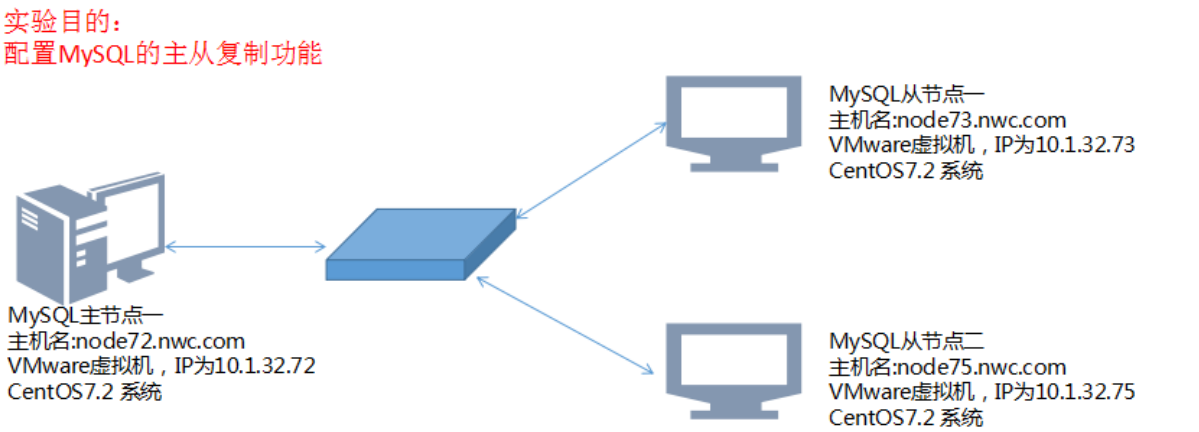
Mariadb数据库复制系列(一)：主从复制

实验一：MySQL主从复制的实现

1、实验环境



确保各节点之间的时间同步

```
[root@node72 ~]# ansible all -m command -a 'date'
10.1.32.72 | success | rc=0 >>
Sat Nov 19 19:21:22 CST 2016

10.1.32.73 | success | rc=0 >>
Sat Nov 19 19:21:22 CST 2016

10.1.32.75 | success | rc=0 >>
Sat Nov 19 19:21:22 CST 2016
```

确保各个节点之间的时间同步

2、修改主节点的mysql服务配置文件，让其符合主从架构中主节点的要求

```
[root@node72 ~]#
[root@node72 ~]# vim /etc/my.cnf
```
修改主节点的配置文件，让其符合主从复制架构中主节点的需求

```
[mysqld]
datadir=/var/lib/mysql
socket=/var/lib/mysql/mysql.sock
# Disabling symbolic-links is recommended to prevent assorted security risks
symbolic-links=0
# Settings user and group are ignored when systemd is used.
# If you need to run mysqld under a different user or group,
# customize your systemd unit file for mariadb according to the
# instructions in http://fedoraproject.org/wiki/Systemd
skip_name_resolve = ON
```
禁用名称解析功能，(必给选项)

```
innodb_file_per_table = ON
```
innodb存储引擎每表一个表空间,(必给选项)

```
log_bin=/var/lib/mysql/binary.log
```
启动二进制日志记录的功能，指明二进制日志存储路径,(必给选项)

```
server_id=1
```
为服务器分配一个服务器ID，此服务器ID必须全局唯一，(必给选项)

```
sync_binlog=1
sync_master_info=1
```
此部分选项为优化选项，建议给出，为一些增强主从复制时候安全性的参数，写在配置文件中，让其永久有效，也可以在命令行中进行指明，但只是临时有效

```
[mysqld_safe]
log-error=/var/log/mariadb/mariadb.log
pid-file=/var/run/mariadb/mariadb.pid

[root@node72 ~]# vim /etc/my.cnf
[root@node72 ~]#
[root@node72 ~]#
[root@node72 ~]#
[root@node72 ~]#
[root@node72 ~]#
[root@node72 ~]# systemctl restart mariadb
```
修改完配置文件重启服务

```
[root@node72 ~]#
[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 ~]#
```

3、查看主节点现有数据情况和二进制日志使用情况

```
[root@node72 ~]# mysql -uroot -hlocalhost -p'111111';
```
查看主节点上相关的数据信息 和二进制日志信息

```
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 18
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)]> SHOW DATABASES;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| hellodb            |
| mysql              |
| performance_schema |
+--------------------+
4 rows in set (0.02 sec)
```

```
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   |
|        8 | zlbfcs1        |
|        9 | zlbfcs2        |
|       10 | zlbfcs3        |
|       11 | zlbfcs4        |
|       12 | ejz1           |
|       13 | ejz2           |
+----------+----------------+
13 rows in set (0.00 sec)

MariaDB [(none)]> SHOW MASTER LOGS;
+---------------+-----------+
| Log_name      | File_size |
+---------------+-----------+
| binary.000001 |      8508 |
| binary.000002 |       264 |
| binary.000003 |       245 |
+---------------+-----------+
3 rows in set (0.02 sec)

MariaDB [(none)]> SHOW MASTER STATUS;
+---------------+----------+--------------+------------------+
| File          | Position | Binlog_Do_DB | Binlog_Ignore_DB |
+---------------+----------+--------------+------------------+
| binary.000003 |      245 |              |                  |
+---------------+----------+--------------+------------------+
1 row in set (0.00 sec)

MariaDB [(none)]>
```

查看服务器使用的二进制日志文件的信息

当前正在使用的二进制日志文件的信息

4、对主节点的数据利用xtrabackup进行完全备份

> 由于两个从节点是后期加入，故采取备份主节点的数据，还原到从节点上，然后让从节点从备份时刻的二进制日志的位置开始复制的方式进行配置

```
[root@node72 ~]#
[root@node72 ~]# innobackupex --user='root' --host='localhost' --password='111111' /tmp
161119 19:56:31 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!".

Can't locate Digest/MD5.pm in @INC (@INC contains: /usr/local/lib64/perl5 /usr/local/share/perl5 /u
sr/lib64/perl5/vendor_perl /usr/share/perl5/vendor_perl /usr/lib64/perl5 /usr/share/perl5 .) at - l
ine 693.
BEGIN failed--compilation aborted at - line 693.
161119 19:56:31 Connecting to MySQL server host: localhost, user: root, password: set, port: 0, soc
ket: /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 = ./
[root@node72 ~]# cat /tmp/2016-11-19_19-56-31/xtrabackup_binlog_info
binary.000003   245
[root@node72 ~]#
[root@node72 ~]# cat /tmp/2016-11-19_19-56-31/xtrabackup_binlog_info
binary.000003   245
[root@node72 ~]#
```

利用xtrabackup工具，对主节点的数据进行完全备份

由于两个从节点是后期加入进来的，因此采用将完全备份恢复到两个节点上，然后让两个从节点从完全备份时的二进制日志所在的位置开始复制

5、在主节点上授权一个具有复制权限的用户，授权该用户只允许在从节点上登录

```
MariaDB [(none)]>
MariaDB [(none)]> GRANT REPLICATION SLAVE,REPLICATION CLIENT ON *.* TO 'rpuser'@'10.1.32.73' IDENTI
FIED BY '111111';
Query OK, 0 rows affected (0.10 sec)

MariaDB [(none)]> GRANT REPLICATION SLAVE,REPLICATION CLIENT ON *.* TO 'rpuser'@'10.1.32.75' IDENTI
FIED BY '111111';
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]>
```

在主服务器上，授权一个具有复制权限的用户，仅允许该用户在两个从节点上登录

6、在两个从节点上安装**mariadb-server**，并利用**xtrabackup**还原备份的数据到两个节点上

```
[root@node72 ~]# ansible slave -m yum -a 'name=mariadb-server state=present'
10.1.32.73 | success >> {
    "changed": true,
    "msg": "",
    "rc": 0,
    "results": [
        "Loaded plugins: fastestmirror\nLoading mirror speeds from cached hostfile\nResolving Depen
dencies\n--> Running transaction check\n---> Package mariadb-server.x86_64 1:5.5.44-2.el7.centos wi
ll be installed\n--> Processing Dependency: mariadb(x86-64) = 1:5.5.44-2.el7.centos for package: 1:
mariadb-server-5.5.44-2.el7.centos.x86_64\n--> Processing Dependency: perl-DBI for package: 1:maria
db-server-5.5.44-2.el7.centos.x86_64\n--> Processing Dependency: perl-DBD-MySQL for package: 1:mari
adb-server-5.5.44-2.el7.centos.x86_64\n--> Processing Dependency: perl(Data::Dumper) for package: 1
```

在两个从节点上安装mariadb-server程序包

```
[root@node72 ~]# ls
aa.txt  anaconda-ks.cfg  hellodb.sql  hellodb.sqlr  percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm
[root@node72 ~]#
[root@node72 ~]# ansible slave -m copy -a 'src=/root/percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm d
est=/root/'
10.1.32.75 | success >> {
    "changed": true,
    "checksum": "b3c1d2458a1a06fcefe8ae9c893c32f1456c4e0f",
    "dest": "/root/percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm",
    "gid": 0,
    "group": "root",
    "md5sum": "182683ad368d2591e7acbe8d2b18120e",
    "mode": "0644",
    "owner": "root",
    "size": 7839980,
    "src": "/root/.ansible/tmp/ansible-tmp-1479557174.64-125485979021106/source",
    "state": "file",
    "uid": 0
}

10.1.32.73 | success >> {
    "changed": true,
    "checksum": "b3c1d2458a1a06fcefe8ae9c893c32f1456c4e0f",
```

将xtrabackup程序包复制到两台从节点，然后安装xtrabackup程序包

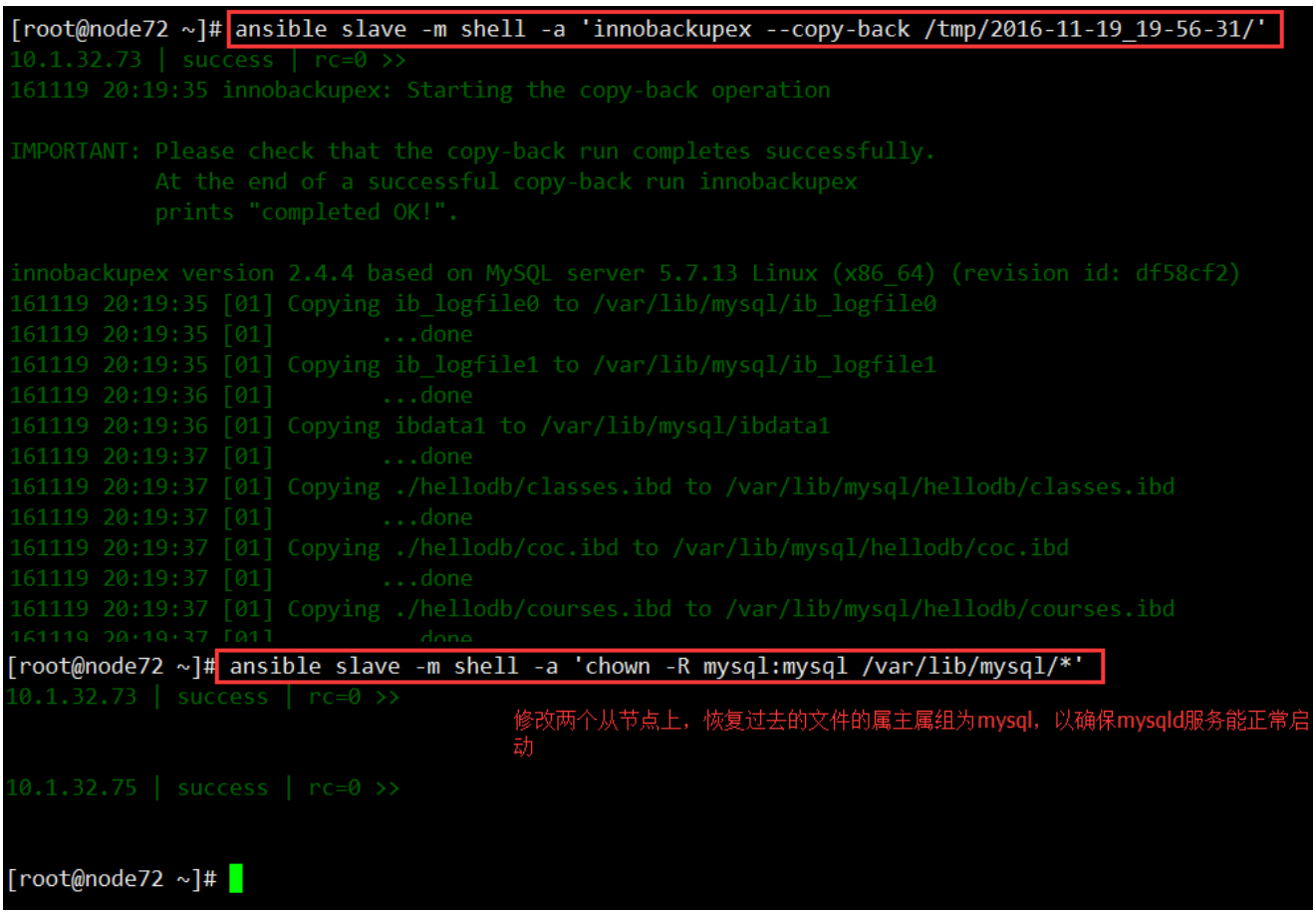
```
[root@node72 ~]# ansible slave -m yum -a 'name=/root/percona-xtrabackup-24-2.4.4-1.el7.x86_64.rpm s
tate=present'
10.1.32.75 | success >> {
    "changed": true,
    "msg": "",
    "rc": 0,
    "results": [
        "Loaded plugins: fastestmirror\nExamining /root/percona-xtrabackup-24-2.4.4-1.el7.x86_64.rp
m: percona-xtrabackup-24-2.4.4-1.el7.x86_64\nMarking /root/percona-xtrabackup-24-2.4.4-1.el7.x86_64
.rpm to be installed\nResolving Dependencies\n--> Running transaction check\n---> Package percona-x
trabackup-24.x86_64 0:2.4.4-1.el7 will be installed\n--> Processing Dependency: rsync for package:
percona-xtrabackup-24-2.4.4-1.el7.x86_64\nLoading mirror speeds from cached hostfile\n--> Processin
g Dependency: libev.so.4()(64bit) for package: percona-xtrabackup-24-2.4.4-1.el7.x86_64\n--> Runnin
g transaction check\n---> Package libev.x86_64 0:4.15-3.el7 will be installed\n---> Package rsync.x
86_64 0:3.0.9-17.el7 will be installed\n--> Finished Dependency Resolution\n\nDependencies Resolved
```

在两台slave节点上安装xtrabackup程序包

```
[root@node72 ~]# ansible slave -m copy -a 'src=/tmp/2016-11-19_19-56-31/ dest=/tmp/'
10.1.32.75 | success >> {
    "changed": true,
    "dest": "/tmp/",
    "src": "/tmp/2016-11-19_19-56-31"
}

10.1.32.73 | success >> {
    "changed": true,
    "dest": "/tmp/",
    "src": "/tmp/2016-11-19_19-56-31"
}
```

拷贝主节点上完全备份的数据到两台从节点上



7、修改两个从节点上的mysql服务的配置文件，让其符合主从架构中从节点的配置要求

```
[root@node73 ~]# vim /etc/my.cnf
                                    修改从节点上的配置文件，让其符合主从架构中从节点的要求
[mysqld]
datadir=/var/lib/mysql
socket=/var/lib/mysql/mysql.sock
# Disabling symbolic-links is recommended to prevent assorted security risks
symbolic-links=0
# Settings user and group are ignored when systemd is used.
# If you need to run mysqld under a different user or group,
# customize your systemd unit file for mariadb according to the
# instructions in http://fedoraproject.org/wiki/Systemd
skip_name_resolve = ON 禁止名称解析，(必给选项)
innodb_file_per_table = ON 设定innodb存储引擎每表一个表空间
server_id=73 设定当前服务器的server id，必须全局唯一
relay_log=relay-log 启动中继日志功能，并指明中继日志文件路径
read_only=ON 禁止无关用户向从服务器数据库执行写操作
skip_slave_start=ON
sync_relay_log=1          此为可选选项，用于提升复制时的安全性和稳定性，建议给明
sync_relay_log_info=1

[mysqld_safe]
log-error=/var/log/mariadb/mariadb.log
pid-file=/var/run/mariadb/mariadb.pid
[root@node75 ~]# vim /etc/my.cnf      在另一个从节点也做出类似配置

[mysqld]
datadir=/var/lib/mysql
socket=/var/lib/mysql/mysql.sock
# Disabling symbolic-links is recommended to prevent assorted security risks
symbolic-links=0
# Settings user and group are ignored when systemd is used.
# If you need to run mysqld under a different user or group,
# customize your systemd unit file for mariadb according to the
# instructions in http://fedoraproject.org/wiki/Systemd
skip_name_resolve = ON
innodb_file_per_table = ON
server_id=75
relay_log=relay-log
read_only=ON
skip_slave_start=ON
sync_relay_log=1
sync_relay_log_info=1

[mysqld_safe]
log-error=/var/log/mariadb/mariadb.log
pid-file=/var/run/mariadb/mariadb.pid
```

8、启动从节点的mysql服务，并配置其连接到主服务器进行工作的复制属性，启动复制线程

```
[root@node73 ~]# systemctl start mariadb
[root@node73 ~]# 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@node73 ~]#
[root@node73 ~]# mysql -uroot -p'111111'
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 2
Server version: 5.5.44-MariaDB 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)]> CHANGE MASTER TO MASTER_HOST='10.1.32.72',MASTER_USER='rpuser',MASTER_PASSWORD='1
11111',MASTER_LOG_FILE='binary.000003',MASTER_LOG_POS=245;
Query OK, 0 rows affected (0.02 sec)

MariaDB [(none)]> START SLAVE;
Query OK, 0 rows affected (0.02 sec)

MariaDB [(none)]>
```

在从节点上启动服务

连接到mysql

配置该从节点以哪个用户身份，登录哪个主服务器的哪个二进制日志文件的哪个位置开始复制，此处复制的位置应该与完全备份时，二进制日志文件所处的位置一直

启动从服务器的复制线程，会自动启动IO_THREAD和SQL_THREAD

```
[root@node75 ~]#
[root@node75 ~]# systemctl start mariadb
[root@node75 ~]# 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@node75 ~]#
[root@node75 ~]# mysql -uroot -p'111111'
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 2
Server version: 5.5.44-MariaDB 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)]> CHANGE MASTER TO MASTER_HOST='10.1.32.72',MASTER_USER='rpuser',MASTER_PASSWORD='1
11111',MASTER_LOG_FILE='binary.000003',MASTER_LOG_POS=245;
Query OK, 0 rows affected (0.05 sec)

MariaDB [(none)]> START SLAVE;
Query OK, 0 rows affected (0.00 sec)

MariaDB [(none)]>
```

在另一个从节点也执行同样操作

```
MariaDB [(none)]> SHOW SLAVE STATUS\G
*************************** 1. row ***************************
               Slave_IO_State: Connecting to master
                  Master_Host: 10.1.32.72
                  Master_User: rpuser
                  Master_Port: 3306
                Connect_Retry: 60
              Master_Log_File: binary.000003
          Read_Master_Log_Pos: 245
               Relay_Log_File: relay-log.000003
```

在两个节点上查看从节点的状态信息

```
               Relay_Log_Pos: 4
       Relay_Master_Log_File: binary.000003
            Slave_IO_Running: Yes
           Slave_SQL_Running: Yes
             Replicate_Do_DB:
         Replicate_Ignore_DB:
          Replicate_Do_Table:
      Replicate_Ignore_Table:
     Replicate_Wild_Do_Table:
  Replicate_Wild_Ignore_Table:
                   Last_Errno: 0
                   Last_Error:
                 Skip_Counter: 0
          Exec_Master_Log_Pos: 245
              Relay_Log_Space: 245
              Until_Condition: None
```

验证复制相关的线程是否正常

9、验证主从复制是否成功

```
MariaDB [hellodb]> DELETE FROM courses WHERE CourseID in (8,9,10,11,12,13);
Query OK, 6 rows affected (0.03 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   |
+----------+----------------+
7 rows in set (0.00 sec)

MariaDB [hellodb]> \q
Bye
[root@node72 ~]# mysql -uroot -h10.1.32.73 -p111111 -e 'SELECT * FROM hellodb.courses'
+----------+----------------+
| CourseID | Course         |
+----------+----------------+
|        1 | Hamo Gong      |
|        2 | Kuihua Baodian |
|        3 | Jinshe Jianfa  |
|        4 | Taiji Quan     |
|        5 | Daiyu Zanghua  |
|        6 | Weituo Zhang   |
|        7 | Dagou Bangfa   |
+----------+----------------+
```

在主节点上对数据进行修改，验证从节点是否同步

发现从节点上的数据与主节点同步