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Boost your web-app with HAProxy and Varnish

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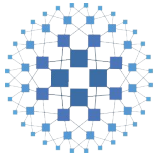
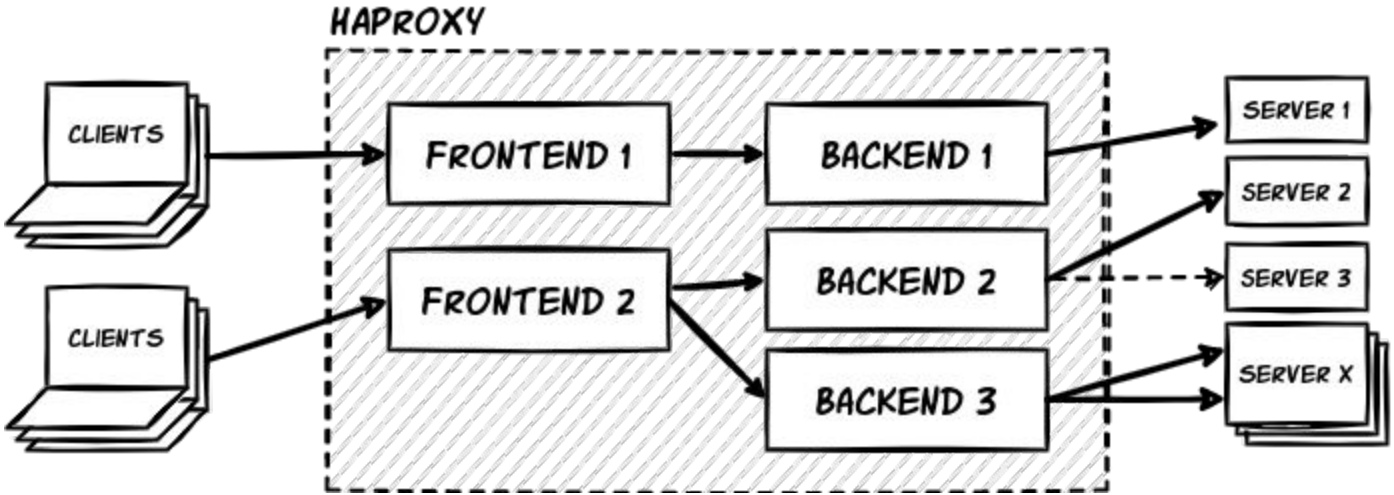
https://gitea.evolix.org/evolix/haproxyconf-2022



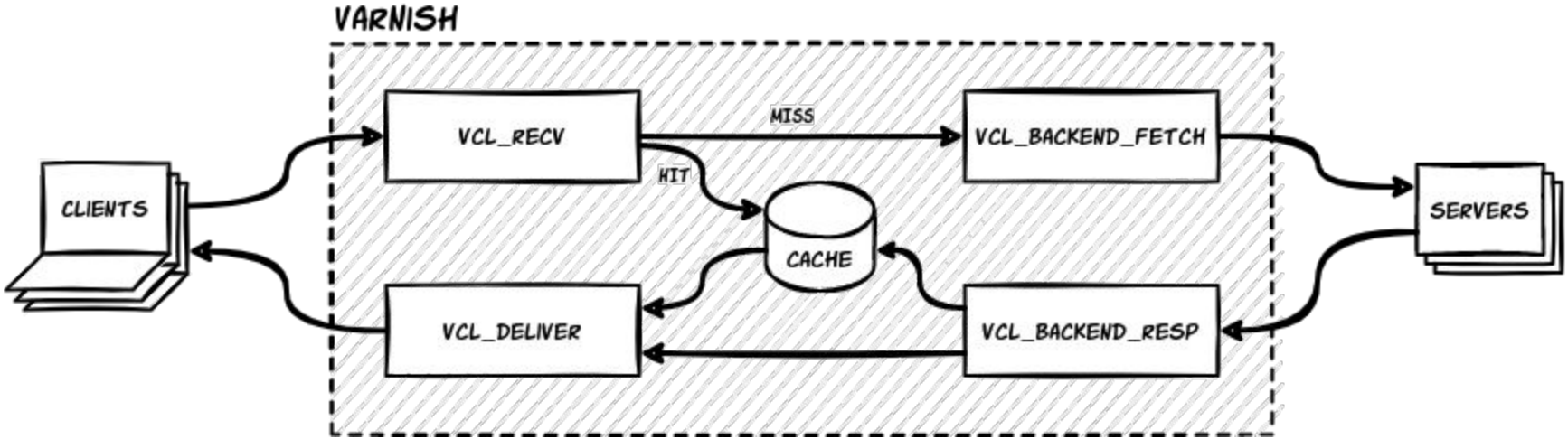
HAPROXY & VARNISH CACHE

- Free Libre Open Source Software
- Run on many platforms
- Resource efficient and stable
- Great documentation and communities
- Commercial support available

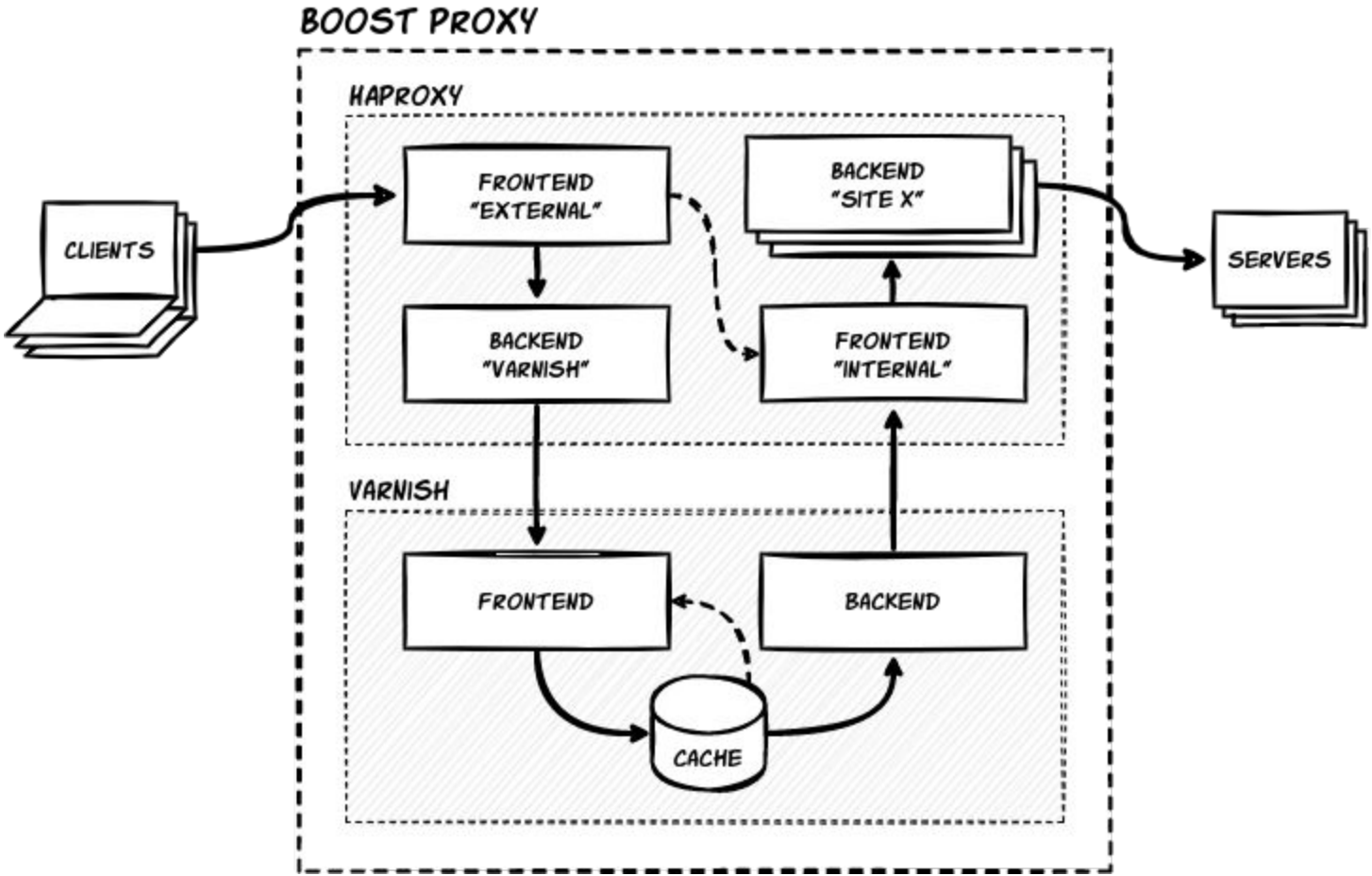
HAProxy – overview



Varnish – overview



HAProxy + Varnish = “Boost” – a CDN-like service


BOOST PROXY
HAPROXY
FRONTEND
"EXTERNAL"
BACKEND
"SITE X"
CLIENTS
SERVERS
BACKEND
"VARNISH"
FRONTEND
"INTERNAL"
VARNISH
FRONTEND
BACKEND
CACHE

Let’s zoom in

Multiple sites or apps

haproxy.cfg

```
frontend external
   acl example_com_domains hdr(host) -i example.com
   acl foo_bar_domains     hdr(host) -i foo-bar.com foo-bar.org
   […]
   use_backend example_com if example_com_domains
   use_backend foo_bar     if foo_bar_domains

backend example_com
   […]
   server srv10-1 192.0.10.1:80

backend foo_bar
   […]
   server srv20-1 192.0.20.1:80
   server srv20-2 192.0.20.2:80
```

Pass the request to Varnish – cache or no cache, there is no 503

haproxy.cfg

```
frontend external
   # Is Varnish available?
   acl varnish_available nbsrv(varnish) gt 0
   # Pass the request to Varnish
   use_backend varnish if varnish_available
   # … or fall back to a direct backend
   default_backend direct_backend

backend varnish
   option httpchk HEAD /varnishcheck
   server varnish_sock /run/varnish.sock check observe layer7 maxconn 3000 inter 1s send-proxy-v2
```

varnish.vcl

```
sub vcl_recv {
   if (req.url == "/varnishcheck") {
      return (synth(200, "Hi HAProxy, I'm fine!"));
   }
   […]
}
```

Pass the request to Varnish – should I stay or should I go?

haproxy.cfg

```
frontend external
   acl example_com_domains hdr(host) -i example.com
   […]
   use_backend varnish if !example_com_domains
```

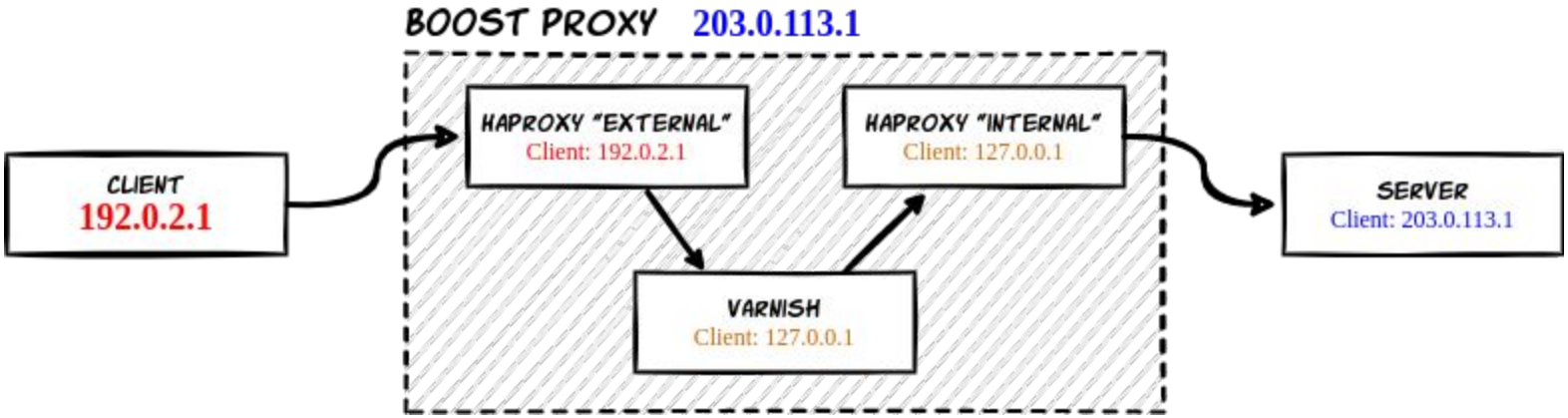
haproxy.cfg

```
frontend external
   acl use_cache if hdr(host) -f /etc/haproxy/cached_domains
   […]
   use_backend varnish if use_cache
```

haproxy.cfg

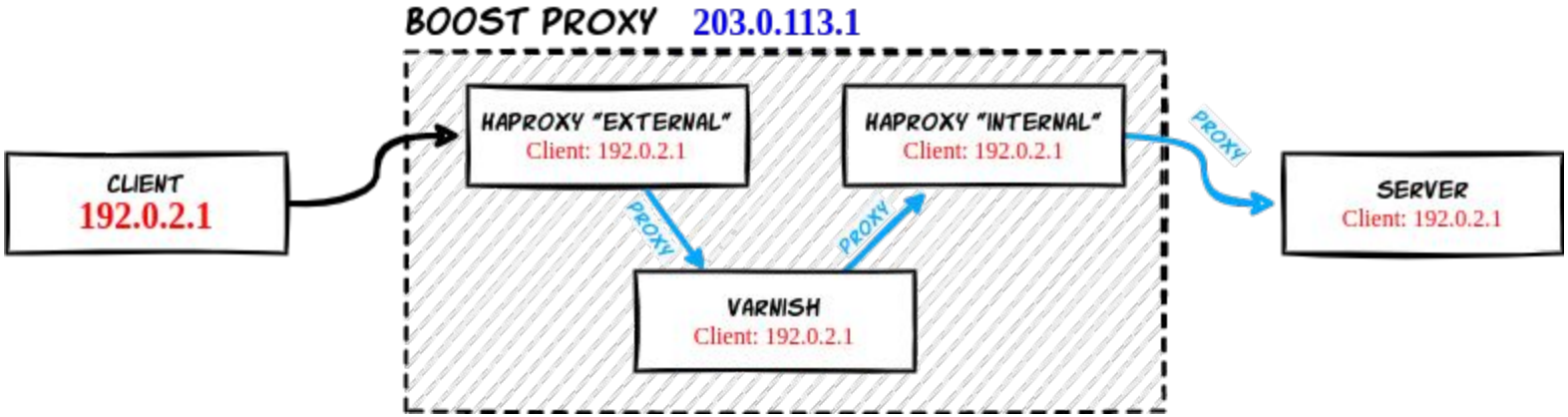
```
frontend external
   acl varnish_http_verb method GET HEAD PURGE
   […]
   use_backend varnish if varnish_http_verb
```

PROXY protocol – who is talking to me?




```
X-Forwarded-For: 192.0.2.1,127.0.0.1,127.0.0.1,203.0.113.1
```

PROXY protocol – who is talking to me?



PROXY protocol – how are you doing?

haproxy.cfg

```
frontend internal
   bind /run/haproxy-frontend-default.sock user root mode 666 accept-proxy

backend varnish
   server varnish_sock /run/varnish.sock check observe layer7 maxconn 3000 inter 1s send-proxy-v2

backend example_com
   server example-hostname 1.2.3.4:443 check observe layer4 ssl verify none send-proxy-v2
```

init

```
$ /usr/sbin/varnishd […] -a /run/varnish.sock,PROXY
```

varnish.vcl

```
backend default {
   .path = "/run/haproxy-frontend-default.sock";
   .proxy_header = 1;
}
```

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```

varnish.vcl

```
backend default {
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   .proxy_header = 1;
}
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backend example_com
   server example-hostname 1.2.3.4:443 check observe layer4 ssl verify none send-proxy-v2
```

init

```
$ /usr/sbin/varnishd […] -a /run/varnish.sock,PROXY
```

varnish.vcl

```
backend default {
   .path = "/run/haproxy-frontend-default.sock";
   .proxy_header = 1;
}
```

PROXY protocol – debug all the things

```
$ /usr/sbin/varnishd […] -a 127.0.0.1:82 -a /run/varnish.sock,PROXY
```

init

```
$ curl --resolve www.example.com:82:127.0.0.1
   ↳ --header "X-Forwarded-Proto: https"
   ↳ http://www.example.com:82/foo/bar
```

command line

PROXY protocol – all the way down

If possible : use PROXY protocol to the final servers

add a secondary non-PROXY interface

Pro-tip : Apache + ForensicLog

forensic.log

```
+X@Ike1sspdiNAko5YHK9HAAAAC4|
    ↳ GET /blog/ HTTP/1.1|
    ↳ host:jeremy.lecour.fr|user-agent:curl/7.64.0|accept:*/*|x-varnish:65545|
    ↳ x-forwarded-for:192.0.2.1,240.0.0.1|x-forwarded-port:443|x-forwarded-proto:https
-X@Ike1sspdiNAko5YHK9HAAAAC4
```

HTTP tagging – standard and custom headers

command line

```
$ curl -sv https://jeremy.lecour.fr/blog/
GET /blog/ HTTP/1.1
Host: jeremy.lecour.fr
User-Agent: curl/7.74.0
Accept: */*

HTTP/1.1 200 OK
Date: Thu, 8 Nov 2022 09:32:30 GMT
Server: Apache
Last-Modified: Tue, 19 May 2020 16:59:15 GMT
ETag: "23c8-5a603330a9ec0"
Accept-Ranges: bytes
Content-Type: text/html
X-Frame-Options: DENY
X-XSS-Protection: 1; mode=block
X-Content-Type-Options: nosniff
Content-Security-Policy: default-src 'none'; img-src 'self'; script-src 'self'; style-src 'self'
Strict-Transport-Security: max-age=63072000
```

HTTP tagging – X-Forwarded-*

haproxy.cfg

```
frontend external
   bind 0.0.0.0:80,:::80
   bind 0.0.0.0:443,:::443 ssl

   option forwardfor

   http-request set-header X-Forwarded-Port  %[dst_port]

   http-request set-header X-Forwarded-Proto http  if !{ ssl_fc }
   http-request set-header X-Forwarded-Proto https if  { ssl_fc }
```

HTTP tagging – X-Unique-ID

haproxy.cfg

```
frontend external
   # Add unique ID to each request
   http-request set-header X-Unique-ID %[uuid()] unless { hdr(X-Unique-ID) -m found }
```

HTTP tagging – X-Boost-Step1

haproxy.cfg

```
frontend external
   # Tag the request for Step 1
   http-request  add-header X-Boost-Step1 "haproxy-external"

   # Tag the response for Step 1
   http-response add-header X-Boost-Step1 "haproxy-external; ssl-frontend"    if  { ssl_fc }
   http-response add-header X-Boost-Step1 "haproxy-external; no-ssl-frontend" if !{ ssl_fc }
   http-response set-header X-Boost-Server my-hostname
```

HTTP tagging – X-Boost-Step2

varnish.vcl

```
sub vcl_recv {
   # Tag the request for Step 2
   set req.http.X-Boost-Step2 = "varnish";
}
```

varnish.vcl

```
sub vcl_deliver {
   # Tag the response for Step 2
   if (resp.http.Set-Cookie && resp.http.Cache-Control) {
     set resp.http.X-Boost-Step2 = "varnish; set-cookie; cache-control";
   } elseif (resp.http.Set-Cookie) {
     set resp.http.X-Boost-Step2 = "varnish; set-cookie; no-cache-control";
   } elseif (resp.http.Cache-Control) {
     set resp.http.X-Boost-Step2 = "varnish; no-set-cookie; cache-control";
   } else {
     set resp.http.X-Boost-Step2 = "varnish; no-set-cookie; no-cache-control";
   }
}
```

HTTP tagging – X-Boost-Step3

haproxy.cfg

```
frontend internal
   # Tag the request for Step 3
   http-request  add-header X-Boost-Step3 "haproxy-internal"
   # Tag the response for Step 3
   http-response add-header X-Boost-Step3 "haproxy-internal; ssl-backend"    if  { ssl_bc }
   http-response add-header X-Boost-Step3 "haproxy-internal; no-ssl-backend" if !{ ssl_bc }
```

HTTP tagging – Full HAProxy log

haproxy.cfg

```
frontend external
   […]
   http-response add-header X-Haproxy-Log-External "%ci:%cp [%tr] %ft %b/%s %TR/%Tw/%Tc/%Tr/%Ta
   ↳ %ST %B %CC %CS %tsc %ac/%fc/%bc/%sc/%rc %sq/%bq %hr %hs %{+Q}r"

frontend internal
   […]
   http-response add-header X-Haproxy-Log-Internal "%ci:%cp [%tr] %ft %b/%s %TR/%Tw/%Tc/%Tr/%Ta
   ↳ %ST %B %CC %CS %tsc %ac/%fc/%bc/%sc/%rc %sq/%bq %hr %hs %{+Q}r"
```

Don’t do this in production

Filtering at HAProxy level

haproxy.cfg

```
frontend external
   […]
   # Reject the request at the TCP level if source is in the denylist
   tcp-request connection reject if { src -f /etc/haproxy/deny_ips }
```

haproxy.cfg

```
userlist vip_users
    user johndoe password $6$k6y3o.eP$JlKBx9za9667qe4(…)xHSwRv6J.C0/D7cV91

frontend external
   […]
   redirect scheme https code 301 if !{ ssl_fc }
   redirect prefix https://example-to.org code 301 if { hdr(host) -i example-from.org }
   http-request auth realm "VIP Section" if !{ http_auth(vip_users) }
```

Maintenance mode – global

haproxy.cfg

```
frontend external
   […]
   # List of IP that will not go the maintenance backend
   acl maintenance_ips src -f /etc/haproxy/maintenance_ips
   # Go to maintenance backend, unless your IP is whitelisted
   use_backend maintenance if !maintenance_ips

backend maintenance
   http-request set-log-level silent
   # Custom 503 error page
   errorfile 503 /etc/haproxy/errors/maintenance.http
   # With no server defined, a 503 is returned for every request
```

Maintenance mode – per site

haproxy.cfg

```
frontend external
   […]
   acl example_com_domains hdr(host) -i example.com

   acl maintenance_ips src -f /etc/haproxy/maintenance_ips
   acl example_com_maintenance_ips src -f /etc/haproxy/example_com/maintenance_ips

   use_backend example_com_maintenance if example_com_domains !example_com_maintenance_ips
   ↳ !maintenance_ips
```

PURGE – let's make a blank slate

varnish.vcl

```
sub vcl_recv {
   if (req.http.host == "example.com" && req.method == "PURGE") {
      if (client.ip == "198.51.100.4" || client.ip == "198.51.100.5") {
          if (req.url == "/_purge_all") {
              ban("req.http.host == " + req.http.host + " && req.url ~ .");
              return (synth(200, "ALL purge cache done"));
          } else {
              ban("req.http.host == "+req.http.host+" && req.url ~ "+req.url);
              return (synth(200, "purge cache done"));
          }
      } else {
          return (synth(403, "permission denied"));
      }
[…]
```

Local services

haproxy.cfg

```
frontend external
   # Is the request coming for the server itself (stats…)
   acl self      hdr(host) -i my-hostname my-hostname.domain.tld
   acl munin     hdr(host) -i munin
   # Detect Let's Encrypt challenge requests
   acl letsencrypt path_dir -i /.well-known/acme-challenge

   use_backend local       if self
   use_backend local       if munin
   use_backend letsencrypt if letsencrypt

backend local
   option httpchk HEAD /haproxy-check
   server localhost 127.0.0.1:81 send-proxy-v2 maxconn 10

backend letsencrypt
   # Use this if the challenge is managed locally
   server localhost 127.0.0.1:81 send-proxy-v2 maxconn 10
   # Use this if the challenge is managed remotely
   ### server my-certbot-challenge-manager 192.168.2.1:80 maxconn 10
```

High availability – for the application

High availability – for HAProxy and Varnish

High availability – for HAProxy and Varnish – round-robin DNS

High availability – for HAProxy and Varnish – active-active

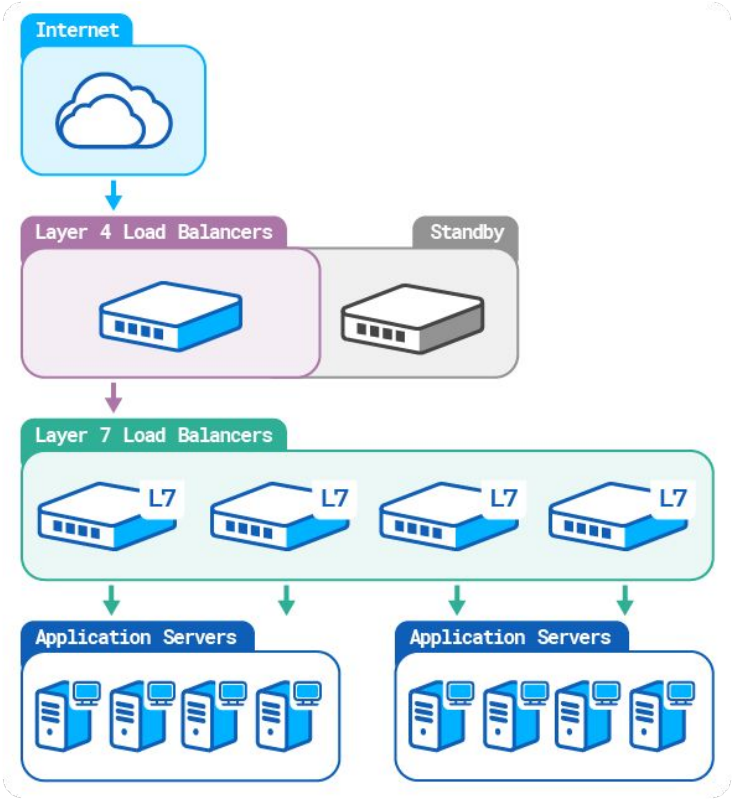
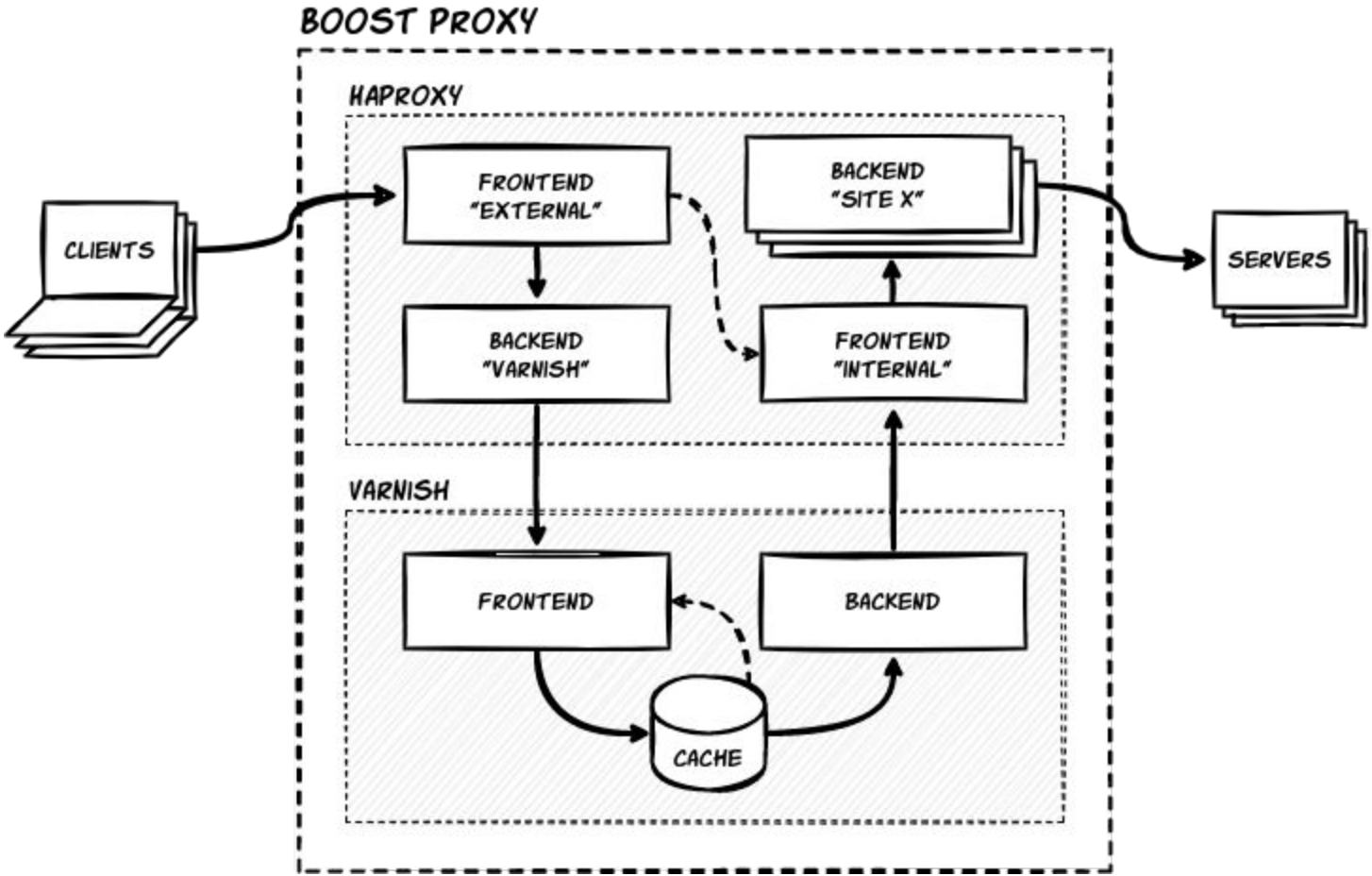


Image shamelessly stolen from HAProxy docs

Questions & Answers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Thank you

Jérémy Lecour
@jlecour – CTO

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https://gitea.evolix.org/evolix/haproxyconf-2022