Relayd: a load-balancer for OpenBSD

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what is relayd useful for ?

- Reverse proxy
- Ssl accelerated reverse proxy
- Transparent proxy with filtering capabilities
- Application redirector
- Load balancer
- Wan link balancer

a short story

- First imported in OpenBSD 4.1
- Initially it was called hoststated(8)
- Renamed to relayd(8) in OpenBSD 4.3
- Written by pyr@ and reyk@

some relayd(8) features

- written with security in mind and based on imsg framework
- ipv4 and ipv6 capable
- carp(4) capable
- snmpd(8) integration

software anatomy

Relayd is divided in a main process and 3 different engines

- Parent process
- HCE: Host check engine
- PFE: Pf engine
- Relay engine

the parent process

The parent process is the only one that runs with elevated privileges, it runs as 'root' to be able to handle:

- configuration files
- setup sockets
- external script execution (privileges will be dropped to _relayd user before "execlp" function call)
- carp demotion requests

host check engine

The Host Check Engine uses some methods to verify that the target host service is functional, before routing traffic to the host. It can use:

- icmp
- tcp
- ssl
- http/https
- external scripts

pf engine

The Packet Filter Engine allows integration with the OpenBSD Packet Filter.

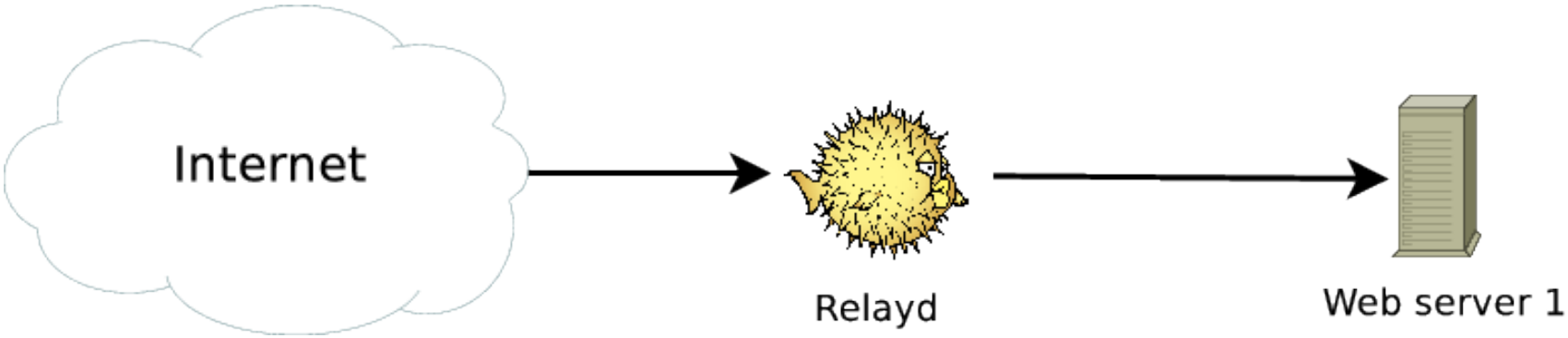
- Creates and destroys PF rules
- Updates PF tables based on HCE notifications

relay engine

This engine is responsible to filter and relay packets

- Creates listening sockets for services
- Filters protocols before relaying

reverse http proxy



reverse http proxy

```
table <web_hosts> { 10.0.0.1 }

interval 10
timeout 200
prefork 5
log updates

relay httpproxy {
   listen on 192.168.0.1 port 80

   forward to <web_hosts> port 80 check http "/" code 200
}
```

reverse http proxy

A script can be used to check the web server status

```
table <web_hosts> { 10.0.0.1 }

relay httpproxy {
   listen on 192.168.0.1 port 80

   forward to <web_hosts> port 80 \
      check script "/scripts/chkweb.pl"
}
```

relayd(8) check scripts

A script can be used to check the web server status ... or everything else

```
#!/usr/bin/perl -w

use Socket;

my $remote = $ARGV[0];
my $proto = getprotobyname('tcp');
socket(Socket_Handle, PF_INET, SOCK_STREAM, $proto);
my $hport = 80; # Http port
my $sin = sockaddr_in($hport,inet_aton("$remote"));
if (connect(Socket_Handle,$sin)) {
 socket(Socket_Handle, PF_INET, SOCK_STREAM, $proto);
 my $mport = 11211; # Memcached port
 $sin = sockaddr_in($mport,inet_aton("$remote"));
 if (connect(Socket_Handle,$sin)) {
  exit 1;
 } else {
  exit 0;
 }
```

http filters

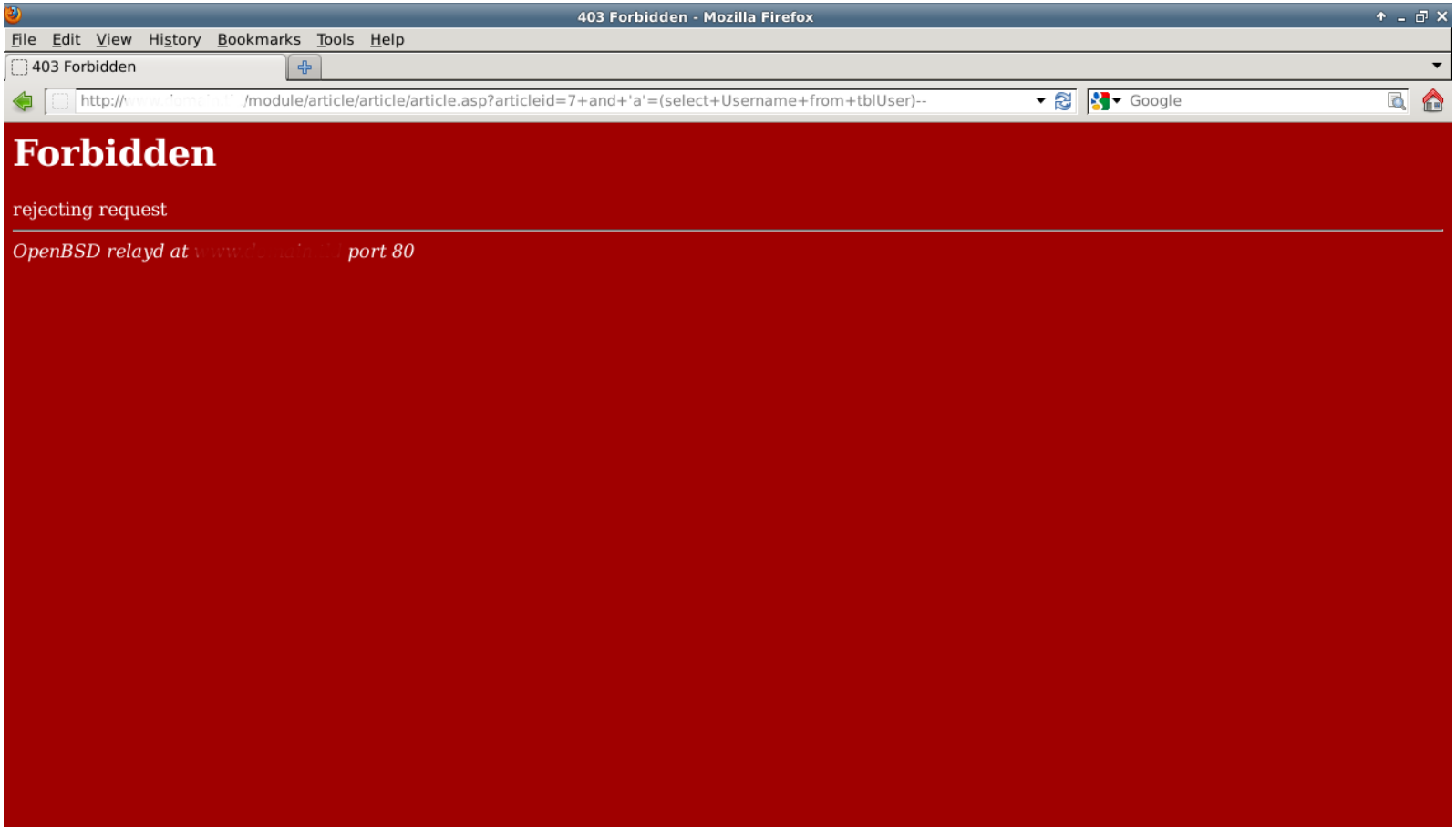
Relayd in "reverse proxy" configuration can filter http requests

- Change or append http headers
- Filter http requests by checking http headers
- Filter http requests by checking url

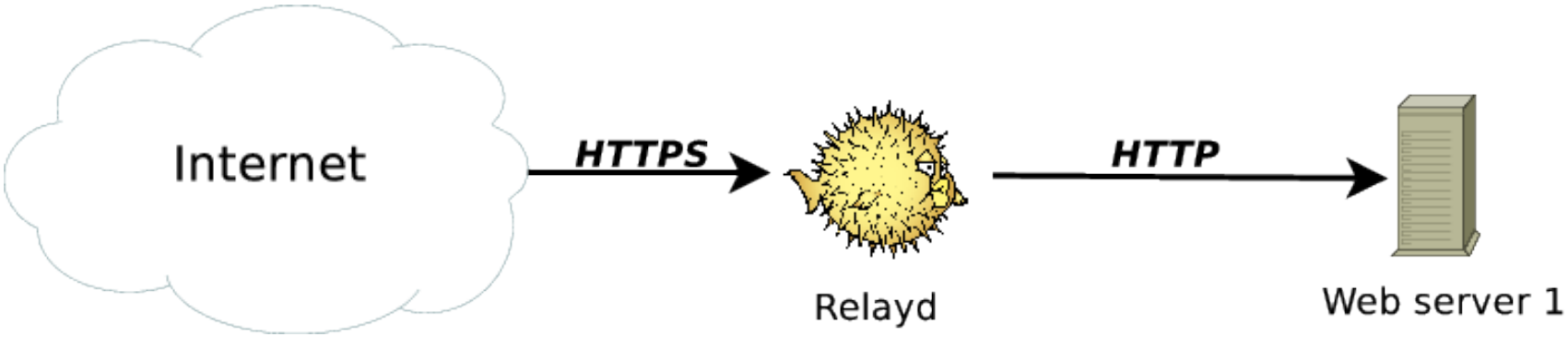
http filters

```
http protocol "httpfilter" {

    # Return HTML error pages
    return error

    # allow logging of remote client ips to internal web servers
    header append "$REMOTE_ADDR" to "X-Forwarded-For"

    # URL filtering
    request path filter "articleid=*select*" \
        from "/module/article/article/article.asp"

    # close connections upon receipt
    header change "Connection" to "close"
}
```

http filters



ssl accelerated reverse http proxy



ssl accelerated reverse http proxy

```
table <web_hosts> { 10.0.0.1 }

http protocol "httpfilter" {

    # close connections upon receipt
    header change "Connection" to "close"
    # SSL accelerator ciphers
    ssl { sslv3, tlsv1, ciphers "HIGH:!ADH", no sslv2 }
}

relay httpproxy {
    listen on 192.168.0.1 port 443 ssl
    protocol "httpfilter"
    forward to <web_hosts> port 80 check http "/" code 200
}
```

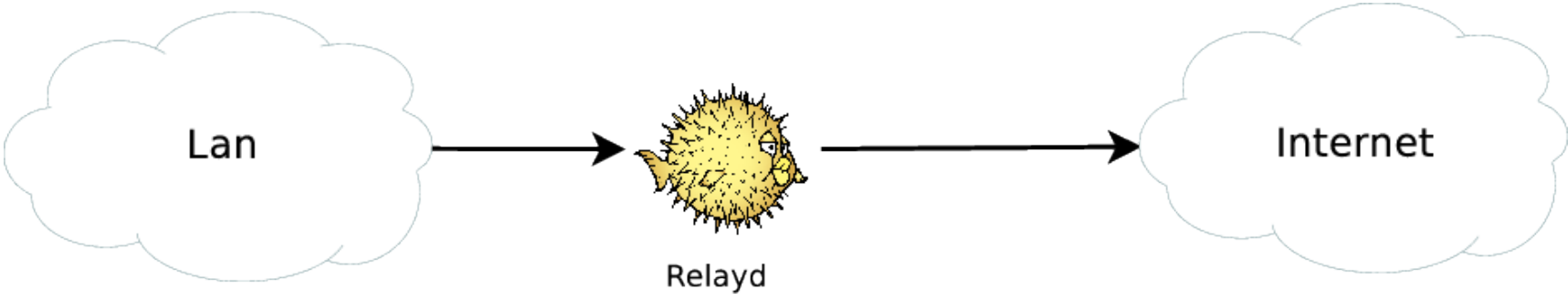
ssl accelerated reverse http proxy

Rsa certificate generation

```
openssl genrsa -out /etc/ssl/private/192.168.0.1:443.key 1024
openssl req -new -key /etc/ssl/private/192.168.0.1:443.key \
   -out /etc/ssl/private/192.168.0.1:443.csr

openssl x509 -req -days 365 \
   -in /etc/ssl/private/192.168.0.1:443.csr \
   -signkey /etc/ssl/private/192.168.0.1:443.key \
   -out /etc/ssl/192.168.0.1:443.crt
```

With the files 192.168.0.1:443.crt and 192.168.0.1:443.key in the right place relayd will do his job

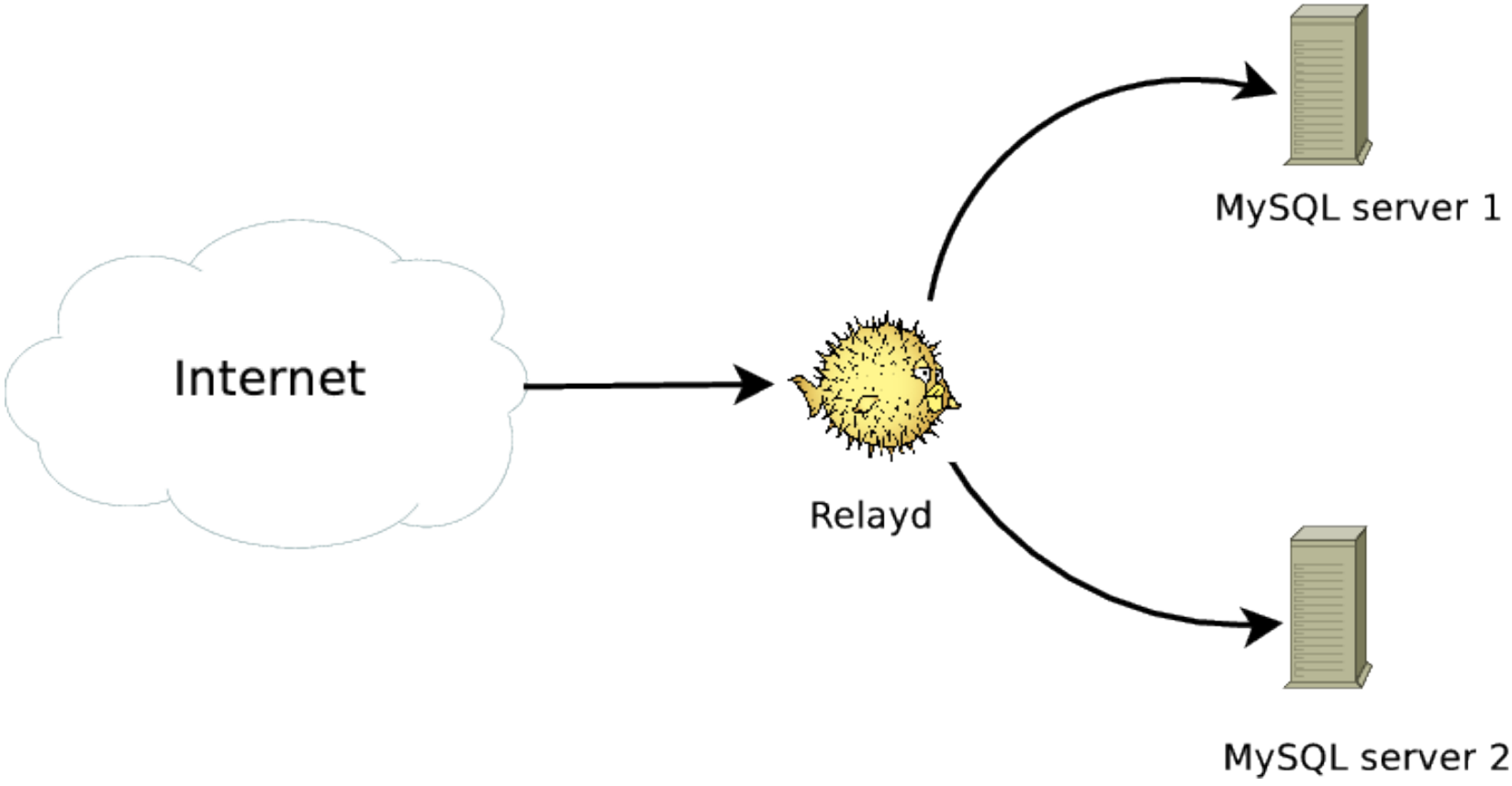
transparent http proxy



transparent http proxy, relayd setup

```
http protocol "httpfilter" {
    # Return HTML error pages
    return error

    header change "Connection" to "close"

    # Block requests to unwanted hosts
    request header filter "*youtube.com*" from "Host"
    request header filter "*facebook.com*" from "Host"
}

relay httpproxy {
    listen on 127.0.0.1 port 8080
    protocol "httpfilter"
    forward to destination
}
```

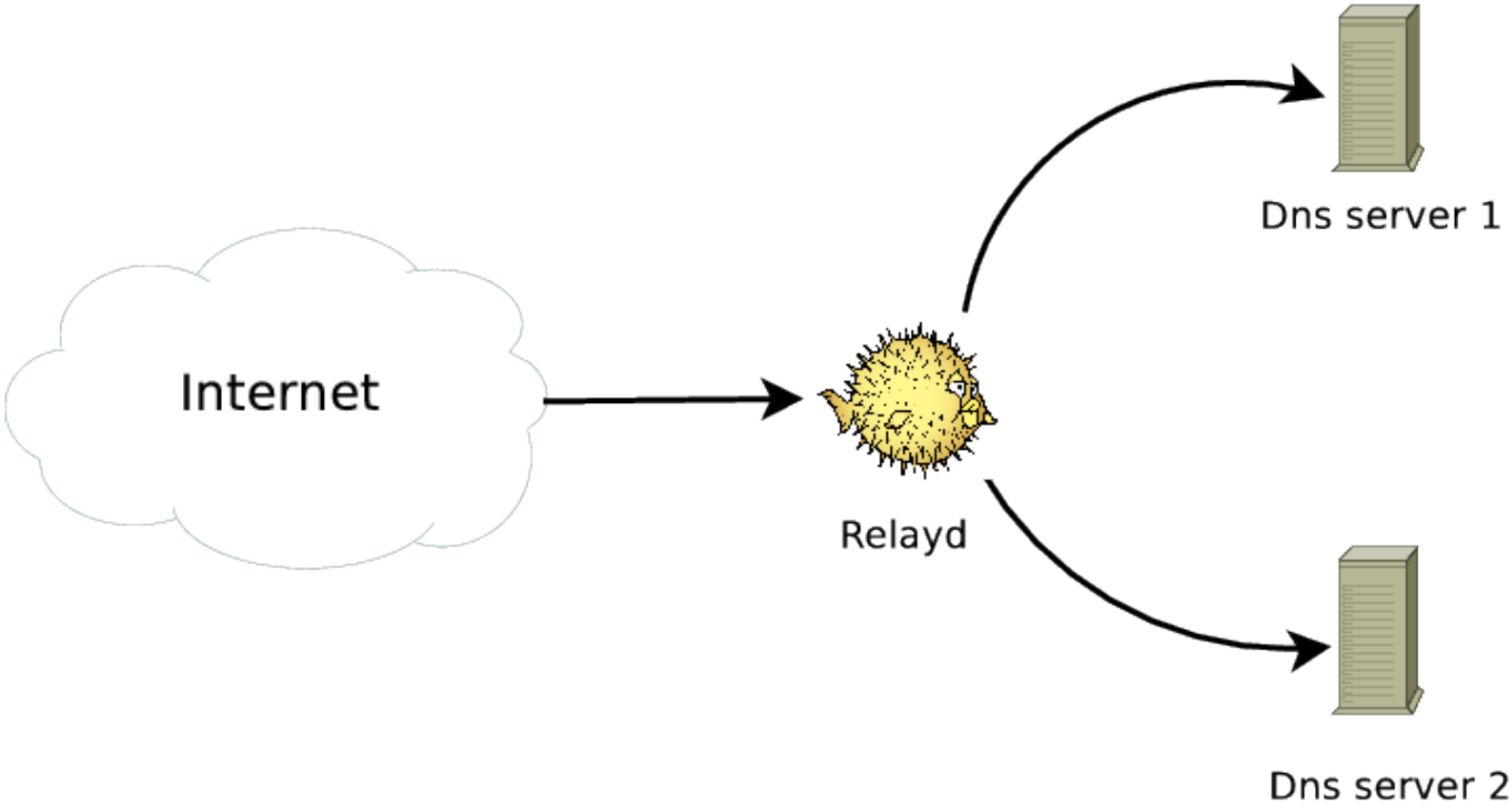
application redirector



application redirector, relayd setup

```
table <srv> { 192.168.0.1, 192.168.0.2 }

redirect mysql {
        listen on 192.168.3.1 port 3306
        tag RELAYD
        sticky-address
        forward to <srv> port 3306 mode roundrobin check tcp
}
```

load balancer



load balancer

```
dns protocol "dnsfilter" {
   tcp { nodelay, sack, socket buffer 1024, backlog 1000 }
}

relay dnsproxy {
      listen on 127.0.0.1 port 8053

      protocol "dnsfilter"

      forward to <dns_servers> port 53 \
                mode loadbalance check tcp
}
```

relayctl(8)

- relayctl is the software used to control relayd
- It can change many configurations at runtime
- It can be used to show many informations about our current relayd(8) setup

relayctl(8)

Some info for our "relay" setup

```
$ sudo relayctl show sessions
session 0:1 192.168.107.205:44159 -> :80          RUNNING
        age 00:00:01, idle 00:00:01, relay 1, pid 5613
$ sudo relayctl show hosts
Id      Type     Name                        Avlblty Status
1       table    web_hosts:80                        active (3 hosts)
1       host     10.0.0.1                            100.00% up
                 total: 12/12 checks
2       host     10.10.10.22                         100.00% up
                 total: 12/12 checks
3       host     10.10.10.33                         100.00% up
                 total: 12/12 checks
```

relayctl(8)

Some info for our "redirect" setup

```
$ sudo relayctl show summary
Id      Type              Name                Avlblty Status
1       redirect          mysql                       active
1       table             srv:3306                    active (1 hosts)
1       host              192.168.1.3                 100.00% up
2       host              192.168.1.4                 0.00%   down
```

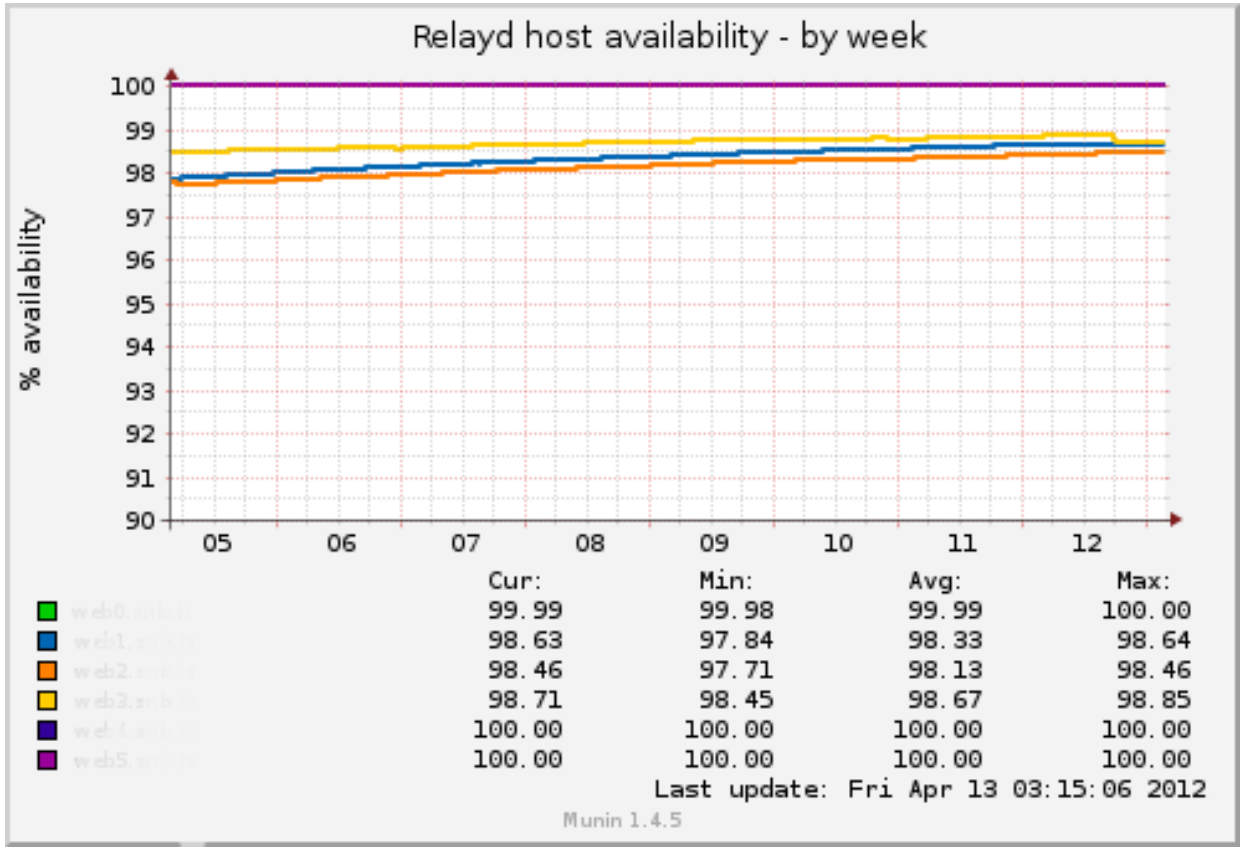
relayctl(8)

Pf interaction

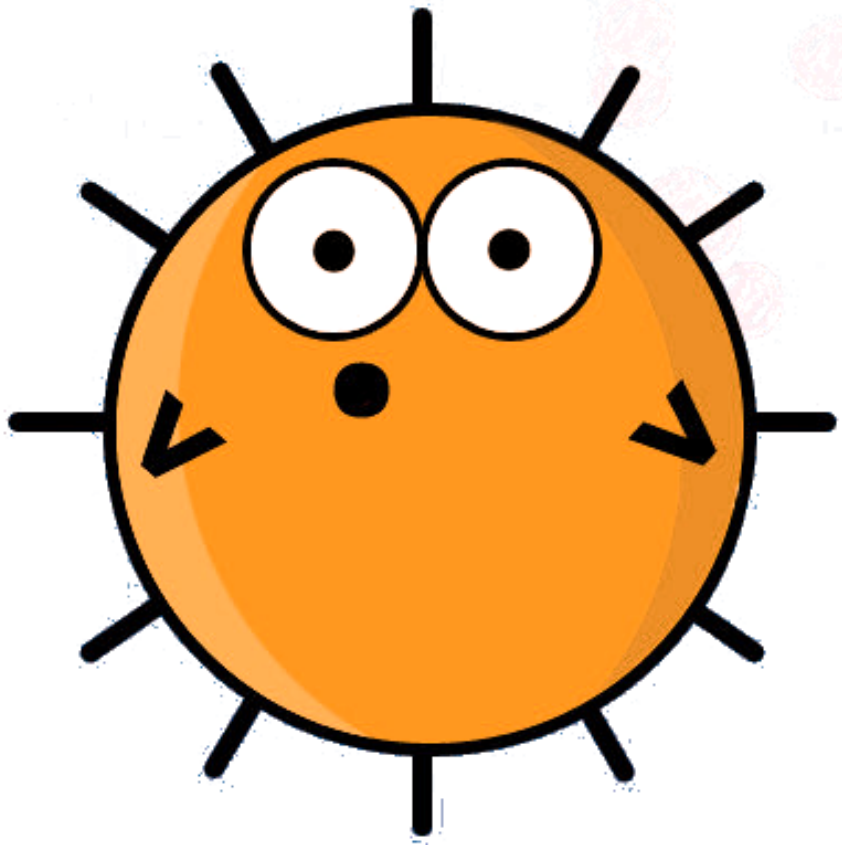
```
$ sudo pfctl -a relayd/mysql -s rules
pass in quick on rdomain 0 inet proto tcp from any \
    to 192.168.1.5 port = 3306 flags S/SA \
    keep state (tcp.established 600) \
    tag RELAYD rdr-to <mysql> port 3306 \
    round-robin sticky-address
```

advanced monitoring

Both Munin and Nagios have plugins to check relayd health status



questions ?



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