

# root@opentodo#

GNU/Linux and Unix notes

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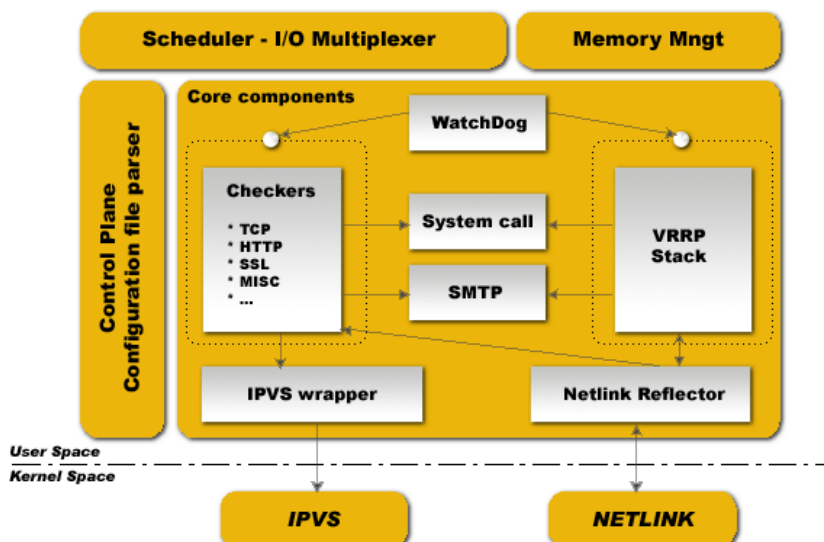
## Load balancing with IPVS + Keepalived



IPVS implements load balancing for level transport inside Linux kernel. Running as frontend balancing the request from the clients to the backend servers using different methods of forwarding and load balance algorithms. Basically supports three methods of package forwarding:

- NAT
- Tunneling
- Direct Routing

Keepalived is a routing software, that provides a framework for load balancing and high availability. Keepalived provided high availability using the protocol VRRP to router failover and the load balancing is provided by LVS.



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For this scenario I'll use the NAT load balancing method, working with keepalived, and as health checker for the backend servers to check if one of the backends nodes fails keepalived reports to the kernel to remove the node of the LVS topology.

Node director (IPVS + Keepalived):

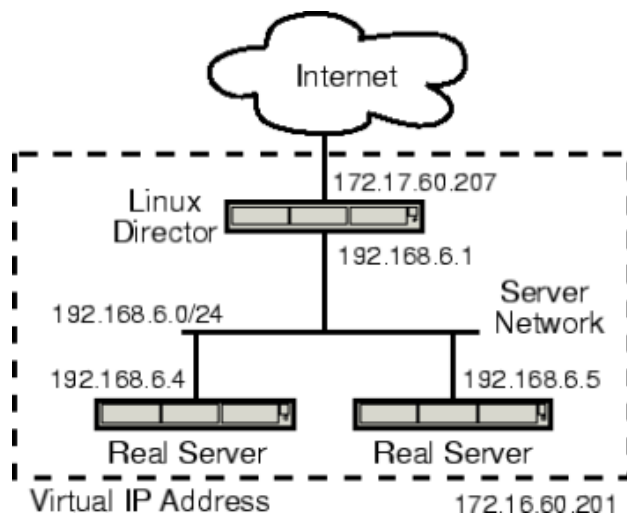
- eth0: 192.168.1.54 (NAT)
- eth1: 172.16.1.1

Backend server1:

- eth0: 172.16.1.2

Backend server2:

- eth0: 172.16.1.3



## Preparing the environment

- Enabling routing:

```
1 | # vi /etc/sysctl.conf
2 | net.ipv4.ip_forward=1
3 | # sysctl -p
```

- Enabling NAT:

```
1 | # iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
```

## Installing and configuring keepalived

- Install keepalived:

```
1 | #apt-get install keepalived
```

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- Create a hash for the url that keepalived will check:

```
1 # genhash -s 172.16.1.2 -p 80 -u /index.html
2 MD5SUM = 01bc6b572ba171d4d3bd89abe9cb9a4c
3 # genhash -s 172.16.1.3 -p 80 -u /index.html
4 MD5SUM = ea53b3baf477a283376779a3c1985085
```

- Edit keepalived configuration:

```
1 # vi /etc/keepalived/keepalived.conf
2
3 global_defs {
4     notification_email {
5         root
6     }
7     notification_email_from
8     keepalived@mydomain.com
9     smtp_server 127.0.0.1
10    smtp_connect_timeout 30
11    router_id LVS_DIRECTOR
12 }
13
14 virtual_server 192.168.1.54 80 {
15     delay_loop 6
16     lb_algo rr
17     lb_kind NAT
18     persistence_timeout 50
19     protocol TCP
20
21     real_server 172.16.1.2 80 {
22         weight 1
23         HTTP_GET {
24             url {
25                 path /index.html
26                 digest 01bc6b572ba171d4d3bd89abe9cb9a4c
27             }
28             connect_timeout 3
29             nb_get_retry 3
30             delay_before_retry 3
31         }
32     }
33
34     real_server 172.16.1.3 80 {
35         weight 1
36         HTTP_GET {
37             url {
38                 path /index.html
39                 digest ea53b3baf477a283376779a3c1985085
40             }
41             connect_timeout 3
42             nb_get_retry 3
43             delay_before_retry 3
44         }
45     }
46 }
47
48 virtual_server 192.168.1.54 25 {
49     delay_loop 6
50     lb_algo rr
51     lb_kind NAT
```

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```

52 | persistence_timeout 50
53 | protocol TCP
54 |
55 | real_server 172.16.1.2 25 {
56 |   weight 1
57 |   TCP_CHECK {
58 |     connect_timeout 3
59 |   }
60 | }
61 |
62 | real_server 172.16.1.3 25 {
63 |   weight 1
64 |   TCP_CHECK {
65 |     connect_timeout 3
66 |   }
67 | }

```

- virtual\_server : identify a server definition block
- delay loop: specify in seconds the interval between checks.
- lb\_algo: scheduler.
- lb\_kind: forwarding method.
- persistence\_timeout: timeout value for persistent connections.
- protocol: (TCP|UDP)
- real\_server: specify a real server member.
- weight: specify weight for load balanced decisions.
- TCP\_CHECK: check real servers with TCP connection.
- HTTP\_GET: checking real servers using HTTP\_GET request.
- connect\_timeout: connect remote server using timeout.
- nb\_get\_retry: maximum number of retries.
- delay\_before\_retry: delay between two successive retries.

### Starting keepalived

```
1 | # /etc/init.d/keepalived start
```

### Final checks

- ipvs code generated by keepalived for load balancing:

```

1 | # ipvsadm -A -t 192.168.1.54:80 -s rr
2 | # ipvsadm -a -t 192.168.1.54:80 -r
3 | 172.16.1.2:80 -m -w 1
   # ipvsadm -a -t 192.168.1.54:80 -r
   172.16.1.3:80 -m -w 1

```

## Options:

- A : add service
- a : add server
- t : tcp service
- r : real server
- m : masquerading (packet forwarding method)
- w : weight
- s (scheduler): rr(round robin), wrr (weighted round robin), lc (least connections), wlc (weighted least connections), lblc (locality based least connection), lblcr (lblc with replication), dh (destination hashing), sh (source hashing), sed (shortest expected delay), nq (never queue).

- List of servers and services:

```
1 | # ipvsadm -l
```

```
root@debian6:/etc/keepalived# ipvsadm -l
IP Virtual Server version 1.2.1 (size=4096)
Prot LocalAddress:Port Scheduler Flags
  -> RemoteAddress:Port      Forward Weight ActiveConn InActConn
TCP  192.168.1.54:smtp rr
  -> 172.16.1.2:smtp          Masq   1       0       0
  -> 172.16.1.3:smtp          Masq   1       0       0
TCP  192.168.1.54:www rr
  -> 172.16.1.2:www           Masq   1       0       0
  -> 172.16.1.3:www           Masq   1       0       0
```


- Test connections with load balanced (Round robin):

```
[perez@localhost ~]$ telnet 192.168.1.54 25
Trying 192.168.1.54...
Connected to 192.168.1.54.
Escape character is '^]'.
220 server1 ESMTP Postfix
quit
221 2.0.0 Bye
Connection closed by foreign host.
[perez@localhost ~]$ telnet 192.168.1.54 25
Trying 192.168.1.54...
Connected to 192.168.1.54.
Escape character is '^]'.
220 server2 ESMTP Postfix
```

## Sources

<http://www.linuxvirtualserver.org/>

<http://www.keepalived.org/documentation.html>

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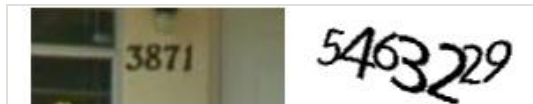
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