ДЗ 9: Отказоустойчивость приложений

3 mysql slave ([Конфигурация HAproxy](#)) и 3 приложения ([Конфигурация NGinx](#)). Балансировка - RoundRobin.

В приложении хранение сессии изменено с "памяти" на mysql, чтобы запросы на разные экземпляры работали с одной сессией.
Нагрузка сделана K6 скриптом - запрос на получение профиля.

Процесс эксперимента

Работа всех приложений и mysql

HAproxy

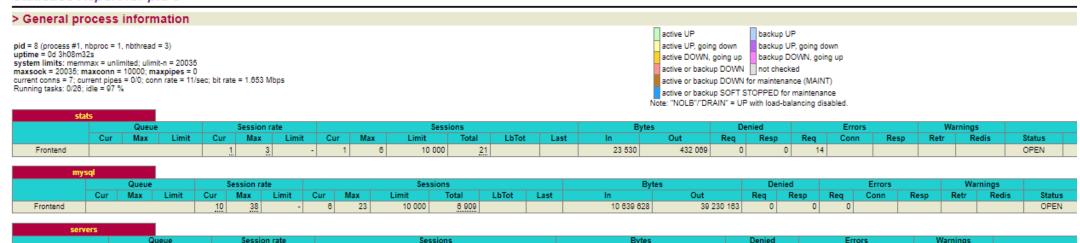### Statistics Report for pid 8

> General process information

pid = 8 (process #1, nbproc = 1, nbthread = 3)
uptime = 0d 3h08m32s
system limits: memmax = unlimited; ulimit-n = 20035
maxsock = 20035; maxconn = 10000; maxpipes = 0
current conns = 7; current pipes = 0/0; conn rate = 11/sec; bit rate = 1.653 Mbps
Running tasks: 0/26; idle = 97 %

	active UP		backup UP
	active UP, going down		backup UP, going down
	active DOWN, going up		backup DOWN, going up
	active or backup DOWN		not checked
	active or backup DOWN for maintenance (MAINT)		
	active or backup SOFT STOPPED for maintenance		

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

stats

	Queue			Session rate			Sessions					Bytes		Denied		Errors			Warnings		
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status
Frontend				1	3	-	1	6	10 000	21			23 530	432 069	0	0	14					OPEN

mysql

	Queue			Session rate			Sessions					Bytes		Denied		Errors			Warnings		
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status
Frontend				10	38	-	6	23	10 000	6 909			10 639 628	39 230 163	0	0	0					OPEN

servers

	Queue			Session rate			Sessions					Bytes		Denied		Errors			Warnings		
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status
mysql-slave1	0	0	-	3	16		0	15	32	1 717	1 619	0s	2 280 610	8 378 850		0		49	7	98	0	12s UP
mysql-slave2	0	0	-	3	19		3	11	32	2 645	2 645	0s	4 062 646	14 961 668		0		0	0	0	0	3h8m UP
mysql-slave3	0	0	-	3	19		3	10	32	2 645	2 645	0s	4 296 372	15 889 645		0		0	0	0	0	3h8m UP
Backend	0	0		10	38		6	23	1 000	6 909	6 909	0s	10 639 628	39 230 163	0	0		49	7	98	0	3h8m UP

Отключение 1-го экземпляра mysql

NAproxy

Statistics Report for pid 8

> General process information

pid = 8 (process #1, nbproc = 1, nbthread = 3)
uptime = 0d 3h08m53s
system limits: memmax = unlimited; ulimit-n = 20035
maxsock = 20035; maxconn = 10000; maxpipes = 0
current conns = 19; current pipes = 0/0; conn rate = 6/sec; bit rate = 684.401 kbps
Running tasks: 0/38; idle = 98 %

	active UP		backup UP
	active UP, going down		backup UP, going down
	active DOWN, going up		backup DOWN, going up
	active or backup DOWN		not checked
	active or backup DOWN for maintenance (MAINT)		
	active or backup SOFT STOPPED for maintenance		

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

stats

	Queue			Session rate			Sessions					Bytes		Denied		Errors			Warnings		
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Sta
Frontend				0	3	-	2	6	10 000	22			24 162	453 306	0		0		14			OP

mysql

	Queue			Session rate			Sessions					Bytes		Denied		Errors			Warnings	
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis
Frontend				6	38	-	17	23	10 000	7 233			11 192 037	41 284 551	0		0		0		

servers

	Queue			Session rate			Sessions					Bytes		Denied		Errors			Warnings		
	Cur	Max	Limit	Cur	Max	Limit	Cur	Max	Limit	Total	LbTot	Last	In	Out	Req	Resp	Req	Conn	Resp	Retr	Redis	Status
mysql-slave1	0	0	-	2	16		9	15	32	1 858	1 721	0s	2 400 511	8 821 952		0		65	10	137	0	3s DOWN
mysql-slave2	0	0	-	2	19		5	11	32	2 756	2 756	1s	4 278 691	15 769 253		0		0	0	0	0	3h8m UP
mysql-slave3	0	0	-	3	19		3	10	32	2 756	2 756	0s	4 512 835	16 693 346		0		0	0	0	0	3h8m UP
Backend	0	0		6	38		17	23	1 000	7 233	7 233	0s	11 192 037	41 284 551	0	0		65	10	137	0	3h8m UP

Лог

Запросы шли на 3 инстанса после отключения на 2 и 3:

{"log":"\u003c134\u003eJun 25 14:48:55 haproxy[8]: 192.168.2.5:42710 [25/Jun/2022:14:48:55.388] mysql servers/mysql-slave1 1/4/46941 -- 7/7/6/1/0 0/0\n","stream":"stdout","time":"2022-06-25T14:48:55.434963298Z"}
{"log":"\u003c134\u003eJun 25 14:48:55 haproxy[8]: 192.168.2.5:41716 [25/Jun/2022:14:48:53.710] mysql servers/mysql-slave1 1/0/1852 23658 SD 7/7/6/0/0 0/0\n","stream":"stdout","time":"2022-06-25T14:48:55.562184075Z"}
{"log":"\u003c134\u003eJun 25 14:48:55 haproxy[8]: 192.168.2.5:42788 [25/Jun/2022:14:48:55.537] mysql servers/mysql-slave3 1/0/27937 -- 6/6/5/3/0 0/0\n","stream":"stdout","time":"2022-06-25T14:48:55.566035416Z"}
{"log":"\u003c134\u003eJun 25 14:48:55 haproxy[8]: 192.168.2.5:42930 [25/Jun/2022:14:48:55.765] mysql servers/mysql-slave3 1/0/27936 -- 9/9/8/3/0 0/0\n","stream":"stdout","time":"2022-06-25T14:48:55.79303396Z"}
{"log":"\u003c134\u003eJun 25 14:48:56 haproxy[8]: 192.168.2.5:42708 [25/Jun/2022:14:48:55.378] mysql servers/mysql-slave3 1/0/79913070 -- 9/9/8/2/0 0/0\n","stream":"stdout","time":"2022-06-25T14:48:56.176968843Z"}

{"log":"\u003c134\u003eJun 25 14:48:56 haproxy[8]: 192.168.2.5:43268 [25/Jun/2022:14:48:56.246] mysql servers/mysql-slave3 1/0/72936 -- 10/10/9/2/0 0/0\n","stream":"stdout","time":"2022-06-25T14:48:56.318664327Z"}
{"log":"\u003c134\u003eJun 25 14:48:56 haproxy[8]: 192.168.2.5:43316 [25/Jun/2022:14:48:56.326] mysql servers/mysql-slave2 1/0/29937 -- 10/10/9/4/0 0/0\n","stream":"stdout","time":"2022-06-25T14:48:56.357474449Z"}
{"log":"\u003c134\u003eJun 25 14:48:57 haproxy[8]: 192.168.2.5:42800 [25/Jun/2022:14:48:55.573] mysql servers/mysql-slave1 1/-1/2002 0 SC 9/9/8/0/3 0/0\n","stream":"stdout","time":"2022-06-25T14:48:57.57567115Z"}
{"log":"\u003c134\u003eJun 25 14:49:02 haproxy[8]: 192.168.2.5:42948 [25/Jun/2022:14:48:55.785] mysql servers/mysql-slave1 1/-1/7002 0 SC 8/8/7/1/3 0/0\n","stream":"stdout","time":"2022-06-25T14:49:02.788956897Z"}
{"log":"\u003c134\u003eJun 25 14:49:03 haproxy[8]: 192.168.2.5:43280 [25/Jun/2022:14:48:56.265] mysql servers/mysql-slave1 1/-1/7008 0 SC 7/7/6/0/3 0/0\n","stream":"stdout","time":"2022-06-25T14:49:03.274352789Z"}
{"log":"[WARNING] (8) : Server servers/mysql-slave1 is DOWN, reason: Layer4 timeout, check duration: 2002ms. 2 active and 0 backup servers left. 0 sessions active, 0 requeued, 0 remaining in queue.\n","stream":"stderr","time":"2022-06-25T14:49:05.507655388Z"}
{"log":"\u003c129\u003eJun 25 14:49:05 haproxy[8]: Server servers/mysql-slave1 is DOWN, reason: Layer4 timeout, check duration: 2002ms. 2 active and 0 backup servers left. 0 sessions active, 0 requeued, 0 remaining in queue.\n","stream":"stdout","time":"2022-06-25T14:49:05.507783512Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:44330 [25/Jun/2022:14:49:24.558] mysql servers/mysql-slave3 1/0/33939 -- 10/10/9/3/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.592291026Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:44348 [25/Jun/2022:14:49:24.580] mysql servers/mysql-slave3 1/0/28944 -- 10/10/9/3/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.611035459Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:41006 [25/Jun/2022:14:48:53.036] mysql servers/mysql-slave2 1/2/31580 69027 -- 9/9/8/5/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.615671134Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:44354 [25/Jun/2022:14:49:24.589] mysql servers/mysql-slave2 1/0/552124 -- 8/8/7/4/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.645252199Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:42920 [25/Jun/2022:14:48:55.755] mysql servers/mysql-slave2 1/0/28900 61985 -- 7/7/6/3/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.656567084Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:44376 [25/Jun/2022:14:49:24.603] mysql servers/mysql-slave3 1/0/1653358 -- 9/9/8/3/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.76882948Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:42232 [25/Jun/2022:14:48:54.553] mysql servers/mysql-slave3 1/0/30222 75088 -- 8/8/7/2/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.776060651Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:44502 [25/Jun/2022:14:49:24.755] mysql servers/mysql-slave2 1/0/391275 -- 8/8/7/4/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.795077157Z"}
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:44524 [25/Jun/2022:14:49:24.776] mysql servers/mysql-slave3 1/0/832117 -- 7/7/6/2/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.861285767Z"}

```
{"log":"\u003c134\u003eJun 25 14:49:24 haproxy[8]: 192.168.2.5:44606 [25/Jun/2022:14:49:24.871] mysql servers/mysql-slave2 1/0/25
942 -- 7/7/6/4/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:24.897666078Z"}
{"log":"\u003c134\u003eJun 25 14:49:25 haproxy[8]: 192.168.2.5:44476 [25/Jun/2022:14:49:24.714] mysql servers/mysql-slave3 1/0/373
7204 -- 7/7/6/2/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:25.089220374Z"}
{"log":"\u003c134\u003eJun 25 14:49:25 haproxy[8]: 192.168.2.5:43080 [25/Jun/2022:14:48:55.959] mysql servers/mysql-slave2
1/0/29341 24146 -- 9/9/8/5/0 0/0\n","stream":"stdout","time":"2022-06-25T14:49:25.301639262Z"}
```

Отключение 1-го экземпляра приложения

NGinx-лог

```
2022/06/25 17:50:24 [error] 3567#3567: *36148 upstream prematurely closed connection while reading response header from upstream,
client: 127.0.0.1, server: , request: "GET /profile/?id=19 HTTP/1.1", upstream: "http://127.0.0.1:9082/profile/?id=19", host:
"127.0.0.1:9080"
```

Итог

Запросы продолжали обрабатываться

```
running (5m05.7s), 00/20 VUs, 560 complete and 0 interrupted iterations
default ✗ [================================] 20 VUs  5m0s

     ✓ logged in successfully
     ✗ retrieved profile
     ↳  99% -- ✓ 27995 / ✗ 5

     checks.........................: 99.98% ✓ 28555      ✗ 5
     data_received..................: 419 MB 1.4 MB/s
     data_sent......................: 4.4 MB 15 kB/s
     http_req_blocked...............: avg=56.66µs  min=1.12µs  med=2.89µs   max=142.38ms p(90)=4.57µs   p(95)=5.66µs
     http_req_connecting............: avg=48.64µs  min=0s      med=0s       max=142.3ms  p(90)=0s       p(95)=0s
     http_req_duration..............: avg=208.42ms min=8.48ms  med=162.45ms max=15.64s   p(90)=412.64ms p(95)=491.03ms
       { expected_response:true }...: avg=208.4ms  min=8.48ms  med=162.43ms max=15.64s   p(90)=412.64ms p(95)=491.07ms
     http_req_failed................: 0.01%  ✓ 5         ✗ 29115
     http_req_receiving.............: avg=6.56ms   min=20.28µs med=232.3µs  max=203.61ms p(90)=25.22ms  p(95)=38.07ms
```

```
    http_req_sending...............: avg=156.15µs min=5.92µs  med=13.56µs  max=232.45ms p(90)=20.15µs  p(95)=38.25µs
    http_req_tls_handshaking.......: avg=0s       min=0s      med=0s       max=0s       p(90)=0s       p(95)=0s
    http_req_waiting...............: avg=201.7ms  min=8.4ms   med=156.29ms max=15.64s   p(90)=402.15ms p(95)=479.83ms
    http_reqs......................: 29120   95.256149/s
    iteration_duration.............: avg=10.86s   min=5.72s   med=10.47s   max=27.77s   p(90)=12.69s   p(95)=14.99s
    iterations.....................: 560     1.831849/s
    vus............................: 9       min=9       max=20
    vus_max........................: 20      min=20      max=20
```

Конфигурация HAproxy

```
global
    maxconn 10000
    log stdout local0 debug

defaults
    log global
    option tcplog
    timeout connect 5000
    timeout client 50000
    timeout server 50000

frontend stats
    mode http
    bind *:4480
    stats enable
    stats uri /

frontend mysql
    mode tcp
    bind *:4400
```

```
        default_backend servers

backend servers
    balance roundrobin
    server mysql-slave1 mysql-slave1:3306 check maxconn 32
    server mysql-slave2 mysql-slave2:3306 check maxconn 32
    server mysql-slave3 mysql-slave3:3306 check maxconn 32
```

Конфигурация NGinx

```
http {
    upstream service {
        server 127.0.0.1:9081;
        server 127.0.0.1:9082;
        server 127.0.0.1:9083;
    }

    server {
        listen 0.0.0.0:9080;
        location / {
            proxy_pass http://service;
        }
    }

    server {
        listen 0.0.0.0:9079;
        location /state {
            stub_status on;
            access_log   on;
        }
```

```
        }
...
}
```