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When Can We Start Dropping IPv4 on the DNS Root Servers?

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Discussion presentation

Problem statement

- IPng has been mentioned in RFC's since 1993 (RFC 1550)
- Most RIR's are not providing IPv4 space freely anymore
- Adoption of IPv6 is lacking .. Even almost 8 years after the World IPv6 day in 2011.

How can we get v6 as the standard ?

- Despite all efforts, most ISP’s and corporations are implementing v4 as the default numbering …
- Management has little to no incentive to move to v6 ...

This is not a v4 vs v6 bashing presentation

- We all know about the v4 status .. And we all love v6 …
- No discussion/questions about one vs the other ..
- Or about lacking deployments or possible lacking vendor support ..
- It can’t be done or I’m scared isn’t a viable argument … (anymore)

The goal of this talk …

- The goal is to think/talk about a possible date … in the future ..
- Beyond a budget / investment period .. (in case of new equipment)
- Let’s start the discussion with some statements …

DNS Rootserver Operators

- All Operators support v4 AND v6 for root-server operations. (Finaly)
- But not all nodes of those operators, support dual-stack (yet?) ..
- Those nodes should be fixed or removed …

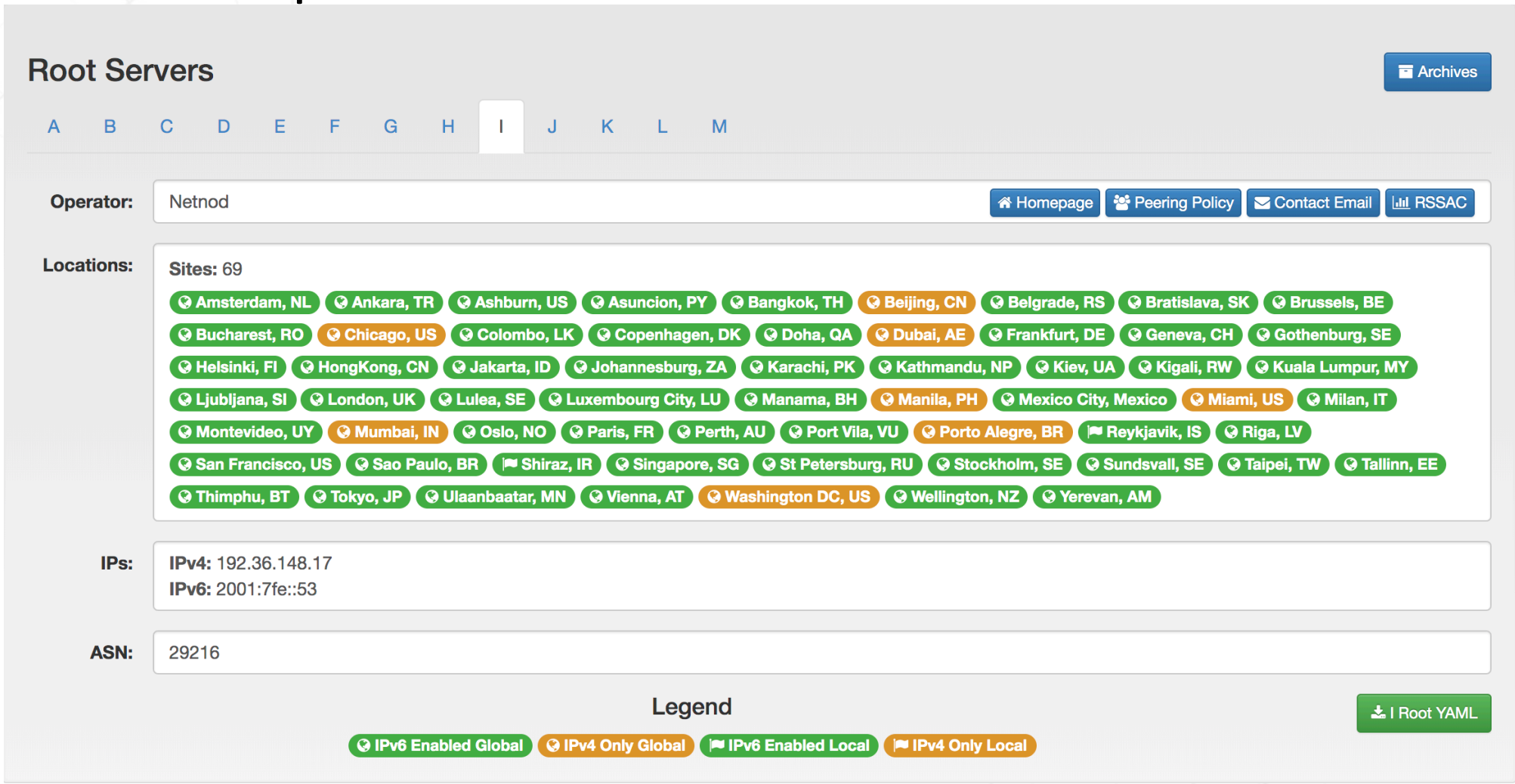
Root-servers by name & IP address

List of Root Servers

HOSTNAME	IP ADDRESSES	MANAGER
a.root-servers.net	198.41.0.4, 2001:503:ba3e::2:30	VeriSign, Inc.
b.root-servers.net	199.9.14.201, 2001:500:200::b	University of Southern California (ISI)
c.root-servers.net	192.33.4.12, 2001:500:2::c	Cogent Communications
d.root-servers.net	199.7.91.13, 2001:500:2d::d	University of Maryland
e.root-servers.net	192.203.230.10, 2001:500:a8::e	NASA (Ames Research Center)
f.root-servers.net	192.5.5.241, 2001:500:2f::f	Internet Systems Consortium, Inc.
g.root-servers.net	192.112.36.4, 2001:500:12::d0d	US Department of Defense (NIC)
h.root-servers.net	198.97.190.53, 2001:500:1::53	US Army (Research Lab)
i.root-servers.net	192.36.148.17, 2001:7fe::53	Netnod
j.root-servers.net	192.58.128.30, 2001:503:c27::2:30	VeriSign, Inc.
k.root-servers.net	193.0.14.129, 2001:7fd::1	RIPE NCC
l.root-servers.net	199.7.83.42, 2001:500:9f::42	ICANN
m.root-servers.net	202.12.27.33, 2001:dc3::35	WIDE Project

Source: https://www.iana.org/domains/root/servers

Example of a node overview - Nednod



Source: https://root-servers.org

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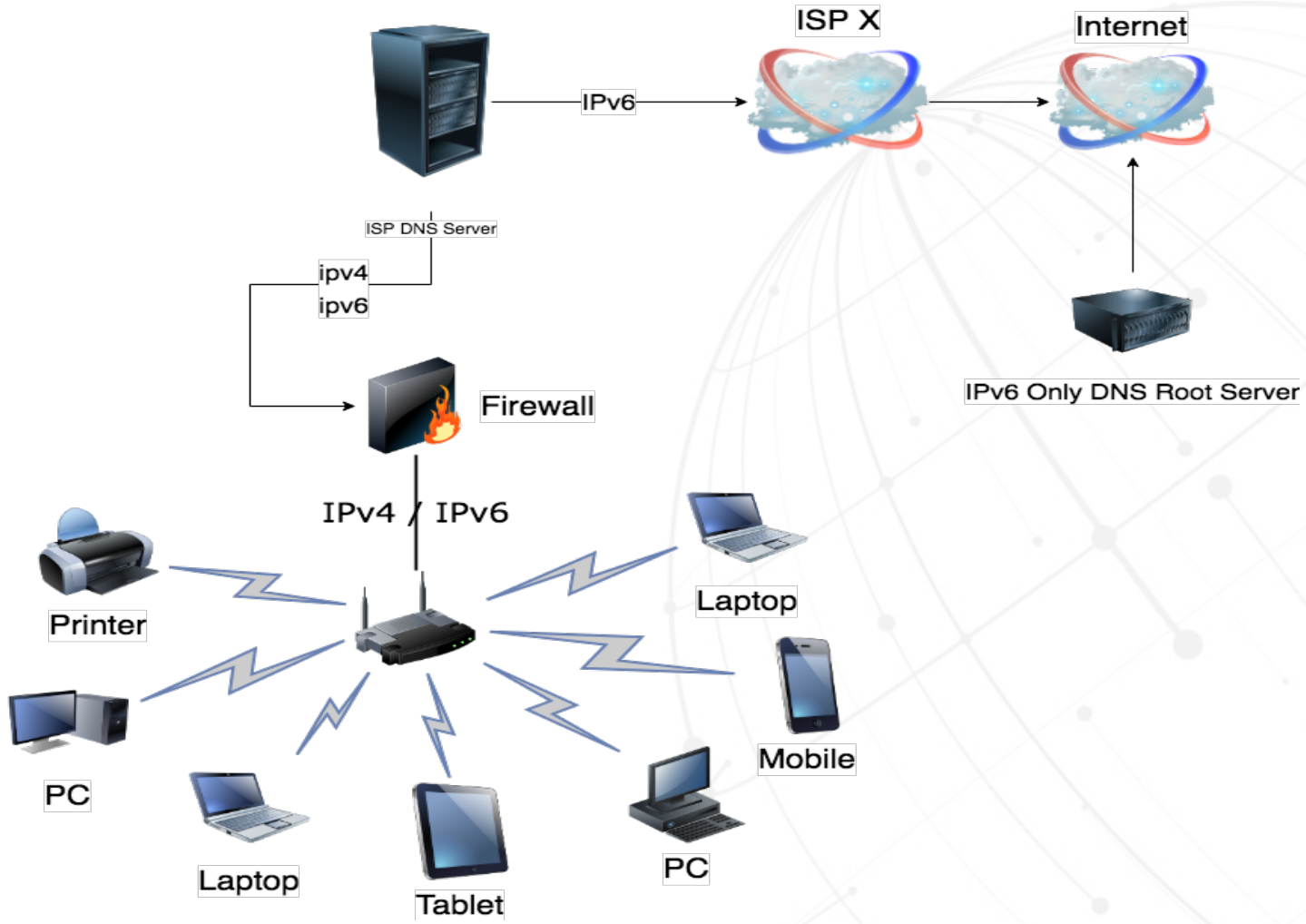
ISP DNS resolvers

- ISP’s can fix their own resolvers for dual-stack within a couple hrs.
- It will allow all their internal customers to connect both with v4 and v6.
- Even if the root-server they query, only resolves on v6
- Required : a v6 prefix in BGP, fix their resolvers to support dual-stack.
- Cost : Free of charge, time to implement is required. Resolver software can be free of charge.

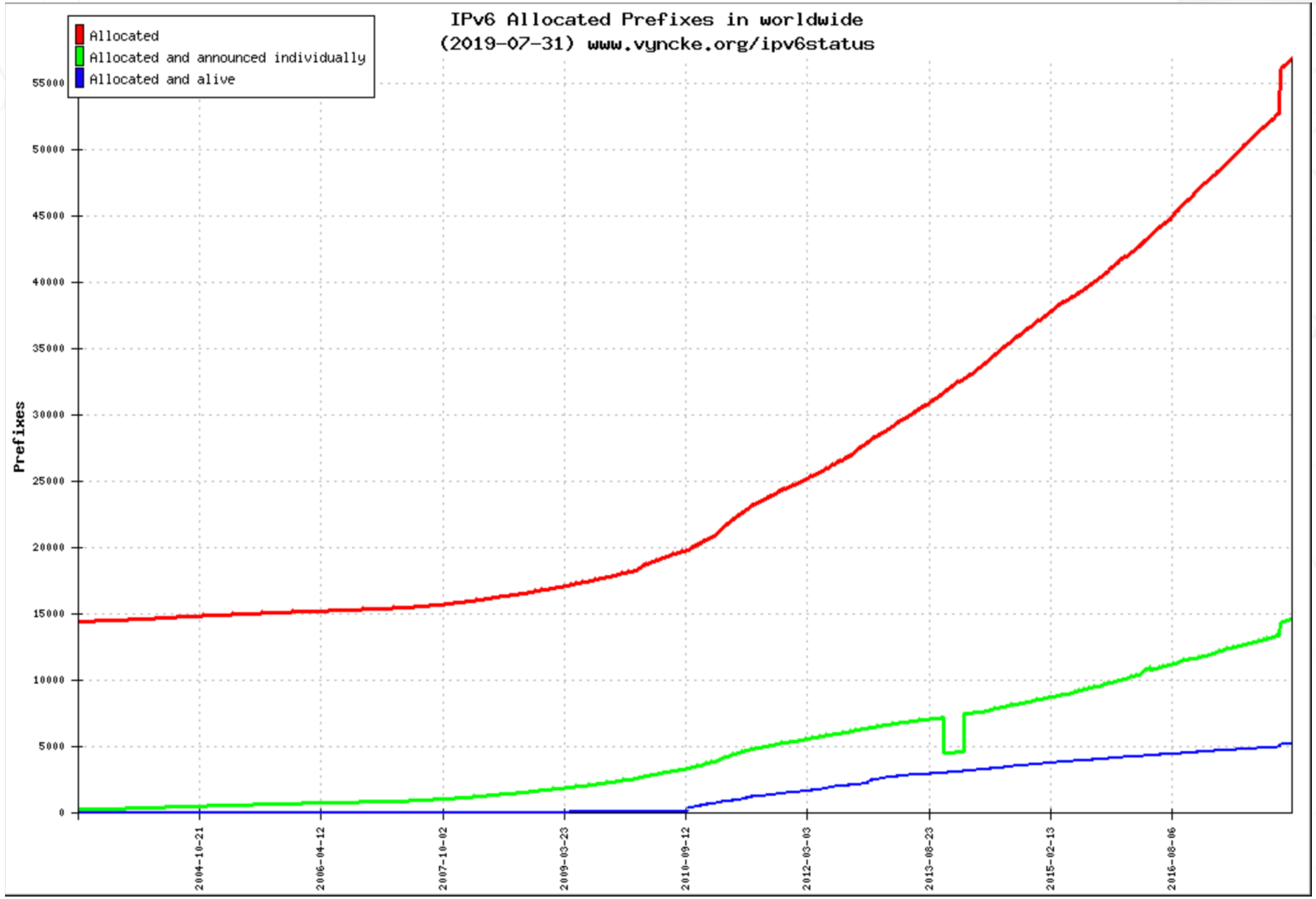
Simplified example



Statement 1

- All DNS Root servers are currently dual-stacked …
  - Most (!!) .tlds are dual-stacked. Some vanity tlds are not ?? (!!)
  - Some nodes are not v6 enabled ... IPv6 only isn't flagged … while IPv4 only is.
- IPv6 is free to obtain for all RIPE NCC members.
  - IPv6 is almost free for non-members of RIPE.
- The goal is to get all ISP's to have IPv6 implemented in BGP in 5 years.

IPv6 allocations and Announced .. and usage



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Statement 2

- As all ISP's have IPv6 and in BGP (even if it would be in a free software router on a second hand server … even without doing any traffic ..)
- The initial step is to get your DNS Servers dual-stacked.
- All current DNS software supports IPv6 and dual-stack configs. Out of the box at no additional charge / cost.

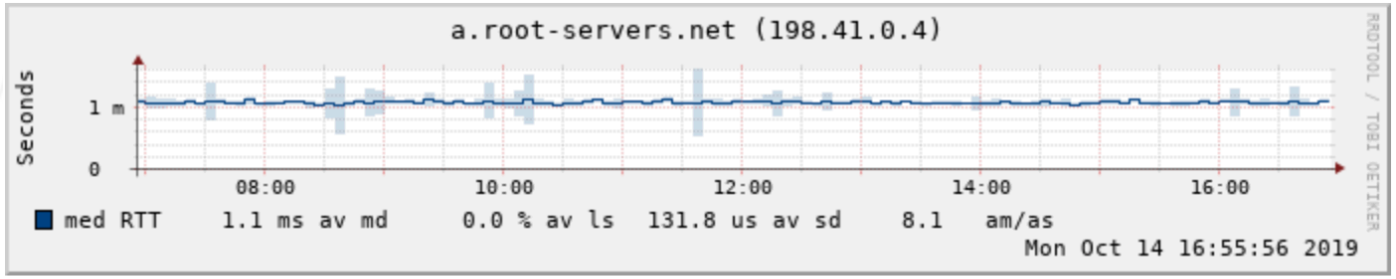
Statement 3

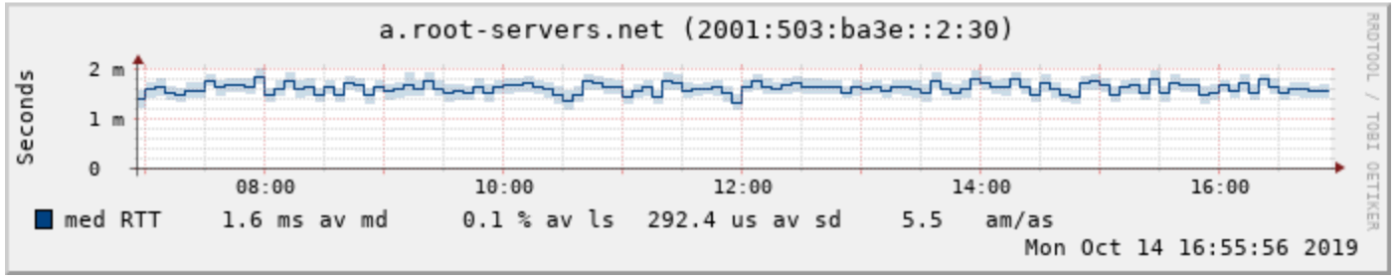
- If a dual-stack DNS resolver can reach the DNS Rootservers over IPv6 ….. And IPv6 is the preferred default for most, if not all OS's …
  - Or is it ??
- Then there is NO technical requirement for DNS Rootservers to keep supporting IPv4 …
- Except for out-dated security tools in military environments and filtering regime's ...
  - Spoiler: They have their own root servers (!!) so who cares ?? …

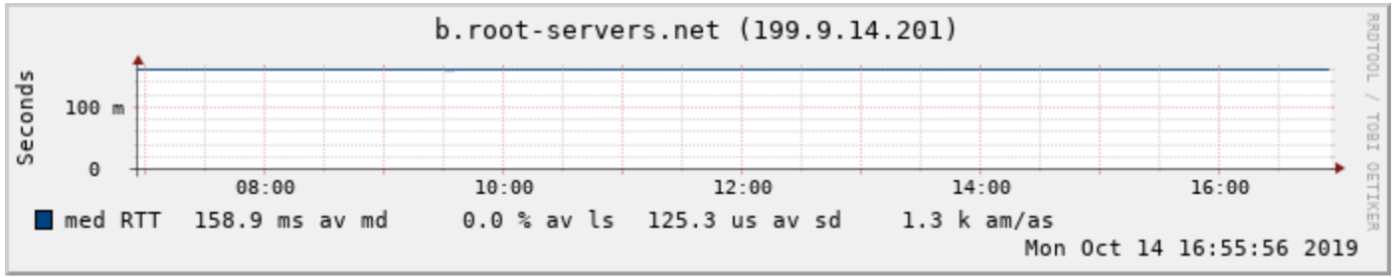
Statement 4

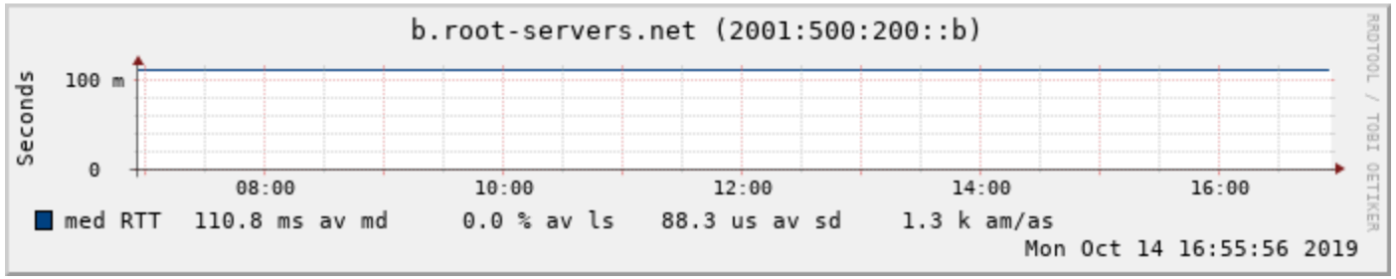
- IPv6 MUST be the only supported protocol on nodes for DNS Rootserver operators within 7 years …
- Reduction off active IPv4 enabled nodes using unicast in after 5 years..
  - This will make it somewhat ‘slower’ for IPv4 only enabled resolvers to use a DNS Root server. And give faster responses to IPv6 enabled nodes.
- Marketing ramp-up ... IPv4 Only networks will go off-line in 2026

Stats from our network









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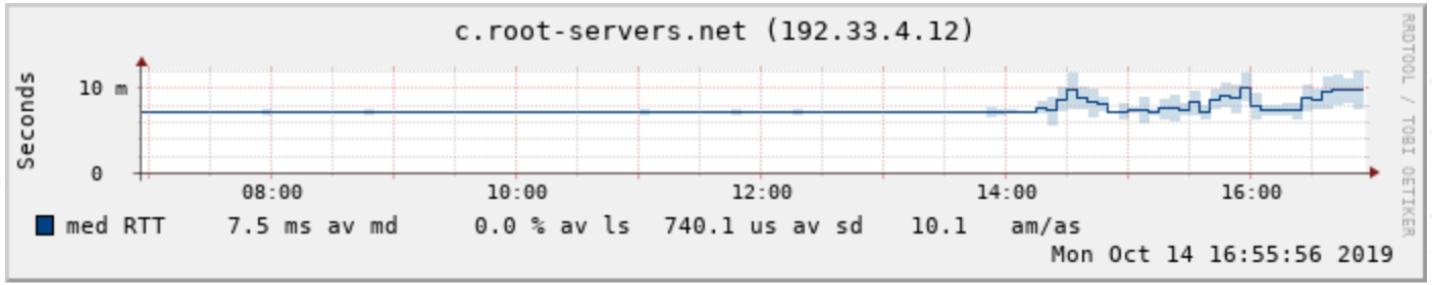

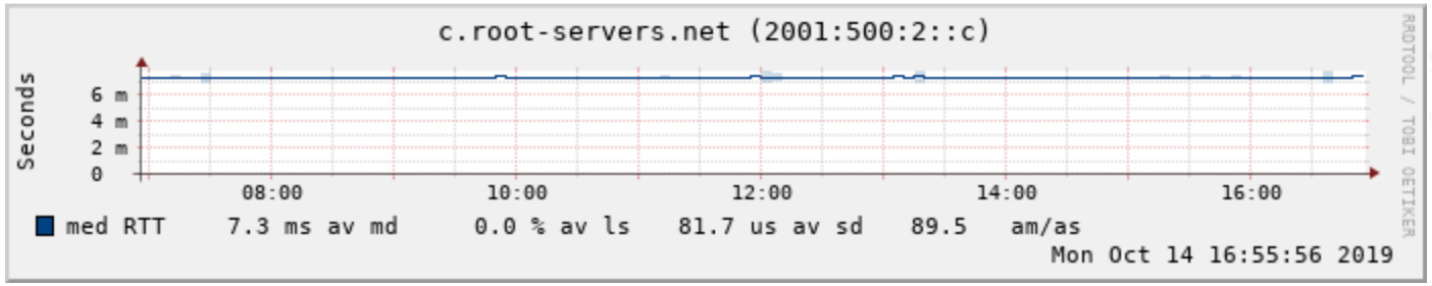

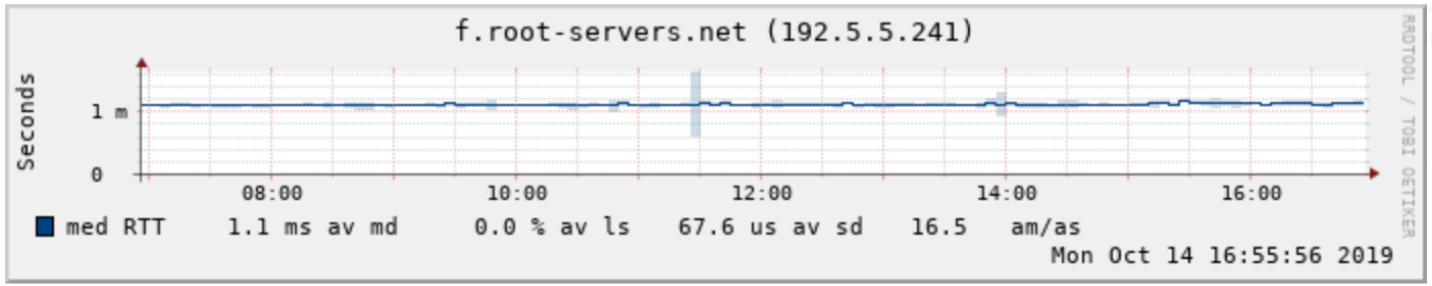

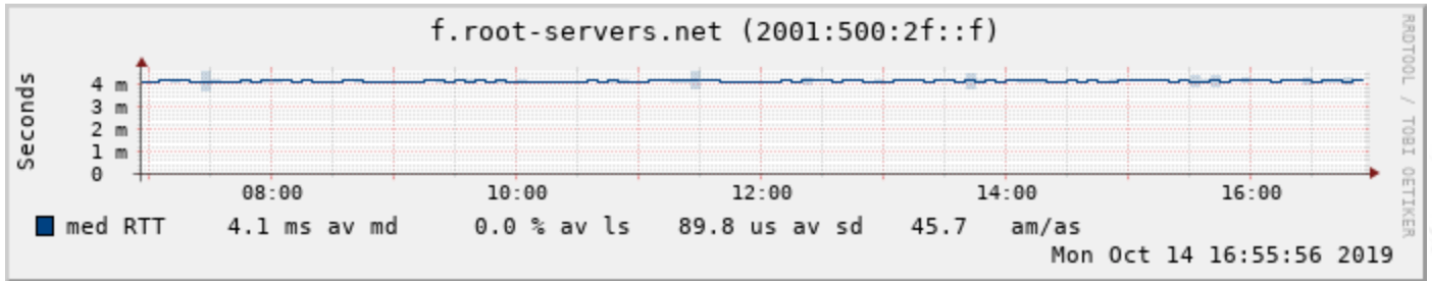

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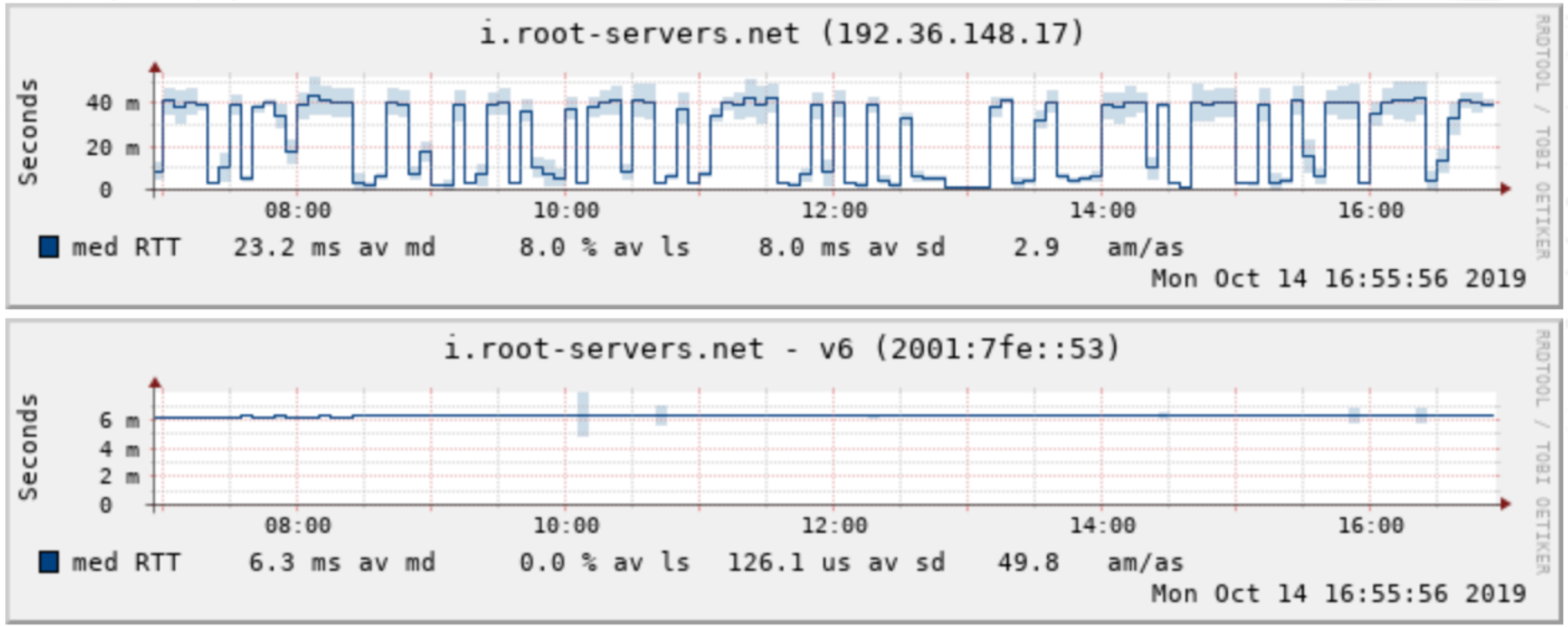

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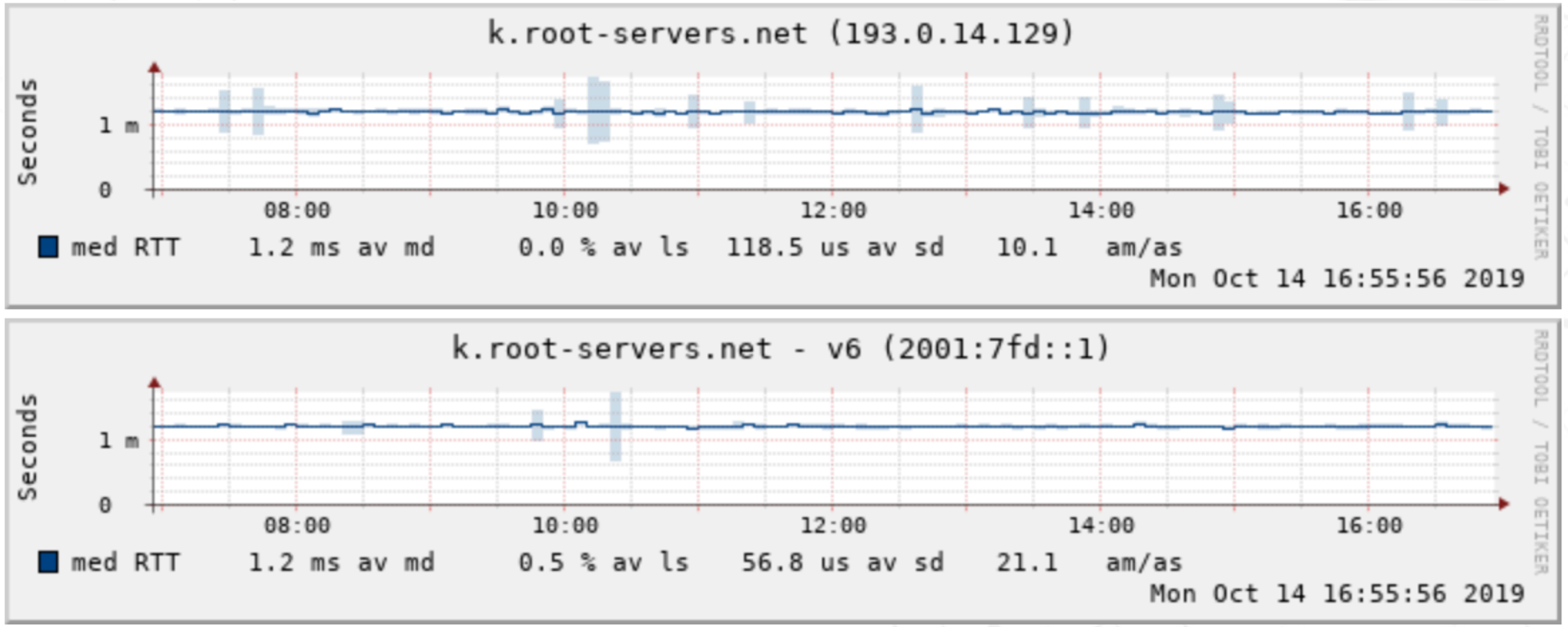

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DNSMon (RIPE)

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Questions or suggestions ?