



# PERCONA

Databases run better with Percona

ProxySQL no MySQL: Apenas  
um load balancer?





# Agenda

# Agenda

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A large, stylized, light orange logo is positioned on the left side of the image. It features a thick, geometric design that combines a triangle and a circle, creating a unique, abstract shape. The logo is composed of several overlapping lines and shapes, giving it a dynamic and modern appearance.

Sobre mim

# Roberto Garcia de Bem



Engenheiro de Suporte  
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DBA durante quase 4  
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Trabalhando com MySQL  
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O que é o ProxySQL?

# O que é o ProxySQL?

A High Performance MySQL Proxy: ProxySQL is an open source high performance, high availability, database protocol aware proxy for MySQL

Um MySQL Proxy de Alta Performance: ProxySQL é um proxy de código aberto de alto desempenho e alta disponibilidade com reconhecimento de protocolo de banco de dados para MySQL. (Tradução Livre)

Criado e mantido por: René Canhaõ

<https://github.com/sysown/proxysql>

<https://proxysql.com/>





# ProxySQL Instalação

- Source code / RPM / DEB / Percona repo (yum / apt)

<https://proxysql.com/documentation/installing-proxysql/>

<https://www.percona.com/download-proxysql>

<https://docs.percona.com/percona-software-repositories/index.html>



# Features ProxySQL



# Features ProxySQL

Load Balance

# Load Balance

## Divisão da Leitura e escrita

```
[root@roberto-garciadebem-node3 ~]# mysql -uroot -p'verysecretpassword1^' -h127.0.0.1 -P6033 -e'INSERT INTO test.t1 VALUES (null,@@hostname)'
```

```
[root@roberto-garciadebem-node3 ~]# mysql -uroot -p'verysecretpassword1^' -h127.0.0.1 -P6033 -e'SELECT @@HOSTNAME,hostname as node FROM test.t1'
```

@@HOSTNAME	node
roberto-garciadebem-node1	roberto-garciadebem-default

```
[root@roberto-garciadebem-node3 ~]# mysql -uroot -p'verysecretpassword1^' -h127.0.0.1 -P6033 -e'SELECT @@HOSTNAME,hostname as node FROM test.t1'
```

@@HOSTNAME	node
roberto-garciadebem-node2	roberto-garciadebem-default

# Load balance – principais tabelas

- mysql\_replication\_hostgroups/mysql\_group\_replication\_hostgroups/  
mysql\_galera\_hostgroups

```
ProxySQL > SELECT * FROM mysql_replication_hostgroups;
```

writer_hostgroup	reader_hostgroup	check_type	comment
1	2	read_only	

```
1 row in set (0.00 sec)
```

# Load balance – principais tabelas

- `mysql_servers`

```
ProxySQL > select hostgroup_id,hostname,status,weight from mysql_servers;
```

hostgroup_id	hostname	status	weight
1	10.124.33.61	ONLINE	1
2	10.124.33.69	ONLINE	1
2	10.124.33.22	ONLINE	1

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

# Load balance – principais tabelas

- `mysql_query_rules`

```
ProxySQL > SELECT rule_id,active,match_pattern,destination_hostgroup,apply FROM mysql_query_rules;
```

rule_id	active	match_pattern	destination_hostgroup	apply
1	1	^SELECT .*	2	0
2	1	^SELECT .* FOR UPDATE	1	0

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

# Load balance – principais tabelas

- mysql\_user

```
ProxySQL > SELECT username,password,active,default_hostgroup FROM mysql_users;
```

username	password	active	default_hostgroup
root	verysecretpassword1^	1	1

```
1 row in set (0.00 sec)
```



# Load Balance

## Configuração dos Hostgroups/Servers

```
ProxySQL > select * from runtime_mysql_replication_hostgroups;
+-----+-----+-----+-----+
| writer_hostgroup | reader_hostgroup | check_type | comment |
+-----+-----+-----+-----+
| 1                | 2                | read_only  |         |
+-----+-----+-----+-----+
1 row in set (0.00 sec)
```

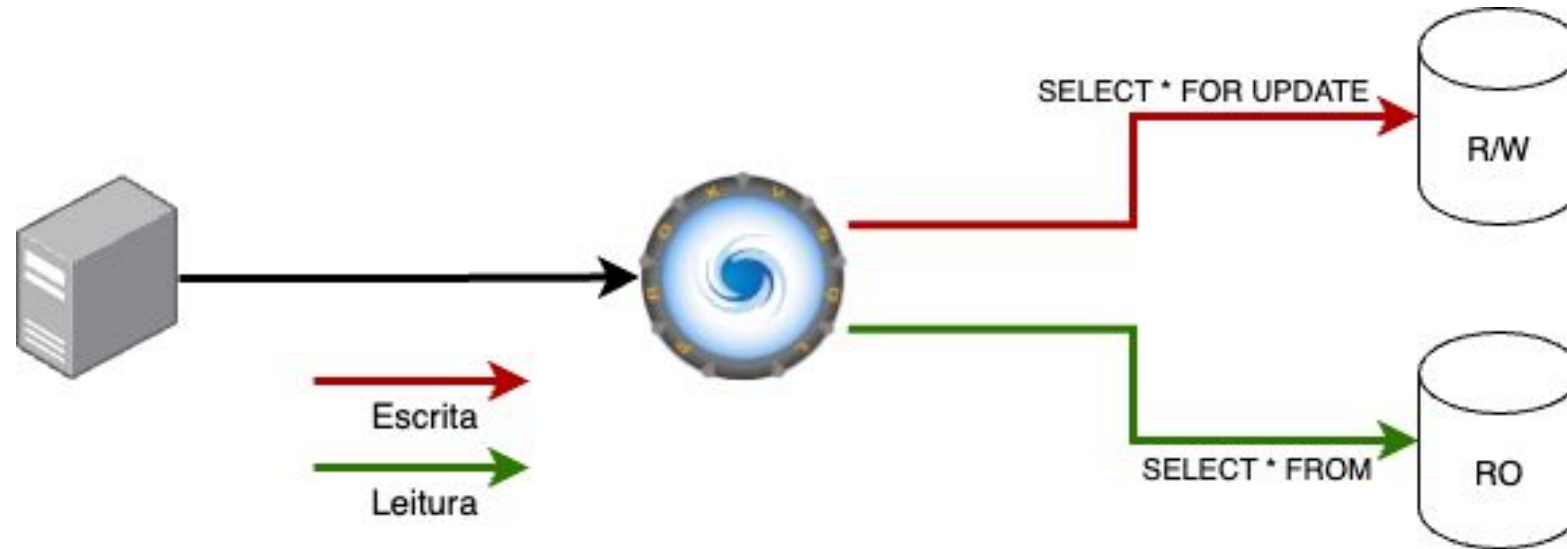
```
ProxySQL > select hostgroup_id,hostname from runtime_mysql_servers;
+-----+-----+
| hostgroup_id | hostname      |
+-----+-----+
| 1            | 10.124.33.61 |
| 2            | 10.124.33.22 |
| 2            | 10.124.33.69 |
+-----+-----+
3 rows in set (0.00 sec)
```

```
ProxySQL > select rule_id,active,match_pattern,destination_hostgroup from runtime_mysql_query_rules;
+-----+-----+-----+-----+
| rule_id | active | match_pattern          | destination_hostgroup |
+-----+-----+-----+-----+
| 1       | 1     | ^SELECT .*            | 2                     |
| 2       | 1     | ^SELECT .* FOR UPDATE | 1                     |
+-----+-----+-----+-----+
2 rows in set (0.00 sec)
```

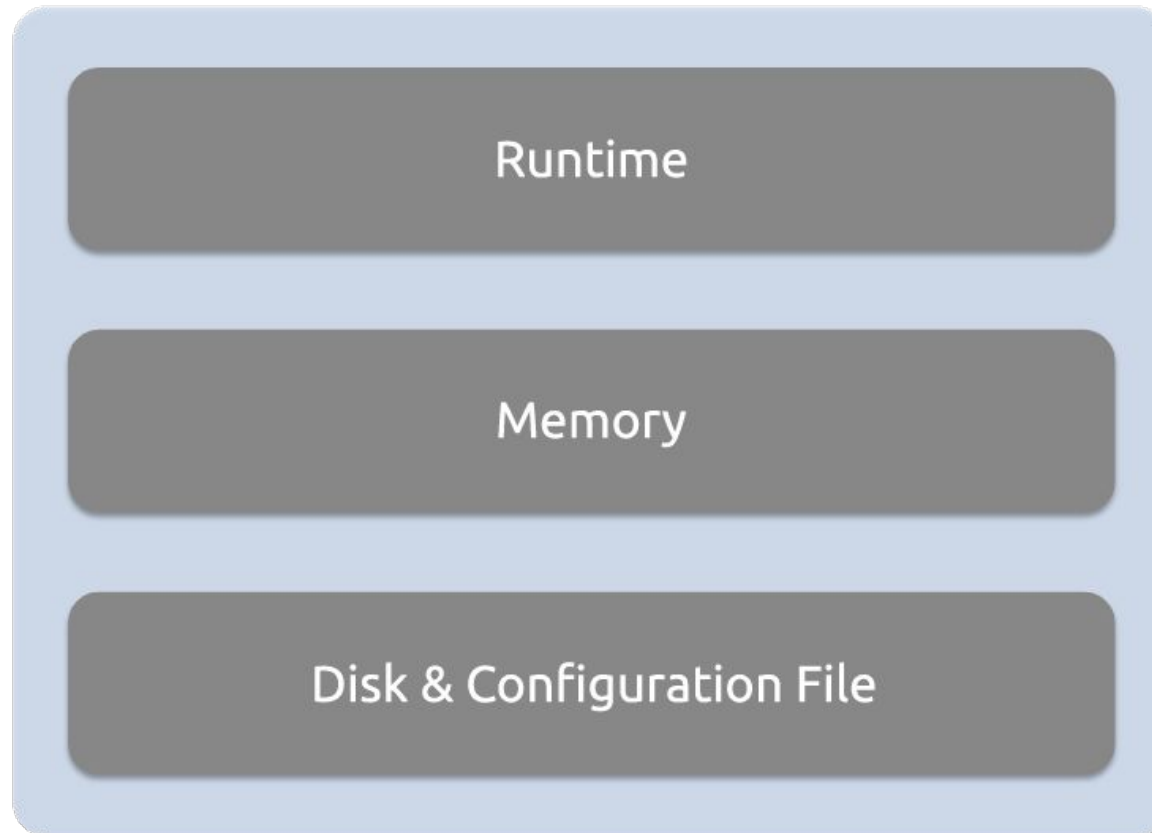
NAME	STATE	IPV4
roberto-garciadebem-default	RUNNING	10.124.33.61 (eth0)
roberto-garciadebem-node1	RUNNING	10.124.33.22 (eth0)
roberto-garciadebem-node2	RUNNING	10.124.33.69 (eth0)
roberto-garciadebem-node3	RUNNING	10.124.33.232 (eth0)

# Load Balance

Divisão da Leitura e escrita



# Camadas ProxySQL

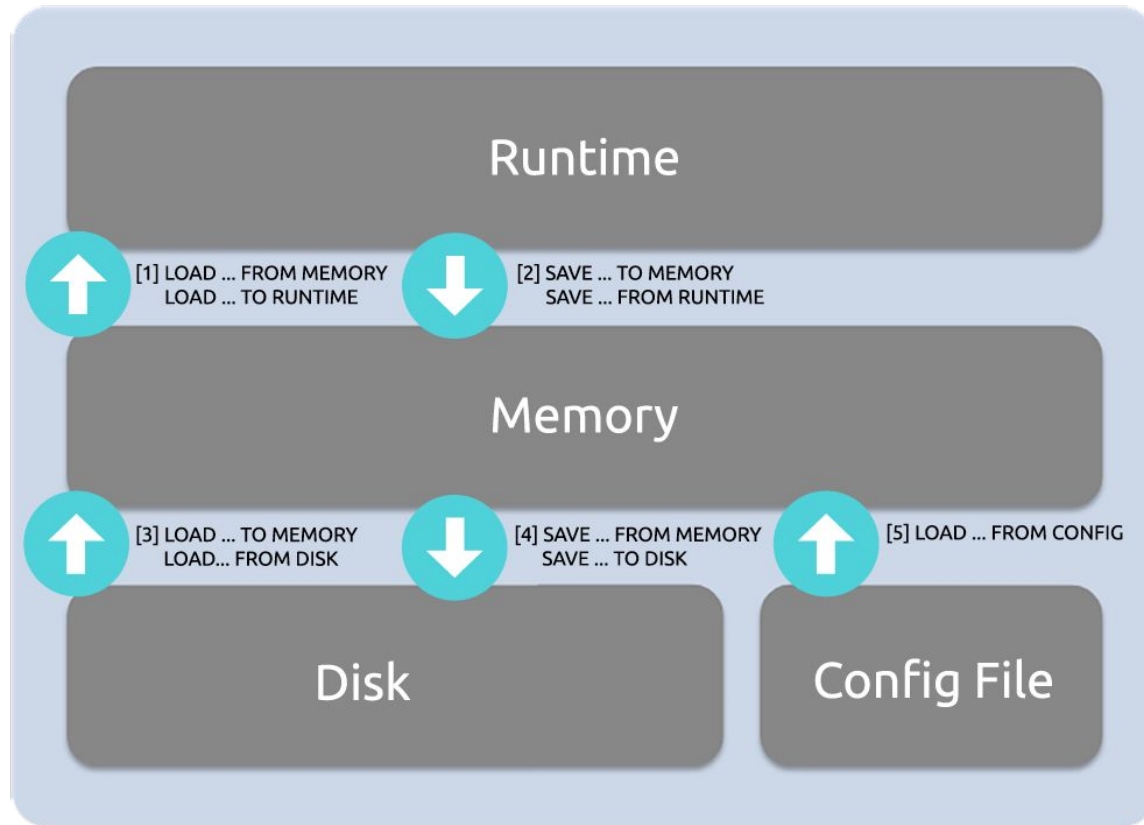


**Runtime:** Representa os valores em memória do ProxySQL. Tabelas iniciadas com runtime.

**Memory:** Representa o banco de dados em memória onde editamos configurações no ProxySQL.

**Disk:** Representa o banco de dados em disco (SQLite3).

# Alterando configurações entre camadas



Utilizamos os comandos LOAD e SAVE para alterar uma configuração entre camadas.

*Nota: mudanças são ativadas quando estão em runtime e mudanças não salvas em disco serão perdidas em caso de restart.*

# Alterando configurações entre camadas – Runtime

```
ProxySQL > INSERT INTO mysql_users (username,password,active,default_hostgroup) VALUES ('sandbox','sandbox',1,1);
Query OK, 1 row affected (0.00 sec)
```

```
ProxySQL > SELECT username,password,active,default_hostgroup FROM runtime_mysql_users;
```

username	password	active	default_hostgroup
root	*A4EAAFACAC7E8241A4C7C903D8E679158895BD32	1	1
root	*A4EAAFACAC7E8241A4C7C903D8E679158895BD32	1	1

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

```
ProxySQL > LOAD MYSQL USERS TO RUNTIME;
Query OK, 0 rows affected (0.00 sec)
```

```
ProxySQL > SELECT username,password,active,default_hostgroup FROM runtime_mysql_users;
```

username	password	active	default_hostgroup
root	*A4EAAFACAC7E8241A4C7C903D8E679158895BD32	1	1
sandbox	*BCA924B5D75F31FC6310837B9AFBB64022D1A0E9	1	1
root	*A4EAAFACAC7E8241A4C7C903D8E679158895BD32	1	1
sandbox	*BCA924B5D75F31FC6310837B9AFBB64022D1A0E9	1	1

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

# Alterando configurações entre camadas – Disk

```
[root@roberto-garciadebem-node3 ~]# systemctl restart proxysql
[root@roberto-garciadebem-node3 ~]# mysql -uadmin -padmin -h127.0.0.1 -P6032 --prompt='ProxySQL > '
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 1
Server version: 5.5.30 (ProxySQL Admin Module)
```

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

```
ProxySQL > SELECT username,password,active,default_hostgroup FROM mysql_users;
```

username	password	active	default_hostgroup
root	verysecretpassword1^	1	1

```
1 row in set (0.00 sec)
```

# Alterando configurações entre camadas – Disk

```
ProxySQL > INSERT INTO mysql_users (username,password,active,default_hostgroup) VALUES ('sandbox','sandbox',1,1);
Query OK, 1 row affected (0.00 sec)
```

```
ProxySQL > SAVE MYSQL USERS TO DISK;
Query OK, 0 rows affected (1.12 sec)
```

```
ProxySQL > EXIT
```

Bye

```
[root@roberto-garciadebem-node3 ~]# systemctl restart proxysql
```

```
[root@roberto-garciadebem-node3 ~]# mysql -uadmin -padmin -h127.0.0.1 -P6032 --prompt='ProxySQL > '
```

Welcome to the MariaDB monitor. Commands end with ; or \g.

Your MySQL connection id is 1

Server version: 5.5.30 (ProxySQL Admin Module)

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

```
ProxySQL > SELECT username,password,active,default_hostgroup FROM mysql_users;
```

username	password	active	default_hostgroup
root	verysecretpassword1^	1	1
sandbox	sandbox	1	1

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



# Alterando configurações entre camadas – Variáveis

Temos dois tipos de variáveis no ProxySQL:

- Admin
- MySQL

```
ProxySQL > SELECT * FROM global_variables LIMIT 115, 2;
```

variable_name	variable_value
mysql-query_cache_stores_empty_result	true
admin-stats_credentials	stats:stats

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



# Alterando configurações entre camadas – Variáveis

MySQL

```
ProxySQL > SELECT * FROM global_variables where variable_name like 'mysql-wait_timeout';
```

# Alterando configurações entre camadas – Variáveis

Admin

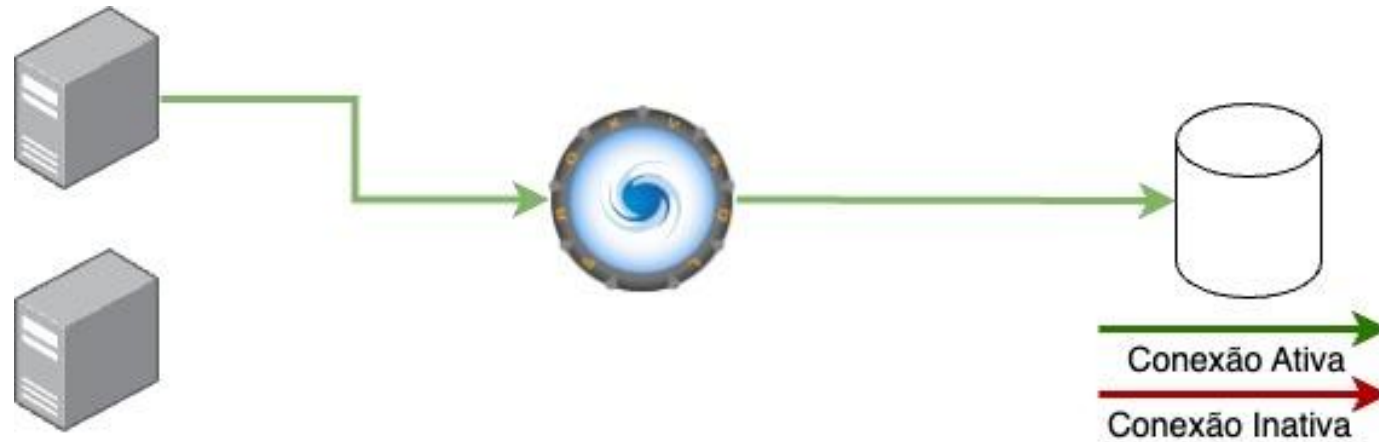
ProxySQL > |



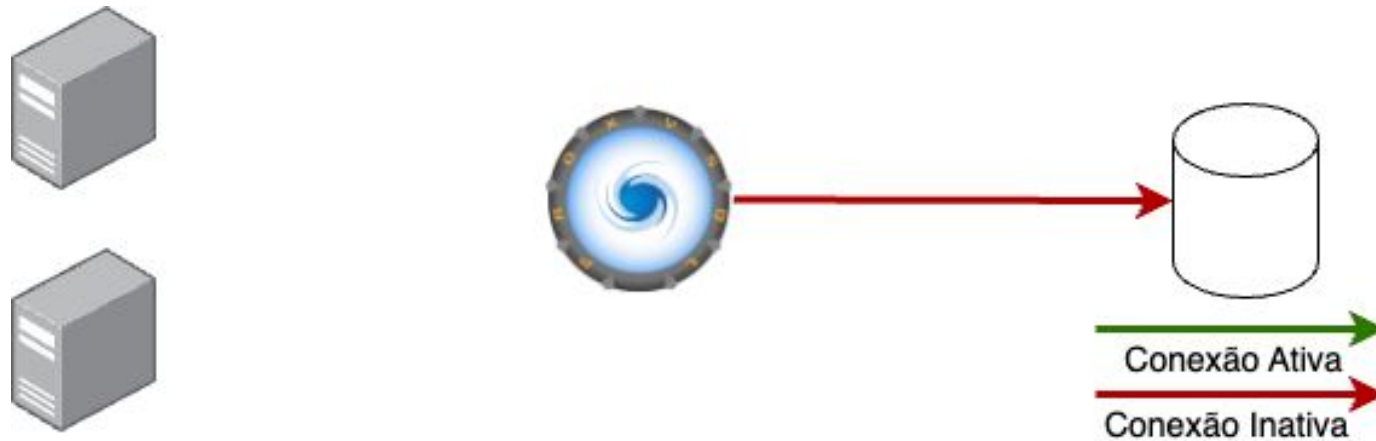
# Features ProxySQL

Connection Pool

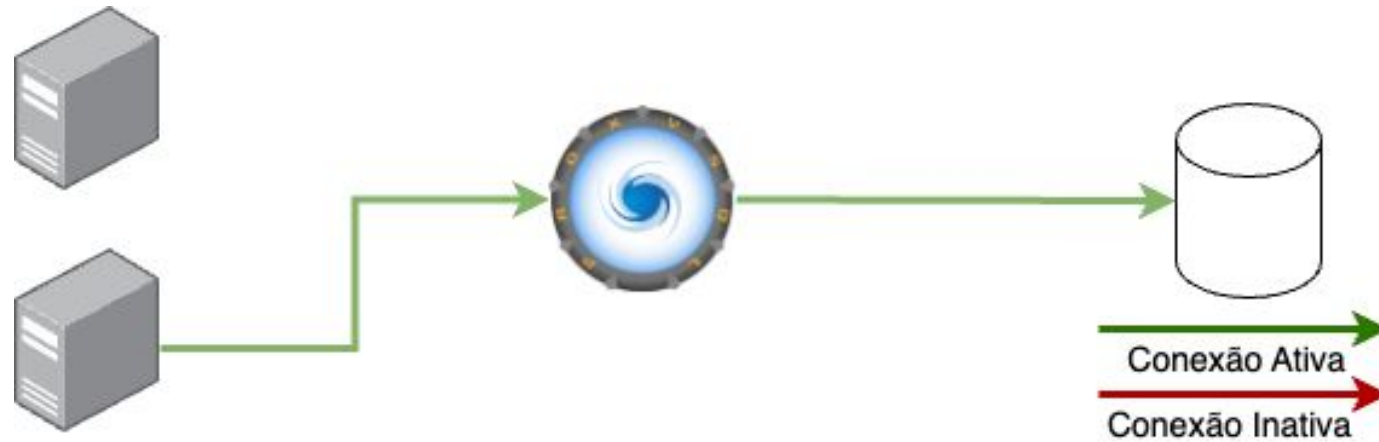
# Connection Pool



# Connection Pool



# Connection Pool

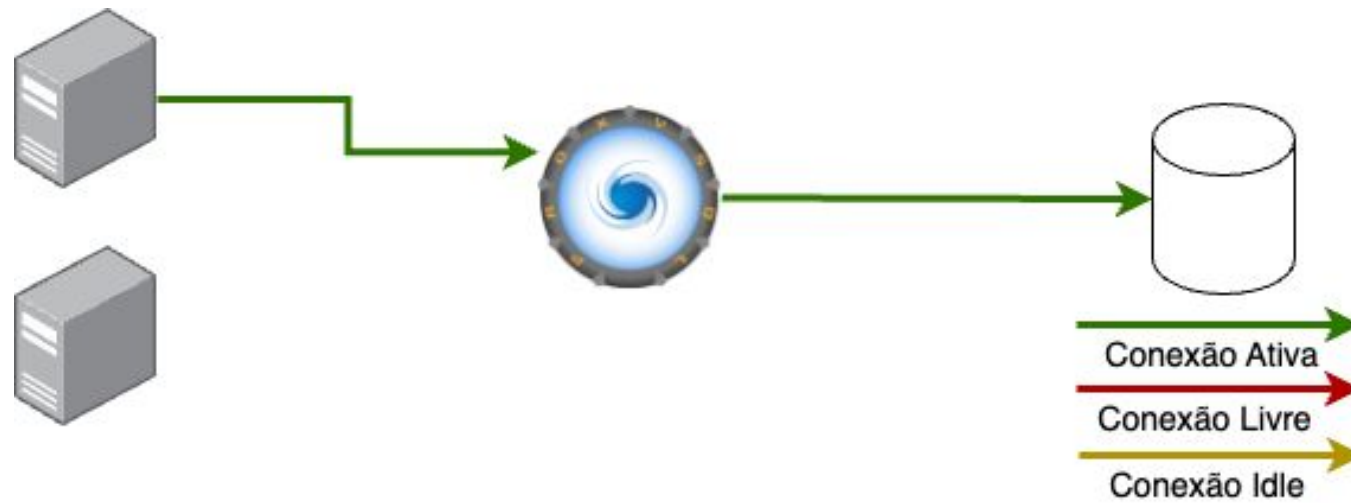




# Features ProxySQL

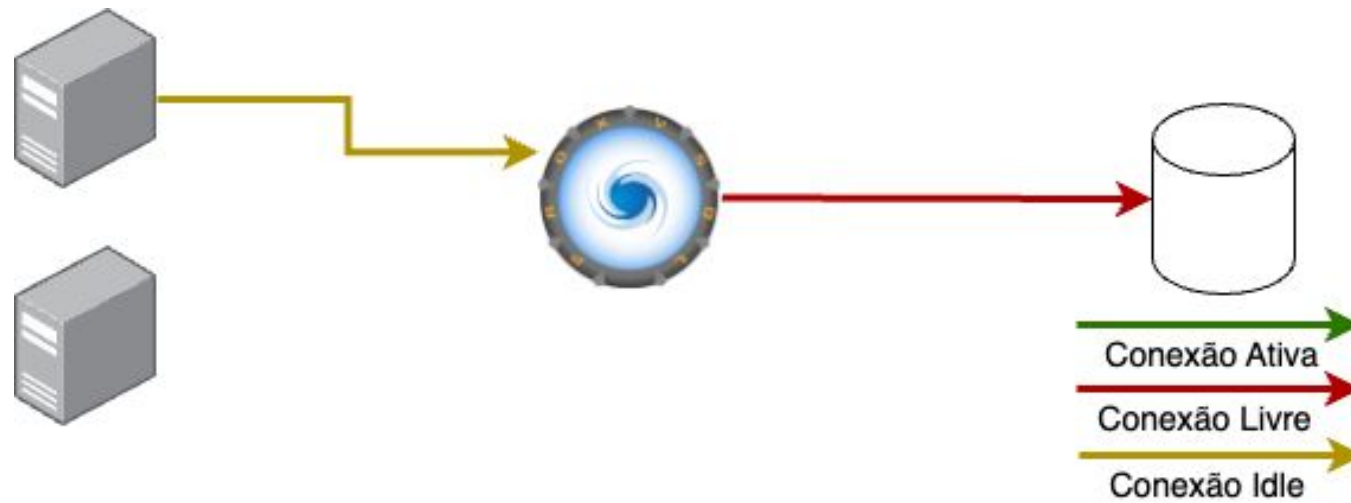
Multiplexing

# Multiplexing

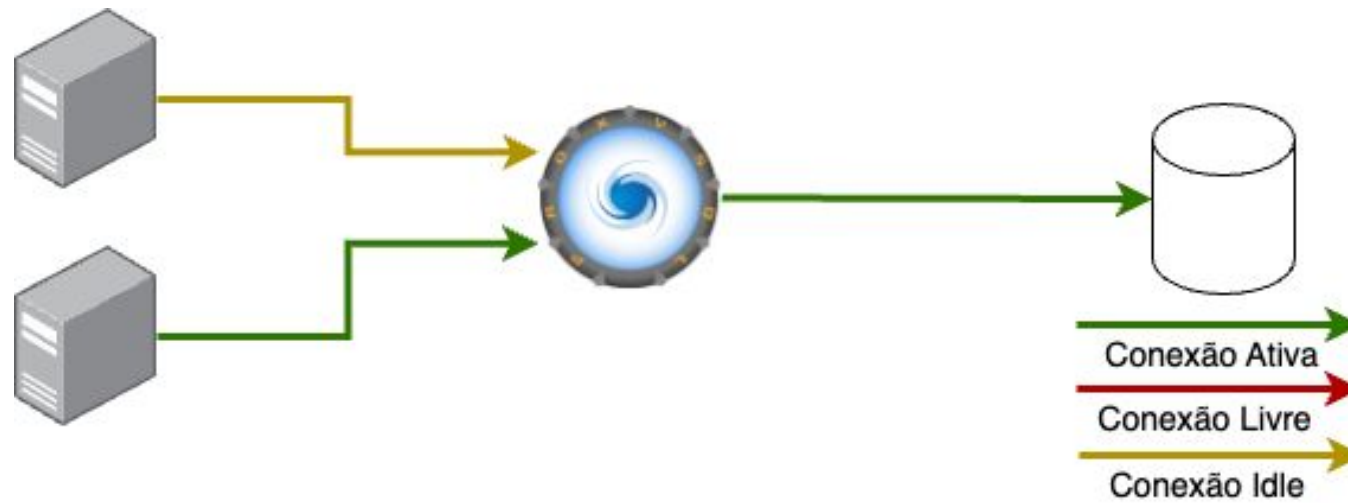




# Multiplexing



# Multiplexing



# Multiplexing – Desabilitar

Condições onde é desabilitado:

- Transação ativa
- Lock em tabela (LOCK TABLE, LOCK TABLES OU FTWRL) – UNLOCK TABLES
- GET\_LOCK()
- SQL\_CALC\_FOUND\_ROWS
- Quando uma tabela temporária é criada (CREATE TEMPORARY TABLE)
- PREPARE
- SQL\_LOG\_BIN=0
- Uso de Variáveis



# Features ProxySQL

Failover

# Failover – Replicação

Variáveis de checagem:

- read\_only
- innodb\_read\_only
- super\_ready\_only
- read\_only|innodb\_read\_only
- read\_only&innodb\_read\_only

```
ProxySQL > SELECT * FROM mysql_replication_hostgroups\G
***** 1. row *****
writer_hostgroup: 1
reader_hostgroup: 2
    check_type: read_only
    comment:
1 row in set (0.00 sec)
```

# Failover – Galera/PXC

Variáveis de check:

- read\_only

```
MySQL [(none)]> select * from mysql_galera_hostgroups\G
***** 1. row *****
      writer_hostgroup: 1
backup_writer_hostgroup: 3
      reader_hostgroup: 2
      offline_hostgroup: 4
            active: 1
          max_writers: 1
    writer_is_also_reader: 0
max_transactions_behind: 100
              comment: NULL
1 row in set (0.00 sec)
```

# Failover – Group Replication

Variáveis de check:

- read\_only

```
MySQL [(none)]> SELECT * FROM mysql_group_replication_hostgroups\G
***** 1. row *****
      writer_hostgroup: 1
 backup_writer_hostgroup: 3
      reader_hostgroup: 2
 offline_hostgroup: 4
           active: 1
        max_writers: 1
 writer_is_also_reader: 0
max_transactions_behind: 100
           comment:
1 row in set (0.01 sec)
```



# Features ProxySQL

Reescrita de query



# Reescrita de query

## Regra de query utilizando match\_partten

```
[root@roberto-garciadebem-node3 ~]# mysql -uadmin -padmin -h127.0.0.1 -P6032
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MySQL connection id is 43
Server version: 5.5.30 (ProxySQL Admin Module)
```

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

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

```
MySQL [(none)]> INSERT INTO mysql_query_rules (rule_id,active,match_pattern,replace_pattern) VALUES (0,1,'^SELECT \* FROM test\.joinit WHERE i=(.*)$',
'SELECT i,s,t FROM test.joinit WHERE i = \1' );
Query OK, 1 row affected (0.00 sec)
```

```
MySQL [(none)]> LOAD MYSQL QUERY RULES TO RUNTIME;
Query OK, 0 rows affected (0.00 sec)
```

# Reescrita de query

```
[root@roberto-garciadebem-node3 ~]# mysql -uroot -p'verysecretpassword1^' -h127.0.0.1 -P6033 -e'SELECT * FROM test.joinit WHERE i=2'
```

i	s	t	g
2	aa3e6d88-8d56-11ee-adec-00163e8ac0a2	18:56:25	8

```
[root@roberto-garciadebem-node3 ~]# mysql -uroot -p'verysecretpassword1^' -h127.0.0.1 -P6033 -e'SELECT * FROM test.joinit WHERE i=2'
```

i	s	t
2	aa3e6d88-8d56-11ee-adec-00163e8ac0a2	18:56:25



# Features ProxySQL

Bloqueando Queries

# Bloqueando Queries

## Executando query suspeita

```
[root@roberto-garciadebem-node3 ~]# mysql -uroot -p'verysecretpassword1^' -h127.0.0.1 -P6033 -e'SELECT * FROM test.joint WHERE i=2;
select user,host,authentication_string from mysql.user limit 1'
```

```
+-----+-----+-----+-----+
| i | s | t | g |
+-----+-----+-----+-----+
| 2 | aa3e6d88-8d56-11ee-adec-00163e8ac0a2 | 18:56:25 | 8 |
+-----+-----+-----+-----+
+-----+-----+-----+-----+
| user | host | authentication_string |
+-----+-----+-----+-----+
| repl | % | *A4EAAFACAC7E8241A4C7C903D8E679158895BD32 |
+-----+-----+-----+-----+
```

# Bloqueando Queries

## Verificando Queries

```
MySQL [(none)]> select username,hostgroup,digest_text,digest from stats_mysql_query_digest;
```

username	hostgroup	digest_text	digest
root	2	SELECT * FROM test.joinit WHERE i=?	0xBB8163FCCB0559B2
root	2	select user,host,authentication_string from mysql.user limit ?	0x80129DBC0AF9B31
root	1	select @@version_comment limit ?	0x226CD90D52A2BA0B

3 rows in set (0.00 sec)

# Bloqueando Queries

## Criando regra de bloqueio

```
[root@roberto-garciadebem-node3 ~]# mysql -uadmin -padmin -h127.0.0.1 -P6032
Welcome to the MariaDB monitor.  Commands end with ; or \g.
MySQL [(none)]> INSERT INTO mysql_query_rules (rule_id,active,digest,error_msg) VALUES (0,1,'0x80129DBCD0AF9B31',
'Usuário suspeito/suspeita de SQL Injection');Query OK, 1 row affected (0.00 sec)

MySQL [(none)]> LOAD MYSQL QUERY RULES TO RUNTIME;
Query OK, 0 rows affected (0.00 sec)
```

## Teste

```
[root@roberto-garciadebem-node3 ~]# mysql -uroot -p'verysecretpassword1^' -h127.0.0.1 -P6033 -e'SELECT * FROM test.joinit WHERE i=2;
select user,host,authentication_string from mysql.user limit 1'
+---+-----+-----+-----+
| i | s | t | g |
+---+-----+-----+-----+
| 2 | aa3e6d88-8d56-11ee-adec-00163e8ac0a2 | 18:56:25 | 8 |
+---+-----+-----+-----+
ERROR 1148 (42000) at line 1: Usuário suspeito/suspeita de SQL Injection
```



# Features ProxySQL

Query Cache

# Query Cache

## Query cache baseado em TTL(Time-to-live)

```
MySQL [(none)]> select hostgroup,digest,digest_text,count_star from stats_mysql_query_digest;
```

hostgroup	digest	digest_text	count_star
2	0xF65A07FDA87C64D1	SELECT * FROM joint	1

```
1 row in set (0.01 sec)
```

```
MySQL [(none)]> INSERT INTO mysql_query_rules (rule_id,active,digest,cache_ttl,apply) VALUES (5,1,'0xF65A07FDA87C64D1',2000,1);
Query OK, 1 row affected (0.00 sec)
```

```
MySQL [(none)]> LOAD MYSQL QUERY RULES TO RUNTIME;SAVE MYSQL QUERY RULES TO DISK;
Query OK, 0 rows affected (0.00 sec)
```

```
Query OK, 0 rows affected (0.04 sec)
```

```
MySQL [(none)]> select hostgroup,digest,digest_text,count_star from stats_mysql_query_digest;
```

hostgroup	digest	digest_text	count_star
-1	0xF65A07FDA87C64D1	SELECT * FROM joint	1
2	0xF65A07FDA87C64D1	SELECT * FROM joint	2

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





# Features ProxySQL

ProxySQL Cluster

# ProxySQL Cluster – Principais Tabelas

- proxysql\_servers

```
ProxySQL > SELECT * FROM proxysql_servers;
```

hostname	port	weight	comment
10.124.33.77	6032	0	
10.124.33.98	6032	0	
10.124.33.61	6032	0	

3 rows in set (0.01 sec)

# ProxySQL Cluster – Principais Tabelas

- Variáveis do Cluster

```
ProxySQL > SELECT * FROM global_variables WHERE variable_name LIKE 'admin-checksum%';
```

variable_name	variable_value
admin-checksum_mysql_query_rules	true
admin-checksum_mysql_servers	true
admin-checksum_mysql_users	true
admin-checksum_mysql_variables	true
admin-checksum_admin_variables	true
admin-checksum_ldap_variables	true

6 rows in set (0.00 sec)

```
ProxySQL > SELECT * FROM global_variables WHERE variable_name LIKE 'admin-cluster%';
```

variable_name	variable_value
admin-cluster_username	radmin
admin-cluster_password	radmin
admin-cluster_check_interval_ms	1000
admin-cluster_check_status_frequency	10
admin-cluster_mysql_query_rules_diffs_before_sync	3
admin-cluster_mysql_servers_diffs_before_sync	3
admin-cluster_mysql_users_diffs_before_sync	3
admin-cluster_proxysql_servers_diffs_before_sync	3
admin-cluster_mysql_variables_diffs_before_sync	3
admin-cluster_admin_variables_diffs_before_sync	3
admin-cluster_mysql_query_rules_save_to_disk	true
admin-cluster_mysql_servers_save_to_disk	true
admin-cluster_mysql_users_save_to_disk	true
admin-cluster_proxysql_servers_save_to_disk	true
admin-cluster_mysql_variables_save_to_disk	true
admin-cluster_admin_variables_save_to_disk	true
admin-cluster_ldap_variables_diffs_before_sync	3
admin-cluster_ldap_variables_save_to_disk	true


18 rows in set (0.00 sec)

# ProxySQL Cluster – Validações

- validações via checksum

```
2023-11-30 19:25:33 [INFO] Cluster: detected a peer 10.124.33.77:6032 with mysql_servers version 4, epoch 1701372331, diff_check 3. Own version: 3, epoch: 1701371936. Proceeding with remote sync
2023-11-30 19:25:33 [INFO] Cluster: detected peer 10.124.33.77:6032 with mysql_servers version 4, epoch 1701372331
2023-11-30 19:25:33 [INFO] Cluster: Fetching MySQL Servers from peer 10.124.33.77:6032 started. Expected checksum 0xFCC21AB57791C8A1
2023-11-30 19:25:33 [INFO] Cluster: Fetching MySQL Servers from peer 10.124.33.77:6032 completed
2023-11-30 19:25:33 [INFO] Cluster: Fetching 'MySQL Group Replication Hostgroups' from peer 10.124.33.77:6032
2023-11-30 19:25:33 [INFO] Cluster: Fetching 'MySQL Galera Hostgroups' from peer 10.124.33.77:6032
2023-11-30 19:25:33 [INFO] Cluster: Fetching 'MySQL Aurora Hostgroups' from peer 10.124.33.77:6032
2023-11-30 19:25:33 [INFO] Cluster: Fetching 'MySQL Hostgroup Attributes' from peer 10.124.33.77:6032
2023-11-30 19:25:33 [INFO] Cluster: Computed checksum for MySQL Servers from peer 10.124.33.77:6032 : 0xFCC21AB57791C8A1
2023-11-30 19:25:33 [INFO] Cluster: Fetching checksum for 'MySQL Servers' from peer 10.124.33.77:6032 successful. Checksum: 0xFCC21AB57791C8A1
2023-11-30 19:25:33 [INFO] Cluster: Writing mysql_servers table
2023-11-30 19:25:33 [INFO] Checksum for table mysql_servers is 0x2700C3A97801C265
2023-11-30 19:25:33 [INFO] Checksum for table mysql_replication_hostgroups is 0x46B740C7F426A83
2023-11-30 19:25:33 [INFO] Rebuilding 'Hostgroup_Manager_Mapping' due to checksums change - mysql_servers { old: 0x12E76C9FDEE03D3A, new: 0x2700C3A97801C265 }, mysql_replication_hostgroups { old: 0x46B740C7F426A83, new: 0x46B740C7F426A83 }
2023-11-30 19:25:33 [INFO] MySQL_HostGroups_Manager::commit() locked for 2ms
2023-11-30 19:25:33 [INFO] Cluster: Saving to disk MySQL Servers from peer 10.124.33.77:6032
2023-11-30 19:25:34 [INFO] Cluster: detected a new checksum for mysql_servers from peer 10.124.33.61:6032, version 4, epoch 1701372331, checksum 0xFCC21AB57791C8A1 . Not syncing yet ...
2023-11-30 19:25:34 [INFO] Cluster: checksum for mysql_servers from peer 10.124.33.61:6032 matches with local checksum 0xFCC21AB57791C8A1 , we won't sync.
2023-11-30 19:25:34 [INFO] Cluster: checksum for mysql_servers from peer 10.124.33.61:6032 matches with local checksum 0xFCC21AB57791C8A1 , we won't sync.
```

# ProxySQL Cluster – Alterações



A terminal window with two tabs. The active tab is titled 'root@roberto-garciadebem-node3:~ (ssh)' and contains the command: `[root@roberto-garciadebem-node3 ~]# mysql -uadmin -padmin -h127.0.0.1 -P6032 --prompt="ProxySQL > "`. The second tab is titled 'root@roberto-garciadebem-node5:~ (ssh)'. The terminal is otherwise empty.



# Features ProxySQL

Tabelas de estatística

# Stats tables

- SHOW TABLES FROM STATS;
  - Stats\_mysql\_commands\_counters - Estatísticas dos comandos
  - Stats\_mysql\_connection\_pool - Conexões por servidor
  - Stats\_mysql\_global - Estatísticas globais
  - Stats\_mysql\_processlist - SHOW PROCESSLIST
  - Stats\_mysql\_query\_digest - Estatísticas agrupadas por digest
  - Stats\_mysql\_query\_rules - Estatísticas das query rules
  - Stats\_proxysql\_servers\_checksums - Visualização atual do Cluster ProxySQL
    - checksums



# Caso de Uso



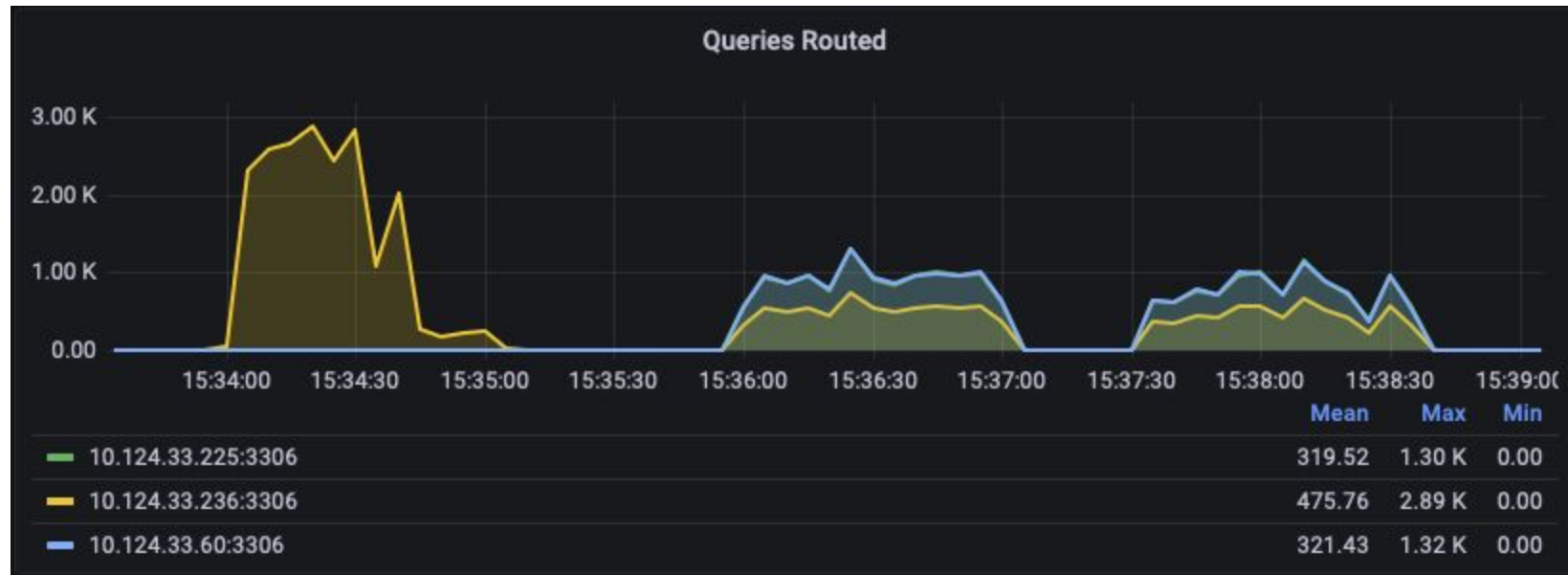
# Caso de Uso

## Sysbench teste

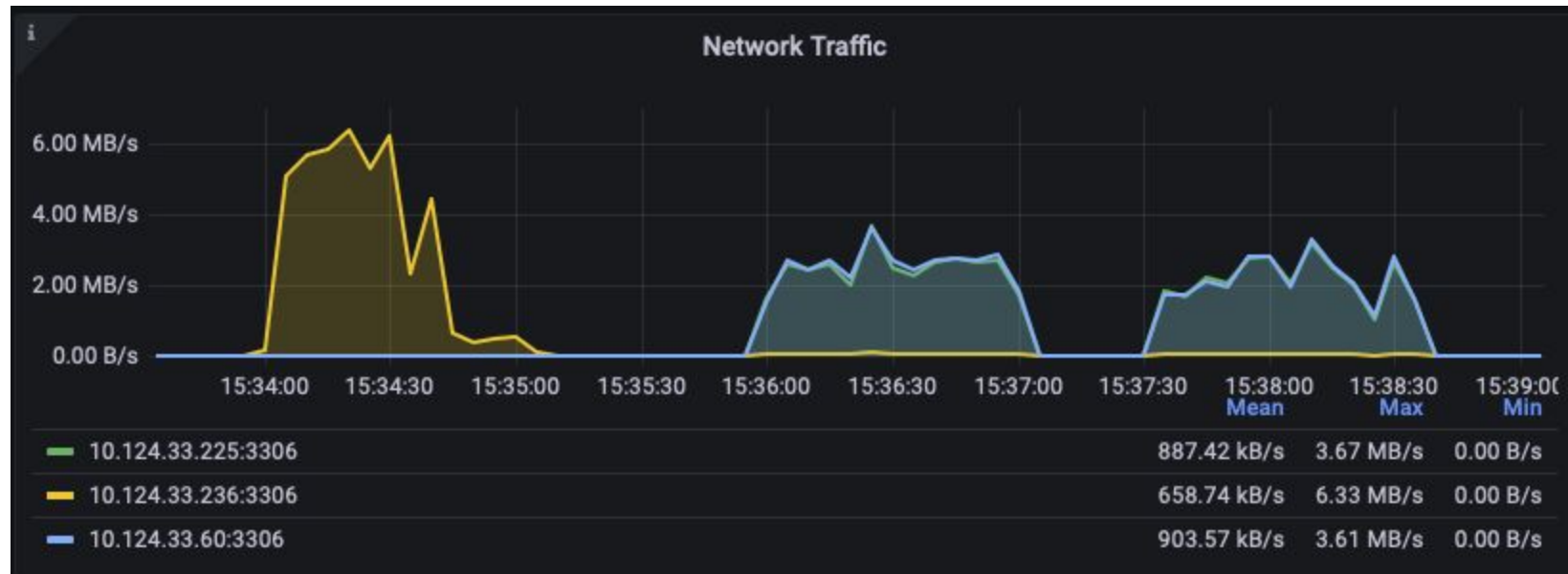
```
sysbench [...] --range_size=100 --table_size=10000 --tables=10  
--threads=20 --events=0 --time=6000 --rand-type=uniform  
/usr/share/sysbench/oltp_read_write.lua
```

- Teste 1 – Todas as conexões no mesmo servidor
- Teste 2 – Fazendo balanceamento de escrita e leitura
- Teste 3 – Fazendo Cache das 10 consultas mais utilizadas

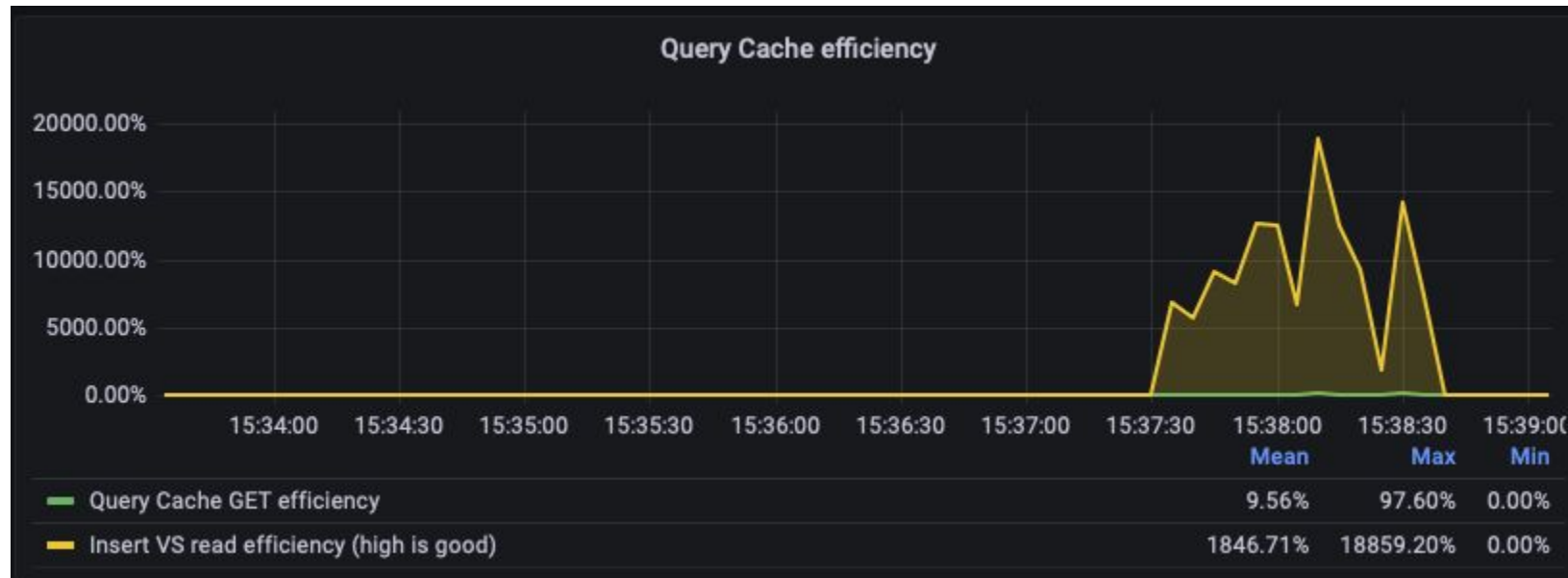
# Caso de Uso



# Caso de Uso



# Caso de Uso



# Perguntas?

Vagas



in





Obrigado!!

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