Unbound & FreeBSD

(A story during the last days of November ’2013)

Presentation for Polish BSD User Group Meetup

November 15th, 2018

Warsaw, Poland

About me:

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Worked as Unix Admin, DNS Admin, Net Admin, etc, the last 2 decades.

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Disclaimer: This story has intentionally workplaces renamed, and sensitive info deleted.

How does this story start?

Five years ago, at work, while taking KPIs from some DNS hardware appliances, I've detected a bottle-neck on CPU usage and queries per second... (HW upgrade was planned in the meantime).

The numbers? **60% CPU usage – 20 kqps per physical box (40 kqps total)** .

(In parallel, - just for "fun" -, I've started to test Unbound on lab environment, because some people gave me good comments).

So, put our hands on the keyboard!

The tools (lab infrastructure, part #1/2)

- **Hardware:** Dell PowerEdge 1950 double Quadcore (2,0 Gigahertz)
- **OS:** FreeBSD 8.4 RELEASE/AMD64
- **DNS software:** Unbound 1.4.21 [*NLNet labs*], installed from ports directory -tree updated-, compiled with Libevent [*Niels Provos*].

  Just in case, I've used Libevent 1.4.14b (proven stable)
- **Measurement tools:** dnstop, from *Measurement factory*.

The tools (lab infrastructure, part #2/2)

- **Stressing tools:** dnsperf tool, in particular resperf (plus query file sample) [*Nominum - Now Akamai*]

  Query files taken from:
  ftp://ftp.nominum.com/pub/nominum/dnsperf/data

- **A depth-in reading (*essential, do not skip*)** from the site: https://calomel.org

  (Specially, *Unbound DNS tutorial* and *FreeBSD Network performance tuning*)

  Note: The site is *highly recommended* for several common tasks like fine tuning services, and *BSD OSes.

The masterplan (The start, #1/2)

After FreeBSD was installed, one terminal was opened with dnstop. The other terminal was running resperf.

Why did I use dnstop?

- It's a powerful tool for debugging queries and gathering dns stats.
- **When queries quantity was almost the same as the answers, it shows that maximum capacity was not reached (yet).**
- It doesn't interfere with any DNS service.
- It's very lightweight, available for several OSes

The masterplan (The start, #2/2)

Why did I use resperf? (Seems that current dnsperf was enhanced)

- It gave me the **MAXIMUM QPS ALLOWED BY RANDOM QUERIES** by simulating a cache resolver and increasing queries quantity
- At that time, it had better(objective) results vs dnsperf.

Note that resperf is an interesting tool for simulating random queries from a with certain maximum desired.

Some sample screenshots (taken from elsewere)

Resperf report 20121229-1007

Resperf output

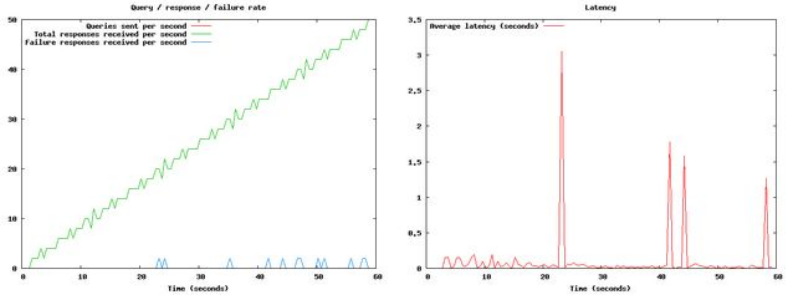
```
DNS Resolution Performance Testing Tool
Nominum Version 2.0.0.0

[Status] Command line: resperf -P 20121229-1007.gnuplot -s localhost -d queryfile-example-current -m 50
[Status] Sending
[Status] Waiting for more responses
[Status] Testing complete

Statistics:

  Queries sent:         1500
  Queries completed:    1500
  Queries lost:         0
  Run time (s):         100.000005
  Maximum throughput:   50.000000 qps
  Lost at that point:   0.00%
```

Plots



RESPERF

```
Queries: 452 new, 12463 total

Sources                Count      %   cum%
--------------- --------- ------ ------
[redacted].13           2877   23.1   23.1
[redacted].72            803    6.4   29.5
[redacted].71            772    6.2   35.7
[redacted].69            675    5.4   41.1
[redacted].74            303    2.4   43.6
[redacted]3.37           138    1.1   44.7
[redacted]63             135    1.1   45.8
[redacted]0.36           119    1.0   46.7
[redacted].153           112    0.9   47.6
[redacted]7.147          102    0.8   48.4
[redacted]9.150           98    0.8   49.2
```

DNSTOP

The masterplan (The end)

- First tests were promising. Without tuning, **I've got 10-15kqps**
- **By following Calomel's hints about Unbound and FreeBSD**, I've ended up by doing fine tuning on network card, OS (udp, sockets, ports range, etc), and Unbound config. (**However, no DNSSEC was used**)
- My dry (but real) tests were incredible: **I've got > 54kqps!**
- Yes, DNS service -with high load in mind- was under my control! :-)

The deployment (The end of this story)

- It should be noted that a rapid deployment for this lab took place because of several factors (including dns performance).
- Final deployment lasted for 6 months; started from 80kqps, ending with 120kqps distributed on 3 physical servers.
- It’s worth to note that the queries were made from subscribers to the internet.

- And yes, the result was incredible!

Acknowledgements

- FreeBD project (https://www.freebsd.org)
- NLNet labs (https://www.nlnetlabs.nl/)
- Nominum (now part of Akamai) (https://ww.akamai.com)
- The Measurement Factory (http://dns.measurement-factory.com/tools/)

Special ACKs to Adam Wolk (@mulander) because his search of a guest speaker for this BSD_PL meetup. ;-)

Thank you!