EDNS Compliance

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Motivation

Deployed Experimental Version
of DNS COOKIES (SIT)
in BIND 9.10.0

Lookups for various zones failed due
to mis-implemention of EDNS

Trial and Error Takes time
especially when requests are dropped

New EDNS option are not the only EDNS extensions people are wishing to use.

Decided to see what mis-behaviour is out there.

DataSets

- Root and TLD servers
- Alexa Top 1000
- Alexa Bottom 1000 of Top 1Million
- GOV servers from Alexa Top 1Million
- AU servers from Alexa Top 1Million

Methodology

dig +norec +noedns soa zone @server

dig +norec +edns=0 soa zone @server

dig +norec +edns=1 +noednsneg soa zone @server

dig +norec +ednsopt=100 soa zone @server

dig +norec +ednsflags=0x80 soa zone @server

dig +norec +dnssec soa zone @server

dig +norec +dnssec +bufsize=512 +ignore dnskey zone @server

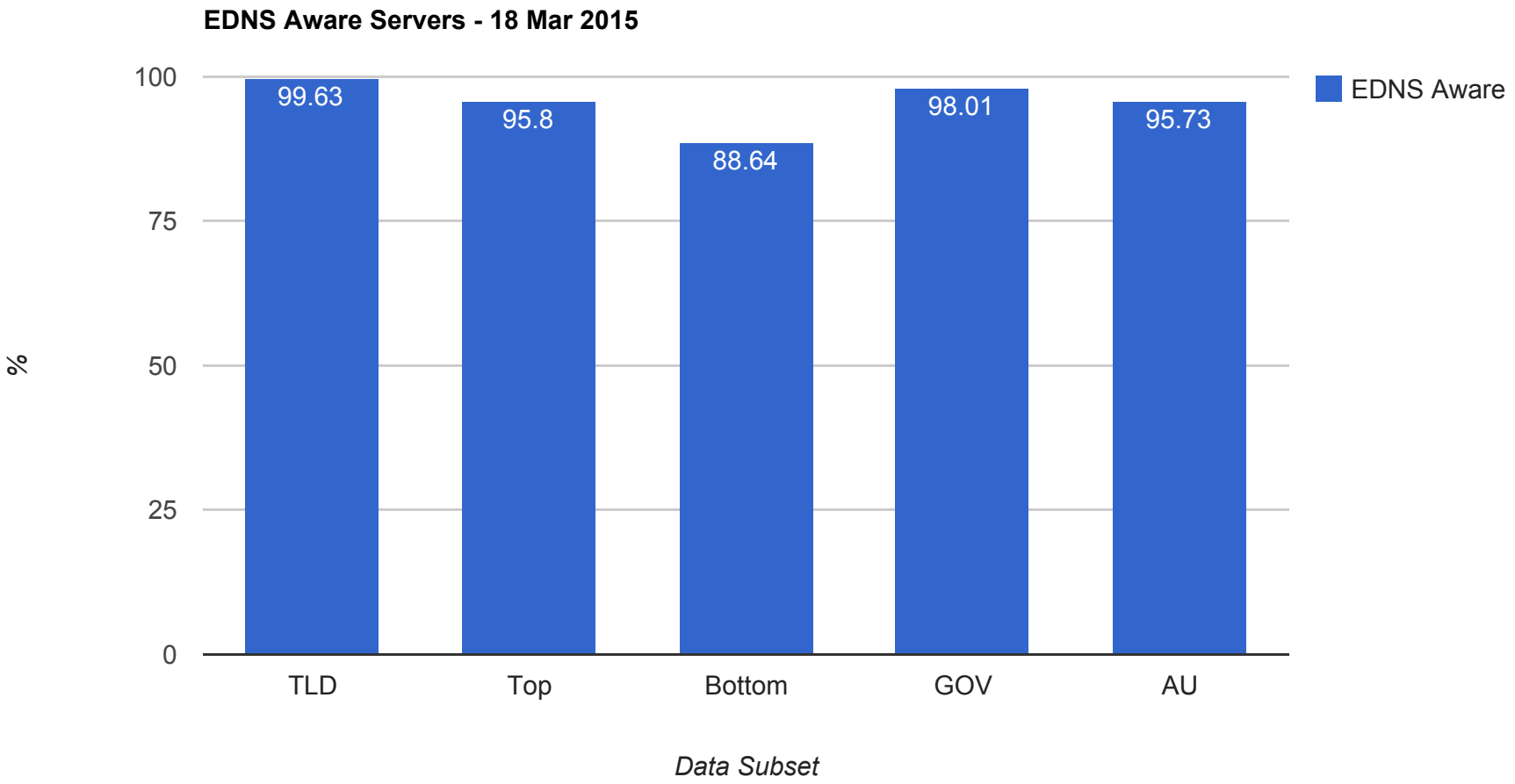
dig +norec +edns=1 +noednsneg +ednsopt=100 soa zone @server

Faults Detected 1/2

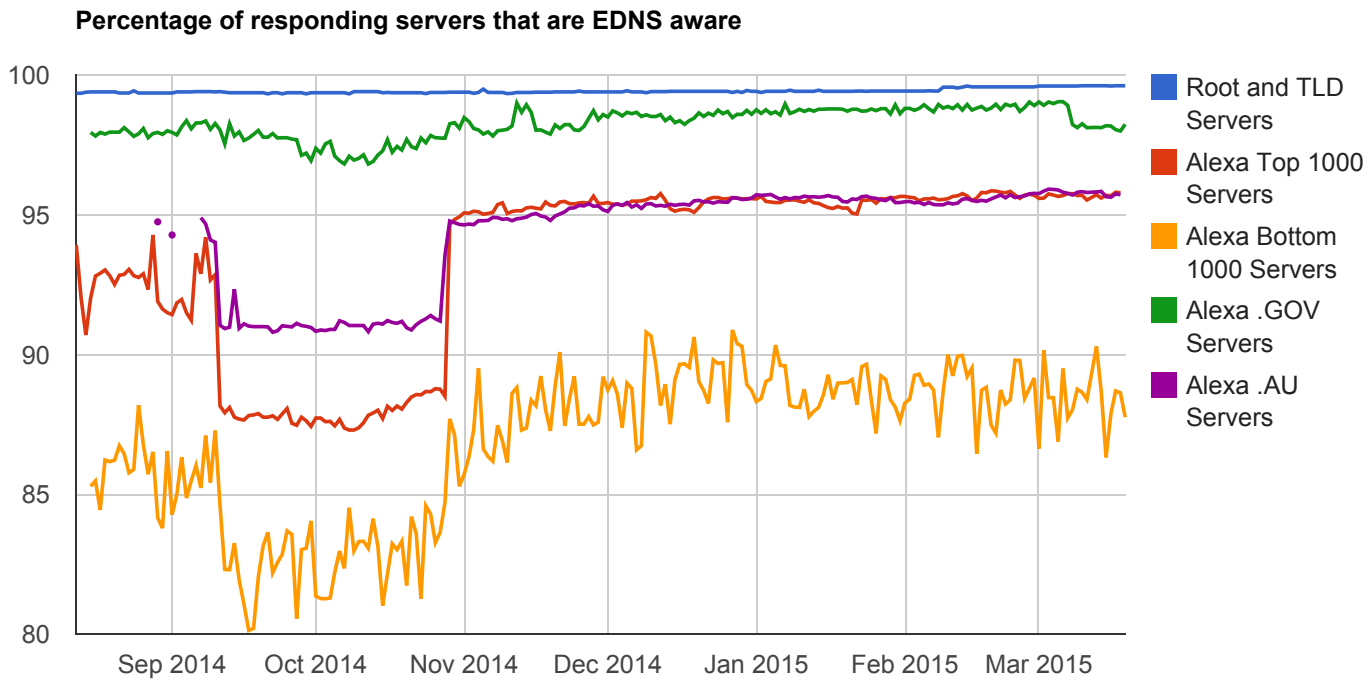
- OPT only returned when DO=1 is present in the request
- BADVER not returned to EDNS (1)
- NOTIMP returned when a EDNS option is present
- FORMERR returned when a EDNS option is present
- BADVERS returned when a EDNS option is present
- NOTIMP returned when a EDNS Z flag is present
- FORMERR returned when a EDNS Z flag is present
- BADVERS returned when a EDNS Z flag is present
- EDNS option echoed back

Faults Detected 2/2

- OPT not returned in truncated response
- EDNS (1) queries being dropped
- EDNS queries with a Z bit being dropped
- EDNS Z bits in queries echoed back
- TCP response size limited to EDNS UPD response size
- Truncated UDP response when send when response will not fit
- Fragmented responses being blocked
- DO=1 not returned by DNSSEC aware servers


EDNS Aware Servers - 18 Mar 2015
100
75
50
25
0
%
99.63
95.8
88.64
98.01
95.73
TLD
Top
Bottom
GOV
AU
Data Subset
EDNS Aware

EDNS Compliance Report: 2015-03-19T05:19:26Z



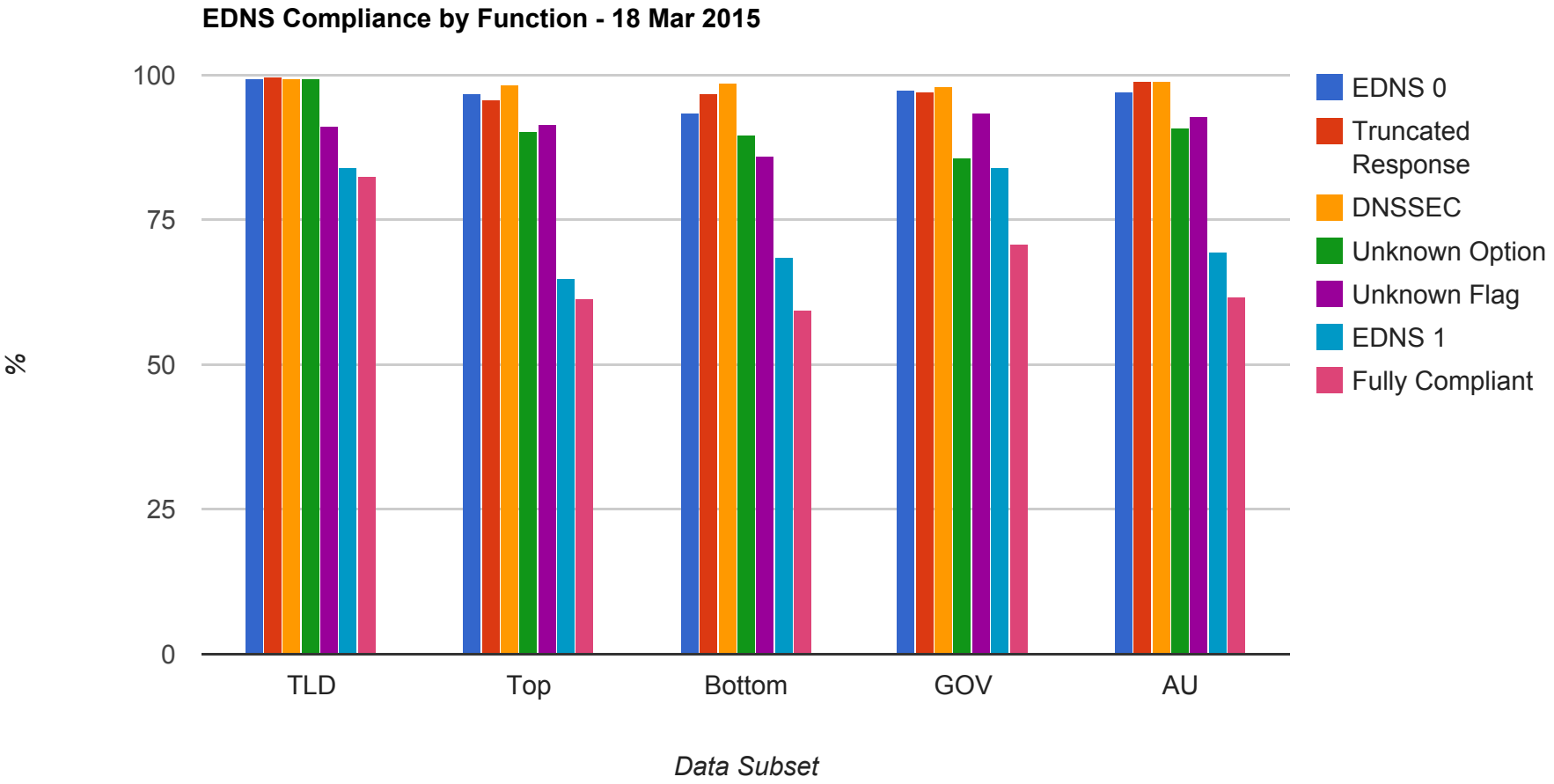
A EDNS aware server is one which returns a EDNS response to at least one of the test queries. A active server is one which returns a response to one of the test queries. Inactive servers are discarded when calculating the EDNS aware percentages.

2014-09-11: Cloudflare replaced server software which only returned a EDNS response when DO was set to one in the request to a server which ignores

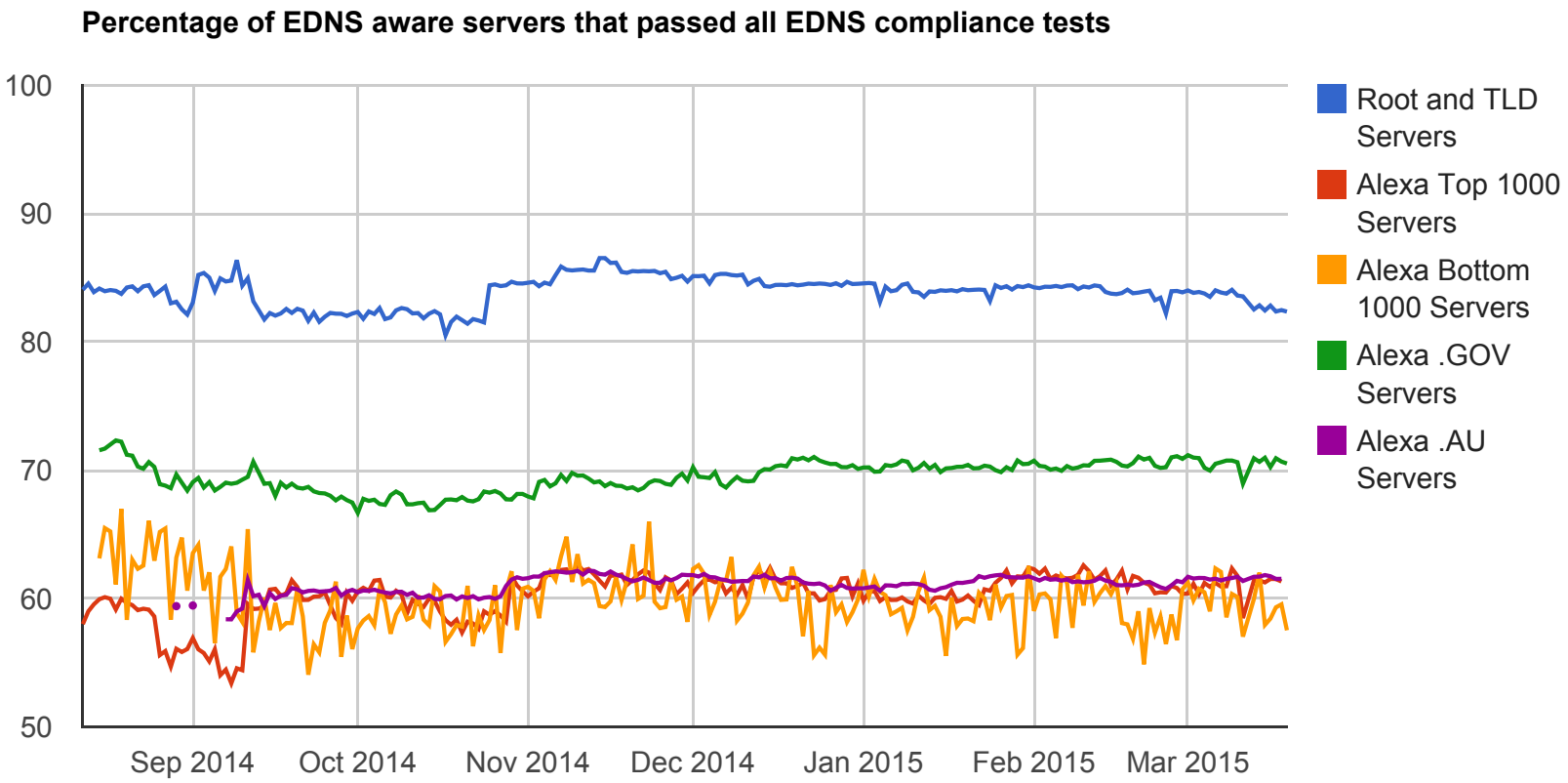
EDNS in the request.

2014-10-10: Stopped setting AD=1 in test queries.

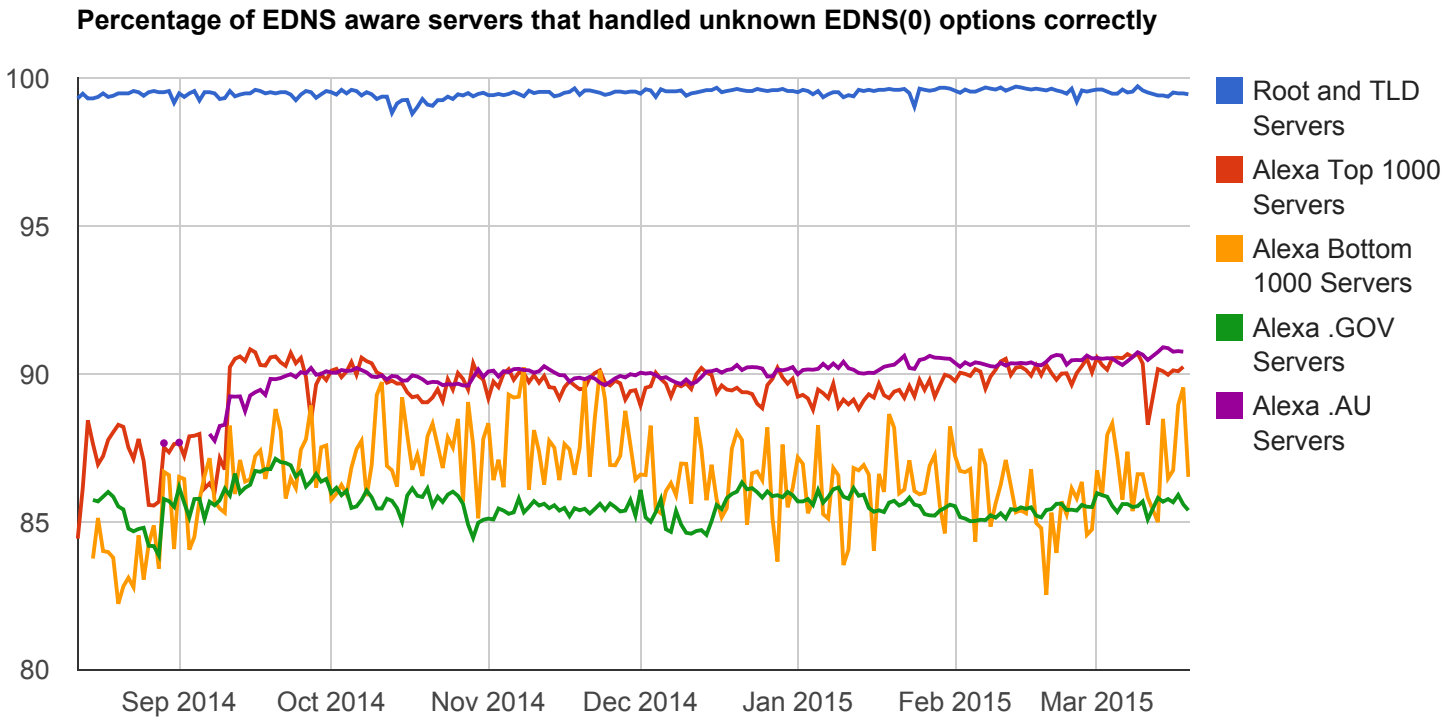
2014-10-29: Cloudflare restored EDNS support.


EDNS Compliance by Function - 18 Mar 2015
100
75
50
25
0
%
TLD
Top
Bottom
GOV
AU
Data Subset
EDNS 0
Truncated Response
DNSSEC
Unknown Option
Unknown Flag
EDNS 1
Fully Compliant

EDNS Compliance Report: 2015-03-19T07:46:51Z



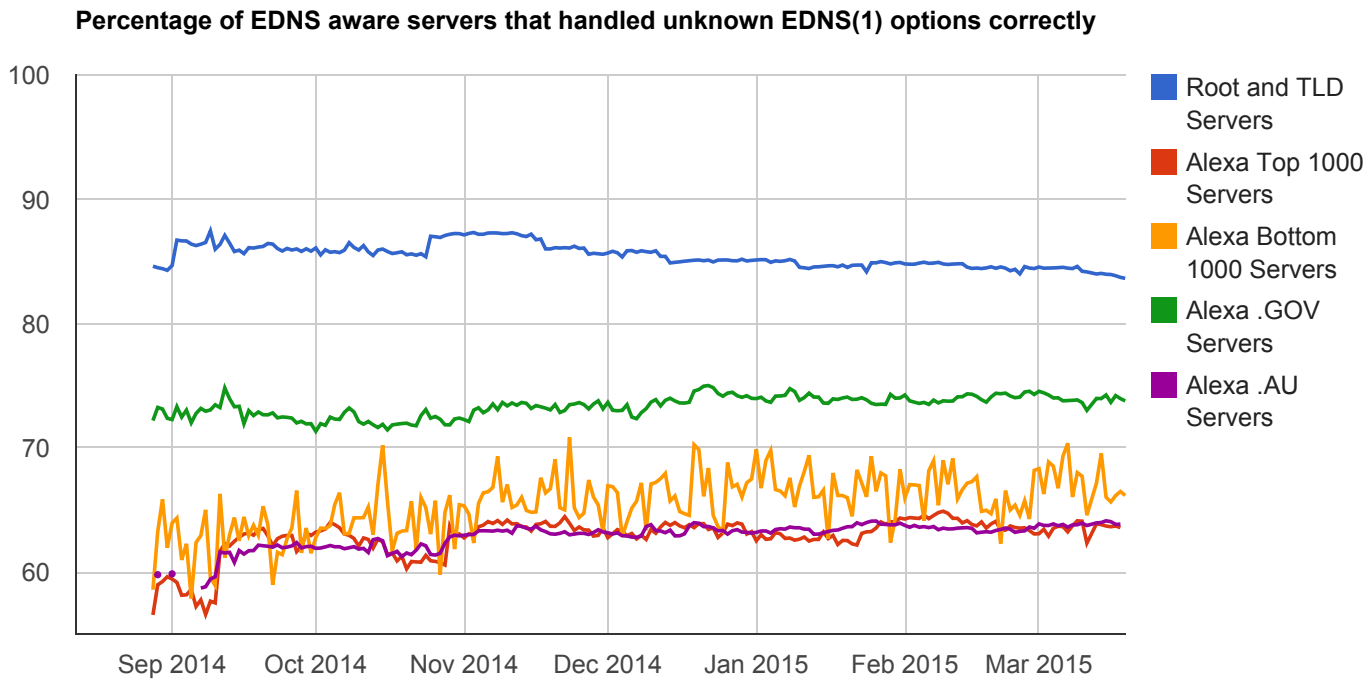
EDNS Compliance Report: 2015-03-19T05:19:26Z



(*dig +ednsopt=100 +norec soa $zone @$server*)
expect: status: NOERROR
expect: SOA record to be present
expect: OPT record to be present

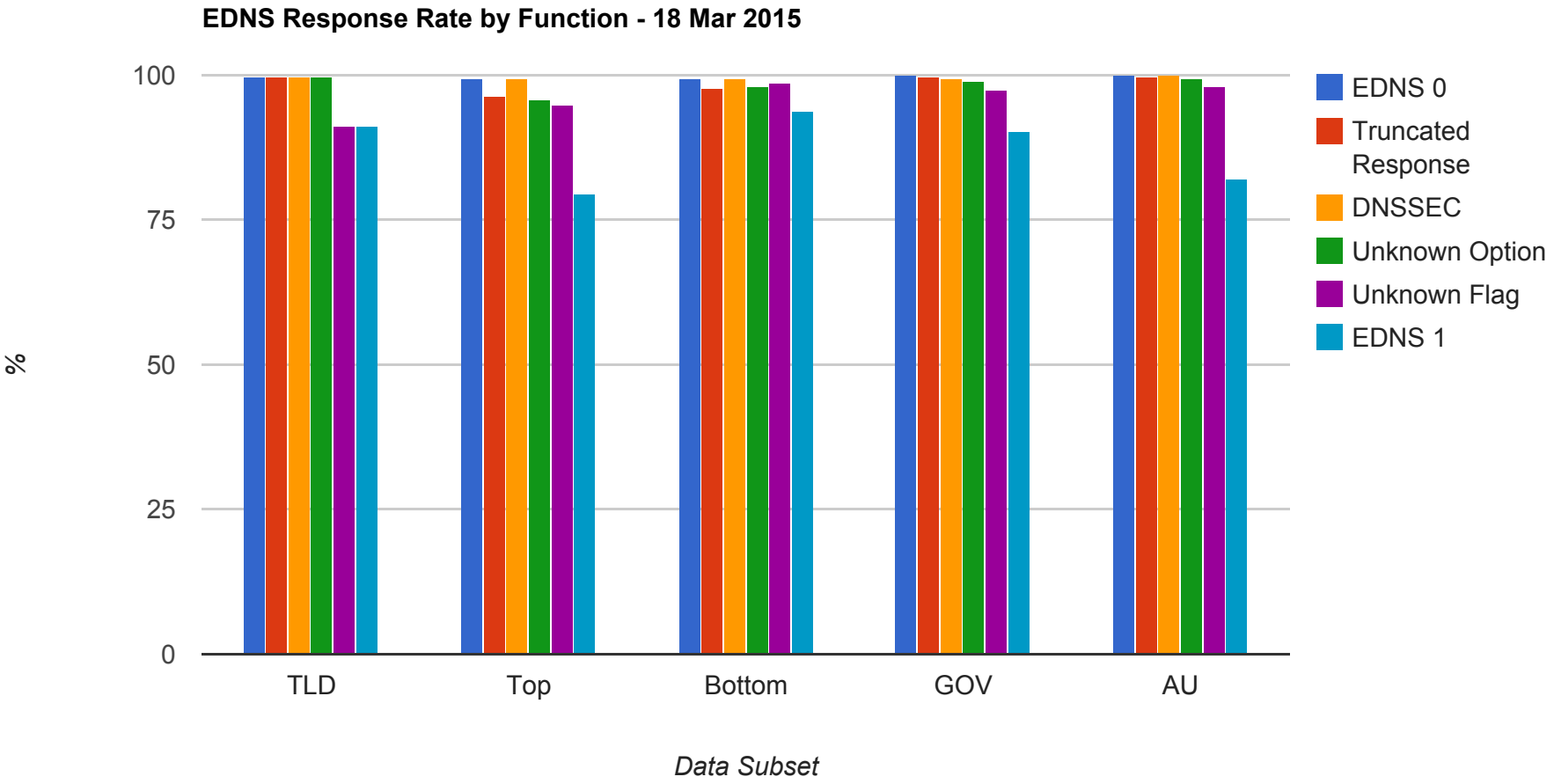
expect: OPT=100 to not be present
See RFC6891, 6.1.2 Wire Format

EDNS Compliance Report: 2015-03-19T07:46:51Z

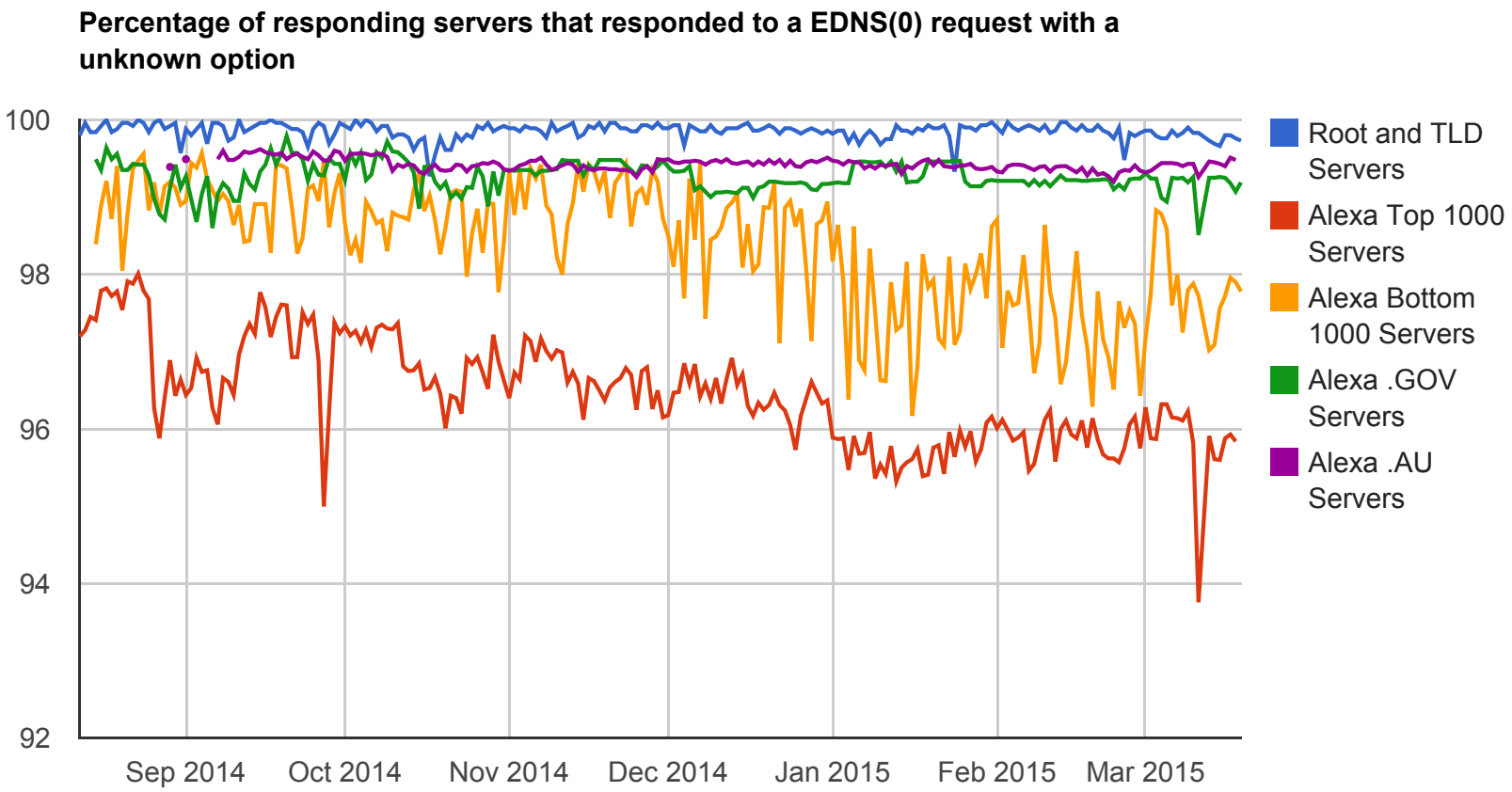


(*dig +ednsopt=100 +edns=1 +norec soa $zone @$server*)
expect: status: BADVERS
expect: SOA record to NOT be present
expect: OPT record to be present

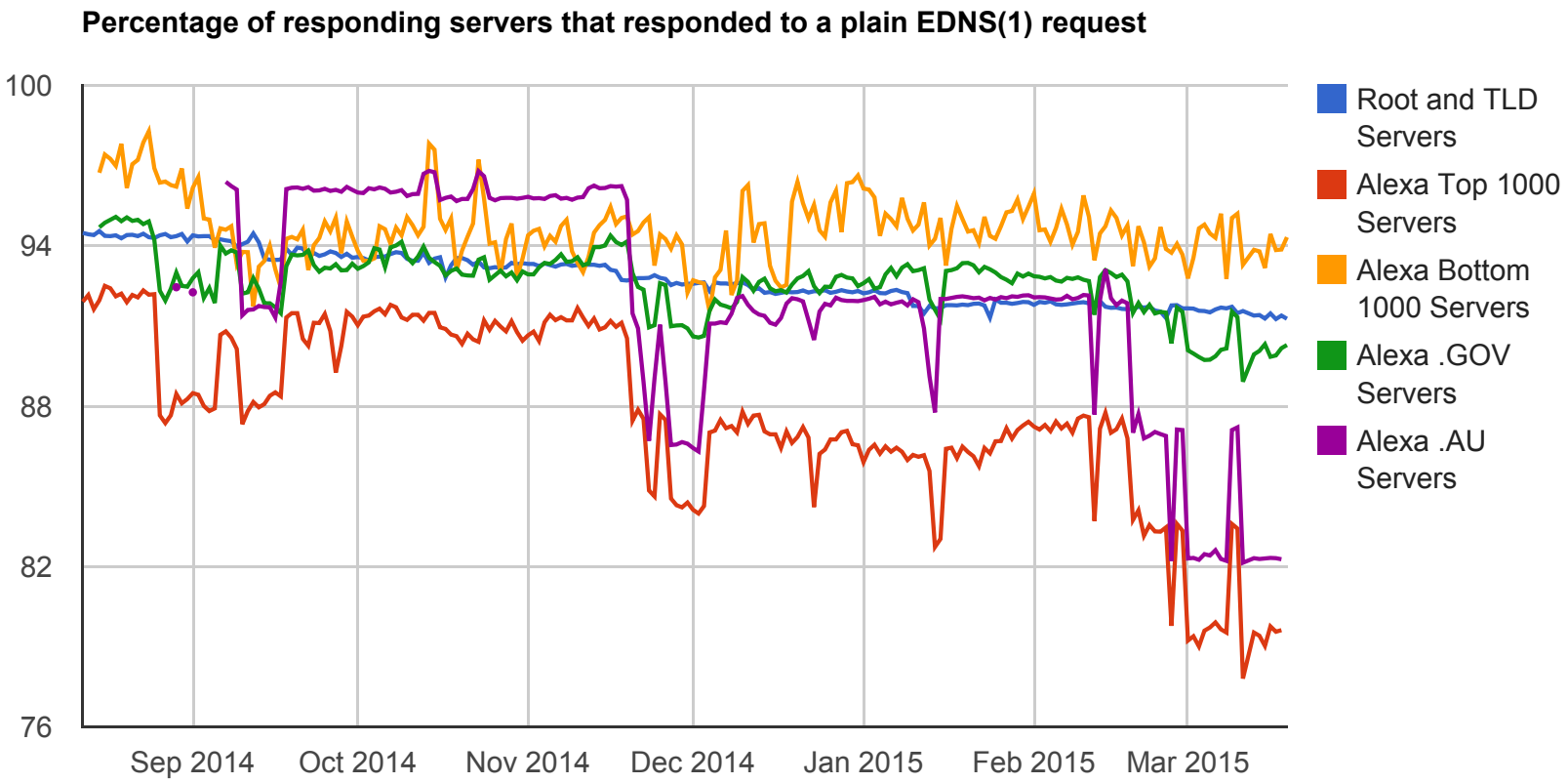
expect: OPT=100 to not be present
expect: EDNS Version 0 in response
See RFC6891


EDNS Response Rate by Function - 18 Mar 2015
100
75
50
25
0
%
TLD
Top
Bottom
GOV
AU
Data Subset
EDNS 0
Truncated Response
DNSSEC
Unknown Option
Unknown Flag
EDNS 1

EDNS Compliance Report: 2015-03-19T05:19:26Z

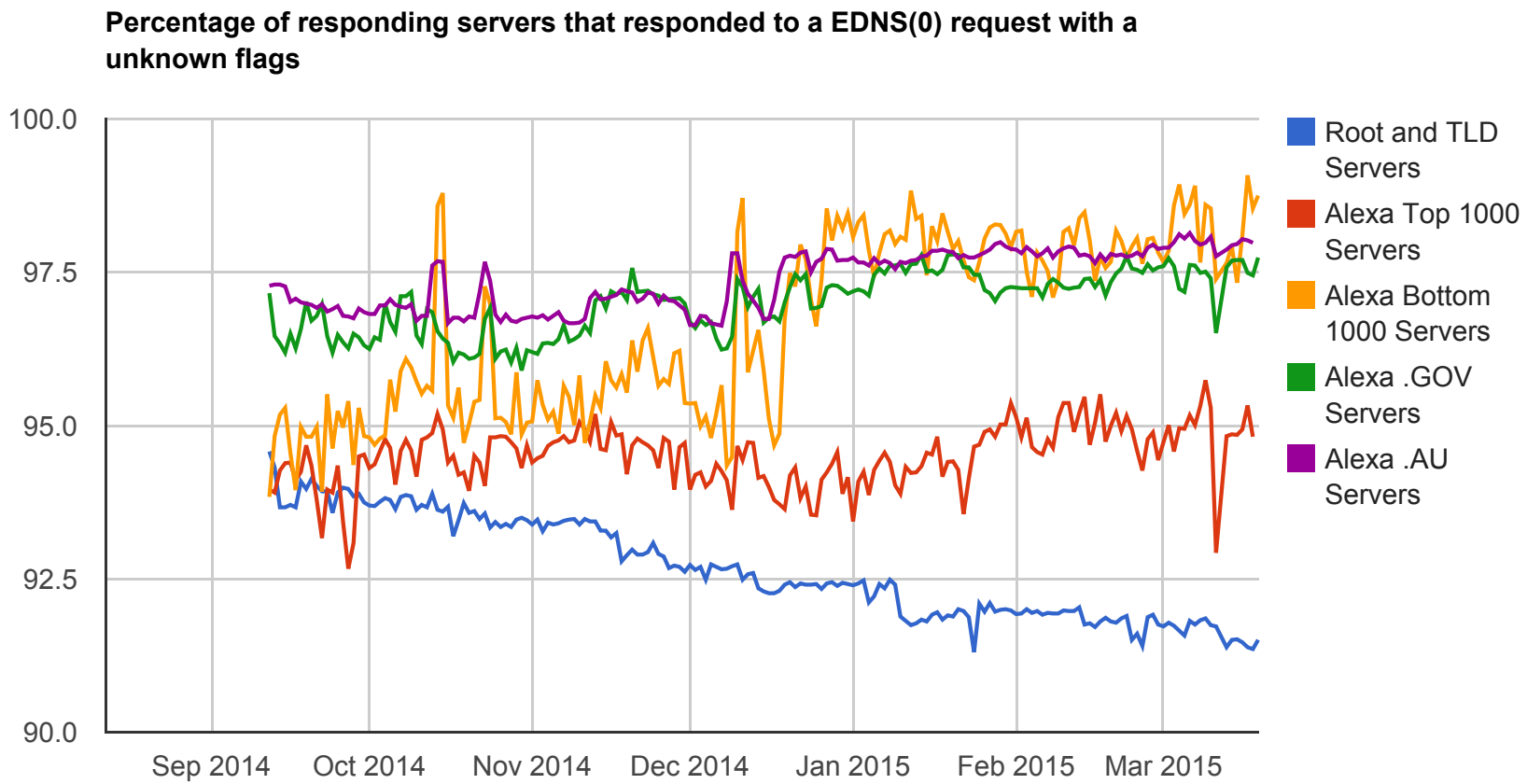


EDNS Compliance Report: 2015-03-19T05:19:26Z



2014-10-12 - 2014-10-15: Domaincontrol removed the firewall blocking EDNS version 1 and EDNS flags.

EDNS Compliance Report: 2015-03-19T05:19:26Z



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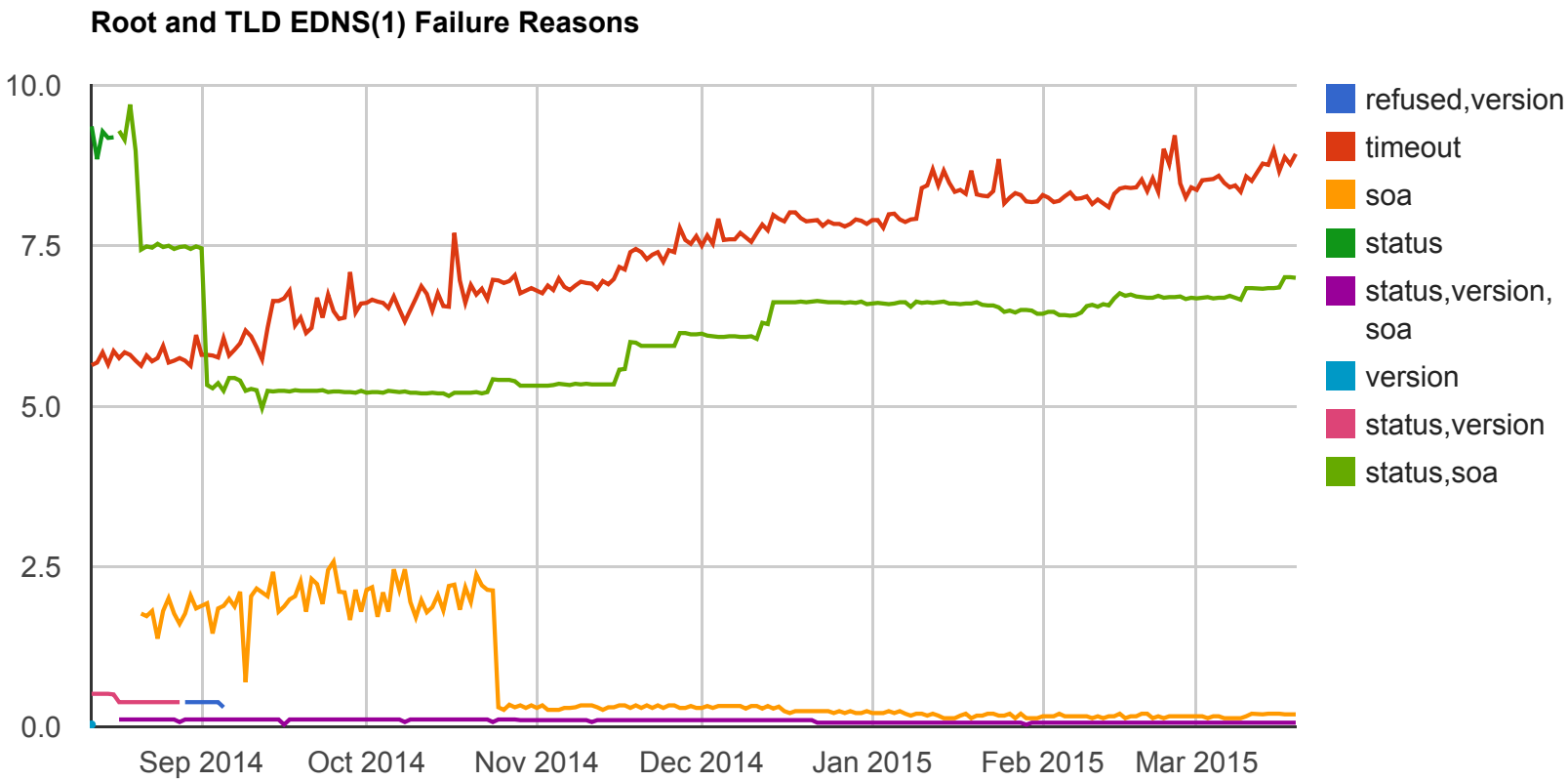
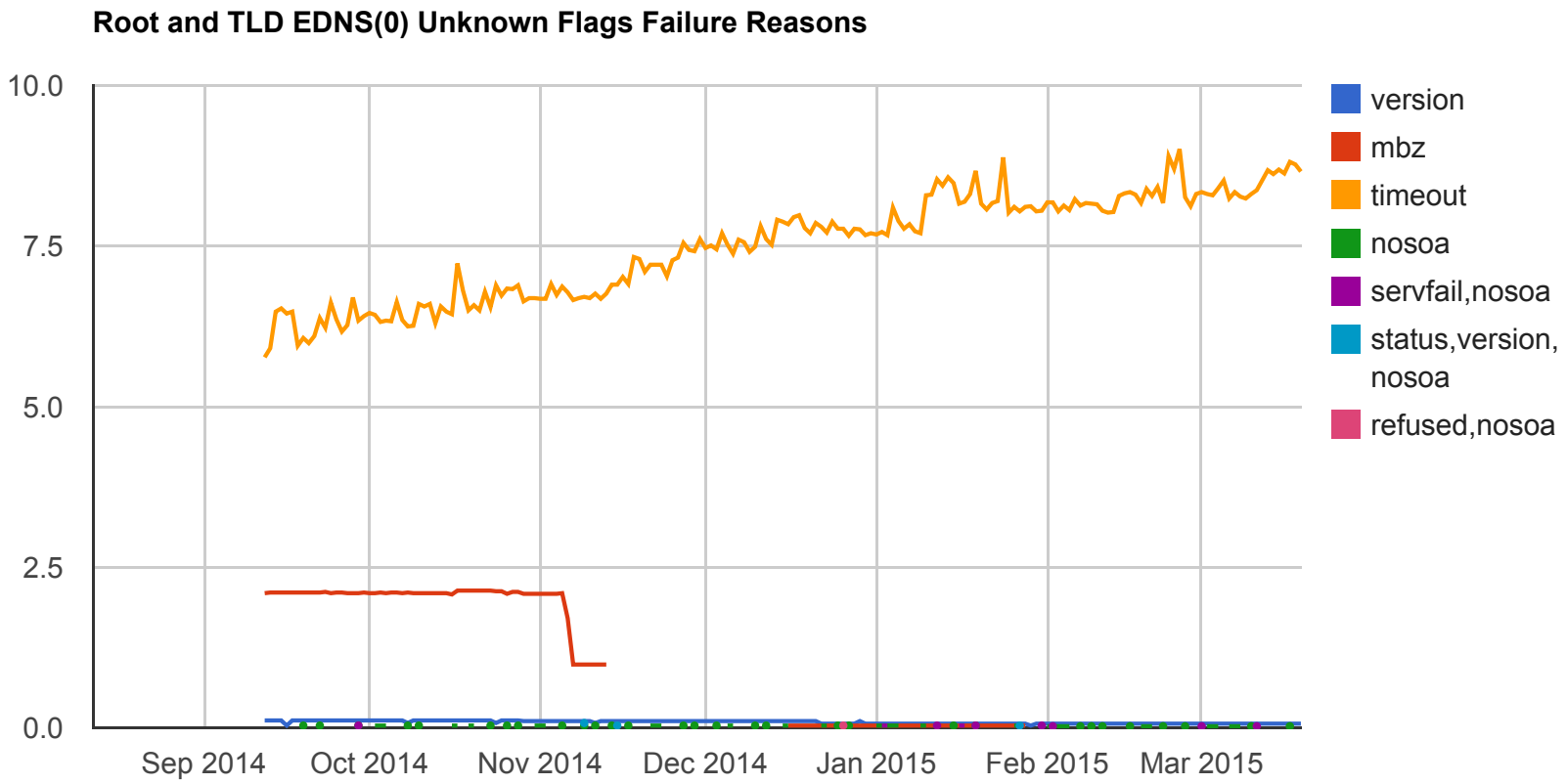
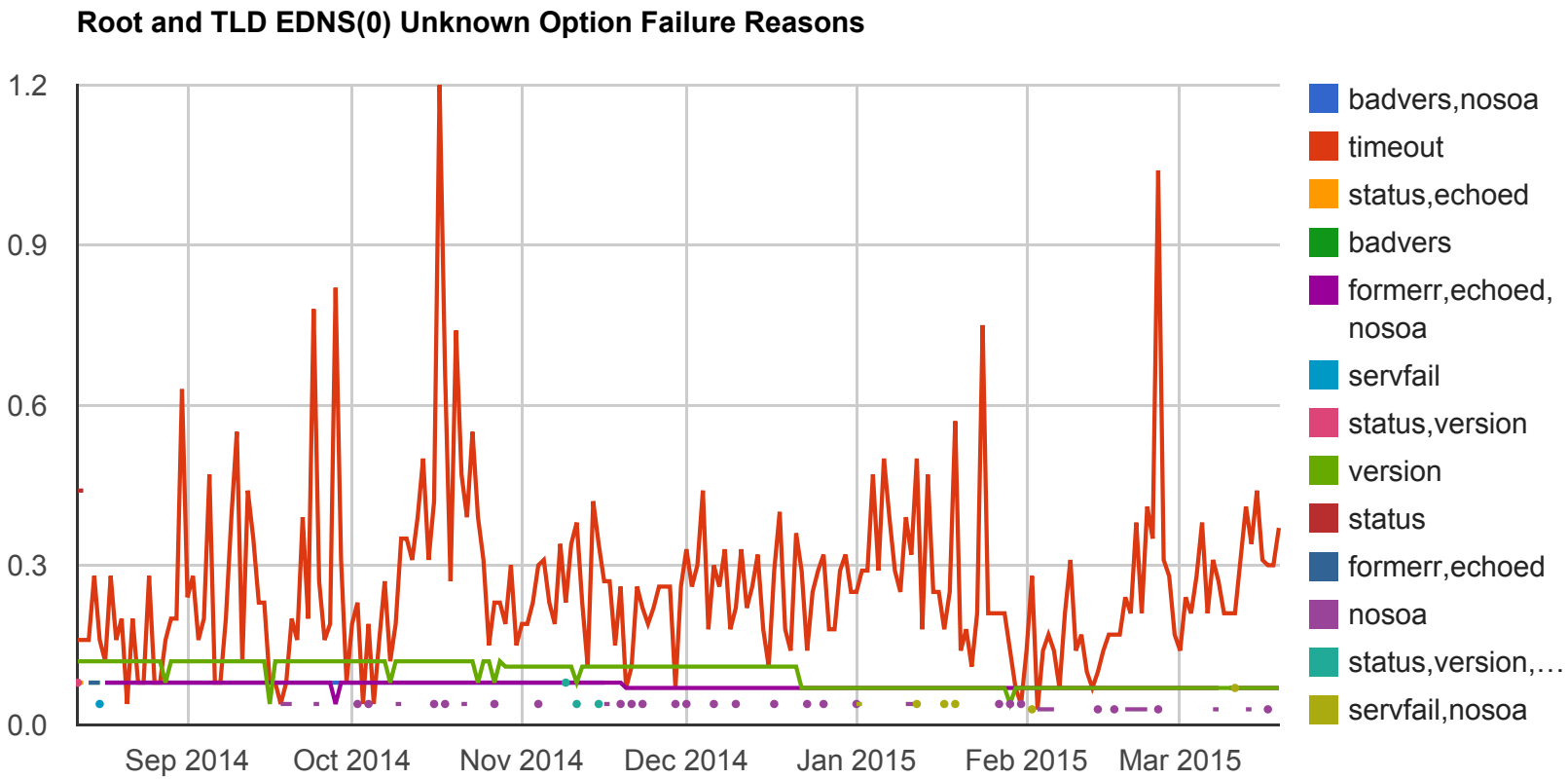


EDNS Compliance Report: 2015-03-19T05:19:26Z

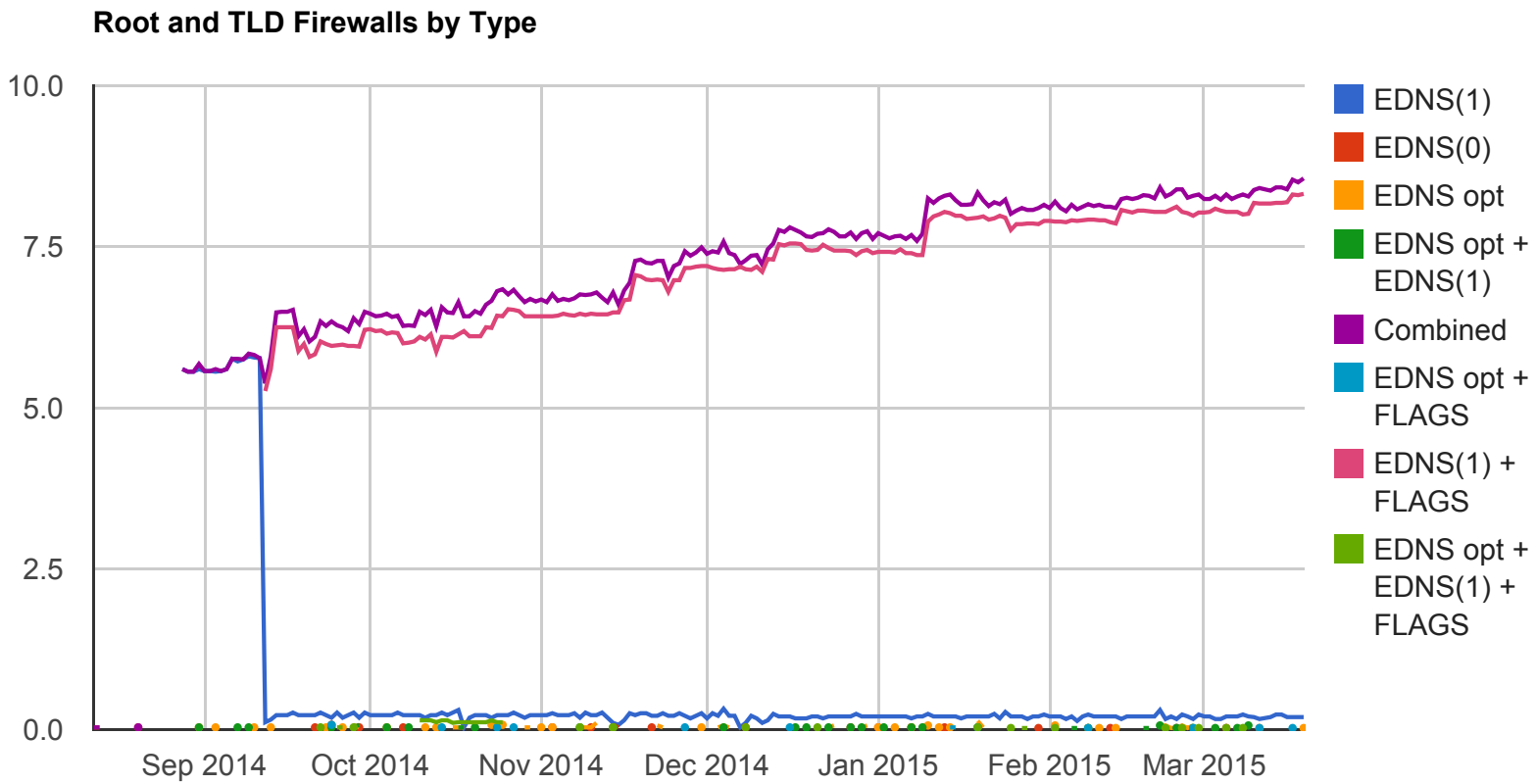


2014-09-14: operators returning unknown flags informed.

EDNS Compliance Report: 2015-03-19T05:19:26Z



EDNS Compliance Report: 2015-03-19T05:19:26Z



EDNS(0) all EDNS queries have timeout and there was a response to the plain DNS query
EDNS(1) only the two EDNS version 1 queries timeout
EDNS(1) + FLAGS the two EDNS version 1 queries timeout as well as the unknown EDNS flags query

Where Next

- Extend draft-andrews-no-response-issue

  (Working group adoption?)
- Contact Firewall Vendors
- Contact Nameserver Vendors
- Contact Zone Owners / DNS hosters
- Convince TLD/SLD operators to run regular checks
- Add to online DNS checkers.

TLDs already involved

SWITCH – CH and LI

.IE

More Information

- http://users.isc.org/~marka/ts.html
- http://users.isc.org/~marka/tld-report.html
- http://users.isc.org/~marka/gov-report.html
- http://users.isc.org/~marka/au-report.html
- http://users.isc.org/~marka/alexa-report.html
- http://users.isc.org/~marka/bottom-report.html
- https://source.isc.org