

PostgreSQL для администраторов баз данных и разработчиков

Создание и тестирование высоконагруженного отказоустойчивого кластера PostgreSQL на базе Patroni



**Меня хорошо видно
& слышно?**



Защита проекта

Тема: Создание и тестирование высоконагруженного отказоустойчивого кластера PostgreSQL на базе Patroni



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Цель и задачи проекта

Цель проекта: создать кластер postgresql на базе patroni и протестировать его в базовых сценариях

1. Применение знаний полученных в ходе курса
2. Развернуть собственный кластер patroni
3. Протестировать взаимодействие с кластером
4. Протестировать отказоустойчивость



Какие технологии использовались

1. Patroni – как метод кластеризации
2. Etcd – как хранилище состояния кластера
3. PgBouncer – управление соединениями
4. Nginx – балансировщик нагрузки
5. Ubuntu 24 - ОС



Что получилось



Кластер etcd:

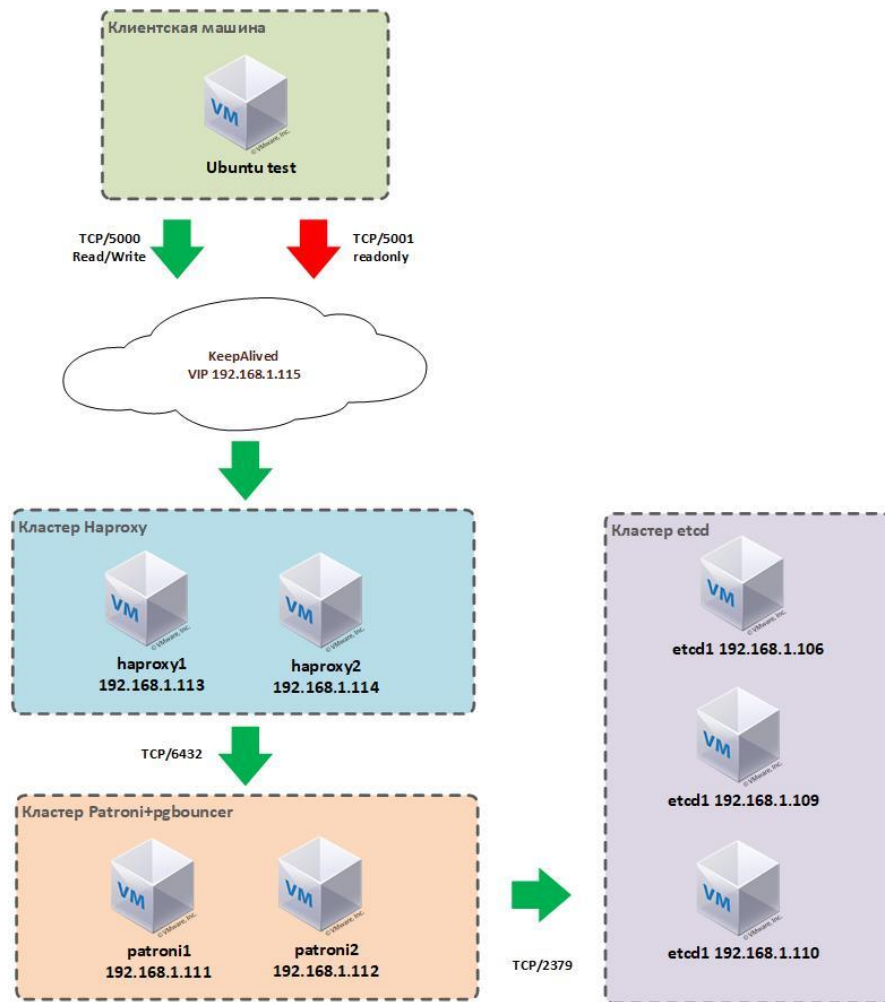
- etcd1 192.168.1.106
- etcd2 192.168.1.109
- etcd3 192.168.1.110

Кластер patroni+pgbouncer

- patroni1 192.168.1.111
- patroni2 192.168.1.112

Кластер haproxy+keepalive

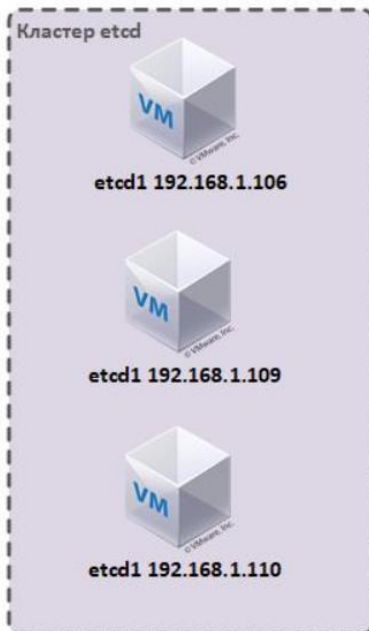
- haproxy1 192.168.1.113
- haproxy2 192.168.1.114



1. ETCD



TCP/2379



ETCD v3.5.17

<https://github.com/etcd-io/etcd/releases/tag/v3.5.17>

```
GNU nano 7.2 /etc/default/etcd
ETCD_NAME=etcd1
ETCD_DATA_DIR=/var/lib/etcd/default
ETCD_INITIAL_CLUSTER=etcd1=http://192.168.1.106:2380,etcd2=http://192.168.1.109:2380,etcd3=http://192.168.1.110:2380
ETCD_INITIAL_ADVERTISE_PEER_URLS=http://192.168.1.106:2380
ETCD_ADVERTISE_CLIENT_URLS=http://192.168.1.106:2379
ETCD_LISTEN_PEER_URLS=http://192.168.1.106:2380
ETCD_LISTEN_CLIENT_URLS=http://192.168.1.106:2379,http://localhost:2379
ETCD_INITIAL_CLUSTER_TOKEN="devops_token"
ETCD_INITIAL_CLUSTER_STATE="new"
ETCD_ENABLE_V2="true"
ETCD_HEARTBEAT_INTERVAL="1000"
ETCD_ELECTION_TIMEOUT="5000"
```

```
ETCD_ELECTION_TIMEOUT=5000
ETCD_HEARTBEAT_INTERVAL=1000
ETCD_ENABLE_V2=true
```


1. ETCD

```
daa@etcd1:~$ sudo etcdctl member list
```

```
2125f1467958dff8, started, etcd1, http://192.168.1.106:2380, http://192.168.1.106:2379, false
```

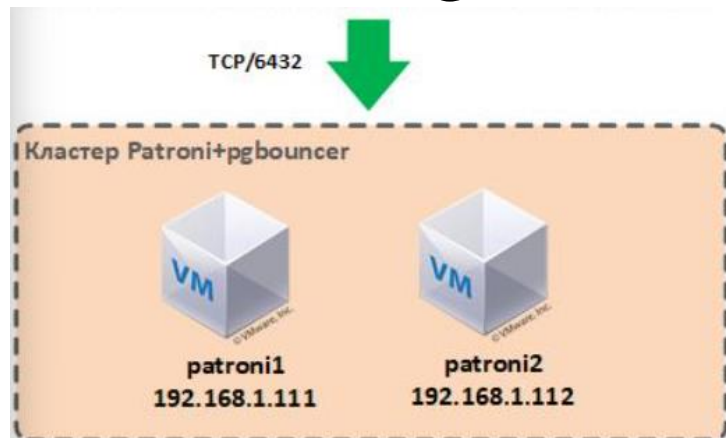
```
265b9c61ffe85ba1, started, etcd3, http://192.168.1.110:2380, http://192.168.1.110:2379, false
```

```
97ba8852ebaddf74, started, etcd2, http://192.168.1.109:2380, http://192.168.1.109:2379, false
```

```
daa@etcd1:~$ etcdctl -w table endpoint --cluster status
```

ENDPOINT	ID	VERSION	DB SIZE	IS LEADER	IS LEARNER	RAFT TERM	RAFT INDEX	RAFT
http://192.168.1.106:2379	2125f1467958dff8	3.5.17	20 kB	false	false	3	10	
http://192.168.1.110:2379	265b9c61ffe85ba1	3.5.17	20 kB	true	false	3	10	
http://192.168.1.109:2379	97ba8852ebaddf74	3.5.17	20 kB	false	false	3	10	
μ44b:\\Jas*Jes*J*J0:533d	93p988256p99q4L4	3*2*J3	50 KB	49J26	49J26	3	10	
μ44b:\\Jas*Jes*J*J0:533d	502p9c0J44622pJ	3*2*J3	50 KB	49J26	49J26	3	10	

2. Patroni+PgBouncer



- PostgreSQL 15
- Python3
- Patroni

<https://github.com/patroni/patroni/tree/master/patroni>

- PgBouncer

```
daa@patroni1:~$ sudo nano /etc/patroni/config.yml
```

```
restapi:
```

```
listen: 192.168.1.111:8008 # адрес узла, на котором находится этот файл
```

```
connect_address: 192.168.1.111:8008 # адрес узла, на котором находится этот файл
```

```
etcd:
```

```
hosts: 192.168.1.106:2379,192.168.1.109:2379,192.168.1.110:2379 # список всех узлов, на
```

```
postgres: 192.168.1.106:5432,192.168.1.109:5432,192.168.1.110:5432 # список всех узлов, на
```

2. Patroni+PgBouncer

```
daa@patroni2:~$ sudo patronictl -c /etc/patroni/config.yml list
```

```
[sudo] password for daa:
```

```
+ Cluster: patroni-cluster (7449702151863418585) ---+-----+
| Member   | Host           | Role    | State   | TL | Lag in MB |
+-----+-----+-----+-----+-----+-----+
| patroni1 | 192.168.1.111 | Leader  | running | 43 |           |
| patroni2 | 192.168.1.112 | Replica | running | 43 |          0 |
+-----+-----+-----+-----+-----+-----+

```

```
+-----+-----+-----+-----+-----+-----+
| b9f1ou75 | 1d5'1e8'1'115 | 86b11c9 | Lnuu1u6 | 43 |          0 |
+-----+-----+-----+-----+-----+-----+

```

2. Patroni+Pgroucer

```
GNU nano 7.2 /etc/pgbouncer/pgbouncer.ini
[databases]
* = host=192.168.1.111,192.168.1.112 port=5432

[pgbouncer]
logfile = /var/log/postgresql/pgbouncer.log
pidfile = /var/run/postgresql/pgbouncer.pid
listen_addr = *
listen_port = 6432
unix_socket_dir = /var/run/postgresql
auth_type = md5
auth_file = /etc/pgbouncer/userlist.txt
admin_users = postgres
ignore_startup_parameters = extra_float_digits,geqo
pool_mode = session
server_reset_query = DISCARD ALL
max_client_conn = 10000
default_pool_size = 800
reserve_pool_size = 150
reserve_pool_timeout = 1
max_db_connections = 1000
pkt_buf = 8192
listen_backlog = 4096
log_connections = 0
log_disconnections = 0
```

```
daa@patroni1:/etc$ psql -p 6432 -U postgres
Password for user postgres:
psql (15.10 (Ubuntu 15.10-1.pgdg24.04+1))
Type "help" for help.
```

```
postgres=# \c demo
You are now connected to database "demo" as user "postgres".
demo=# \q
```

```
postgres=# /d
```

```
100 916 1000 1000000000 100 916 1000 1000000000 100 916 1000 1000000000
```

```
postgres=# \q
postgres=# \q
postgres=# \q
```

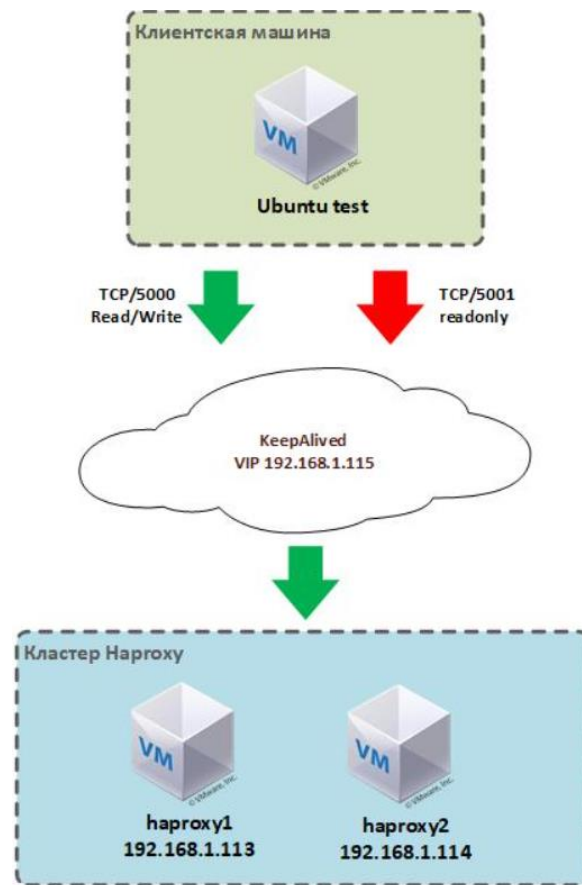


3. Haproxy+Keepalived

```
GNU nano 7.2 /etc/keepalived/keepalived.conf
global_defs {
    router_id haproxy1
    enable_script_security
    script_user root
}

vrrp_script haproxy_check {
    script "/usr/libexec/keepalived/haproxy_check.sh"
    interval 2
    weight 2
}

vrrp_instance VI_1 {
    interface ens33
    virtual_router_id 101
    priority 100
    advert_int 2
    state MASTER
    virtual_ipaddress {
        192.168.1.115
    }
    track_script {
        haproxy_check
    }
    authentication {
        auth_type PASS
        auth_pass SecretPassword
    }
}
```



3. Haproxy+Keepalived

PostgreSQL

listen postgres_master

bind *:5000

option tcplog

option httpchk OPTIONS /master

http-check expect status 200

default-server inter 3s fastinter 1s fall 3 rise 4 on-marked-down shutdown-sessions

server patroni1 patroni1:6432 check port 8008

server patroni2 patroni2:6432 check port 8008

listen postgres_replicas

bind *:5001

option tcplog

option httpchk OPTIONS /health

balance roundrobin

http-check expect status 200

default-server inter 3s fastinter 1s fall 3 rise 2 on-marked-down shutdown-sessions

server patroni1 patroni1:6432 check port 8008

server patroni2 patroni2:6432 check port 8008

PostgreSQL

PostgreSQL

server patroni1 patroni1:6432 check port 8008

server patroni2 patroni2:6432 check port 8008

default-server inter 3s fastinter 1s fall 3 rise 2 on-marked-down shutdown-sessions

http-check expect status 200

daa@haproxy1:~\$ psql -h 192.168.1.115 -U postgres -d demo -p 5000

Password for user postgres:

psql (15.9 (Ubuntu 15.9-1.pgdg24.04+1), server 15.10 (Ubuntu 15.10-1.pgdg24.04+1))

Type "help" for help.

demo=#

demo=#

daa@haproxy2:/dev\$ psql -h 192.168.1.115 -U postgres -d demo -p 5001

Password for user postgres:

psql (15.9 (Ubuntu 15.9-1.pgdg24.04+1), server 15.10 (Ubuntu 15.10-1.pgdg24.04+1))

Type "help" for help.

demo=#



3. Haproxy+Keepalived

<http://192.168.1.115:7000/>

Note: "NOLB / DRAIN" = UP with load-balancing disabled.

stats

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server									
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle	
Frontend				1 ...	2 ...	-	2	2	100 000	3 ...			894	52 944	0	0	1					OPEN									
Backend	0	0		0	0		0	0	10 000	0	0	0s	894	52 944	0	0		0	0	0	0	4m1s UP		0/0	0	0			0		

postgres_master

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server									
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntime	Thrtle	
Frontend				0	0	-	0	0	100 000	0			0	0	0	0	0	0	0	0		OPEN									
patroni1	0	0	-	0	0		0	0	-	0	0	?	0	0		0	0	0	0	0	0	1m3s UP	L7OK/200 in 1ms	1/1	Y	-	1	1	2m55s	-	
patroni2	0	0	-	0	0		0	0	-	0	0	?	0	0		0	0	0	0	0	0	3m58s DOWN	L7STS/503 in 1ms	1/1	Y	-	1	1	3m58s	-	
Backend	0	0		0	0		0	0	10 000	0	0	?	0	0	0	0	0	0	0	0	0	1m3s UP		1/1	1	0		1	2m55s		

postgres_replicas

	Queue			Session rate			Sessions							Bytes		Denied		Errors			Warnings		Server								
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle	
Frontend						-	0	0	100 000	0							0					OPEN									
patroni1	0	0	-	0	0		0	0	-	0	0	?	0	0		0			0	0	0	1m5s UP	L7OK/200 in 1ms	1/1	Y	-	1	1	2m53s	-	
patroni2	0	0	-	0	0		0	0	-	0	0	?	0	0		0			0	0	0	39s UP	L7OK/200 in 1ms	1/1	Y	-	1	1	3m19s	-	
Backend	0	0		0	0		0	0	10 000	0	0	?	0	0	0	0	0	0	0	0	0	1m5s UP		2/2	2	0		1		2m53s	

Backend	0	0	...	0	0	...	0	0	10 000	0	0	?	0	0	0	0	...	0	0	0	0	1m5s UP	...	2/2	2	0	...	1	2m53s	...
Backend	0	0	-	0	0	...	0	0	-	0	0	?	0	0	...	0	0	0	0	0	0	39s UP	L7OK/200 in 1ms	1/1	Y	-	1	1	3m19s	-
Backend	0	0	-	0	0	...	0	0	-	0	0	?	0	0	...	0	0	0	0	0	0	1m5s UP	L7OK/200 in 1ms	1/1	Y	-	1	1	2m53s	...
Backend	0	0	...	0	0	...	0	0	100 000	0	...	...	0	0	0	0	0	...	...	...	...	OPEN	...	...	...	...	...	...	...	...



4. Тесты. Потеря связи с replica

```
daa@patroni2:~$ sudo patronictl -c /etc/patroni/config.yml list
+ Cluster: patroni-cluster (7449702151863418585) ---+-----+
| Member  | Host          | Role  | State  | TL | Lag in MB |
+-----+-----+-----+-----+-----+-----+
| patroni2 | 192.168.1.112 | Leader | running | 20 |           |
+-----+-----+-----+-----+-----+-----+
```

```
Working with:    REPLICA - 192.168.1.111
Retrieved: 2024-12-24 14:56:20.123431
```

Trying to connect

```
Working with:    MASTER - 192.168.1.112
Inserted: 2024-12-24 14:56:35.042064
```

```
Working with:    MASTER - 192.168.1.112
Inserted: 2024-12-24 14:56:36.046823
```

patroni1:

```
2024-12-24 15:00:21,403 ERROR: Failed to get list of machines from http://192.168.1.106:2379/v2: MaxRetryError
ol(host='192.168.1.106', port=2379): Max retries exceeded with url: /v2/machines (Caused by NewConnectionError
ion.HTTPConnection object at 0x73b31412b860>: Failed to establish a new connection: [Errno 101] Network is un
2024-12-24 15:00:21,403 ERROR: Could not get the list of servers, maybe you provided the wrong host(s) to conn
2024-12-24 15:00:22,426 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
2024-12-24 15:00:26,393 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
```

```
2024-12-24 15:00:30,303 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
```

```
2024-12-24 15:00:30,303 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
```

```
haproxy1 haproxy[2455]: [WARNING] (2455) : Server postgres_replicas/patroni1 is DOWN, reason: Layer4 timeout,
```



5. Тесты. Потеря связи с Leader

```
Working with: MASTER - 192.168.1.112
Inserted: 2024-12-24 17:51:02.142796
```

```
Trying to connect
```

```
Unable to connect to database :
```

```
connection to server at "192.168.1.115", port 5000 failed: server closed the connection unexpectedly
        This probably means the server terminated abnormally
        before or while processing the request.
```

```
daa@test1:~$ ./HAtester.py 5000
```

```
Working with: MASTER - 192.168.1.111
Inserted: 2024-12-24 17:52:04.977101
```

```
Working with: MASTER - 192.168.1.111
Inserted: 2024-12-24 17:52:05.980919
```

```
Working with: REPLICA - 192.168.1.111
Retrieved: 2024-12-24 17:51:02.142796
```

```
Working with: MASTER - 192.168.1.111
Trying to connect
```

```
Working with: MASTER - 192.168.1.111
Inserted: 2024-12-24 17:51:49.967949
```

```
1026L6G: 5054-J5-54 J1:25:02'0800J0
MOLKJUB MIFU: WY21EB - J05'J08'J'JJI
```

```
haproxy1 haproxy[1350]: [WARNING] (1350) : Server postgres_master/patroni2 is UP, reason: Layer7 check passed, co
haproxy1 haproxy[1350]: [WARNING] (1350) : Server postgres_replicas/patroni1 is UP, reason: Layer7 check passed,
haproxy1 haproxy[1350]: [WARNING] (1350) : Server postgres_replicas/patroni2 is DOWN, reason: Layer4 timeout, che
haproxy1 haproxy[1350]: [WARNING] (1350) : Server postgres_master/patroni2 is DOWN, reason: Layer4 timeout, check
haproxy1 haproxy[1350]: [ALERT] (1350) : proxy 'postgres_master' has no server available!
haproxy1 haproxy[1350]: [WARNING] (1350) : Server postgres_master/patroni1 is UP, reason: Layer7 check passed, co
```

```
μ9b10xλJ μ9b10xλ[J320]: [μVBIING] (J320) : 26L6L6 b0zF6L62'W0zF6L6\B0zF6L6J J2 nB' L6920U: F9L6L6 Cμ6Ck B0z26q' co
```

5. Тесты. Потеря связи с Leader

```
daa@patroni1:~$ sudo patronictl -c /etc/patroni/config.yml list
+ Cluster: patroni-cluster (7449702151863418585) --+-----+
| Member   | Host           | Role   | State   | TL | Lag in MB |
+-----+-----+-----+-----+-----+-----+
| patroni1 | 192.168.1.111 | Leader | running | 32 |           |
+-----+-----+-----+-----+-----+-----+

```

```
2024-12-24 17:29:11,784 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
2024-12-24 17:29:21,785 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
2024-12-24 17:29:32,294 INFO: Selected new etcd server http://192.168.1.110:2379
2024-12-24 17:29:32,298 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
2024-12-24 17:29:42,292 INFO: Selected new etcd server http://192.168.1.109:2379
2024-12-24 17:29:42,296 INFO: no action. I am (patroni1), a secondary, and following a leader (patroni2)
2024-12-24 17:29:54,095 WARNING: Request failed to patroni2: GET http://192.168.1.112:8008/patroni (HTTPCor
2024-12-24 17:29:54,101 INFO: promoted self to leader by acquiring session lock
2024-12-24 17:29:55,175 INFO: no action. I am (patroni1), the leader with the lock
2024-12-24 17:30:05,167 INFO: Lock owner: patroni1; I am patroni1
2024-12-24 17:30:05,170 INFO: Dropped unknown replication slot 'patroni2'
2024-12-24 17:30:05,172 INFO: no action. I am (patroni1), the leader with the lock
2024-12-24 17:30:15,172 INFO: no action. I am (patroni1), the leader with the lock

```

```
2024-12-24 17:30:15,172 INFO: no action. I am (patroni1), the leader with the lock
2024-12-24 17:30:15,172 INFO: no action. I am (patroni1), the leader with the lock

```



5. Тесты. Потеря связи с Leader

```
2024-12-26 23:42:09,798 ERROR: Failed to get list of machines from http://192.168.1.109:2379/v3: MaxRetryError("HTTPCor
2024-12-26 23:42:09,798 ERROR: KVCache.run EtcdException('Could not get the list of servers, maybe you provided the wr
2024-12-26 23:42:10,931 WARNING: Postgresql is not running.
2024-12-26 23:42:10,931 INFO: Lock owner: patroni1; I am patroni2
```

```
2024-12-26 23:42:10,933 INFO: Lock owner: patroni1; I am patroni2
2024-12-26 23:42:10,939 INFO: Local timeline=50 lsn=0/AD000028
2024-12-26 23:42:10,959 INFO: primary_timeline=51
2024-12-26 23:42:10,959 INFO: primary: history=47          0/AA0001F0          no recovery target specified
48      0/AB0000A0          no recovery target specified
49      0/AC0000A0          no recovery target specified
50      0/AC0001B8          no recovery target specified
2024-12-26 23:42:10,965 INFO: running pg_rewind from patroni1
2024-12-26 23:42:10,993 INFO: running pg_rewind from dbname=postgres user=postgres host=192.168.1.111 port=5432 target_session_
2024-12-26 23:42:17,141 INFO: Lock owner: patroni1; I am patroni2
2024-12-26 23:42:17,141 INFO: running pg_rewind from patroni1 in progress
```

```
2024-12-26 23:43:02,198 INFO: Lock owner: patroni1; I am patroni2
2024-12-26 23:43:02,198 INFO: starting as a secondary
2024-12-26 23:43:02,699 INFO: postmaster pid=5170
2024-12-26 23:43:02,848 INFO: establishing a new patroni heartbeat connection to postgres
2024-12-26 23:43:02,876 INFO: establishing a new patroni heartbeat connection to postgres
2024-12-26 23:43:03,770 INFO: Lock owner: patroni1; I am patroni2
2024-12-26 23:43:03,770 INFO: establishing a new patroni heartbeat connection to postgres
2024-12-26 23:43:03,902 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
```

5. Тесты. Kill -9

```
2024-12-25 23:17:54,609 INFO: no action. I am (patroni1), the leader with the lock
2024-12-25 23:17:57,893 INFO: Selected new etcd server http://192.168.1.109:2379
2024-12-25 23:17:57,896 WARNING: I am the leader but not owner of the lease
2024-12-25 23:17:57,902 INFO: No PostgreSQL configuration items changed, nothing to reload.
2024-12-25 23:17:57,969 INFO: establishing a new patroni heartbeat connection to postgres
2024-12-25 23:17:57,995 INFO: Changed archive_mode from 'on' to 'True' (restart might be required)
2024-12-25 23:17:57,995 INFO: Changed synchronous_commit from 'on' to 'True'
2024-12-25 23:17:57,996 INFO: Changed wal_compression from 'pglz' to 'True'
2024-12-25 23:17:58,004 INFO: Reloading PostgreSQL configuration.
2024-12-25 23:17:59,529 WARNING: I am the leader but not owner of the lease
2024-12-25 23:17:59,751 INFO: no action. I am (patroni1), the leader with the lock
2024-12-25 23:17:59,870 INFO: establishing a new patroni restapi connection to postgres
2024-12-25 23:18:09,615 INFO: no action. I am (patroni1), the leader with the lock
2024-12-25 23:18:19,572 INFO: no action. I am (patroni1), the leader with the lock
```

```
2024-12-25 23:18:29,572 INFO: no action. I am (patroni1), the leader with the lock
2024-12-25 23:18:39,572 INFO: no action. I am (patroni1), the leader with the lock
2024-12-25 23:18:49,572 INFO: establishing a new patroni heartbeat connection to postgres
2024-12-25 23:18:59,572 INFO: no action. I am (patroni1), the leader with the lock
```

5. Тесты. Отключение etcd

```
daa@etcd1:~$ etcdctl -w table endpoint --cluster status
```

ENDPOINT	ID	VERSION	DB SIZE	IS LEADER	IS LEARNER	RAFT TERM	RAFT INDEX
http://192.168.1.106:2379	2125f1467958dff8	3.5.17	127 kB	true	false	17	413670
http://192.168.1.110:2379	265b9c61ffe85ba1	3.5.17	139 kB	false	false	17	413670
http://192.168.1.109:2379	97ba8852ebaddf74	3.5.17	115 kB	false	false	17	413645

```
2024-12-27 00:00:49,802 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
2024-12-27 00:00:59,716 INFO: Lock owner: patroni1; I am patroni2
2024-12-27 00:01:01,387 ERROR: Failed to get list of machines from http://192.168.1.106:2379/v3: MaxRetryError("HTTPConnect
2024-12-27 00:01:01,445 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
```

```
2024-12-27 00:46:15,497 - ERROR - Request to server http://192.168.1.109:2379 failed: MaxRetryError("HTTPConnectionPool(hos
2024-12-27 00:46:16,072 - ERROR - Request to server http://192.168.1.106:2379 failed: MaxRetryError("HTTPConnectionPool(hos
2024-12-27 00:46:19,410 - ERROR - Request to server http://192.168.1.110:2379 failed: ReadTimeoutError("HTTPConnectionPool(
2024-12-27 00:46:21,080 - ERROR - Failed to get list of machines from http://192.168.1.106:2379/v3: MaxRetryError("HTTPConn
patroni.dcs.etcd3.Etcd3Error: Etcd is not responding properly
```

```
ba9f0u1'qc2'6fcd3'fcd3fello: fcd3 f2 uog l6zbuqtu8 blobelja
```



5. Тесты. Отключение etcd

HAProxy version 2.8.5-1ubuntu3.2, released 2024/12/02

Statistics Report for pid 1388

> General process information

pid = 1388 (process #1, nbproc = 1, nbthread = 2)
uptime = 0d 1h33m14s; warnings = 30
system limits: memmax = unlimited; ulimit-n = 200061
maxsock = 200061; maxconn = 100000; reached = 0; maxpipes = 0
current conns = 4; current pipes = 0/0; conn rate = 0/sec; bit rate = 2.718 kbps
Running tasks: 0/24; idle = 100 %

active UP
active UP, going down
active DOWN, going up
active or backup DOWN
active or backup DOWN for maintenance (MAINT)
active or backup SOFT STOPPED for maintenance

backup UP
backup UP, going down
backup DOWN, going up
not checked

Note: "NOLB"/"DRAIN" = UP with load-balancing disabled.

Display option:

- Scope :
- Hide 'DOWN' servers
- Refresh now
- CSV export
- JSON export (schema)

External resources:

- Primary site
- Updates (v2.8)
- Online manual

stats																															
	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Server									
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle	
Frontend				0	2	-	2	2	100 000	7			6 705	399 299	0	0	3					OPEN									
Backend	0	0		0	0		0	0	10 000	0	0	0s	6 705	399 299	0	0		0	0	0	0	1h33m UP		0/0	0	0		0			

postgres_master																															
	Queue			Session rate			Sessions						Bytes		Denied		Errors		Warnings		Server										
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle	
Frontend				0	2	-	0	3	100 000	21			365 783	668 749	0	0	0					OPEN									
patroni1	0	0	-	0	1		0	3	-	8	8	48s	365 687	668 749		0		0	0	0	0	43s DOWN	L7STS/503 in 1ms	1/1	Y	-	16	6	14m1s	-	
patroni2	0	0	-	0	0		0	0	-	0	0	?	0	0		0		0	0	0	0	1h5m DOWN	L7STS/503 in 1ms	1/1	Y	-	7	3	1h25m	-	
Backend	0	0		0	2		0	3	10 000	21	8	48s	365 783	668 749	0	0		13	0	0	0	43s DOWN		0/0	0	0		8	6m14s		

postgres_replicas																															
	Queue			Session rate			Sessions						Bytes		Denied		Errors		Warnings		Server										
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status	LastChk	Wght	Act	Bck	Chk	Dwn	Dwntme	Thrtle	
Frontend				0	1	-	2	3	100 000	6			271 749	697 642	0	0	0					OPEN									
patroni1	0	0	-	0	1		1	2	-	3	3	10s	560	1 596		0		0	0	0	0	58m35s UP	L7OK/200 in 1ms	1/1	Y	-	12	4	6m12s	-	
patroni2	0	0	-	0	1		1	1	-	3	3	8s	271 199	696 046		0		0	0	0	0	58m34s UP	L7OK/200 in 1ms	1/1	Y	-	10	3	5m52s	-	
Backend	0	0		0	1		2	3	10 000	6	6	8s	271 749	697 642	0	0		0	0	0	0	58m35s UP		2/2	2	0		2	3m5s		

5. Тесты. Отключение etcd

```
Working with: REPLICA - 192.168.1.112  
Retrieved: 2024-12-27 00:45:52.234837
```

```
Working with: REPLICA - 192.168.1.112  
Retrieved: 2024-12-27 00:45:52.234837
```

```
Working with: REPLICA - 192.168.1.112  
Retrieved: 2024-12-27 00:45:52.234837
```

```
daa@patroni2:~$ psql -p 6432 -U postgres  
Password for user postgres:  
psql (15.10 (Ubuntu 15.10-1.pgdg24.04+1))  
Type "help" for help.
```

```
postgres=# \c demo  
You are now connected to database "demo" as user "postgres".  
demo=# CREATE TABLE splitblain(c1 text);  
ERROR: cannot execute CREATE TABLE in a read-only transaction  
demo=#
```

```
Q6W0=#
```

```
daa@patroni1:~$ psql -p 6432 -U postgres  
Password for user postgres:  
psql (15.10 (Ubuntu 15.10-1.pgdg24.04+1))  
Type "help" for help.
```

```
postgres=# \c demo  
You are now connected to database "demo" as user "postgres".  
demo=# CREATE TABLE splitblain(c1 text);  
ERROR: cannot execute CREATE TABLE in a read-only transaction  
demo=#
```

```
Q6W0=#
```

```
ERROR: cannot execute CREATE TABLE in a read-only transaction
```



5. Тесты. Отключение etcd

```
2024-12-27 00:56:42,800 ERROR: Failed to get list of machines from http://192.168.1.109:2379/v3: MaxRetryError("HTTPConn
2024-12-27 00:56:42,804 INFO: Lock owner: patroni1; I am patroni1
2024-12-27 00:56:42,850 WARNING: Dropping physical replication slot patroni2 because of its xmin value 32600
2024-12-27 00:56:42,850 WARNING: Unable to drop replication slot 'patroni2', slot is active
2024-12-27 00:56:42,893 INFO: promoted self to leader because I had the session lock
2024-12-27 00:56:44,032 INFO: no action. I am (patroni1), the leader with the lock
2024-12-27 00:56:53,942 INFO: no action. I am (patroni1), the leader with the lock
```

```
2024-12-27 00:56:38,340 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
2024-12-27 00:56:38,342 WARNING: Loop time exceeded, rescheduling immediately.
2024-12-27 00:56:38,382 INFO: Lock owner: patroni1; I am patroni2
2024-12-27 00:56:41,721 ERROR: Request to server http://192.168.1.110:2379 failed: ReadTimeoutError("HTTPCo
2024-12-27 00:56:41,721 INFO: Reconnection allowed, looking for another server.
2024-12-27 00:56:41,721 INFO: Retrying on http://192.168.1.109:2379
2024-12-27 00:56:45,058 ERROR: Request to server http://192.168.1.109:2379 failed: ReadTimeoutError("HTTPCo
2024-12-27 00:56:45,058 INFO: Reconnection allowed, looking for another server.
2024-12-27 00:56:45,058 INFO: Retrying on http://192.168.1.106:2379
2024-12-27 00:56:45,060 INFO: Selected new etcd server http://192.168.1.106:2379
2024-12-27 00:56:45,061 ERROR: watchprefix failed: ProtocolError("Connection broken: InvalidChunkLength(got
2024-12-27 00:56:45,146 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
2024-12-27 00:56:45,190 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
2024-12-27 00:56:55,690 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
2024-12-27 00:56:55,690 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
2024-12-27 00:56:55,690 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
2024-12-27 00:56:55,690 INFO: no action. I am (patroni2), a secondary, and following a leader (patroni1)
```


5. Тесты. Отключение etcd

AProxy version 2.8.5-1ubuntu3.2, released 2024/12/12

Statistics Report for pid 1388

> General process information

pid = 1388 (process #1, nbproc = 1, nbthread = 2)
uptime = 0d 1h46m18s; warnings = 31
system limits: memmax = unlimited; ulimit-n = 200061
maxsock = 200061; maxconn = 100000; reached = 0; maxpipes = 0
current conns = 4; current pipes = 0/0; conn rate = 2/sec; bit rate = 0.815 kbps
Running tasks: 0/24; idle = 100 %

```
daa@patroni1:~$ sudo patronictl -c /etc/patroni/config.yml list
```

```
[sudo] password for daa:
```

```
+ Cluster: patroni-cluster (7449702151863418585) +-----+-----+
| Member | Host | Role | State | TL | Lag in MB |
+-----+-----+-----+-----+-----+-----+
| patroni1 | 192.168.1.111 | Leader | running | 53 | |
| patroni2 | 192.168.1.112 | Replica | streaming | 53 | 0 |
+-----+-----+-----+-----+-----+-----+
| patroni1 | 192.168.1.111 | Leader | running | 53 | |
| patroni2 | 192.168.1.112 | Replica | streaming | 53 | 0 |
+-----+-----+-----+-----+-----+-----+
```

active UP
active UP, go
active DOWN
active or bad
active or backup DOWN for maintenance (MAINT)
active or backup SOFT STOPPED for maintenance.

Note: "NOLOGYDRAIN" = UP with load-balancing disabled.

stats

	Queue			Session rate			Sessions						Bytes		Denied		Errors			Warnings		Status	LastChk	W
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis			
Frontend				2	2	-	2	2	100 000	9			7 152	426 889	0	0	4					OPEN		
Backend	0	0		0	0		0	0	10 000	0	0	0s	7 152	426 889	0	0	0	0	0	0	0	1h46m UP		

postgres_master

	Queue			Session rate			Sessions					Bytes		Denied		Errors		Warnings		Status	LastChk		
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp			Retr	Redis
Frontend	0	0	-	0	2	-	0	3	100 000	21			365 783	668 749	0	0	0	0	0	0	0	OPEN	
patroni1	0	0	-	0	1	-	0	3	-	8	8	13m52s	365 887	668 749	0	0	0	0	0	0	0	2m58s UP	L7OK/200 in 1ms
patroni2	0	0	-	0	0	-	0	0	-	0	0	?	0	0	0	0	0	0	0	0	0	1h19m DOWN	L7STS/503 in 1ms
Backend	0	0	-	0	2	-	0	3	10 000	21	8	13m52s	365 783	668 749	0	0	13	0	0	0	0	2m58s UP	

postgres_replicas

	Queue			Session rate			Sessions						Bytes		Denied		Errors		Warnings		Status	LastChk	
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr			Redis
Frontend							-	2	3	100 000	6		271 749	697 642	0	0	0					OPEN	
patroni1	0	0	-	0	1			1	2		-	3	3	13m14s	550	1 596	0	0	0	0	0	1h11m UP	L7OK/200 in 1ms
patroni2	0	0	-	0	1			1	1		-	3	3	13m12s	271 199	696 046	0	0	0	0	0	1h11m UP	L7OK/200 in 1ms
Backend	0	0		0	1			2	3	10 000	6	6	13m12s	271 749	697 642	0	0	0	0	0	0	1h11m UP	

Что можно улучшить\попробовать ?

1. Настроить https взаимодействие между компонентами
2. Увеличить etcd до 5
3. Добавить ноду patroni
4. Настроить взаимодействие по DNS именам
5. Провести более глубокое тестирование
6. Попробовать другие продукты consul, kuber, cloud
7. Подключить NFS хранилище для WAL



Выводы:

1. Получен навык развертывания кластера на базе patroni
2. Получено понимание как можно тестировать кластер
3. Получено понимание как заниматься трабл шутингом



Вопросы и рекомендации



если есть вопросы



если вопросов нет

Спасибо за внимание!

