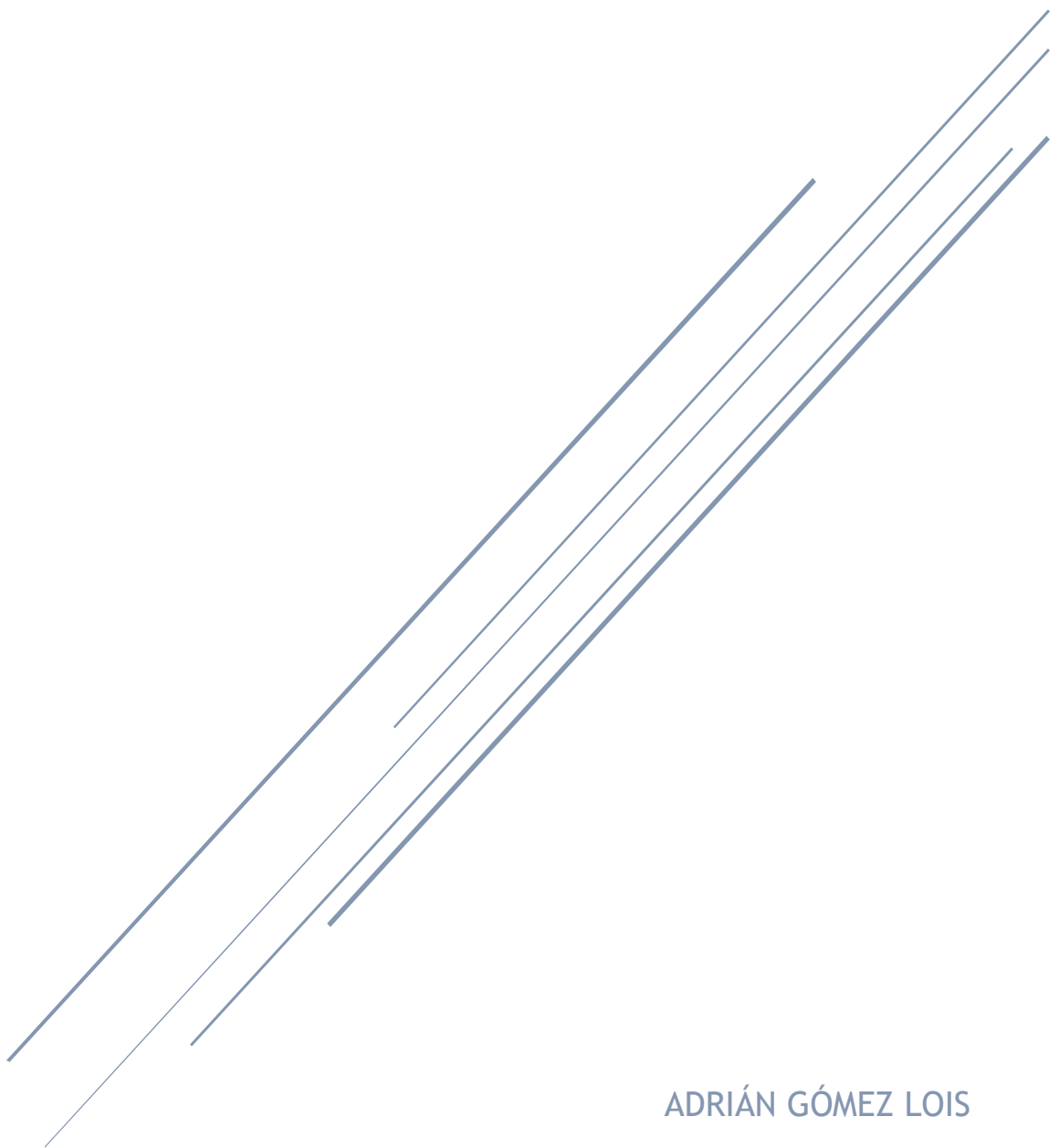


HAPROXY BALANCEO WEB

DISPONIBILIDADE DE SERVIZO WEB



ADRIÁN GÓMEZ LOIS

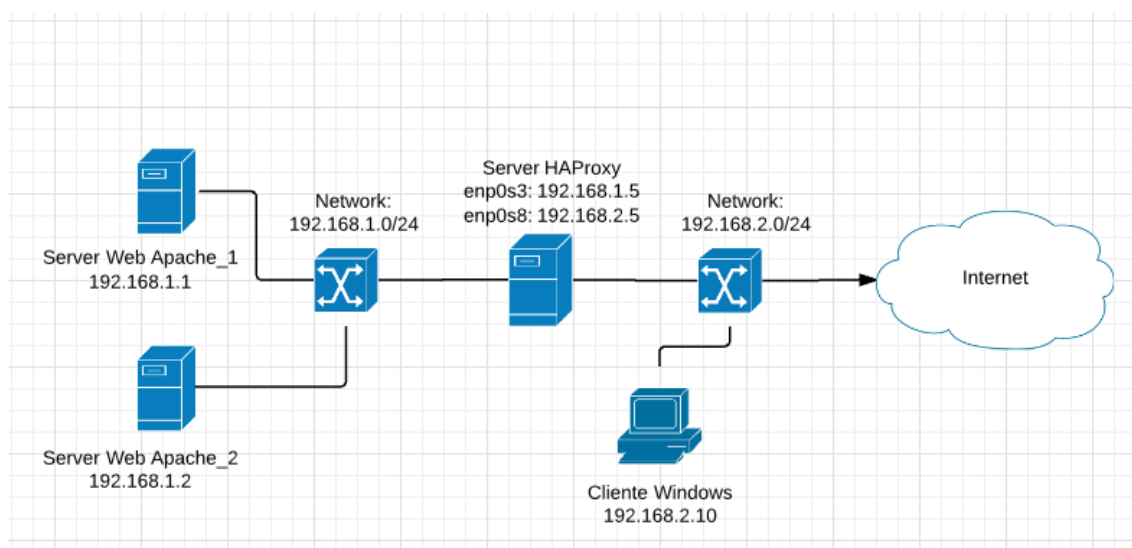
1. Balanceo de Apache2 con HAProxy

Nesta tarefa configuraremos un servidor HAProxy o cal fará de balanceador nas peticións Web recibidas ao servidores Apache dispoñibles.

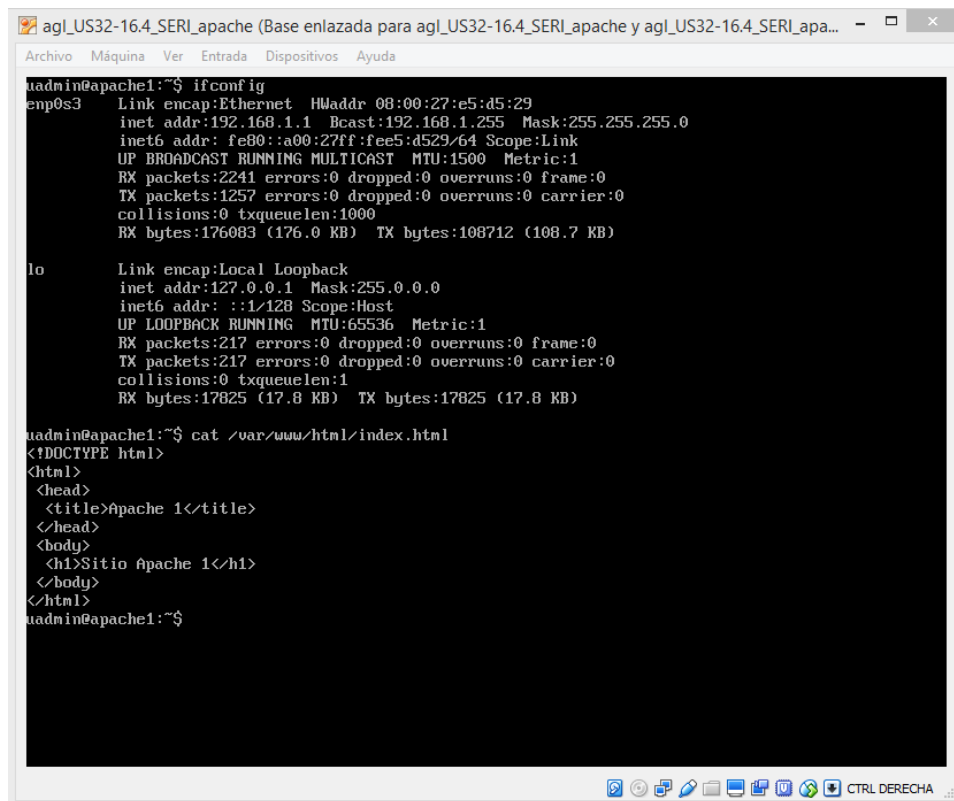
Instalamos e configuramos un sitio para servidor Apache2 o cal responderá as peticións co ServerName establecido de “asir.gal”.

Para tentar simular un caso real, estableceremos dous servidor web Apache exactamente iguais ca diferenza, a modo de exemplo para que se poida ver, de establecer no index.html de cada un un texto significativo hacía cada un dos servidores web.

Traballaremos co seguinte esquema de rede.



O servidor Apache 1 – 192.168.1.1



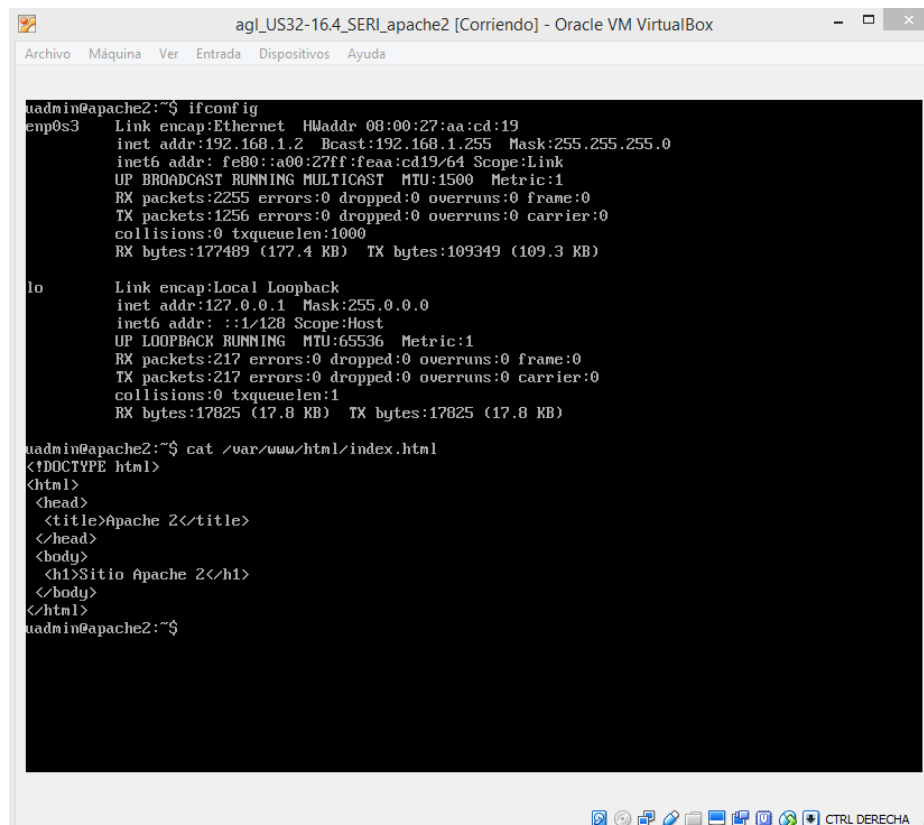
```
agl_US32-16.4_SERI_apache (Base enlazada para agl_US32-16.4_SERI_apache y agl_US32-16.4_SERI_ap...
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda

uadmin@apache1:~$ ifconfig
emp0s3  Link encap:Ethernet  HWaddr 08:00:27:e5:d5:29
        inet addr:192.168.1.1  Bcast:192.168.1.255  Mask:255.255.255.0
        inet6 addr: fe80::a00:27ff:fee5:d529/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:2241 errors:0 dropped:0 overruns:0 frame:0
        TX packets:1257 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:176083 (176.0 KB)  TX bytes:108712 (108.7 KB)

lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:217 errors:0 dropped:0 overruns:0 frame:0
        TX packets:217 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1
        RX bytes:17825 (17.8 KB)  TX bytes:17825 (17.8 KB)

uadmin@apache1:~$ cat /var/www/html/index.html
<!DOCTYPE html>
<html>
<head>
  <title>Apache 1</title>
</head>
<body>
  <h1>Sitio Apache 1</h1>
</body>
</html>
uadmin@apache1:~$
```

O servidor Apache 2 – 192.168.1.2



```
agl_US32-16.4_SERI_apache2 [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda

uadmin@apache2:~$ ifconfig
emp0s3  Link encap:Ethernet  HWaddr 08:00:27:aa:cd:19
        inet addr:192.168.1.2  Bcast:192.168.1.255  Mask:255.255.255.0
        inet6 addr: fe80::a00:27ff:faa:cd19/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:2255 errors:0 dropped:0 overruns:0 frame:0
        TX packets:1256 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:177489 (177.4 KB)  TX bytes:109349 (109.3 KB)

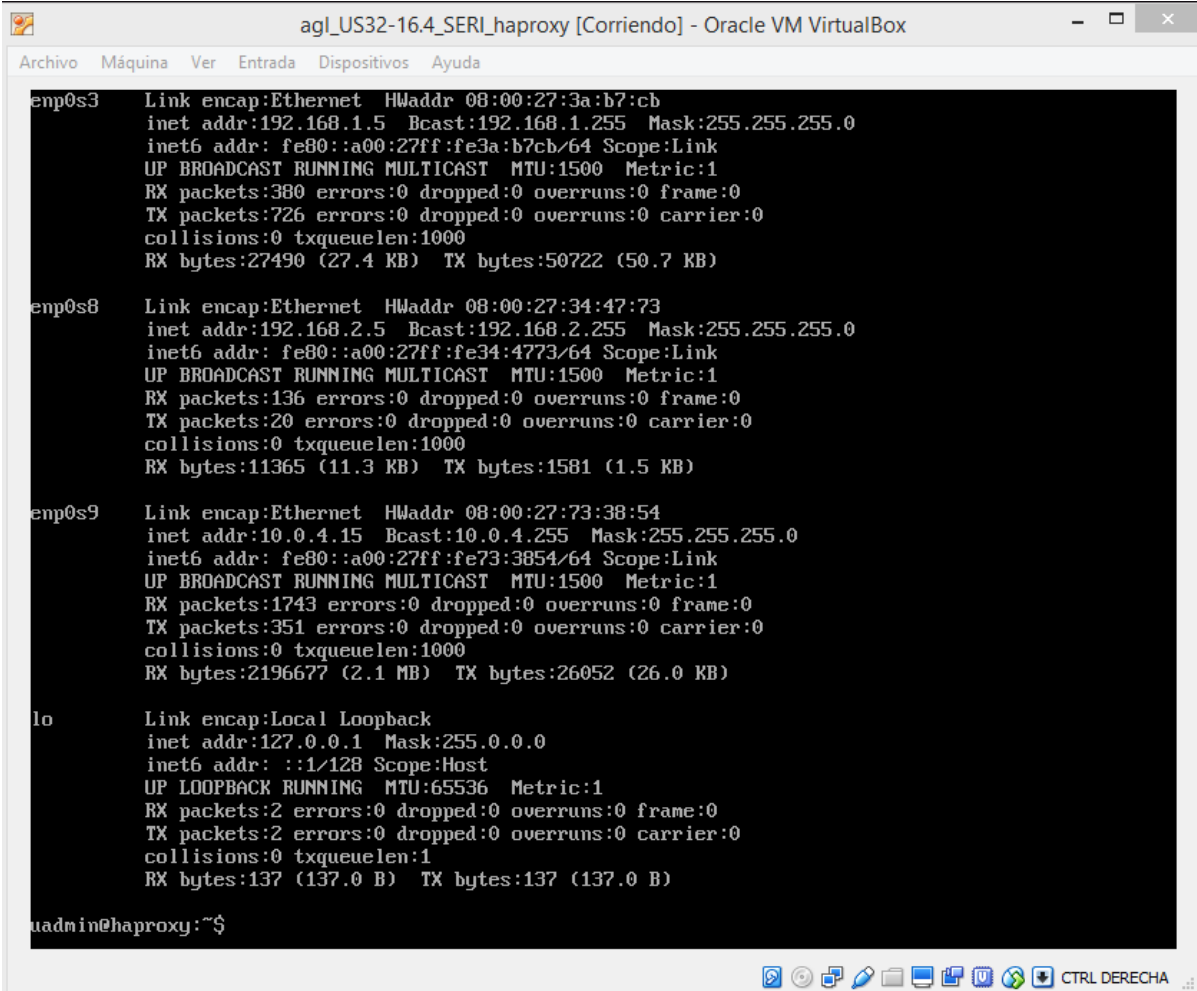
lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:217 errors:0 dropped:0 overruns:0 frame:0
        TX packets:217 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1
        RX bytes:17825 (17.8 KB)  TX bytes:17825 (17.8 KB)

uadmin@apache2:~$ cat /var/www/html/index.html
<!DOCTYPE html>
<html>
<head>
  <title>Apache 2</title>
</head>
<body>
  <h1>Sitio Apache 2</h1>
</body>
</html>
uadmin@apache2:~$
```

O servidor HAProxy, ten dúas tarxetas en rede interna e outra en modo NAT. Cada unha das internas ten unha dirección IP establecida para cada unha das subredes.

enp0s3 – 192.168.1.5

enp0s8 – 192.168.2.5



```
agl_US32-16.4_SERI_haproxy [Corriendo] - Oracle VM VirtualBox
Archivo  Máquina  Ver  Entrada  Dispositivos  Ayuda

enp0s3  Link encap:Ethernet  HWaddr 08:00:27:3a:b7:cb
        inet addr:192.168.1.5  Bcast:192.168.1.255  Mask:255.255.255.0
        inet6 addr: fe80::a00:27ff:fe3a:b7cb/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:380 errors:0 dropped:0 overruns:0 frame:0
        TX packets:726 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:27490 (27.4 KB)  TX bytes:50722 (50.7 KB)

enp0s8  Link encap:Ethernet  HWaddr 08:00:27:34:47:73
        inet addr:192.168.2.5  Bcast:192.168.2.255  Mask:255.255.255.0
        inet6 addr: fe80::a00:27ff:fe34:4773/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:136 errors:0 dropped:0 overruns:0 frame:0
        TX packets:20 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:11365 (11.3 KB)  TX bytes:1581 (1.5 KB)

enp0s9  Link encap:Ethernet  HWaddr 08:00:27:73:38:54
        inet addr:10.0.4.15  Bcast:10.0.4.255  Mask:255.255.255.0
        inet6 addr: fe80::a00:27ff:fe73:3854/64 Scope:Link
        UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
        RX packets:1743 errors:0 dropped:0 overruns:0 frame:0
        TX packets:351 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1000
        RX bytes:2196677 (2.1 MB)  TX bytes:26052 (26.0 KB)

lo      Link encap:Local Loopback
        inet addr:127.0.0.1  Mask:255.0.0.0
        inet6 addr: ::1/128 Scope:Host
        UP LOOPBACK RUNNING  MTU:65536  Metric:1
        RX packets:2 errors:0 dropped:0 overruns:0 frame:0
        TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
        collisions:0 txqueuelen:1
        RX bytes:137 (137.0 B)  TX bytes:137 (137.0 B)

admin@haproxy:~$
```

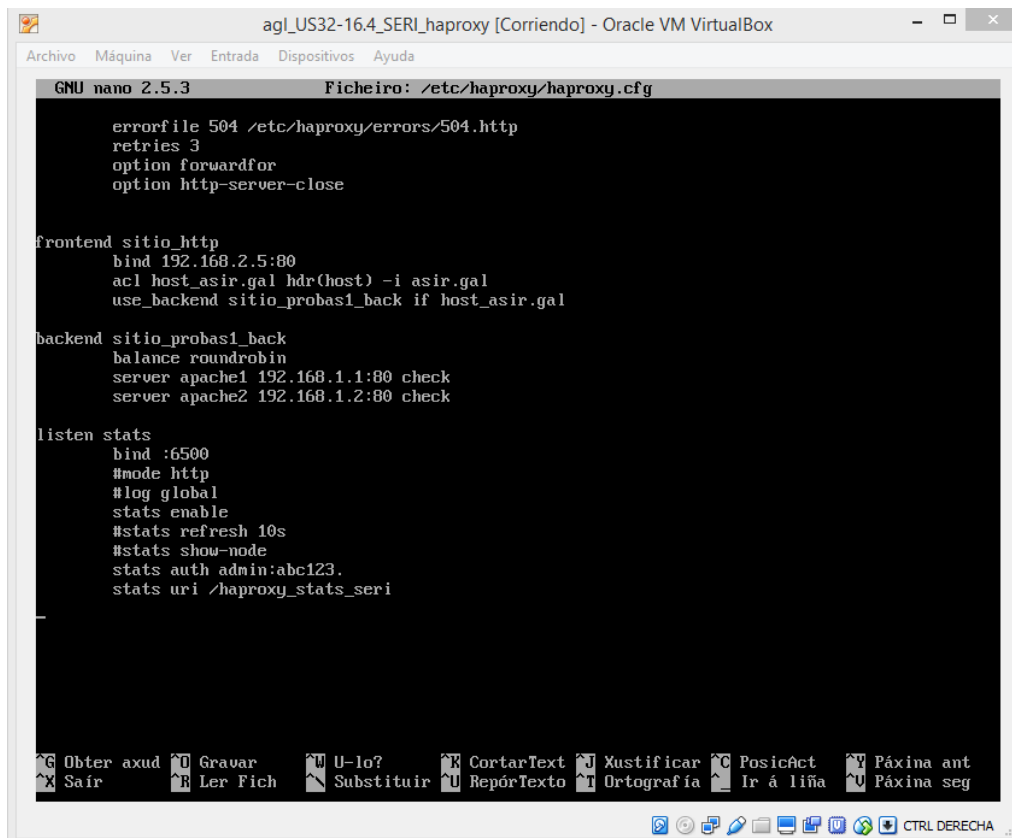
Unha vez instalado HAProxy configuramos o ficheiro `/etc/haproxy/haproxy.cfg`.

Na sección defaults: Sección por defecto que afecta a toda a configuración do servidor HAProxy.
option forwardfor: para engadir a cabeceira X-Forwarded-For para permitir identificar ós servidores internos a IP do cliente real. Pensade que nos logs dos servidores web internos sempre aparecerá a IP do proxy como a IP do equipo que lle solicita un recurso; desta forma podemos saber a IP do equipo cliente real.
http-server-close: permite mellorar o rendemento das conexións ó manterse o http keep-alive (http persistente).

Na sección do frontend: definen como se reenvían as solicitudes ós backends.
bind 192.168.2.5:50: define o socket onde se recibirán as peticións dos clientes.
acl host_asir.gal hdr(host) -i asir.gal: crea unha onde se verifica que o contido da cabeceira http host. Lembrar que nas solicitudes http, a cabeceira Host úsase para indicar o sitio web no que está interesado o cliente.
use_backend sitio_probas1_back if host_asir.gal: indica que as peticións serán enviadas ó backend chamado sitio_probas1_back se é certa a ACL `host_asir.gal`.

Na sección do backend: definen un conxunto de servidores que recibirán as solicitudes reenviadas por HAProxy.
Balance roundrobin: indica que os servidores que forma parte do backend estarán balanceados usando o algoritmo RoundRobin.
server apache1 192.168.1.1:80 check: define o equipo porto tcp/80 como membro do backend chamado sitio_probas1_back. Ademais, o seu estado será monitorizado por HAProxy.
server apache2 192.168.1.2:80 check: define o equipo porto tcp/80 como membro do backend chamado sitio_probas1_back. Ademais, o seu estado será monitorizado por HAProxy.

Listen stats: definen o conxunto de regras para a monitorización web do balanceo de HAProxy.
bind :6500: define o porto de escoita para a monitorización de estadísticas web de HAProxy.
stats enable: habilita a monitorización de estadísticas para a súa visualización web.
stats auth admin:abc123: define as credenciais de autenticación para a visualización web da monitorización de HAProxy.
stats uri /haproxy_stats_seri: define a url (`http://[ip_servidor_haproxy]/haproxy_stats_seri`) a cal accederemos para visualizar a monitorización do balanceo de HAProxy.



```
GNU nano 2.5.3 Ficheiro: /etc/haproxy/haproxy.cfg

errorfile 504 /etc/haproxy/errors/504.http
retries 3
option forwardfor
option http-server-close

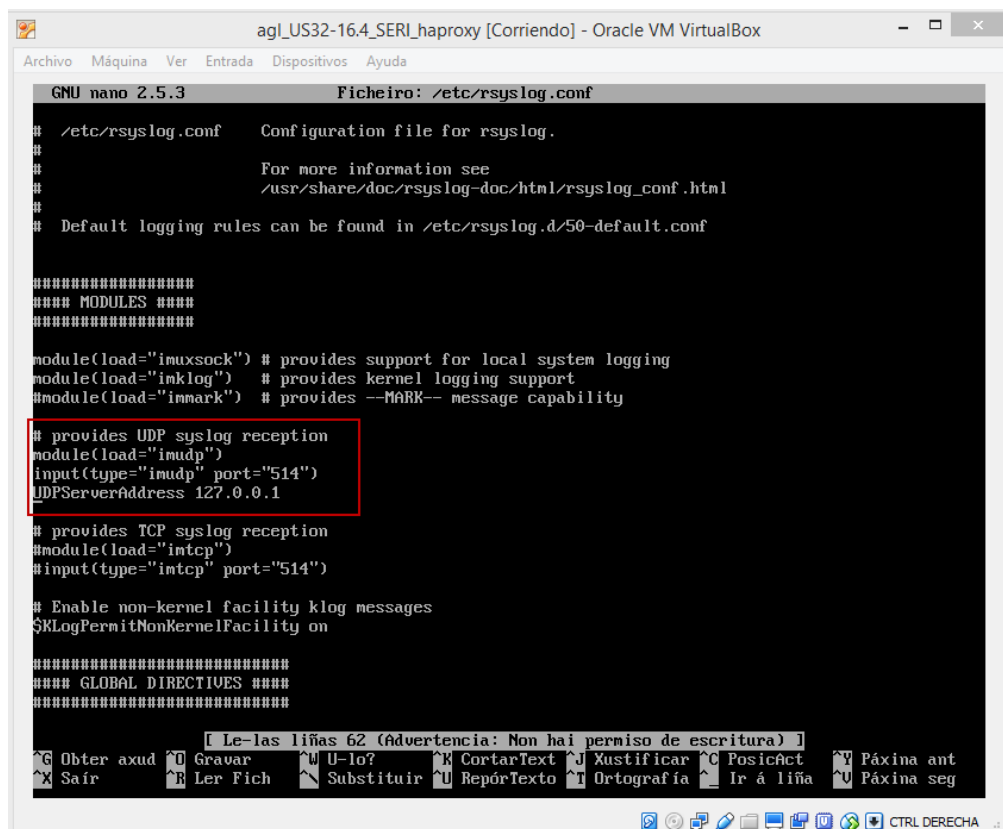
frontend sitio_http
bind 192.168.2.5:80
acl host_asir.gal hdr(host) -i asir.gal
use_backend sitio_probas1_back if host_asir.gal

backend sitio_probas1_back
balance roundrobin
server apache1 192.168.1.1:80 check
server apache2 192.168.1.2:80 check

listen stats
bind :6500
#mode http
#log global
stats enable
#stats refresh 10s
#stats show-node
stats auth admin:abc123.
stats uri /haproxy_stats_seri
```

Modificaremos o syslog para gardar os rexistros do noso balanceador. Editamos o arquivo /etc/rsyslog.conf e habilitamos o syslog por UDP, e finalmente reiniciamos o servizo:

`sudo service haproxy restart`



```
GNU nano 2.5.3 Ficheiro: /etc/rsyslog.conf

# /etc/rsyslog.conf Configuration file for rsyslog.
#
# For more information see
# /usr/share/doc/rsyslog-doc/html/rsyslog_conf.html
#
# Default logging rules can be found in /etc/rsyslog.d/50-default.conf

#####
#### MODULES ####
#####

module(load="imuxsock") # provides support for local system logging
module(load="imklog") # provides kernel logging support
#module(load="immark") # provides --MARK-- message capability

# provides UDP syslog reception
module(load="imudp")
input(type="imudp" port="514")
UDPServerAddress 127.0.0.1

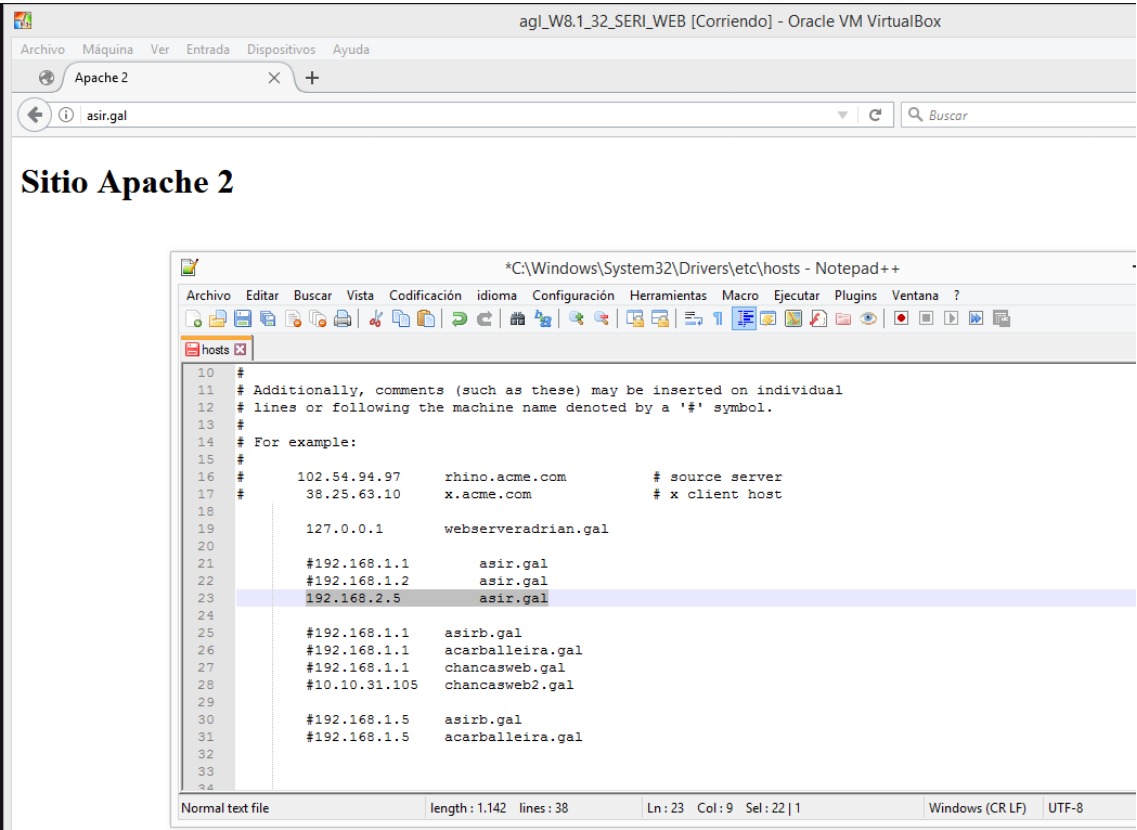
# provides TCP syslog reception
#module(load="imtcp")
#input(type="imtcp" port="514")

# Enable non-kernel facility klog messages
$KLogPermitNonKernelFacility on

#####
#### GLOBAL DIRECTIVES ####
#####

[ Le-las liñas 62 (Advertencia: Non hai permiso de escritura) ]
Obter axud Gravar U-lo? CortarText Xustificar PosicAct Páxina ant
Sair Ler Fich Substituir RepórTexto Ortografía Ir á liña Páxina seg
```

Configuramos o ficheiro hosts do cliente Windows para que resolva a dirección IP 192.168.2.5 (do servidor HAProxy) a solicitudes de nome “asir.gal”.



No panel web de monitorización do servidor HAProxy podemos ver como efectuan correctamente os balanceos do serivodora apache_1 e apache_2.

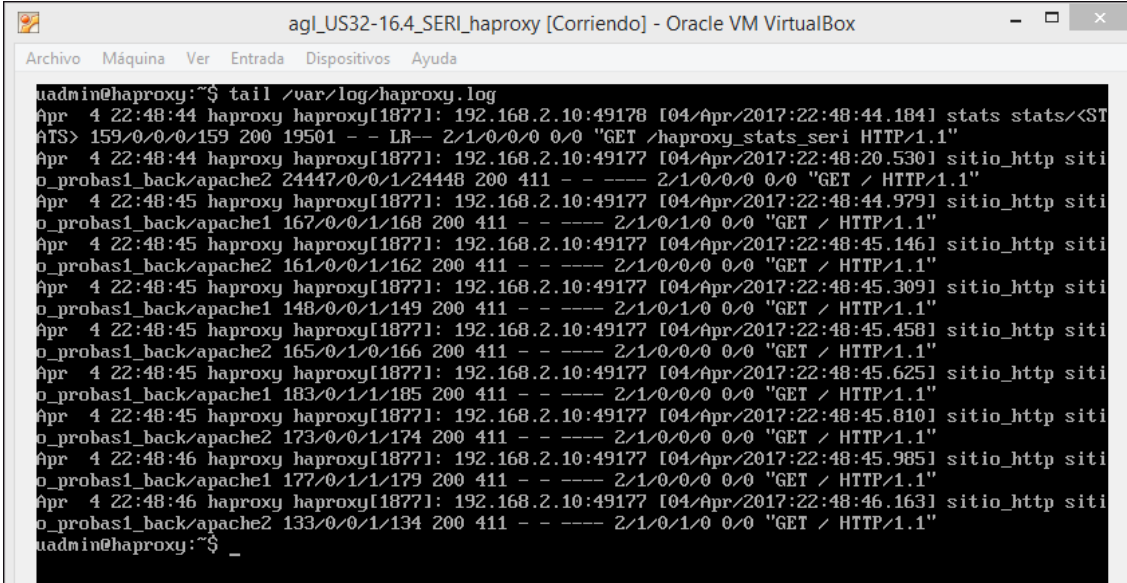
The screenshot shows the HAProxy web interface for version 1.6.3, released 2015/12/25. The page displays a "Statistics Report for pid 1237". The "General process information" section shows the following details:

- pid = 1237 (process #1, nbproc = 1)
- uptime = 0d 0h05m05s
- system limits: memmax = unlimited; ulimit-n = 4034
- maxsock = 4034; maxconn = 2000; maxpipes = 0
- current conn = 1; current pipes = 0/0; conn rate = 1/sec
- Running tasks: 1/8; idle = 100 %

The "Display option" section shows "Scope" set to "Frontend". The "External resources" section includes links to "Primary site", "Updates (v1.6)", and "Online manual".

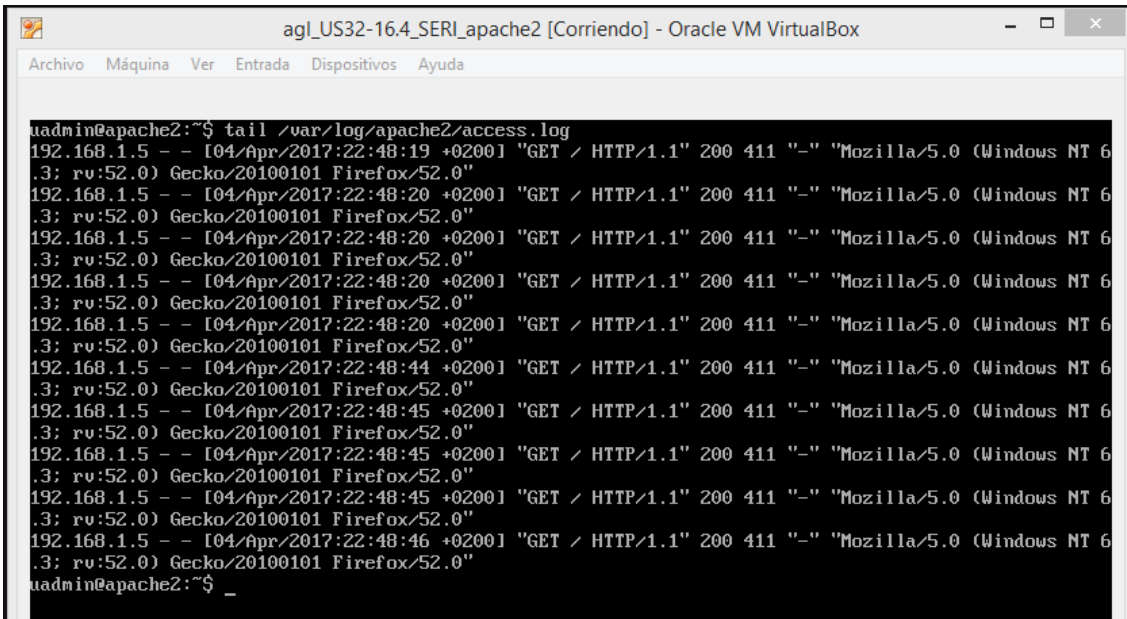
The "Stats" section displays a table with the following columns: Queue, Session rate, Sessions, Bytes, Denied, Errors, Warnings, Status, LastChk, Wght, Act, Bck, Chk, Dwn, Downtime, Thrtle. The table shows data for the "Frontend" and "Backend" sections, including the "asir" and "asirb" servers.

No log do servidor de HAProxy (taul /var/log/haproxy) podemos ver as solicitudes feitas polo cliente dende o frontend hacia os servidores apache configurados no backend.



```
admin@haproxy:~$ tail /var/log/haproxy.log
Apr  4 22:48:44 haproxy haproxy[18771]: 192.168.2.10:49178 [04/Apr/2017:22:48:44.184] stats stats/<ST
ATS> 159/0/0/0/159 200 19501 - - LR-- 2/1/0/0/0 0/0 "GET /haproxy_stats_seri HTTP/1.1"
Apr  4 22:48:44 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:20.530] sitio_http siti
o_probas1_back/apache2 24447/0/0/1/24448 200 411 - - ---- 2/1/0/0/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:45 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:44.979] sitio_http siti
o_probas1_back/apache1 167/0/0/1/168 200 411 - - ---- 2/1/0/1/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:45 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:45.146] sitio_http siti
o_probas1_back/apache2 161/0/0/1/162 200 411 - - ---- 2/1/0/0/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:45 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:45.309] sitio_http siti
o_probas1_back/apache1 148/0/0/1/149 200 411 - - ---- 2/1/0/1/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:45 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:45.458] sitio_http siti
o_probas1_back/apache2 165/0/0/1/166 200 411 - - ---- 2/1/0/0/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:45 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:45.625] sitio_http siti
o_probas1_back/apache1 183/0/0/1/185 200 411 - - ---- 2/1/0/0/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:45 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:45.810] sitio_http siti
o_probas1_back/apache2 173/0/0/1/174 200 411 - - ---- 2/1/0/0/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:46 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:45.985] sitio_http siti
o_probas1_back/apache1 177/0/0/1/179 200 411 - - ---- 2/1/0/0/0 0/0 "GET / HTTP/1.1"
Apr  4 22:48:46 haproxy haproxy[18771]: 192.168.2.10:49177 [04/Apr/2017:22:48:46.163] sitio_http siti
o_probas1_back/apache2 133/0/0/1/134 200 411 - - ---- 2/1/0/1/0 0/0 "GET / HTTP/1.1"
admin@haproxy:~$ _
```

Vemos que nun dos servidores web apache (servidor: apache2) a dirección IP real do cliente e a do servidor Haproxy. E non a do cliente, isto pódese solucionar da seguinte habilitando un módulo.



```
admin@apache2:~$ tail /var/log/apache2/access.log
192.168.1.5 - - [04/Apr/2017:22:48:19 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:20 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:20 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:20 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:20 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:20 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:44 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:45 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:45 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:45 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:22:48:46 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
admin@apache2:~$ _
```


Para poder ver a IP real do cliente, habilitamos o módulo “remoteip”. (Previamente habería que ter configurado no ficheiro haproxy.cfg do servidor HAProxy a opción de “option forwardfor”).

a2enmod remoteip

Reiniciamos o servizo de apache.

Entramos no módulo “/etc/apache/mods-enabled/remoteip.load” e engadimos:

RemoteIPHeader X-Forwarded-For

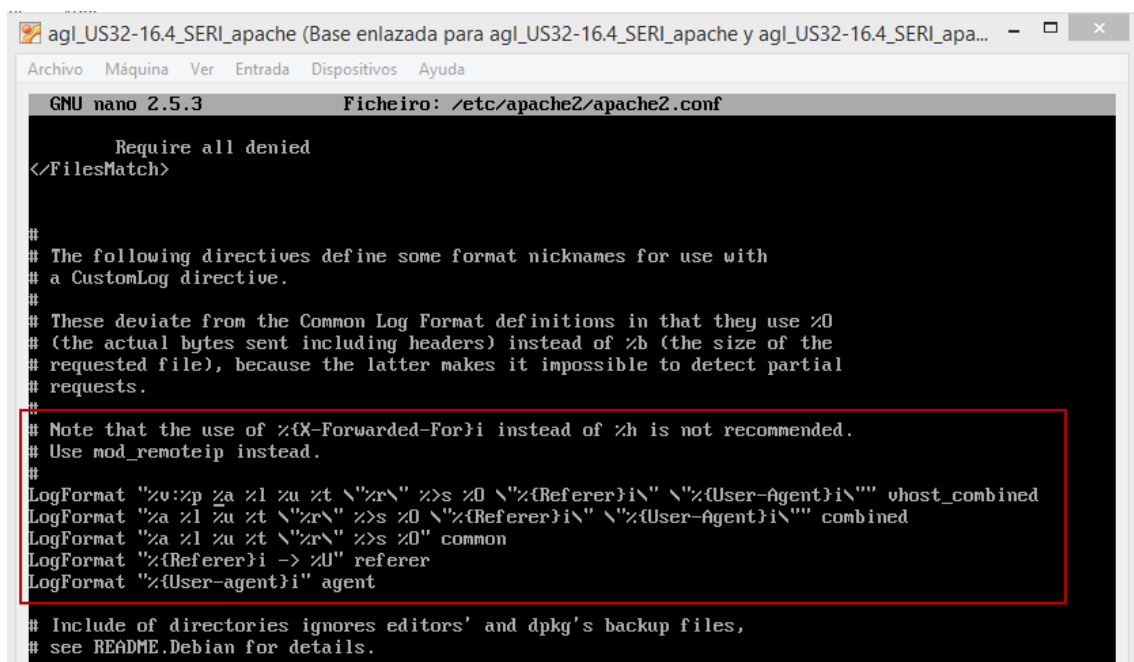
RemoteIPInternalProxy 192.168.1.5

Donde 192.168.1.5 sería a IP do servidor HAProxy na subrede que conecta co servidor apache en cuestión.



```
agI_US32-16.4_SERI_apache (Base enlazada para agI_US32-16.4_SERI_apache y agI_US32-16.4_SERI_ap... - □ ×
GNU nano 2.5.3 Fichero: /etc/apache2/mods-enabled/remoteip.load
LoadModule remoteip_module /usr/lib/apache2/modules/mod_remoteip.so
RemoteIPHeader X-Forwarded-For
RemoteIPInternalProxy 192.168.1.5
```

Modificamos o formato dos logs “LogFormat” do ficheiro principal de apache /etc/apache2/apache2.conf, cambiando as variables %h por %a (son un total de tres).

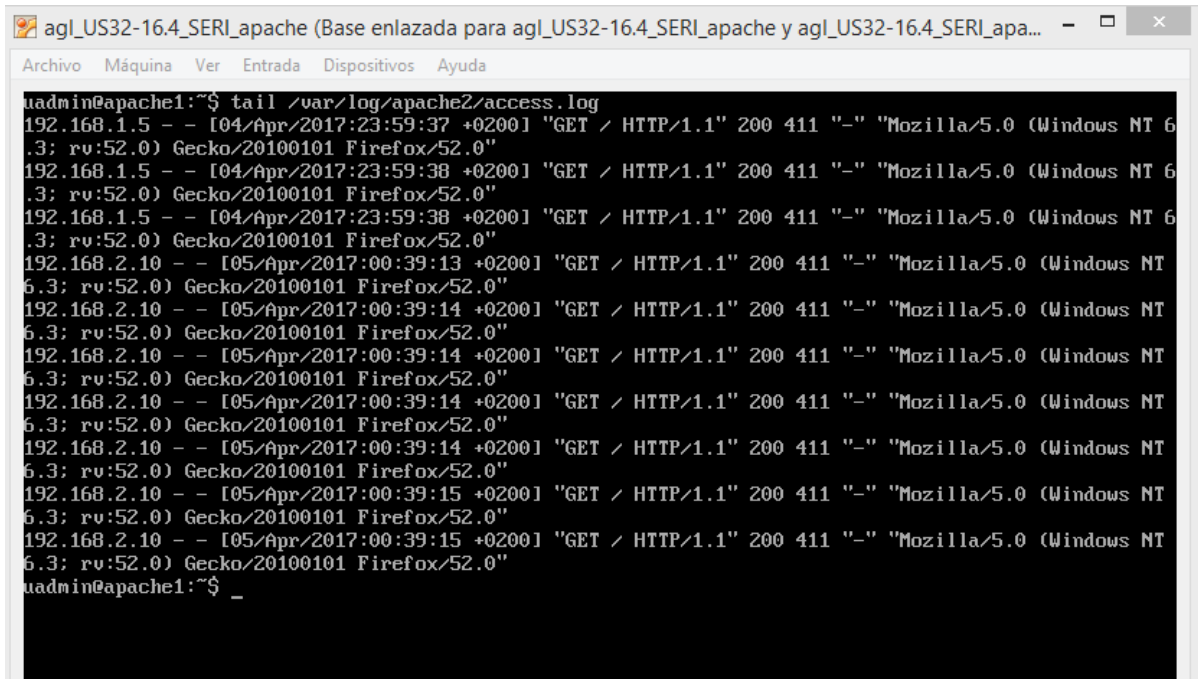


```
agI_US32-16.4_SERI_apache (Base enlazada para agI_US32-16.4_SERI_apache y agI_US32-16.4_SERI_ap... - □ ×
GNU nano 2.5.3 Fichero: /etc/apache2/apache2.conf
    Require all denied
</FilesMatch>

#
# The following directives define some format nicknames for use with
# a CustomLog directive.
#
# These deviate from the Common Log Format definitions in that they use %D
# (the actual bytes sent including headers) instead of %b (the size of the
# requested file), because the latter makes it impossible to detect partial
# requests.
#
# Note that the use of %X-Forwarded-For}i instead of %h is not recommended.
# Use mod_remoteip instead.
#
LogFormat "%v:%p %a %l %u %t \"%r\"> %> %D \"%{Referer}i\" \"%{User-Agent}i\"> vhost_combined
LogFormat "%a %l %u %t \"%r\"> %> %D \"%{Referer}i\" \"%{User-Agent}i\"> combined
LogFormat "%a %l %u %t \"%r\"> %> %D" common
LogFormat "%{Referer}i -> %U" referer
LogFormat "%{User-agent}i" agent

# Include of directories ignores editors' and dpkg's backup files,
# see README.Debian for details.
```

Agora podemos comprobar como da 192.168.1.5 (servidor HAProxy) que hai o principio do log e despois de aplicar estos cambiamos e volver comprobar vemos como xa rexistra a dirección IP real do cliente a cal sería a 192.168.2.10 (da outra subrede).



```
uadmin@apache1:~$ tail /var/log/apache2/access.log
192.168.1.5 - - [04/Apr/2017:23:59:37 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:23:59:38 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.1.5 - - [04/Apr/2017:23:59:38 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT 6
.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.2.10 - - [05/Apr/2017:00:39:13 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT
6.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.2.10 - - [05/Apr/2017:00:39:14 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT
6.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.2.10 - - [05/Apr/2017:00:39:14 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT
6.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.2.10 - - [05/Apr/2017:00:39:14 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT
6.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.2.10 - - [05/Apr/2017:00:39:14 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT
6.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.2.10 - - [05/Apr/2017:00:39:15 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT
6.3; rv:52.0) Gecko/20100101 Firefox/52.0"
192.168.2.10 - - [05/Apr/2017:00:39:15 +0200] "GET / HTTP/1.1" 200 411 "-" "Mozilla/5.0 (Windows NT
6.3; rv:52.0) Gecko/20100101 Firefox/52.0"
uadmin@apache1:~$ _
```