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Set up and testing ProxySQL

objectives:

- setup ProxySQL load balancer on one server
- configuring ProxySQL
- test the performance and load balancing of ProxySQL with SYSBENCH
- setup ProxySQL architecture with no single point of failure

Installation

Follow this tutorial to install the latest ProxySQL:

https://github.com/sysown/proxysql/wiki

in order to connect to admin interface in proxysql use:

```
mysql -u admin -padmin -h 127.0.0.1 -P6032 --prompt='Admin> '
```

After installation and services configuration, it’s time to move on to the next part.

Configuring ProxySQL

Follow this tutorial to Config ProxySQL:

https://github.com/sysown/proxysql/wiki/ProxySQL-Configuration

in our example we have added our galera cluster to server hosts.

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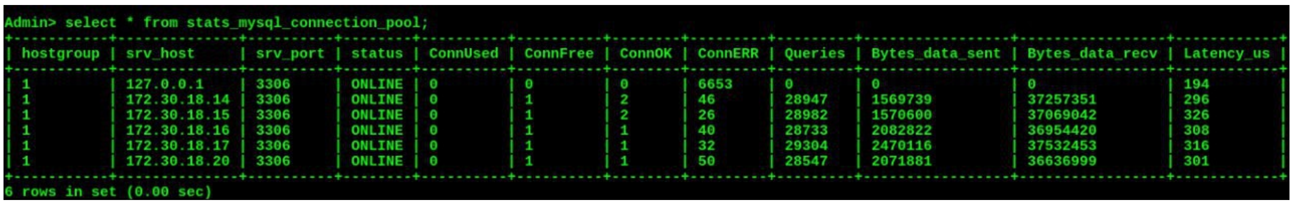

```
Admin> select * from stats_mysql_connection_pool;
+-----------+--------------+----------+--------+----------+----------+--------+---------+---------+-----------------+-----------------+------------+
| hostgroup | srv_host     | srv_port | status | ConnUsed | ConnFree | ConnOK | ConnERR | Queries | Bytes_data_sent | Bytes_data_recv | Latency_us |
+-----------+--------------+----------+--------+----------+----------+--------+---------+---------+-----------------+-----------------+------------+
| 1         | 127.0.0.1    | 3306     | ONLINE | 0        | 0        | 0      | 6653    | 0       | 0               | 0               | 194        |
| 1         | 172.30.18.14 | 3306     | ONLINE | 0        | 1        | 2      | 46      | 28947   | 1569739         | 37257351        | 296        |
| 1         | 172.30.18.15 | 3306     | ONLINE | 0        | 1        | 2      | 26      | 28982   | 1570600         | 37069042        | 326        |
| 1         | 172.30.18.16 | 3306     | ONLINE | 0        | 1        | 1      | 40      | 28733   | 2082822         | 36954420        | 308        |
| 1         | 172.30.18.17 | 3306     | ONLINE | 0        | 1        | 1      | 32      | 29304   | 2470116         | 37532453        | 316        |
| 1         | 172.30.18.20 | 3306     | ONLINE | 0        | 1        | 1      | 50      | 28547   | 2071881         | 36636999        | 301        |
+-----------+--------------+----------+--------+----------+----------+--------+---------+---------+-----------------+-----------------+------------+
6 rows in set (0.00 sec)
```

As you see there are 5 servers (ignore the localhost).

COMMON ERRORS AND CONSIDERATIONS

1) grant remote access to the proxy sql in galera nodes:

https://confluence.atlassian.com/jirakb/configuring-database-connection-results-in-error-host-xxxxxxx-is-not-allowed-to-connect-to-this-mysql-server-358908249.html

Example:

```
GRANT ALL PRIVILEGES ON *.* TO root@95.38.85.241 IDENTIFIED BY '*****' WITH
GRANT OPTION;
GRANT ALL PRIVILEGES ON *.* TO root@95.38.85.242 IDENTIFIED BY '*****' WITH
GRANT OPTION;
GRANT ALL PRIVILEGES ON *.* TO root@95.38.85.243 IDENTIFIED BY '*****' WITH
GRANT OPTION;
```

for example after granting remote access to server 22, 241, 242, 243 the output of following command should be something like this:

```
SELECT IFNULL(usr,'All Users') user,IFNULL(hst,'All Hosts') host,COUNT(1) Connections
FROM (     SELECT user usr,LEFT(host,LOCATE(':',host) - 1) hst     FROM
information_schema.processlist ) A GROUP BY usr,hst WITH ROLLUP;
```

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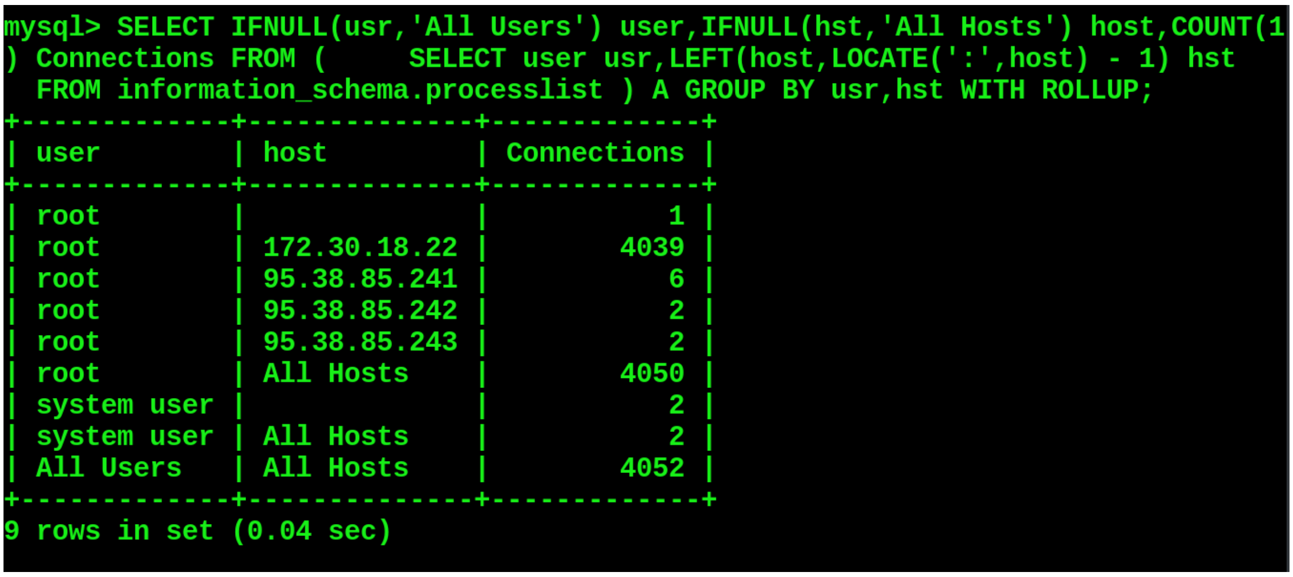

```
mysql> SELECT IFNULL(usr,'All Users') user,IFNULL(hst,'All Hosts') host,COUNT(1
) Connections FROM (     SELECT user usr,LEFT(host,LOCATE(':',host) - 1) hst
  FROM information_schema.processlist ) A GROUP BY usr,hst WITH ROLLUP;
+-------------+--------------+-------------+
| user        | host         | Connections |
+-------------+--------------+-------------+
| root        |              |           1 |
| root        | 172.30.18.22 |        4039 |
| root        | 95.38.85.241 |           6 |
| root        | 95.38.85.242 |           2 |
| root        | 95.38.85.243 |           2 |
| root        | All Hosts    |        4050 |
| system user |              |           2 |
| system user | All Hosts    |           2 |
| All Users   | All Hosts    |        4052 |
+-------------+--------------+-------------+
9 rows in set (0.04 sec)
```

2) change mysql password and creating users:

https://stackoverflow.com/questions/33510184/change-mysql-root-password-on-centos7

https://dev.mysql.com/doc/refman/8.0/en/resetting-permissions.html

https://www.fastwebhost.in/blog/mysql-list-users-how-to-list-mysql-user-accounts-via-command-line/

examples for user management:

```
CREATE USER 'root'@'95.38.85.241' BY '*******';

ALTER USER 'root'@'localhost' IDENTIFIED BY '';
```

3) configuring mysql users in proxy sql:

https://github.com/sysown/proxysql/wiki/Users-configuration

examples:

```
UPDATE mysql.user SET authentication_string = PASSWORD('*******') WHERE User = 'root'
AND Host = 'localhost';

GRANT ALL PRIVILEGES ON *.* TO root@172.30.18.15 IDENTIFIED BY '('*******')' WITH
GRANT OPTION;

INSERT INTO mysql_users (username,password,default_hostgroup) VALUES
```

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```
('root','('*******')',1);
```

4) Also consider number of connections per user:

https://dba.stackexchange.com/questions/115309/view-active-mysql-connections-per-user

sometimes the default maximum number of connections will the bottle in performance tests.

In order to change the value:

https://dev.mysql.com/doc/refman/5.5/en/user-resources.html

5) consider limitations on mysql and OS:

for example number of open files in mysql:

https://dev.mysql.com/doc/refman/5.5/en/server-options.html#option_mysqld_open-files-limit

and os limitations like ulimit and number of open files (I have documented this part TCP and OS tuning document)

6) detailed mysql server configurations in proxysql:

https://github.com/sysown/proxysql/wiki/MySQL-Server-Configuration

usage of weighted balancing, SSL connection and so on.

Split and process queries

There are many options, simple one should be spliting read and writes with host group id:

https://severalnines.com/blog/how-set-read-write-split-galera-cluster-using-proxysql

https://github.com/sysown/proxysql/wiki/ProxySQL-Configuration#mysql-replication-hostgroups

NOTE config the galera nodes (mysql) to `read_only` see the separation of host id’s.

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The more complex query processing is to use query roles with regex:

https://github.com/sysown/proxysql/wiki/ProxySQL-Configuration#mysql-query-rules

Testing With SYSBENCH

For testing we will follow the tutorial here.

https://www.percona.com/doc/percona-xtradb-cluster/LATEST/howtos/proxysql.html#testing-cluster-with-sysbench

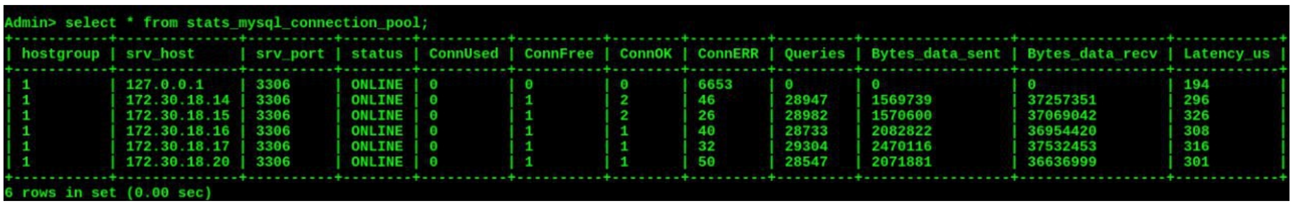
First create database on one of the galera nodes and it will be created on the other nodes automatically.

For SYSBENCH use this version:

http://repo.percona.com/release/centos/7/RPMS/x86_64/sysbench-0.5-6.el7.x86_64.rpm

The results for our configuration is here (there has been no rules set and there is only one host group)

the load balancing data:



```
Admin> select * from stats_mysql_connection_pool;
+-----------+--------------+----------+--------+----------+----------+--------+---------+---------+-----------------+-----------------+------------+
| hostgroup | srv_host     | srv_port | status | ConnUsed | ConnFree | ConnOK | ConnERR | Queries | Bytes_data_sent | Bytes_data_recv | Latency_us |
+-----------+--------------+----------+--------+----------+----------+--------+---------+---------+-----------------+-----------------+------------+
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| 1         | 172.30.18.17 | 3306     | ONLINE | 0        | 1        | 1      | 32      | 29304   | 2470116         | 37532453        | 316        |
| 1         | 172.30.18.20 | 3306     | ONLINE | 0        | 1        | 1      | 50      | 28547   | 2071881         | 36636999        | 301        |
+-----------+--------------+----------+--------+----------+----------+--------+---------+---------+-----------------+-----------------+------------+
6 rows in set (0.00 sec)
```

as you can see the queries are well balanced among 5 galera nodes.

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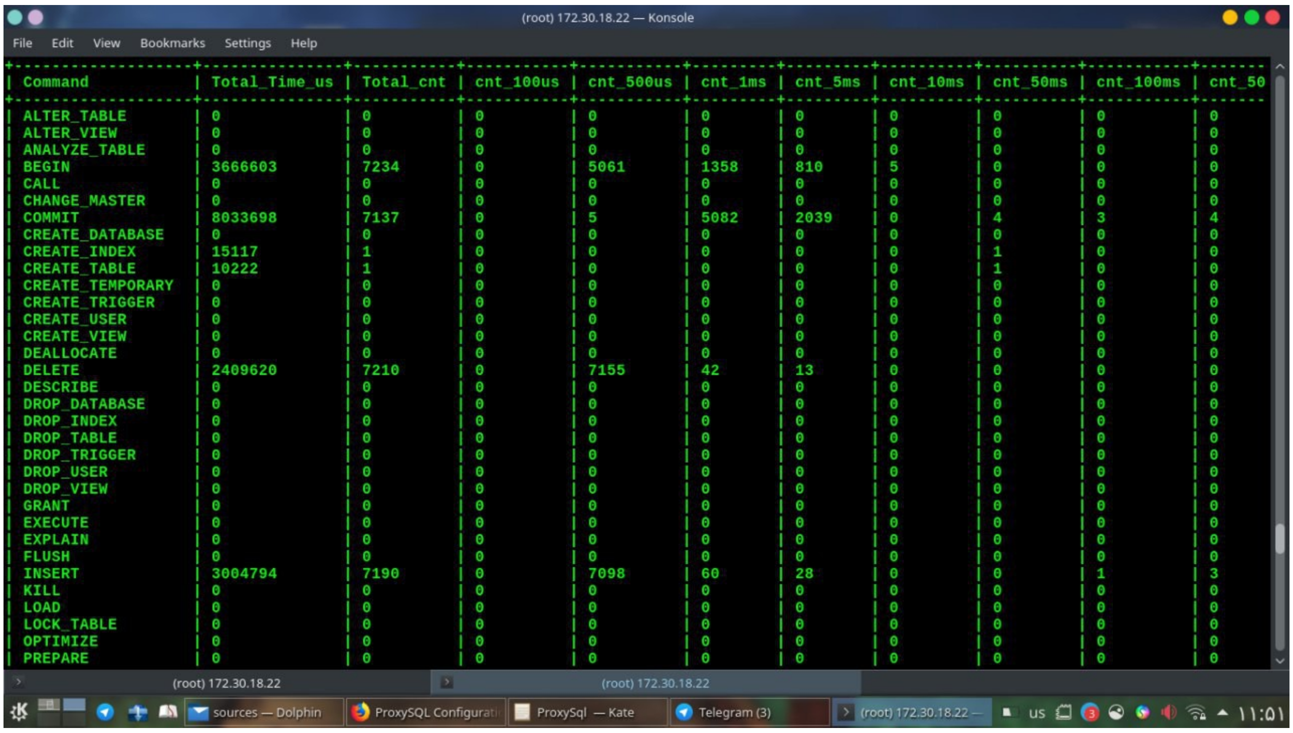
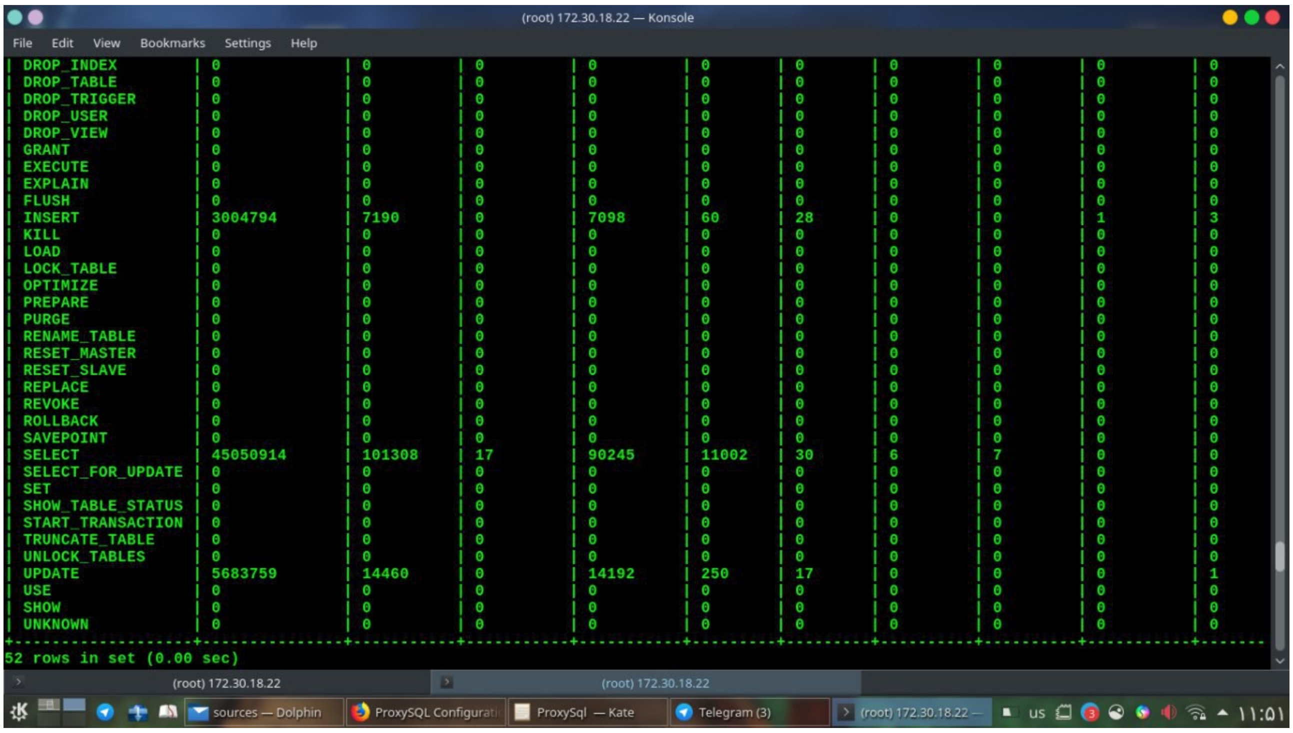
Type of queries



```
+-------------------+---------------+-----------+-----------+-----------+---------+---------+----------+----------+-----------+-------
| Command           | Total_Time_us | Total_cnt | cnt_100us | cnt_500us | cnt_1ms | cnt_5ms | cnt_10ms | cnt_50ms | cnt_100ms | cnt_50
+-------------------+---------------+-----------+-----------+-----------+---------+---------+----------+----------+-----------+-------
| ALTER_TABLE       | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| ALTER_VIEW        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| ANALYZE_TABLE     | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| BEGIN             | 3666603       | 7234      | 0         | 5061      | 1358    | 810     | 5        | 0        | 0         | 0
| CALL              | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| CHANGE_MASTER     | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| COMMIT            | 8033698       | 7137      | 0         | 5         | 5082    | 2039    | 0        | 4        | 3         | 4
| CREATE_DATABASE   | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| CREATE_INDEX      | 15117         | 1         | 0         | 0         | 0       | 0       | 0        | 1        | 0         | 0
| CREATE_TABLE      | 10222         | 1         | 0         | 0         | 0       | 0       | 0        | 1        | 0         | 0
| CREATE_TEMPORARY  | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| CREATE_TRIGGER    | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| CREATE_USER       | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| CREATE_VIEW       | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DEALLOCATE        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DELETE            | 2409620       | 7210      | 0         | 7155      | 42      | 13      | 0        | 0        | 0         | 0
| DESCRIBE          | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_DATABASE     | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_INDEX        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_TABLE        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_TRIGGER      | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_USER         | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_VIEW         | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| GRANT             | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| EXECUTE           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| EXPLAIN           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| FLUSH             | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| INSERT            | 3004794       | 7190      | 0         | 7098      | 60      | 28      | 0        | 0        | 1         | 3
| KILL              | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| LOAD              | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| LOCK_TABLE        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| OPTIMIZE          | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| PREPARE           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
```



```
| DROP_INDEX        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_TABLE        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_TRIGGER      | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_USER         | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| DROP_VIEW         | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| GRANT             | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| EXECUTE           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| EXPLAIN           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| FLUSH             | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| INSERT            | 3004794       | 7190      | 0         | 7098      | 60      | 28      | 0        | 0        | 1         | 3
| KILL              | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| LOAD              | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| LOCK_TABLE        | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| OPTIMIZE          | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| PREPARE           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| PURGE             | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| RENAME_TABLE      | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| RESET_MASTER      | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| RESET_SLAVE       | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| REPLACE           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| REVOKE            | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| ROLLBACK          | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| SAVEPOINT         | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| SELECT            | 45050914      | 101308    | 17        | 90245     | 11002   | 30      | 6        | 7        | 0         | 0
| SELECT_FOR_UPDATE | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| SET               | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| SHOW_TABLE_STATUS | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| START_TRANSACTION | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| TRUNCATE_TABLE    | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| UNLOCK_TABLES     | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| UPDATE            | 5683759       | 14460     | 0         | 14192     | 250     | 17      | 0        | 0        | 0         | 1
| USE               | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| SHOW              | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
| UNKNOWN           | 0             | 0         | 0         | 0         | 0       | 0       | 0        | 0        | 0         | 0
+-------------------+---------------+-----------+-----------+-----------+---------+---------+----------+----------+-----------+-------
52 rows in set (0.00 sec)
```

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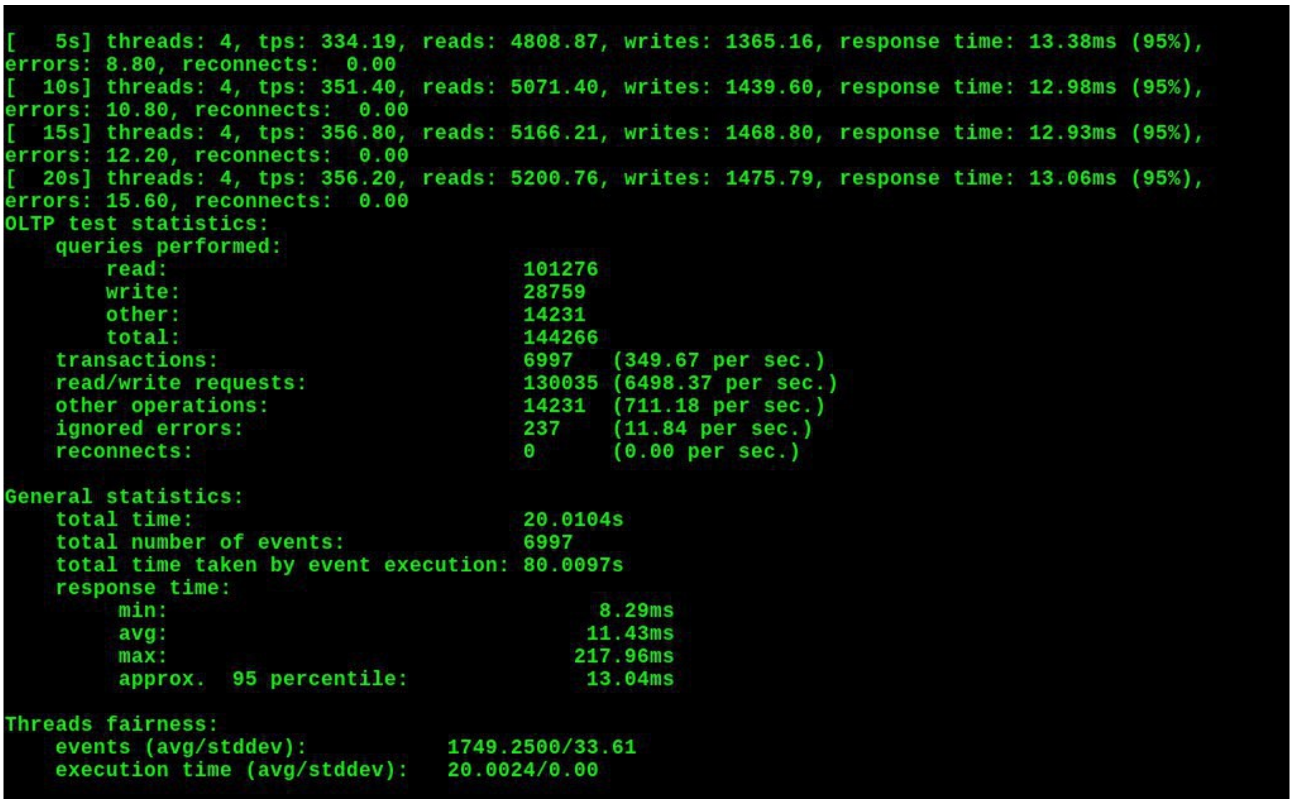
The statistical report



```
[   5s] threads: 4, tps: 334.19, reads: 4808.87, writes: 1365.16, response time: 13.38ms (95%),
errors: 8.80, reconnects:  0.00
[  10s] threads: 4, tps: 351.40, reads: 5071.40, writes: 1439.60, response time: 12.98ms (95%),
errors: 10.80, reconnects:  0.00
[  15s] threads: 4, tps: 356.80, reads: 5166.21, writes: 1468.80, response time: 12.93ms (95%),
errors: 12.20, reconnects:  0.00
[  20s] threads: 4, tps: 356.20, reads: 5200.76, writes: 1475.79, response time: 13.06ms (95%),
errors: 15.60, reconnects:  0.00
OLTP test statistics:
    queries performed:
        read:                            101276
        write:                           28759
        other:                           14231
        total:                           144266
    transactions:                        6997   (349.67 per sec.)
    read/write requests:                 130035 (6498.37 per sec.)
    other operations:                    14231  (711.18 per sec.)
    ignored errors:                      237    (11.84 per sec.)
    reconnects:                          0      (0.00 per sec.)

General statistics:
    total time:                          20.0104s
    total number of events:              6997
    total time taken by event execution: 80.0097s
    response time:
         min:                                  8.29ms
         avg:                                 11.43ms
         max:                                217.96ms
         approx.  95 percentile:              13.04ms

Threads fairness:
    events (avg/stddev):           1749.2500/33.61
    execution time (avg/stddev):   20.0024/0.00
```

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ProxySQL High-Availability

ProxySQL it self can be a SPOF, but there are many workarounds for this problem:

https://github.com/sysown/proxysql/wiki/Frequently-Asked-Questions#5-how-do-we-avoid-the-problem-of-proxysql-being-a-single-point-of-failure-

for more information I recommend reading this article:

https://dzone.com/articles/setting-up-proxysql-for-high-availability-no-singl

depend on your need of availability and architecture the solution differs.

For small number of app nodes, I will recommend deploy app and proxysql with each other on one server.

//TO DO

the results of high availability tests are not reachable at the moment.