Results from project DNS EDER

IETF 112 1-5 November 2021 Online



Hackathon Plan

- DNS Error Reporting
 - draft-ietf-dnsop-dns-error-reporting
 - Builds upon Extended DNS Errors [RFC8914],
 but reporting to authoritative instead of querier

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- DNS Error Reporting
 - draft-ietf-dnsop-dns-error-reporting
 - Builds upon Extended DNS Errors [RFC8914], but reporting to authoritative instead of querier
 ... Hence EDER (Extended DNS Error Reporting)
 - Discussed during the DNSOP interim meeting on the 26th October



What got done

- BPF Program that appends EDNS Option on outgoing responses
 - BPF = new Berkley Packet Filter (way beyond tcpdump -f)
 - Run program in the Linux kernel
 - Name server agnostic
 - You don't have to anticipate it beforehand
 - https://github.com/NLnetLabs/XDPeriments/tree/master/opt-extend

```
😰 🖯 🗊 root@eder: ~/XDPeriments/opt-extend
                                  root@eder: ~/XDPeriments/opt-extend 84x26
     To see these additional updates run: apt list --upgradable
     BPiroot@eder:~# git clone https://github.com/NLnetLabs/XDPeriments.git
                                                                                        ses
     Cloning into 'XDPeriments'...
     remote: Enumerating objects: 314, done.
     remote: Counting objects: 100% (314/314), done.
     remote: Compressing objects: 100% (219/219), done.
     remote: Total 314 (delta 185), reused 212 (delta 92), pack-reused 0
     Receiving objects: 100% (314/314), 83.83 KiB | 5.99 MiB/s, done.
     Resolving deltas: 100% (185/185), done.
     root@eder:~# cd XDPeriments/
     root@eder:~/XDPeriments# git submodule update --init
    Submodule 'libbpf' (https://github.com/libbpf/libbpf) registered for path 'libbpf'
     Cloning into '/root/XDPeriments/libbpf'...
     Submodule path 'libbpf': checked out 'db9614b6bd69746809d506c2786f914b0f812c37'
   oroot@eder:~/XDPeriments# cd opt-extend
     root@eder:~/XDPeriments/opt-extend# make load
     sudo /sbin/tc gdisc add dev eth0 clsact
   /usr/bin/touch clsact
     clang -target bpf -O3 -Wall -Werror -I../libbpf/src -D'DEFAULT IFACE="eth0"' -c -o t
     c dns add option.o tc dns add option.c
     sudo /sbin/tc filter del dev eth0 egress || true
     sudo /sbin/tc filter add dev eth0 egress bpf da obj tc_dns_add_option.o
     root@eder:~/XDPeriments/opt-extend#
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```

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🔊 🖨 🕕 root@eder: ~/XDPeriments/opt-extend
                                        root@eder: ~/XDPeriments/opt-extend 84x12
     Submodule 'libbpf' (https://github.com/libbpf/libbpf) registered for path 'libbpf'
     Cloning into '/root/XDPeriments/libbpf'...
      Submodule path 'libbpf': checked out 'db9614b6bd69746809d506c2786f914b0f812c37'
      root@eder:~/XDPeriments# cd opt-extend/
BD root@eder:~/XDPeriments/opt-extend# make load
                                                                                                        ses
     sudo /sbin/tc gdisc add dev eth0 clsact
     /usr/bin/touch clsact
     clang -target bpf -03 -Wall -Werror -I../libbpf/src -D'DEFAULT_IFACE="eth0"' -c -o t
     c dns add option.o tc dns add option.c
     sudo /sbin/tc filter del dev eth0 egress || true
     sudo /sbin/tc filter add dev eth0 egress bpf da obj tc dns add option.o
      root@eder:~/XDPeriments/opt-extend#
                                               willem@makaak: ~ 108x15
       rillem@makaak:~$ dig @167.172.42.125 random.eder.nlnetlabs.nl A +norec
       <<>> DiG 9.16.15-Ubuntu <<>> @167.172.42.125 random.eder.nlnetlabs.nl A +norec
       (1 server found)
      ;; global options: +cmd
      ;; Got answer:
      ;; ->>HEADER<<- opcode: OUERY, status: NOERROR, id: 63926
      ;; flags: qr aa; OUERY: 1, ANSWER: 1, AUTHORITY: 1, ADDITIONAL: 3
                                                                                                       bne
     :: OPT PSEUDOSECTION:
       EDNS: version: 0, flags:; udp: 1232
       OPT=65001: 06 72 65 70 6f 72 74 09 6e 6c 6e 65 74 6c 61 62 73 02 6e 6c 00 00 (".report.nlnetlabs.nl..")
     ;; OUESTION SECTION:
     ;random.eder.nlnetlabs.nl.
                                  ΙN
                                         Α
```

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```
🚫 🖨 🗊 root@eder: ~/XDPeriments/opt-extend
                                root@eder: ~/XDPeriments/opt-extend 84x26
 * This program is distributed in the hope that it will be useful,
 * but WITHOUT ANY WARRANTY; without even the implied warranty of
 * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
 * GNU General Public License for more details.
                                                                                          ises
 * You should have received a copy of the GNU General Public License
 * along with this program. If not, see <a href="https://www.gnu.org/licenses/">https://www.gnu.org/licenses/</a>.
#include <linux/pkt cls.h> /* for TC ACT_OK*/
#include <iproute2/bpf_elf.h> /* for struct bpf_elf_map */
#include <bpf helpers.h> /* for SEC */
#include "bpf-dns.h"
#define REPORT DOMAIN "\x06report\x09nlnetlabs\x02nl\x00\"
#define OPT CODE EDER 65001 /* first experimental opt code from: RFC6891 */
#define RANDOM CHANCE 100 /st sampling rate of the EDER code in percentage st/
struct bpf_elf_map eder_map SEC("maps") = {
        .type
                         = BPF MAP TYPE PROG ARRAY.
         .id
                         = 1.
                                                                                          Pnd
        .size key
                        = sizeof(uint32 t),
         .size value = sizeof(uint32 t),
                         = PIN GLOBAL NS.
         .pinning
         .max elem
                         = 2.
                                                                     22.57
                                                                                     4%
```

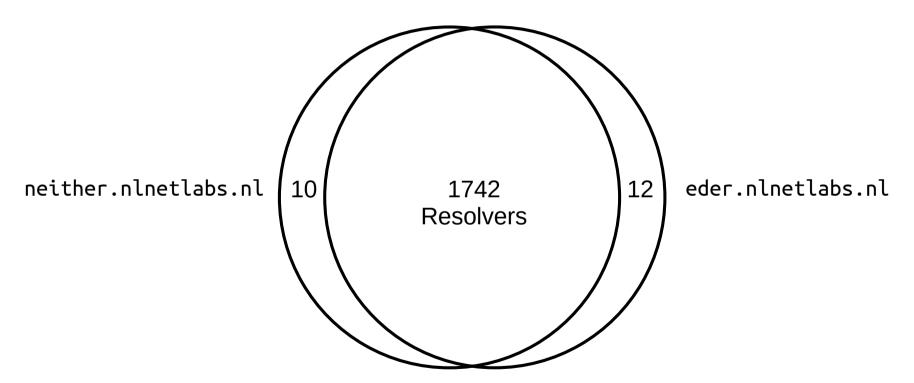
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What got done

- RIPE Atlas measurements:
 - 1) Baseline measurement with neither.nlnetlabs.nl https://atlas.ripe.net/measurements/33172615/
 - 2) Measurement with unsolicited option with eder.nlnetlabs.nl https://atlas.ripe.net/measurements/33173068/
- One-off measurement targeting 1000 (the same) probes
- 962 probes participated
- Python program to process results:

https://github.com/NLnetLabs/XDPeriments/blob/master/opt-extend/process-RIPE-Atlas-results.py

What we learned



Wrap Up

Team members:



Tom Carpay



Willem Toorop

Maybe present all this a bit more elaborately at DNSOP next week.