       39 |
+----------+
1 row in set (0.00 sec)

mysql>
```

检查数据和条数是否正确，如果正确，再到生产库里执行

流程请看 闪回大致流程

binlog2sql

概述

一款基于python开发的开源工具，是由大众点评团队的DBA使用python开发出来的，可以从MySQL binlog解析出你要的SQL。根据不同选项，你可以得到原始SQL、回滚SQL、去除主键的INSERT SQL等

用途

- 数据快速回滚(闪回)
- 主从切换后新master丢数据的修复
- 从binlog生成标准SQL，带来的衍生功能

MySQL要求

MySQL server必须设置以下参数：

```
[mysqld]
server_id = 1
log_bin = /var/log/mysql/mysql-bin.log
max_binlog_size = 1G
binlog_format = row
binlog_row_image = full
```

建议授权：

```
GRANT SELECT, REPLICATION SLAVE, REPLICATION CLIENT ON *.* TO
```

- select：需要读取server端information_schema.COLUMNS表，获取表结构的元信息，拼接成可视化的sql语句
- super/replication client：两个权限都可以，需要执行'SHOW MASTER STATUS', 获取server端的binlog列表
- replication slave：通过BINLOG_DUMP协议获取binlog内容的权限

限制

- mysql server必须开启，离线模式下不能解析

- 参数 *binlog_row_image* 必须为FULL，暂不支持MINIMAL
- 解析速度不如mysqlbinlog

环境部署

项目是Python写的，需要Python环境，克隆项目需要git，需要使用pip安装依赖库

Python要求：Python 2.7, 3.4+

git版本控制系统

参考 git版本控制系统

Python

自行百度

pip

自行百度

项目部署

克隆项目

命令：

```
git clone https://github.com/danfengcao/binlog2sql
```

克隆完成后项目根目录如下：

```
PS D:\opensoft\binlog2sql> ls


    目录: D:\opensoft\binlog2sql


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----         2023/9/29     20:22                .idea
d-----         2023/9/29     20:22                binlog2sql
d-----         2023/9/29     20:22                example
d-----         2023/9/29     20:22                tests
d-----         2023/9/29     20:22                venv
-a----         2023/9/28      0:35           1148 .gitignore
-a----         2023/9/28      0:35          35815 LICENSE
-a----         2023/9/28      0:35           9746 README.md
-a----         2023/9/28      0:35             57 requirements.txt


PS D:\opensoft\binlog2sql>
```

安装依赖

查看requirements.txt文件，需要以下依赖：

```
PyMySQL==0.7.11
wheel==0.29.0
mysql-replication==0.13
```

安装命令：

```
pip install -r requirements.txt
```

常用参数

mysql连接配置

-h

MySQL服务IP

-P

MySQL服务端口，大写

-u

MySQL服务用户名

-p

MySQL服务密码，小写

解析模式

--stop-never

持续解析binlog。可选。默认False，同步至执行命令时最新的binlog位置

-K, --no-primary-key

对INSERT语句去除主键。可选。默认False

-B, --flashback

生成回滚SQL，可解析大文件，不受内存限制。可选。默认False。与stop-never或no-primary-key不能同时添加

--back-interval

-B模式下，每打印一千行回滚SQL，加一句SLEEP多少秒，如不想加SLEEP，请设为0。可选。默认1.0

解析范围控制

--start-file

起始解析文件，只需文件名，无需全路径 。必须

--start-position/--start-pos

起始解析位置。可选。默认为start-file的起始位置

--stop-file/--end-file

终止解析文件。可选。默认为start-file同一个文件。若解析模式为stop-never，此选项失效

--stop-position/--end-pos

终止解析位置。可选。默认为stop-file的最末位置；若解析模式为stop-never，此选项失效

--start-datetime

起始解析时间，格式'%Y-%m-%d %H:%M:%S'。可选。默认不过滤

--stop-datetime

终止解析时间，格式'%Y-%m-%d %H:%M:%S'。可选。默认不过滤

对象过滤

-d, --databases

只解析目标db的sql，多个库用空格隔开，如-d db1 db2。可选。默认为空

-t, --tables

只解析目标table的sql，多张表用空格隔开，如-t tbl1 tbl2。可选。默认为空

--only-dml

只解析dml，忽略ddl。可选。默认False

--sql-type

只解析指定类型，支持INSERT, UPDATE, DELETE。多个类型用空格隔开，如--sql-type INSERT DELETE。可选。默认为增删改都解析。用了此参数但没填任何类型，则三者都不解析

示例

解析出标准SQL

```
python binlog2sql.py -h127.0.0.1 -P3306 -uroot -p'123456' -dtest -t test3 test4 --start-file='mysql-bin.000002'
```

解析出回滚SQL

```
python binlog2sql.py --flashback -h127.0.0.1 -P3306 -uroot -p'123456' -dtest -ttest3 --start-file='mysql-bin.000002' --start-position=763 --stop-position=1147
```

注意：binlog2sql.py文件位于binlog2sql目录下，而不是位于根目录

实战

背景：小明在11:44时误删了test库user表大批的数据，需要紧急回滚。

```
test库user表原有数据
mysql> select * from user;
+----+--------+---------------------+
| id | name   | addtime             |
+----+--------+---------------------+
|  1 | 小赵   | 2013-11-11 00:04:33 |
|  2 | 小钱   | 2014-11-11 00:04:48 |
|  3 | 小孙   | 2016-11-11 20:25:00 |
|  4 | 小李   | 2013-11-11 00:00:00 |
.........
+----+--------+---------------------+
16384 rows in set (0.04 sec)

11:44时，user表大批数据被误删除。与此同时，正常业务数据是在继续写入的
mysql> delete from user where addtime>'2014-01-01';
Query OK, 16128 rows affected (0.18 sec)
```

```

mysql> select count(*) from user;
+----------+
| count(*) |
+----------+
|      261 |
+----------+
```

恢复数据步骤:

1. 登录mysql，查看目前的binlog文件

```
mysql> show master logs;
+------------------+-----------+
| Log_name         | File_size |
+------------------+-----------+
| mysql-bin.000053 | 168652863 |
| mysql-bin.000054 |    504549 |
+------------------+-----------+
```

2. 最新的binlog文件是mysql-bin.000054。我们的目标是筛选出需要回滚的SQL，由于误操作人只知道大致的误操作时间，我们首先根据时间做一次过滤。只需要解析test库user表。(注：如果有多个sql误操作，则生成的binlog可能分布在多个文件，需解析多个文件)

```
shell> python binlog2sql/binlog2sql.py -h127.0.0.1 -P3306 -uadmin -p'admin' -dtest -tuser --start-file='mysql-bin.000054' --start-datetime='2016-12-26 11:44:00' --stop-datetime='2016-12-26 11:50:00' > /tmp/raw.sql

raw.sql输出：
DELETE FROM `test`.`user` WHERE `addtime`='2014-11-11 00:04:48' AND `id`=2 AND `name`='小钱' LIMIT 1; #start 257427 end 265754 time 2016-12-26 11:44:56
DELETE FROM `test`.`user` WHERE `addtime`='2015-11-11 20:25:00' AND `id`=3 AND `name`='小孙' LIMIT 1; #start 257427 end 265754 time 2016-12-26 11:44:56
...
DELETE FROM `test`.`user` WHERE `addtime`='2016-12-14 23:09:07' AND `id`=24530 AND `name`='tt' LIMIT 1; #start 257427 end 504272 time 2016-12-26 11:44:56
INSERT INTO `test`.`user`(`addtime`, `id`, `name`) VALUES ('2016-12-10 00:04:33', 32722, '小王'); #start 504299 end 504522 time 2016-12-26 11:49:42
...
```

3. 根据位置信息，我们确定了误操作sql来自同一个事务，准确位置在257427-504272之间(binlog2sql对于同一个事务会输出同样的start position)。再根据位置过滤，使用 ***-B*** 选项生成回滚sql，检查回滚sql是否正确。(注：真实场景下，生成的回滚SQL经常会需要进一步筛选。结合grep、编辑器等)

```
shell> python binlog2sql/binlog2sql.py -h127.0.0.1 -P3306 -uadmin -p'admin' -dtest -tuser --start-file='mysql-bin.000054' --start-position=257427 --stop-position=504272 -B > /tmp/rollback.sql

rollback.sql 输出:
INSERT INTO `test`.`user`(`addtime`, `id`, `name`) VALUES ('2016-12-14 23:09:07', 24530, 'tt'); #start 257427 end 504272 time 2016-12-26 11:44:56
INSERT INTO `test`.`user`(`addtime`, `id`, `name`) VALUES ('2016-12-12 00:00:00', 24529, '小李'); #start 257427 end 504272 time 2016-12-26 11:44:56
...
INSERT INTO `test`.`user`(`addtime`, `id`, `name`) VALUES ('2014-11-11 00:04:48', 2, '小钱'); #start 257427 end 265754 time 2016-12-26 11:44:56

shell> wc -l /tmp/rollback.sql
16128 /tmp/rollback.sql
```

4. 与业务方确认回滚sql没问题，执行回滚语句。登录mysql，确认回滚成功。

```
shell> mysql -h127.0.0.1 -P3306 -uadmin -p'admin' < /tmp/rollback.sql

mysql> select count(*) from user;
+----------+
| count(*) |
+----------+
|    16389 |
+----------+
```

MyFlash

概述

MyFlash是由美团点评公司技术工程部开发维护的一个回滚DML操作的工具。该工具通过解析v4版本的binlog，完成回滚操作。相对已有的回滚工具，其增加了更多的过滤选项，让回滚更加容易。

该工具已经在美团点评内部使用

限制

1. binlog格式必须为row,且binlog_row_image=full
2. 仅支持5.6与5.7
3. 只能回滚DML（增、删、改）

环境部署

项目是用c语言写的，源码不是跨平台的，生成的可执行文件也不是跨平台的，项目需要在Linux机器上编译和运行，c语言项目编译需要gcc编译器，项目需要`glib2-devel`库，克隆项目需要git

git

参考 git版本控制系统

gcc

c语言编译器，如果你的Linux机器上没有gcc，自行百度如何安装

glib2-devel

安装命令：

```
yum install glib2-devel -y
```

centos机器上执行以上命令，ubuntu机器可以使用apt命令

项目部署和编译

克隆项目

命令：

```
git clone https://github.com/Meituan-Dianping/MyFlash
```

克隆完成后项目根目录如下：

```
PS D:\opensoft\MyFlash> ls


    目录: D:\opensoft\MyFlash


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
d-----         2023/9/29     20:22                binary
d-----         2023/9/29     20:22                doc
d-----         2023/9/29     20:22                source
d-----         2023/9/29     20:22                testbinlog
-a----         2023/9/28      0:35             18 .gitignore
-a----         2023/9/28      0:35            490
binlog_output_base.flashback
-a----         2023/9/28      0:35            124 build.sh
-a----         2023/9/28      0:35           1112 License.md
-a----         2023/9/28      0:35           1299 README.md


PS D:\opensoft\MyFlash>
```

编译项目

动态编译链接

```
gcc -w  `pkg-config --cflags --libs glib-2.0` source/binlogParseGlib.c  -o
binary/flashback
```

然而用户不想每次去重新编译，可以选择使用静态链接，但是该方法需要知道glib库的版本和位置，因此对于每台机器略有不同

静态编译链接

```
gcc -w -g `pkg-config --cflags  glib-2.0` source/binlogParseGlib.c   -o binary/flashback /usr/lib64/libglib-2.0.a -lrt
```

为了保证在一台机器上编译后，可以在其它机器上使用，需要满足以下两个条件

- 将glib做成静态链接
- 在编译的那台机器的glibc版本（查看方法为ldd --version）要小于等于要运行该软件的那台机器glibc版本

常用参数

使用`./flashback --help`命令可以查看帮助：

```
Usage:
  flashback [OPTION...]

Help Options:
  -?, --help                  Show help options

Application Options:
  --databaseNames             databaseName to apply. if multiple, seperate by comma(,)
  --tableNames                tableName to apply. if multiple, seperate by comma(,)
  --start-position            start position
  --stop-position             stop position
  --start-datetime            start time (format %Y-%m-%d %H:%M:%S)
  --stop-datetime             stop time (format %Y-%m-%d %H:%M:%S)
  --sqlTypes                  sql type to filter . support INSERT, UPDATE ,DELETE. if multiple, seperate by comma(,)
  --maxSplitSize              max file size after split, the uint is M
  --binlogFileNames           binlog files to process. if multiple, seperate by comma(,)
  --outBinlogFileNameBase     output binlog file name base
  --logLevel                  log level, available option is debug,warning,error
  --include-gtids             gtids to process
  --exclude-gtids             gtids to skip
```

- 1.databaseNames

  指定需要回滚的数据库名。多个数据库可以用“,”隔开。如果不指定该参数，相当于指定了所有数据库。

- 2.tableNames

指定需要回滚的表名。多个表可以用“,”隔开。如果不指定该参数，相当于指定了所有表。

- 3.start-position

  指定回滚开始的位置。如不指定，从文件的开始处回滚。请指定正确的有效的位置，否则无法回滚

- 4.stop-position

  指定回滚结束的位置。如不指定，回滚到文件结尾。请指定正确的有效的位置，否则无法回滚

- 5.start-datetime

  指定回滚的开始时间。注意格式必须是 %Y-%m-%d %H:%M:%S。 如不指定，则不限定时间

- 6.stop-datetime

  指定回滚的结束时间。注意格式必须是 %Y-%m-%d %H:%M:%S。 如不指定，则不限定时间

- 7.sqlTypes

  指定需要回滚的sql类型。目前支持的过滤类型是INSERT, UPDATE ,DELETE。多个类型可以用“,”隔开。

- 8.maxSplitSize

  一旦指定该参数，对文件进行固定尺寸的分割（单位为M），过滤条件有效，但不进行回滚操作。该参数主要用来将大的binlog文件切割，防止单次应用的binlog尺寸过大，对线上造成压力

- 9.binlogFileNames

  指定需要回滚的binlog文件，目前只支持单个文件，后续会增加多个文件支持

- 10.outBinlogFileNameBase

  指定输出的binlog文件前缀，如不指定，则默认为binlog_output_base.flashback

- 11.logLevel

  仅供开发者使用，默认级别为error级别。在生产环境中不要修改这个级别，否则输出过多

- 12.include-gtids

  指定需要回滚的gtid,支持gtid的单个和范围两种形式。

- 13.exclude-gtids

  指定不需要回滚的gtid，用法同include-gtids

示例

回滚整个文件

```
./flashback --binlogFileNames=haha.000041
mysqlbinlog binlog_output_base.flashback | mysql -h<host> -u<user> -p
```

回滚该文件中的所有insert语句

```
./flashback  --sqlTypes='INSERT' --binlogFileNames=haha.000041
mysqlbinlog binlog_output_base.flashback | mysql -h<host> -u<user> -p
```

回滚大文件

```
回滚
./flashback --binlogFileNames=haha.000042
切割大文件
./flashback --maxSplitSize=1 --binlogFileNames=binlog_output_base.flashback
应用
mysqlbinlog binlog_output_base.flashback.000001 | mysql -h<host> -u<user> -p
...
mysqlbinlog binlog_output_base.flashback.<N> | mysql -h<host> -u<user> -p
```

总结

MyFlash是c语言写的，不是跨平台的，有时候需要在Windows平台使用，binlog2sql是Python写的，效率比较低，解析binlog太慢，推荐使用my2sql

闪回大致流程