Is a single DNS vendor enough?

How can we make multi-vendor setups manageable?

Petr Špaček • petr.spacek@nic.cz • 2019-02-03

KNOT RESOLVER

cz.nic | CZ DOMAIN REGISTRY

Outline

- A single vendor
  - Selection
  - Why not ...
- Multiple vendors
- Recommendations
- Discussion – common config interface

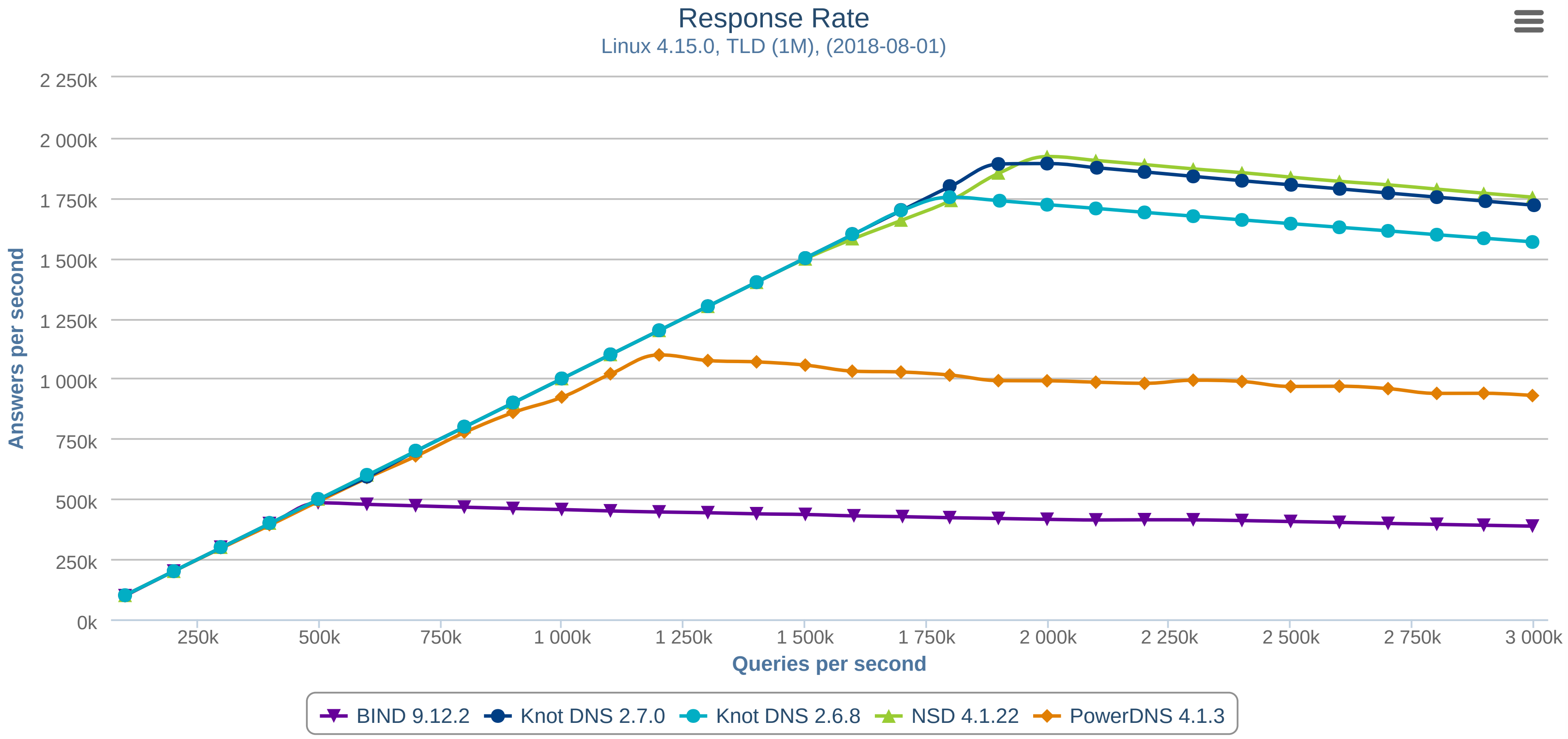
Selecting a vendor

- Features
- Performance
- SLA
- Price
- ...

Selecting a vendor: Features

docID	title	pages	currentStatus	obsoleted	sections
	DNSSEC		STANDARD		
RFC6147	DNS64: DNS Extensions for Network Address Translation from IPv6 Clients to IPv4 Servers	32	PROPOSED STANDARD	0	core
RFC6604	xNAME RCODE and Status Bits Clarification	5	PROPOSED STANDARD	0	core
RFC6605	Elliptic Curve Digital Signature Algorithm (DSA) for DNSSEC	8	PROPOSED STANDARD	0	core
RFC6672	DNAME Redirection in the DNS	22	PROPOSED STANDARD	0	core
RFC6725	DNS Security (DNSSEC) DNSKEY Algorithm IANA Registry Updates	5	PROPOSED STANDARD	0	core
RFC6731	Improved Recursive DNS Server Selection for Multi-Interfaced Nodes	29	PROPOSED STANDARD	0	core
RFC6761	Special-Use Domain Names	13	PROPOSED STANDARD	0	core
RFC6840	Clarifications and Implementation Notes for DNS Security (DNSSEC)	21	PROPOSED STANDARD	0	core
RFC6891	Extension Mechanisms for DNS (EDNS(0))	16	INTERNET STANDARD	0	core
RFC6944	Applicability Statement: DNS Security (DNSSEC) DNSKEY Algorithm Implementation Status	7	PROPOSED STANDARD	0	core
RFC6975	Signaling Cryptographic Algorithm Understanding in DNS Security Extensions (DNSSEC)	9	PROPOSED STANDARD	0	core

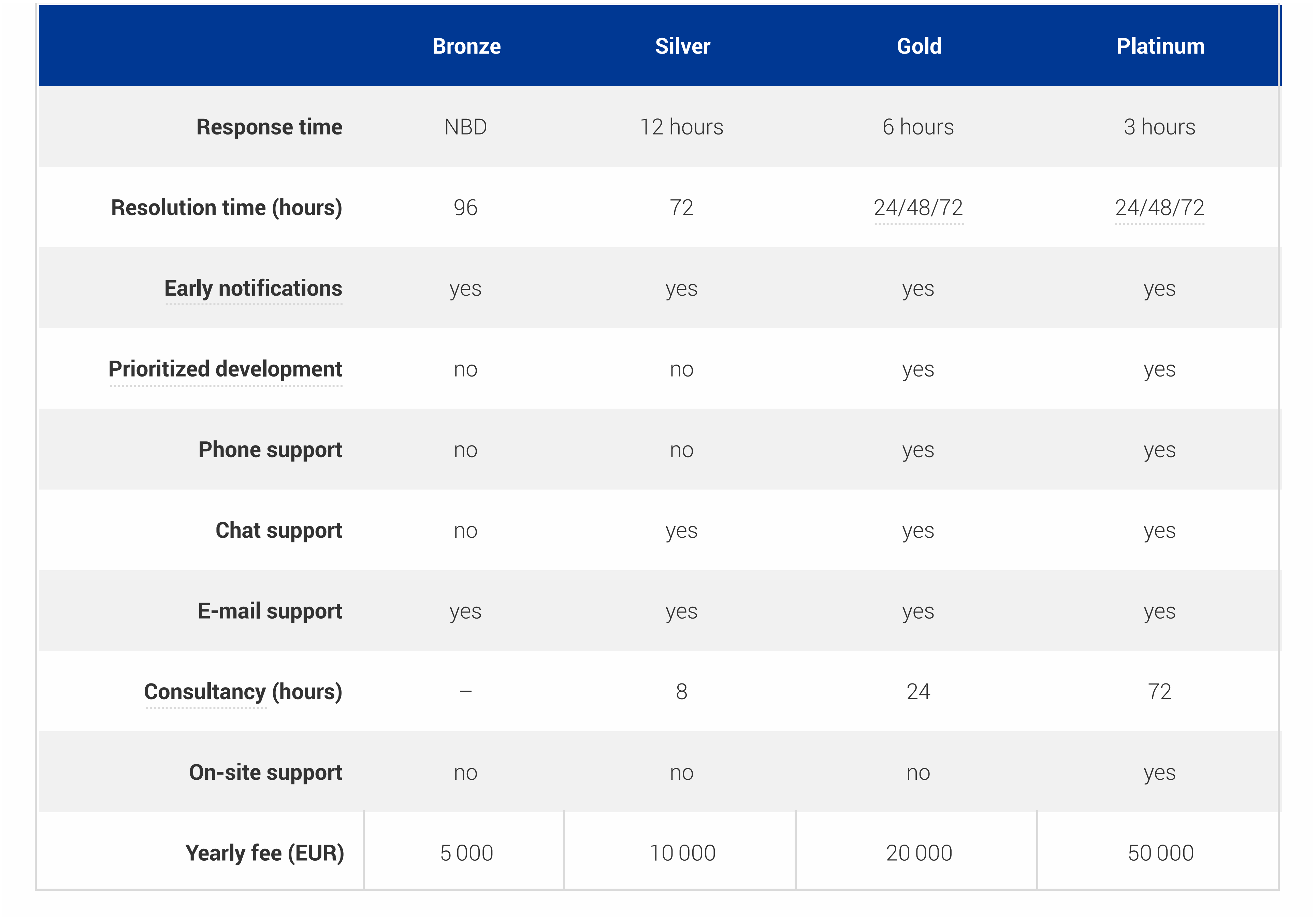
Selecting a vendor: Performance



TLD (1M)

- Zones: 1
- DNSSEC: no
- RR count: 1M
- Content: delegations (2 NS) + glue records (A, AAAA)
- Queries: random QNAME

Selecting a vendor: SLA, price, ...



	Bronze	Silver	Gold	Platinum
Response time	NBD	12 hours	6 hours	3 hours
Resolution time (hours)	96	72	24/48/72	24/48/72
Early notifications	yes	yes	yes	yes
Prioritized development	no	no	yes	yes
Phone support	no	no	yes	yes
Chat support	no	yes	yes	yes
E-mail support	yes	yes	yes	yes
Consultancy (hours)	–	8	24	72
On-site support	no	no	no	yes
Yearly fee (EUR)	5 000	10 000	20 000	50 000

Still, you can't avoid ...

```
Segmentation fault
(core dumped)
```

Image attribution: Videoplasty.com

You cannot win with … BIND

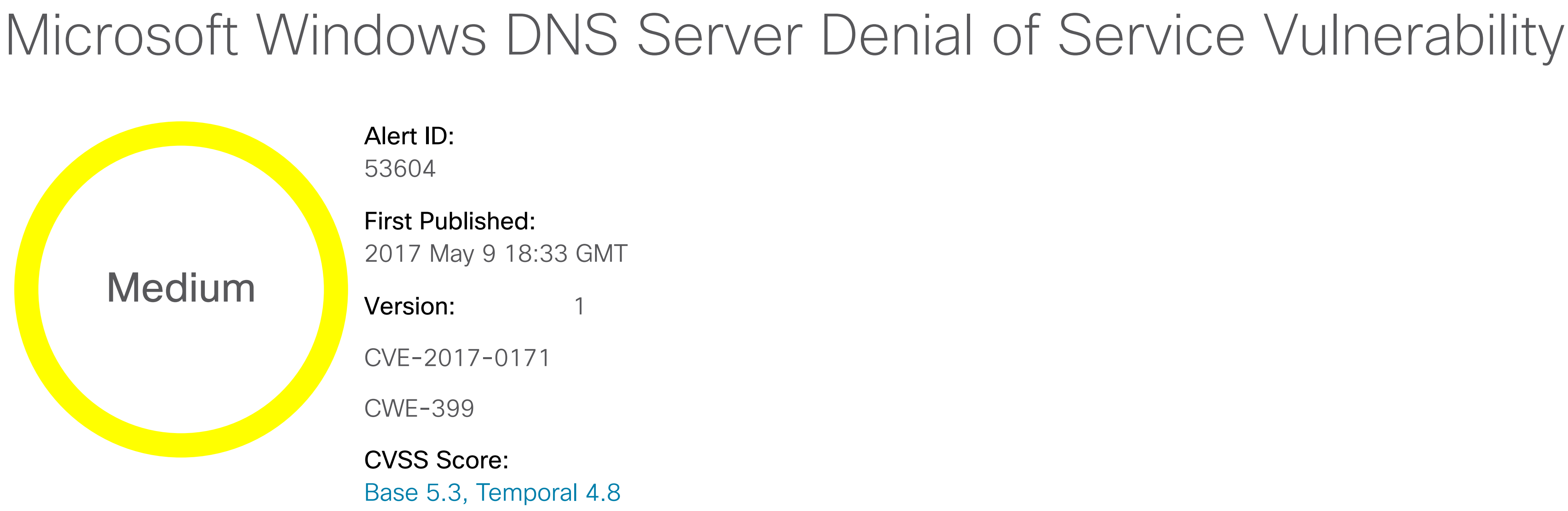
#	CVE Number	Short Description
98	2018-5741 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2018-5741)	Update policies krb5-subdomain and ms-subdomain do not enforce controls promised in their documentation (https://kb.isc.org/docs/cve-2018-5741)
97	2018-5740 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2018-5740)	A flaw in the "deny-answer-aliases" feature can cause an INSIST assertion failure in named (https://kb.isc.org/docs/aa-01639)
96	2018-5738 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2018-5738)	Some versions of BIND can improperly permit recursive query service to unauthorized clients (https://kb.isc.org/docs/aa-01616)
95	2018-5737 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2018-5737)	BIND 9.12's serve-stale implementation can cause an assertion failure in rbtdb.c or other undesirable behavior, even if serve-stale is not enabled (https://kb.isc.org/docs/aa-01606)
94	2018-5736 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2018-5736)	Multiple transfers of a zone in quick succession can cause an assertion failure in rbtdb.c (https://kb.isc.org/docs/aa-01602)
93	2018-5734 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2018-5734)	A malformed request can trigger an assertion failure in badcache.c (https://kb.isc.org/docs/aa-01562)
92	2017-3145 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2017-3145)	Improper fetch cleanup sequencing in the resolver can cause named to crash (https://kb.isc.org/docs/aa-01542)
91	2017-3143 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2017-3143)	An error in TSIG handling can permit unauthorized dynamic updates (https://kb.isc.org/docs/aa-01503)
90	2017-3142 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2017-3142)	An error in TSIG handling can permit unauthorized zone transfers (https://kb.isc.org/docs/aa-01504)
89	2017-3141 (http://cve.mitre.org/cgi-bin/cvename.cgi?name=CVE-2017-3141)	Windows service and uninstall paths are not quoted when BIND is installed (https://kb.isc.org/docs/aa-01496)

You cannot win with … Knot

```
Knot DNS 1.4.0 (2014-01-06)
===========================

Bugfixes:
---------
 - AXFR crash with specific packet
```

You cannot win with … Microsoft



Microsoft Windows DNS Server Denial of Service Vulnerability

Medium

Alert ID:
53604

First Published:
2017 May 9 18:33 GMT

Version: 1

CVE-2017-0171

CWE-399

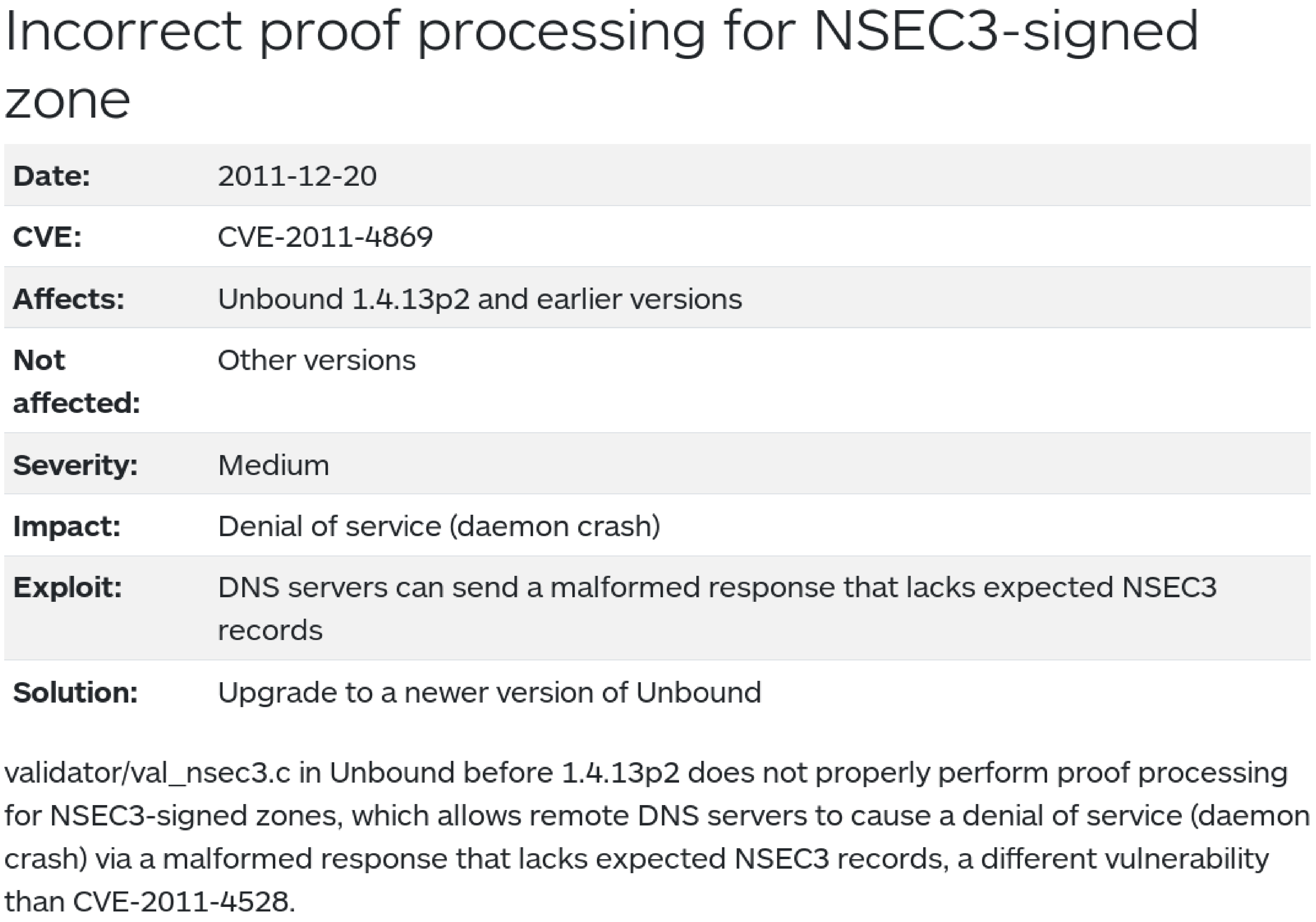
CVSS Score:
Base 5.3, Temporal 4.8

You cannot win with … PowerDNS

All security advisories for the PowerDNS Authoritative Server are listed here.

- PowerDNS Security Advisory 2018-05: Packet cache pollution via crafted query (powerdns-advisory-2018-05.html)
- PowerDNS Security Advisory 2018-03: Crafted zone record can cause a denial of service (powerdns-advisory-2018-03.html)
- PowerDNS Security Advisory 2018-02: Buffer overflow in dnsreplay (powerdns-advisory-2018-02.html)
- PowerDNS Security Advisory 2017-04: Missing check on API operations (powerdns-advisory-2017-04.html)
- PowerDNS Security Advisory 2016-05: Crafted zone record can cause a denial of service (powerdns-advisory-2016-05.html)
- PowerDNS Security Advisory 2016-04: Insufficient validation of TSIG signatures (powerdns-advisory-2016-04.html)
- PowerDNS Security Advisory 2016-03: Denial of service via the web server (powerdns-advisory-2016-03.html)
- PowerDNS Security Advisory 2016-02: Crafted queries can cause abnormal CPU usage (powerdns-advisory-2016-02.html)
- PowerDNS Security Advisory 2016-01: Crafted queries can cause unexpected backend load (powerdns-advisory-2016-01.html)
- PowerDNS Security Advisory 2015-03: Packet parsing bug can lead to crashes (powerdns-advisory-2015-03.html)
- PowerDNS Security Advisory 2015-02: Packet parsing bug can cause thread or process abortion (powerdns-advisory-2015-02.html)
- PowerDNS Security Advisory 2015-01: Label decompression bug can cause crashes or CPU spikes (powerdns-advisory-2015-01.html)

You cannot win with … Unbound



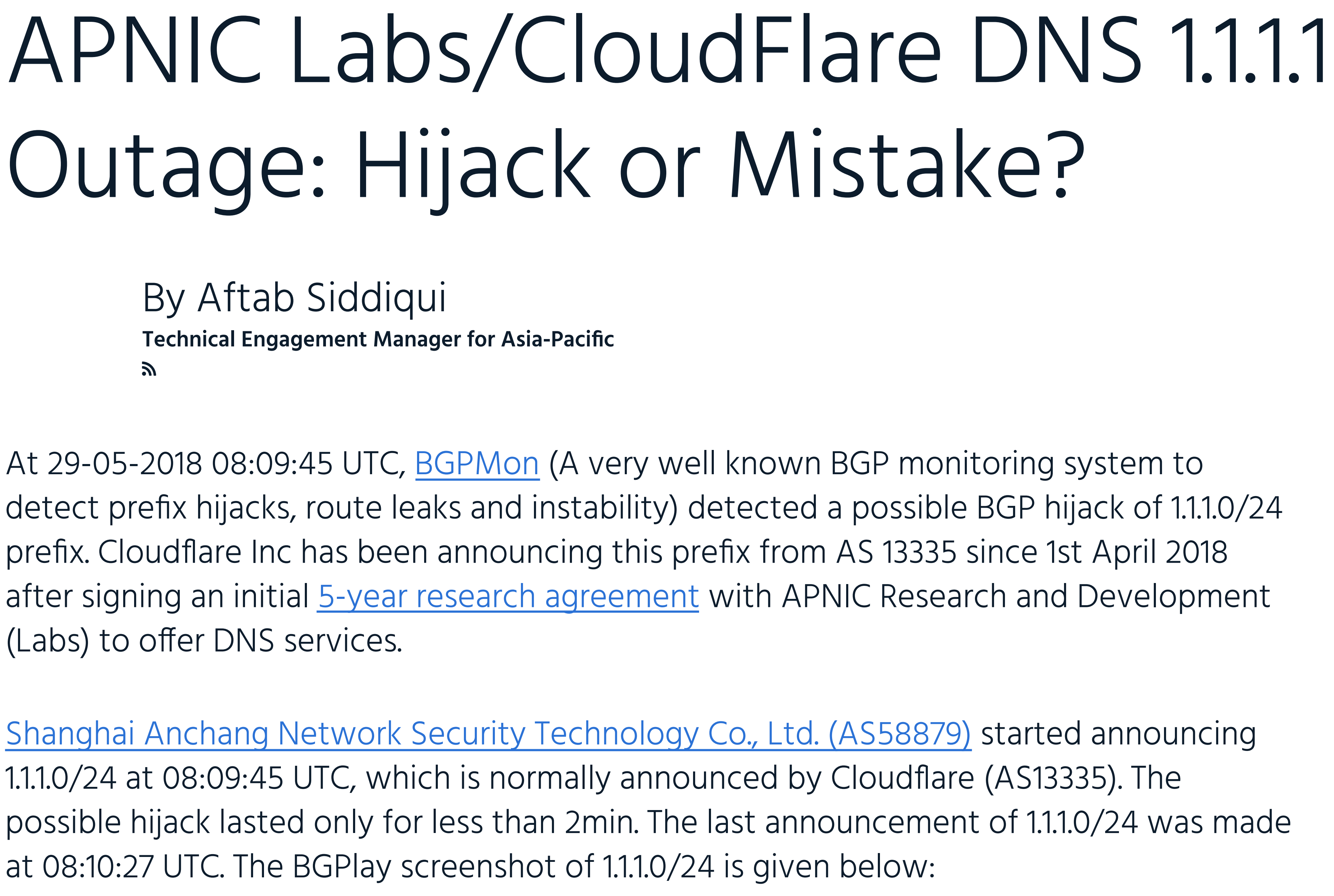
Incorrect proof processing for NSEC3-signed zone

Date:	2011-12-20
CVE:	CVE-2011-4869
Affects:	Unbound 1.4.13p2 and earlier versions
Not affected:	Other versions
Severity:	Medium
Impact:	Denial of service (daemon crash)
Exploit:	DNS servers can send a malformed response that lacks expected NSEC3 records
Solution:	Upgrade to a newer version of Unbound

validator/val_nsec3.c in Unbound before 1.4.13p2 does not properly perform proof processing for NSEC3-signed zones, which allows remote DNS servers to cause a denial of service (daemon crash) via a malformed response that lacks expected NSEC3 records, a different vulnerability than CVE-2011-4528.

Cloud to the rescue?

You cannot win with … Cloudflare



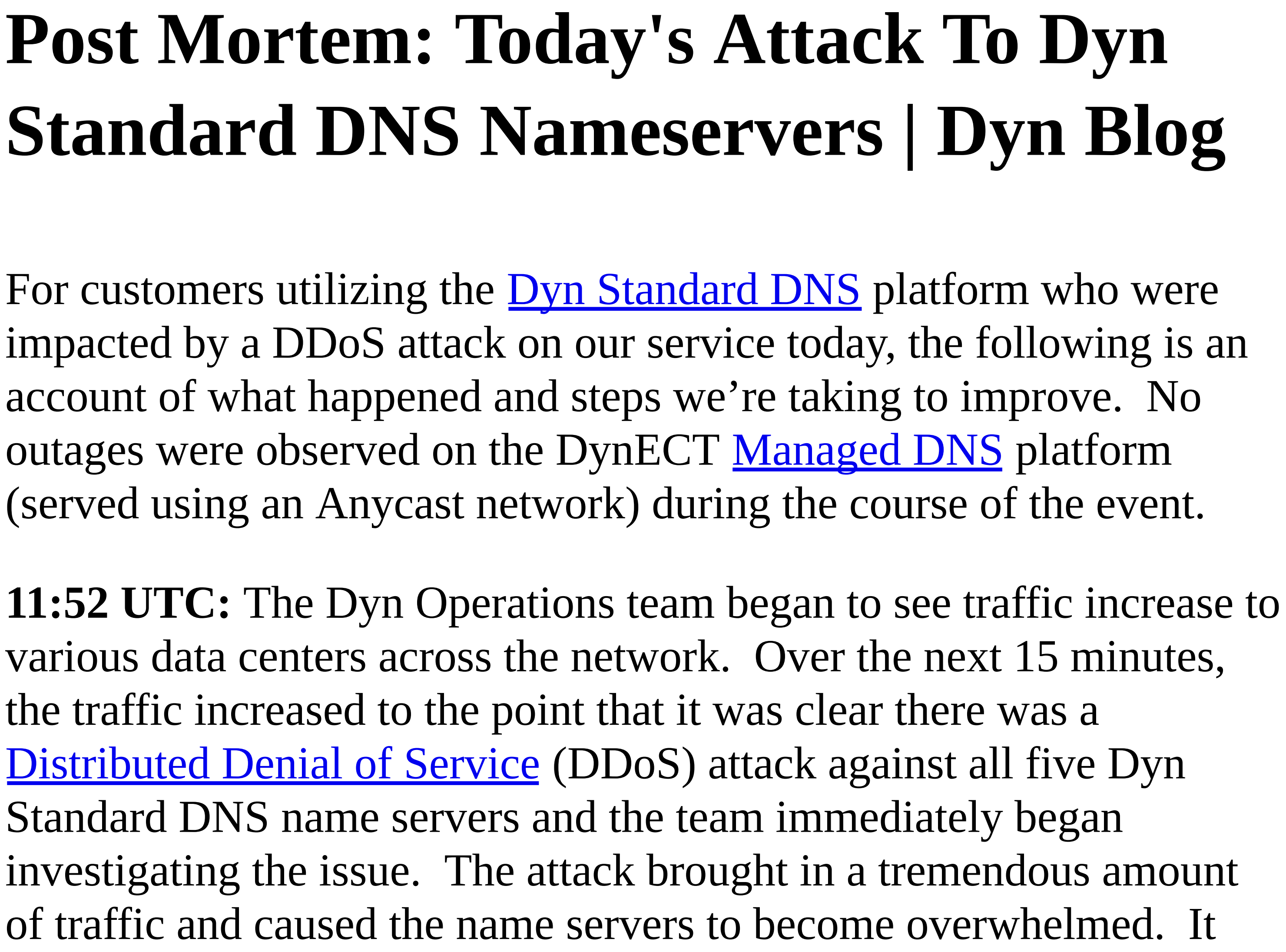
APNIC Labs/CloudFlare DNS 1.1.1.1 Outage: Hijack or Mistake?

By Aftab Siddiqui
Technical Engagement Manager for Asia-Pacific

At 29-05-2018 08:09:45 UTC, BGPMon (A very well known BGP monitoring system to detect prefix hijacks, route leaks and instability) detected a possible BGP hijack of 1.1.1.0/24 prefix. Cloudflare Inc has been announcing this prefix from AS 13335 since 1st April 2018 after signing an initial 5-year research agreement with APNIC Research and Development (Labs) to offer DNS services.

Shanghai Anchang Network Security Technology Co., Ltd. (AS58879) started announcing 1.1.1.0/24 at 08:09:45 UTC, which is normally announced by Cloudflare (AS13335). The possible hijack lasted only for less than 2min. The last announcement of 1.1.1.0/24 was made at 08:10:27 UTC. The BGPlay screenshot of 1.1.1.0/24 is given below:

You cannot win with … Dyn



Post Mortem: Today's Attack To Dyn Standard DNS Nameservers | Dyn Blog

For customers utilizing the Dyn Standard DNS platform who were impacted by a DDoS attack on our service today, the following is an account of what happened and steps we’re taking to improve. No outages were observed on the DynECT Managed DNS platform (served using an Anycast network) during the course of the event.

11:52 UTC: The Dyn Operations team began to see traffic increase to various data centers across the network. Over the next 15 minutes, the traffic increased to the point that it was clear there was a Distributed Denial of Service (DDoS) attack against all five Dyn Standard DNS name servers and the team immediately began investigating the issue. The attack brought in a tremendous amount of traffic and caused the name servers to become overwhelmed. It

You cannot win with … Google

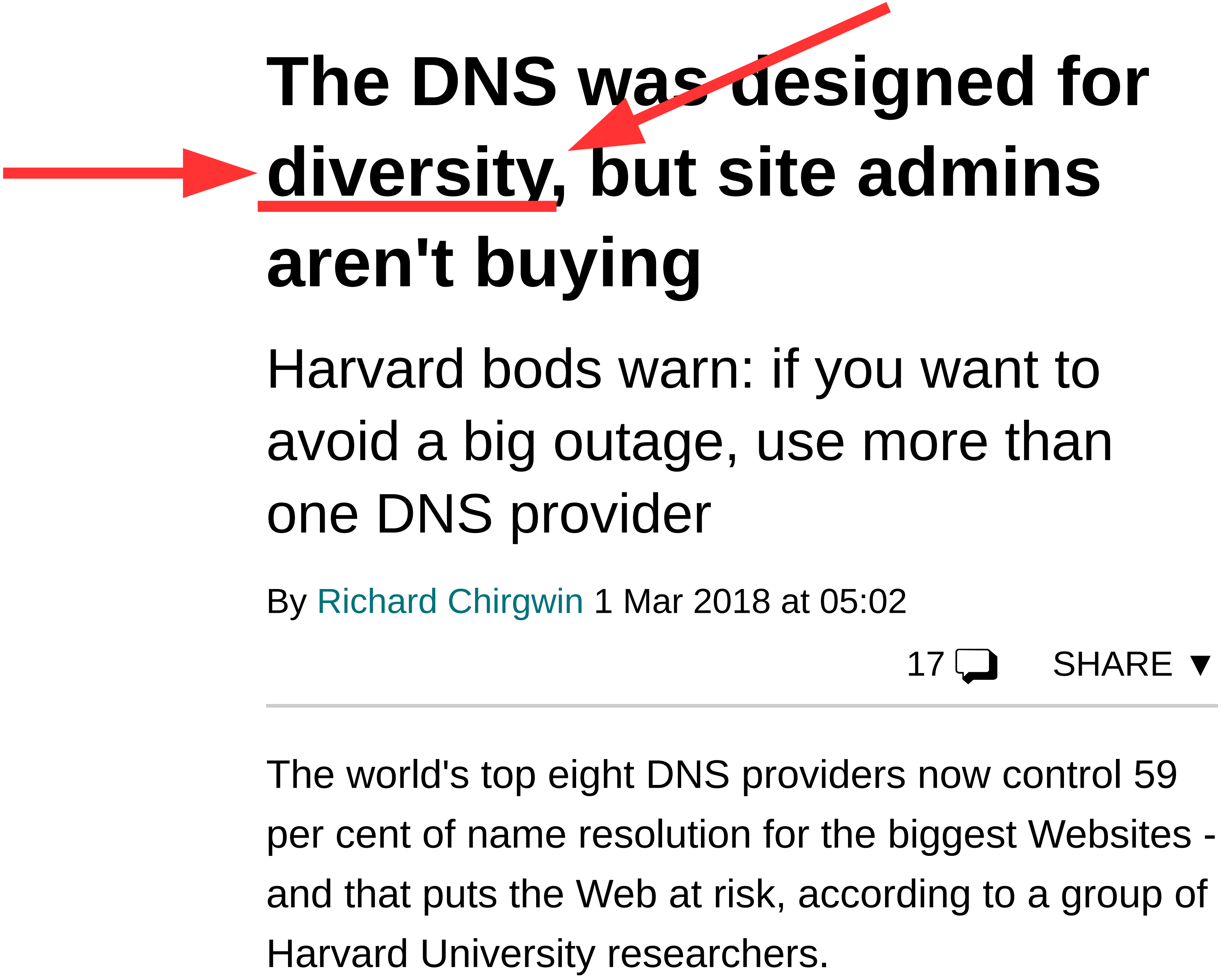
Google DNS Outage: 4.7% drop in global traffic

Google's brief outage caused a noticeable drop in GoSquared Traffic

Simon Tabor avatar Simon Tabor on October 13, 2014

Google’s DNS service (8.8.8.8 and 8.8.4.4) went down very briefly today at 11:29am GMT. This took down Google.com at the same time – preventing website domains from being resolved and users from searching for information. Because of this, there was a noticeable drop in the number of pageviews coming into

What can we do?



The DNS was designed for diversity, but site admins aren't buying

Harvard bods warn: if you want to avoid a big outage, use more than one DNS provider

By Richard Chirgwin 1 Mar 2018 at 05:02

17 SHARE ▼

The world's top eight DNS providers now control 59 per cent of name resolution for the biggest Websites - and that puts the Web at risk, according to a group of Harvard University researchers.

Why diversity? 1/2

From: Linus Torvalds
Date: Mon, 7 May 2007 09:11:33 -0700

- if your mission to another star
***depends* on every single piece of
complex equipment staying up** with
zero reboots for 200+ years, **you have
some serious technology problems.**

...

Why diversity? 2/2

From: Linus Torvalds
Date: Mon, 7 May 2007 09:11:33 -0700

Trust me, if you are going to another star, **you'd better have the capabilities to handle bugs**. You'd better have multiple fail-over etc.

A notion of "robustness" cannot and must not hinge on "no bugs". That's unrealistic.

Multiple vendors: advantages

- Avoids SPOF
  - "packet-of-death" unlikely
- Lessens pressure
  - 9:00 Monday
    vs.
  - 2:15 Saturday (or Christmas day)
- Cheaper support contracts?

Multiple vendors: costs

- Selection process *N* times
- Higher operational complexity
  - multiple configurations
  - monitoring
  - automation!
- More paperwork (SLAs etc...)

Multiple vendors: traps

- Beware of OEMs
  - Ask what's inside your DNS "appliance"!
- Often customized versions of open-source SW
  - Same "packet-of-death"
  - Changes over time, ask your OEM!

Recommendations

- Use **at least two** DNS vendors
  - **at very least** at the edge
- Beware of OEMs

Discussion: Common config interface

- Deleting a zone is always the same, right?
- RESTCONF example

```
curl --http2 -k -X DELETE
https://local/restconf/data/
dns-server:dns-server/zones/
zone=newzone.cz
```

- What **else** do you need?

Discussion: Common config interface

- What do you configure most frequently?
  - Add/delete zone?
  - Configure parameters for zone slaving?
    - TSIG keys?
    - ACL?
      - How does it look like?
  - Zone content?
  - ...? ? ? ? ? ?

Recommendations

- Thank you for discussion!

- Use **at least two** DNS vendors
  - **at very least** at the edge
- Beware of OEMs