

Mariadb数据库备份恢复系列(二): xtrabackup物理备份工具之完全备份

实验二：利用xtrabackup+二进制日志实现完全备份和恢复数据库

1、安装xtrabackup软件包

```
[root@node72 ~]# ls
anaconda-ks.cfg  percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm  下载并安装xtrabackup软件包
[root@node72 ~]# yum install -y percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm
已加载插件: fastestmirror, langpacks
正在检查 percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm: percona-xtrabackup-24-2.4.4-1.el7.x86_64
percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm 将被安装
正在解决依赖关系
--> 正在检查事务
---> 软件包 percona-xtrabackup-24.x86_64.0.2.4.4-1.el7 将被 安装
--> 正在处理依赖关系 libev.so.4()(64bit), 它被软件包 percona-xtrabackup-24-2.4.4-1.el7.x86_64 需要
Loading mirror speeds from cached hostfile
--> 正在检查事务
---> 软件包 libev.x86_64.0.4.15-3.el7 将被 安装
--> 解决依赖关系完成

依赖关系解决

=====
Package                架构      版本      源                        大小
=====
正在安装:
percona-xtrabackup-24    x86_64    2.4.4-1.el7    /percona-xtrabackup-24-2.4.4-1.el7.x86_64    31 M
为依赖而安装:
libev                   x86_64    4.15-3.el7     EPEL                                           43 k

事务概要
=====
安装 1 软件包 (+1 依赖软件包)

总计: 31 M
总下载量: 43 k
```

2、验证数据的存储引擎类型

```

MariaDB [hellodb]> use hellodb;
Database changed
MariaDB [hellodb]>
MariaDB [hellodb]> SHOW TABLE STATUS LIKE 'courses'\G
***** 1. row *****
      Name: courses
      Engine: InnoDB
      Version: 10
      Row_format: Compact
      Rows: 7
      Avg_row_length: 2340
      Data_length: 16384
      Max_data_length: 0
      Index_length: 0
      Data_free: 0
      Auto_increment: 8
      Create_time: 2016-08-23 18:26:20
      Update_time: NULL
      Check_time: NULL
      Collation: utf8_general_ci
      Checksum: NULL
      Create_options:
      Comment:
1 row in set (0.01 sec)

MariaDB [hellodb]>

```

查看表的存储引擎类型，xtrabackup能对innodb存储引擎做热备、完全备份、增量备份；对MyISAM存储引擎能做温备、完全备份

3、查看数据初始状态

```

MariaDB [(none)]> use hellodb;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
MariaDB [hellodb]> show tables;
+-----+
| Tables_in_hellodb |
+-----+
| classes            |
| coc                |
| courses            |
| scores             |
| students           |
| teachers           |
| toc                |
+-----+
7 rows in set (0.00 sec)

MariaDB [hellodb]> select * from courses;
+-----+-----+
| CourseID | Course |
+-----+-----+
| 1        | Hamo Gong |
| 2        | Kuihua Baodian |
| 3        | Jinshe Jianfa |
| 4        | Taiji Quan |
| 5        | Daiyu Zanghua |
| 6        | Weituo Zhang |
| 7        | Dagou Bangfa |
+-----+-----+

```

查看原始数据的信息

4、利用innobackupex进行完全备份

```

[root@node72 ~]# innobackupex --user='root' --host='localhost' --password='111111' /tmp;
160823 18:33:53 innobackupex: Starting the backup operation
IMPORTANT: Please check that the backup run completes successfully.
At the end of a successful backup run innobackupex
prints "completed OK!".
用innobackupex命令执行完全备份，指明备份文件存放的路径
也可以用--databases= 指明只备份哪个库

Can't locate Digest/MD5.pm in @INC (@INC contains: /usr/local/lib64/perl5 /usr/local/share/perl5 /usr/lib64/p
erl5/vendor_perl /usr/share/perl5/vendor_perl /usr/lib64/perl5 /usr/share/perl5 .) at - line 693.
BEGIN failed--compilation aborted at - line 693.
160823 18:33:53 Connecting to MySQL server host: localhost, user: root, password: set, port: 0, socket: /var/
lib/mysql/mysql.sock
Using server version 5.5.44-MariaDB-log
innobackupex version 2.4.4 based on MySQL server 5.7.13 Linux (x86_64) (revision id: df58cf2)
xtrabackup: uses posix_fadvise().
xtrabackup: cd to /var/lib/mysql
xtrabackup: open files limit requested 0, set to 1024
xtrabackup: using the following InnoDB configuration:
xtrabackup: innodb_data_home_dir = .
xtrabackup: innodb_data_file_path = ibdata1:10M:autoextend
xtrabackup: innodb_log_group_home_dir = ./
xtrabackup: innodb_log_files_in_group = 2
xtrabackup: innodb_log_file_size = 5242880
160823 18:33:55 All tables unlocked
160823 18:33:55 Backup created in directory '/tmp/2016-08-23_18-33-53'
MySQL binlog position: filename 'binary.000008', position '8692'
160823 18:33:55 [00] Writing backup-my.cnf
160823 18:33:55 [00] ...done
160823 18:33:55 [00] Writing xtrabackup_info
160823 18:33:55 [00] ...done
xtrabackup: Transaction log of lsn (1695026) to (1695026) was copied.
160823 18:33:55 completed OK!
[root@node72 ~]#
[root@node72 ~]#

```

5、进行apply-log操作

```

[root@node72 ~]#
[root@node72 ~]# innobackupex --apply-log /tmp/2016-08-23_18-33-53/
160823 19:37:24 innobackupex: Starting the apply-log operation
IMPORTANT: Please check that the apply-log run completes successfully.
            At the end of a successful apply-log run innobackupex
            prints "completed OK!".

innobackupex version 2.4.4 based on MySQL server 5.7.13 Linux (x86_64) (revision id: df58cf2)
xtrabackup: cd to /tmp/2016-08-23_18-33-53
xtrabackup: This target seems to be not prepared yet.
InnoDB: Number of pools: 1
xtrabackup: xtrabackup_logfile detected: size=8388608, start_lsn=(1695026)
xtrabackup: using the following InnoDB configuration for recovery:
xtrabackup:   innodb_data_home_dir = .
xtrabackup:   innodb_data_file_path = ibdata1:10M:autoextend
xtrabackup:   innodb_log_group_home_dir = .
xtrabackup:   innodb_log_files_in_group = 1
xtrabackup:   innodb_log_file_size = 8388608
xtrabackup: using the following InnoDB configuration for recovery:
xtrabackup:   innodb_data_home_dir = .
xtrabackup:   innodb_data_file_path = ibdata1:10M:autoextend
xtrabackup:   innodb_log_group_home_dir = .
xtrabackup:   innodb_log_files_in_group = 1
xtrabackup:   innodb_log_file_size = 8388608
xtrabackup: Starting InnoDB instance for recovery.
xtrabackup: Using 104857600 bytes for buffer pool (set by --use-memory parameter)
InnoDB: PUNCH HOLE support available
InnoDB: Mutexes and rw_locks use GCC atomic builtins
InnoDB: 32 non-redo rollback segment(s) are active.
InnoDB: 5.7.13 started; log sequence number 1695253
xtrabackup: starting shutdown with innodb_fast_shutdown = 1
InnoDB: FTS optimize thread exiting.
InnoDB: Starting shutdown...
InnoDB: Shutdown completed; log sequence number 1695272
160823 19:37:29 completed OK!
[root@node72 ~]#
[root@node72 ~]#

```

对备份出来的数据进行apply-log操作，相当于将备份出来的数据中事务日志中已经提交的事务信息写入数据文件中，未提交的事务进行回滚操作

apply log完成

6、查看备份出来的文件的信息

```

[root@node72 ~]# ls /tmp
2016-08-23_18-33-53
[root@node72 ~]# ls /tmp/2016-08-23_18-33-53/
backup-my.cnf  ibdata1  performance_schema  xtrabackup_checkpoints  xtrabackup_logfile  ib_logfile0  ib_logfile1
helloadb      mysql    xtrabackup_binlog_info  xtrabackup_info  xtrabackup_binlog_pos_innodb

```

查看备份出来的文件，因为xtrabackup是一款物理备份工具，因此备份的直接是数据文件，而不是类似mysqldump备份出来的是SQL语句

备份出来的helloadb的数据文件

```

[root@node72 ~]# cat /tmp/2016-08-23_18-33-53/backup-my.cnf
# This MySQL options file was generated by innobackupex.

# The MySQL server
[mysqld]
innodb_checksum_algorithm=innodb
innodb_log_checksum_algorithm=innodb
innodb_data_file_path=ibdata1:10M:autoextend
innodb_log_files_in_group=2
innodb_log_file_size=5242880
innodb_fast_checksum=false
innodb_page_size=16384
innodb_log_block_size=512
innodb_undo_directory=.
innodb_undo_tablespaces=0
server_id=0

redo_log_version=0

```

此文件表示备份时使用的mysqld服务其的相关配置信息

备份出来的mysql库的信息，因为备份的时候没有指明对哪个库进行备份，从而将所有库全部备份

```

[root@node72 ~]# cat /tmp/2016-08-23_18-33-53/xtrabackup_checkpoints
backup_type = full-backuped
from_lsn = 0
to_lsn = 1695026
last_lsn = 1695026
compact = 0
recover_binlog_info = 0

```

此文件用于显示备份检查点相关的信息

标明此备份的类型是完全备份还是增量备份

```

[root@node72 ~]# cat /tmp/2016-08-23_18-33-53/xtrabackup_info
uuid = 17a7abfc-691d-11e6-a616-000c29ecd40f
name =
tool_name = innobackupex
tool_command = --user=root --host=localhost --password=... /tmp
tool_version = 2.4.4
ibbackup_version = 2.4.4
server_version = 5.5.44-MariaDB-log
start_time = 2016-08-23 18:33:53
end_time = 2016-08-23 18:33:55
lock_time = 0
binlog_pos = filename 'binary.000008', position '8692'
innodb_from_lsn = 0
innodb_to_lsn = 1695026
partial = N
incremental = N
format = file
compact = N
compressed = N
encrypted = N

```

此文件用于显示备份的相关信息

```

[root@node72 ~]# cat /tmp/2016-08-23_18-33-53/xtrabackup_binlog_info
binary.000008 8692
[root@node72 ~]# cat /tmp/2016-08-23_18-33-53/xtrabackup_binlog_pos_innodb
/var/lib/mysql/binary.000008 7963

```

对备份数据进行apply-log操作后，备份数据里会有两个文件说明备份数据对应的binlog的文件名和位置，xtrabackup_binlog_pos_innodb和xtrabackup_binlog_info，具体区别：

对于纯InnoDB存储引擎的操作，备份出来的数据中上述两个文件的内容是一致的

对于InnoDB和非事务存储引擎混合操作，xtrabackup_binlog_info 中所示的 position 应该会比 xtrabackup_pos_innodb 所示的数值大。此时应以 xtrabackup_binlog_info 为准；而后者和 apply-log 时 InnoDB recovery log 中显示的内容是一致的，只针对 InnoDB 这部分数据

因为本处我们是全库备份，而库中mysql库中的表的存储引擎为MyISAM，从而导致两个文件中的二进制日志文件的信息不一致，此时要以xtrabackup_binlog_info 为准

7、模拟在完全备份后，对数进行修改，以测试通过二进制日志还原完全备份后尚未来得及备份的变化的数据

```

MariaDB [hellodb]> SELECT * FROM courses;
+-----+-----+
| CourseID | Course |
+-----+-----+
| 1 | Hamo Gong |
| 2 | Kuihua Baodian |
| 3 | Jinshe Jianfa |
| 4 | Taiji Quan |
| 5 | Daiyu Zanghua |
| 6 | Weituo Zhang |
| 7 | Dagou Bangfa |
+-----+-----+
7 rows in set (0.00 sec)

MariaDB [hellodb]> INSERT INTO courses (Course) VALUES ('2jz_test1'),('2jz_test2');
Query OK, 2 rows affected (0.02 sec)
Records: 2 Duplicates: 0 Warnings: 0
模拟在完全备份后，对数据库做出的更改操作，以测试用二进制日志文件对完全备份后，修改的尚未进行备份的数据进行还原

MariaDB [hellodb]> SELECT * FROM courses;
+-----+-----+
| CourseID | Course |
+-----+-----+
| 1 | Hamo Gong |
| 2 | Kuihua Baodian |
| 3 | Jinshe Jianfa |
| 4 | Taiji Quan |
| 5 | Daiyu Zanghua |
| 6 | Weituo Zhang |
| 7 | Dagou Bangfa |
| 8 | 2jz_test1 |
| 9 | 2jz_test2 |
+-----+-----+

```

8、模拟损坏数据库，以测试还原

```

MariaDB [hellodb]>
MariaDB [hellodb]> DROP DATABASE hellodb;
Query OK, 7 rows affected (0.08 sec)

MariaDB [(none)]>
MariaDB [(none)]> SHOW DATABASES;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
+-----+
3 rows in set (0.00 sec)

MariaDB [(none)]> \q
Bye
[root@node72 ~]# ls /var/lib/mysql/ 查看数据库的数据目录下，已经没有hellodb库的文件
aria_log.00000001  binary.000002  binary.000005  binary.000008  ib_logfile0  mysql.sock
aria_log_control  binary.000003  binary.000006  binary.index  ib_logfile1  node72.log
binary.000001     binary.000004  binary.000007  ibdata1       mysql        performance_schema
[root@node72 ~]#

MariaDB [(none)]> SHOW MASTER STATUS;
+-----+-----+-----+-----+
| File | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+-----+-----+-----+-----+
| binary.000008 | 9034 | | |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
查看要恢复时刻，二进制日志的文件和所处位置

```

9、导出自从完全备份到数据库损坏时的二进制日志事件


```

[root@node72 ~]# mysqlbinlog --start-position=8692 /var/lib/mysql/binary.000008
/*!50530 SET @@SESSION.PSEUDO_SLAVE_MODE=1*/;
/*!40019 SET @@session.max_insert_delayed_threads=0*/;
/*!50003 SET @@OLD_COMPLETION_TYPE=@@COMPLETION_TYPE,COMPLETION_TYPE=0*/;
DELIMITER /*!*/;
# at 4
#160823 16:51:09 server id 1 end_log_pos 245 Start: binlog v 4, server v 5.5.44-MariaDB-log created 160823
16:51:09 at startup
# Warning: this binlog is either in use or was not closed properly.
ROLLBACK/*!*/;
BINLOG '
fQ68Vw8BAAAA8QAAAPUAAAAABAAQANS41LjQ0LU1hcmlhREItbG9nAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAB9DrXEXzGNAAGAEgAEBAQEgAA2QAEGggAAAAICAgCAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAhD7gnA==
'/*!*/;
# at 8692
#160823 19:46:23 server id 1 end_log_pos 8763 Query thread_id=18 exec_time=0 error_code=0
SET TIMESTAMP=1471952783/*!*/;
SET @@session.pseudo_thread_id=18/*!*/;
SET @@session.foreign_key_checks=1, @@session.sql_auto_is_null=0, @@session.unique_checks=1, @@session.autocom
mit=1/*!*/;
SET @@session.sql_mode=0/*!*/;
SET @@session.auto_increment_increment=1, @@session.auto_increment_offset=1/*!*/;
/*!\\C utf8 *//*!*/;
SET @@session.character_set_client=33,@@session.collation_connection=33,@@session.collation_server=8/*!*/;
SET @@session.lc_time_names=0/*!*/;
SET @@session.collation_database=DEFAULT/*!*/;
# at 8763
#160823 19:46:23 server id 1 end_log_pos 8791 Intvar
SET INSERT_ID=8/*!*/;
# at 8791
#160823 19:46:23 server id 1 end_log_pos 8920 Query thread_id=18 exec_time=0 error_code=0
use `hellodb`/*!*/;
SET TIMESTAMP=1471952783/*!*/;
INSERT INTO courses (Course) VALUES ('2jz_test1'),('2jz_test2')
/*!*/;
# at 8920
#160823 19:46:23 server id 1 end_log_pos 8947 Xid = 280
COMMIT/*!*/;
# at 8947
#160823 19:49:00 server id 1 end_log_pos 9034 Query thread_id=18 exec_time=0 error_code=0
SET TIMESTAMP=1471952940/*!*/;
DROP DATABASE hellodb
/*!*/;
DELIMITER ;
# End of log file
ROLLBACK /* added by mysqlbinlog */;
/*!50003 SET COMPLETION_TYPE=@@OLD_COMPLETION_TYPE*/;
/*!50530 SET @@SESSION.PSEUDO_SLAVE_MODE=0*/;

```

根据完全备份时的二进制日志文件的位置，和需要恢复时二进制日志文件的位置，来查看相关二进制日志文件，找到此前误删除数据库时二进制日志文件的位置，然后将完全备份到删除数据库前的这一部分二进制日志文件进行导出

找到误删除时，二进制日志文件的位置

```

[root@node72 ~]# mysqlbinlog --start-position=8692 --stop-position=8947 /var/lib/mysql/binary.000008 > /tmp/2jz.sql
[root@node72 ~]# cat /tmp/2jz.sql
/*!50530 SET @@SESSION.PSEUDO_SLAVE_MODE=1*/;
/*!40019 SET @@session.max_insert_delayed_threads=0*/;
/*!50003 SET @@OLD_COMPLETION_TYPE=@@COMPLETION_TYPE,COMPLETION_TYPE=0*/;
DELIMITER /*!*/;
# at 4
#160823 16:51:09 server id 1 end_log_pos 245 Start: binlog v 4, server v 5.5.44-MariaDB-log created 160823
16:51:09 at startup
# Warning: this binlog is either in use or was not closed properly.
ROLLBACK/*!*/;
BINLOG '
fQ68Vw8BAAAA8QAAAPUAAAAABAAQANS41LjQ0LU1hcmlhREItbG9nAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAB9DrXEXzGNAAGAEgAEBAQEgAA2QAEGggAAAAICAgCAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAhD7gnA==
'/*!*/;
# at 8692
#160823 19:46:23 server id 1 end_log_pos 8763 Query thread_id=18 exec_time=0 error_code=0
SET TIMESTAMP=1471952783/*!*/;

```

导出完全备份到误操作删除之间的二进制日志信息，

如果中间不止一个日志文件，可类似如下操作：

```

mysqlbinlog --start-position=1122 /binary.0001/binary.0002 --stop-position=356 /binary.0003 > /aaa.sql

```

相当于道出了/binary.0001从1122位置开始的内容，/binary.0002文件的所有内容，以及/binary.0003从开始到356位置的内容


```
SET @@session.pseudo_thread_id=18/*!*/;  
SET @@session.foreign_key_checks=1, @@session.sql_auto_is_null=0, @@session.unique_checks=1, @@session.autocommit=1/*!*/;  
SET @@session.sql_mode=0/*!*/;  
SET @@session.auto_increment_increment=1, @@session.auto_increment_offset=1/*!*/;  
/*!\\C utf8 *//*!*/;  
SET @@session.character_set_client=33,@@session.collation_connection=33,@@session.collation_server=8/*!*/;  
SET @@session_lc_time_names=0/*!*/;  
SET @@session.collation_database=DEFAULT/*!*/;
```

10、利用完全备份，进行恢复

```
[root@node72 ~]# systemctl stop mariadb
```

执行还原时，由于是物理备份，因此需要停止服务后，再进行还原操作

```
[root@node72 ~]# innobackupex --copy-back /tmp/2016-08-23_18-33-53/
```

160823 20:48:21 innobackupex: Starting the copy-back operation

IMPORTANT: Please check that the copy-back run completes successfully.
At the end of a successful copy-back run innobackupex prints "completed OK!".

innobackupex version 2.4.4 based on MySQL server 5.7.13 Linux (x86_64) (revision id: df58cf2)
Original data directory /var/lib/mysql is not empty!

```
[root@node72 ~]# mv /var/lib/mysql/* /tmp/
```

```
[root@node72 ~]# innobackupex --copy-back /tmp/2016-08-23_18-33-53/
```

160823 20:51:41 innobackupex: Starting the copy-back operation

IMPORTANT: Please check that the copy-back run completes successfully.
At the end of a successful copy-back run innobackupex prints "completed OK!".

innobackupex version 2.4.4 based on MySQL server 5.7.13 Linux (x86_64) (revision id: df58cf2)

160823 20:51:41 [01] Copying ib_logfile0 to /var/lib/mysql/ib_logfile0
160823 20:51:41 [01] ...done
160823 20:51:42 [01] Copying ib_logfile1 to /var/lib/mysql/ib_logfile1
160823 20:51:42 [01] ...done
160823 20:51:42 [01] Copying ibdata1 to /var/lib/mysql/ibdata1
160823 20:51:42 [01] ...done
160823 20:51:42 [01] Copying ./hellodb/classes.ibd to /var/lib/mysql/hellodb/classes.ibd
160823 20:51:42 [01] ...done
160823 20:51:42 [01] Copying ./hellodb/coc.ibd to /var/lib/mysql/hellodb/coc.ibd
160823 20:51:42 [01] ...done
160823 20:51:42 [01] Copying ./xtrabackup_binlog_pos_innodb to /var/lib/mysql/xtrabackup_binlog_pos_innodb
160823 20:51:42 [01] ...done
160823 20:51:42 [01] Copying ./ibtmp1 to /var/lib/mysql/ibtmp1
160823 20:51:43 [01] ...done
160823 20:51:43 completed OK!

copy-back完成

```
[root@node72 ~]# ll /var/lib/mysql/
```

查看还原回来的文件

```
总用量 40980
drwxr-x--- 2 root root 4096 8月 23 20:51 hellodb
-rw-r----- 1 root root 18874368 8月 23 20:51 ibdata1
-rw-r----- 1 root root 5242880 8月 23 20:51 ib_logfile0
-rw-r----- 1 root root 5242880 8月 23 20:51 ib_logfile1
-rw-r----- 1 root root 12582912 8月 23 20:51 ibtmp1
drwxr-x--- 2 root root 4096 8月 23 20:51 mysql
drwxr-x--- 2 root root 4096 8月 23 20:51 performance_schema
-rw-r----- 1 root root 34 8月 23 20:51 xtrabackup_binlog_pos_innodb
-rw-r----- 1 root root 483 8月 23 20:51 xtrabackup_info
```

发现已经有hellodb的信息，但是还原回来的文件的属主属组是root，故需要修改为mysql用户才能正常启动

```
[root@node72 ~]# chown -R mysql:mysql /var/lib/mysql/*
```

```
[root@node72 ~]# systemctl start mariadb
```

启动mysql服务

```
[root@node72 ~]# ss -tnl
```

State	Recv-Q	Send-Q	Local Address:Port	Peer Address:Port
LISTEN	0	50	*:3306	*:*
LISTEN	0	128	*:22	*:*
LISTEN	0	100	127.0.0.1:25	*:*
LISTEN	0	128	:::22	:::*
LISTEN	0	100	:::1:25	:::*

```
[root@node72 ~]# mysql -uroot -p
```

Enter password:

Welcome to the MariaDB monitor. Commands end with ; or \g.
Your MariaDB connection id is 3
Server version: 5.5.44-MariaDB-log MariaDB Server

Copyright (c) 2000, 2015, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

```
MariaDB [(none)]>
MariaDB [(none)]> USE hellodb;
```

Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed

MariaDB [hellodb]> `SELECT * FROM courses;`

连接进mysql，发现并没有完全备份后的修改的数据，因此利用二进制日志还原

```
+-----+-----+
| CourseID | Course |
+-----+-----+
| 1 | Hamo Gong |
| 2 | Kuihua Baodian |
| 3 | Jinshe Jianfa |
| 4 | Taiji Quan |
| 5 | Daiyu Zanghua |
| 6 | Weituo Zhang |
| 7 | Dagou Bangfa |
+-----+-----+
```

7 rows in set (0.00 sec)

MariaDB [hellodb]>

11、利用导出的二进制日志文件事件，进行及时点恢复

MariaDB [hellodb]> `SET sql_log_bin=OFF;`

Query OK, 0 rows affected (0.00 sec)

由于利用二进制日志还原时会产生无用的二进制日志信息，因此暂时关闭此会话级别的二进制日志功能，然后导入此前根据需要导出的二进制日志

MariaDB [hellodb]> `SOURCE /tmp/2jz.sql`

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.02 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

Query OK, 0 rows affected (0.00 sec)

MariaDB [hellodb]> `SELECT * FROM courses;`

导入完成后，发现已经成功还原了完全备份后又发生变化的数据

```
+-----+-----+
| CourseID | Course |
+-----+-----+
| 1 | Hamo Gong |
| 2 | Kuihua Baodian |
| 3 | Jinshe Jianfa |
| 4 | Taiji Quan |
| 5 | Daiyu Zanghua |
| 6 | Weituo Zhang |
| 7 | Dagou Bangfa |
| 8 | 2jz_test1 |
| 9 | 2jz_test2 |
+-----+-----+
```

9 rows in set (0.02 sec)

MariaDB [hellodb]> `SET sql_log_bin=ON;`

Query OK, 0 rows affected (0.00 sec)

重新启动二进制日志记录的功能

MariaDB [hellodb]>

