

IPv4 vs. IPv6 for Authoritative DNS

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Motivation

We (IBM NS1 Connect) have answered DNS queries over IPv4 and IPv6 since early start-up days.

Professional services was asked about the performance of our IPv6 edge.

Measurement Summary

1. Make IPv4-only zone with only A records for NS.
 - Do a query from 1000 random probes.
 - Repeat query from the same probes.
2. Make IPv6-only zone with only AAAA records for NS.
 - Do a query from the same probes as above.
 - Repeat query from the same probes.

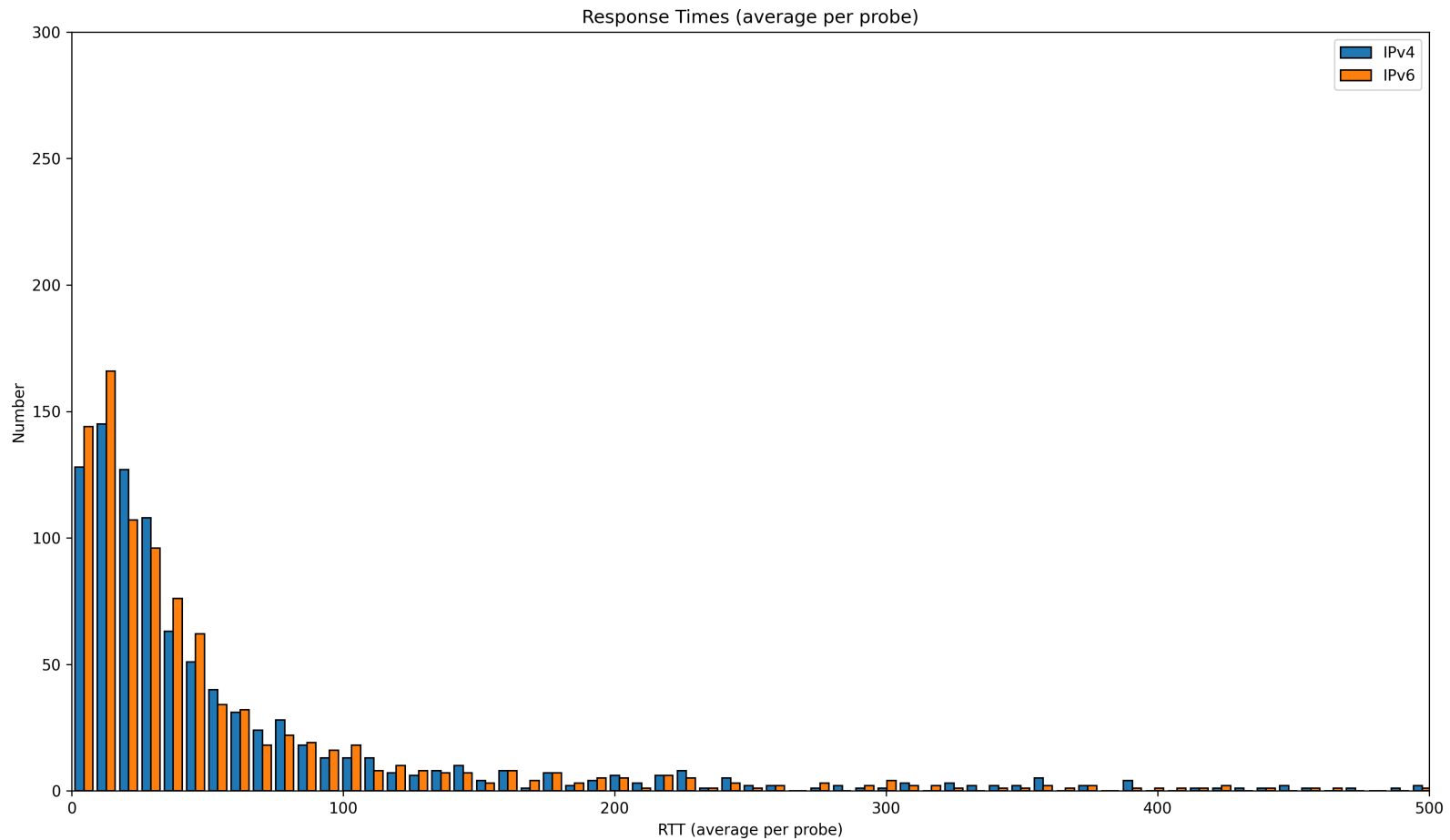
▼ Delegation ⚠ 1 ✓ 6

📅 ⚠ Minimum number of name servers 📄 Delegation01

WARNING Child lists no nameserver that resolves to an IPv4 address. If any were present, the minimum allowed would be 2.

WARNING Delegation lists no nameserver that resolves to an IPv4 address. If any were present, the minimum allowed would be 2.

Results



Analysis & Observation

IPv4 mean: 91.280 milliseconds

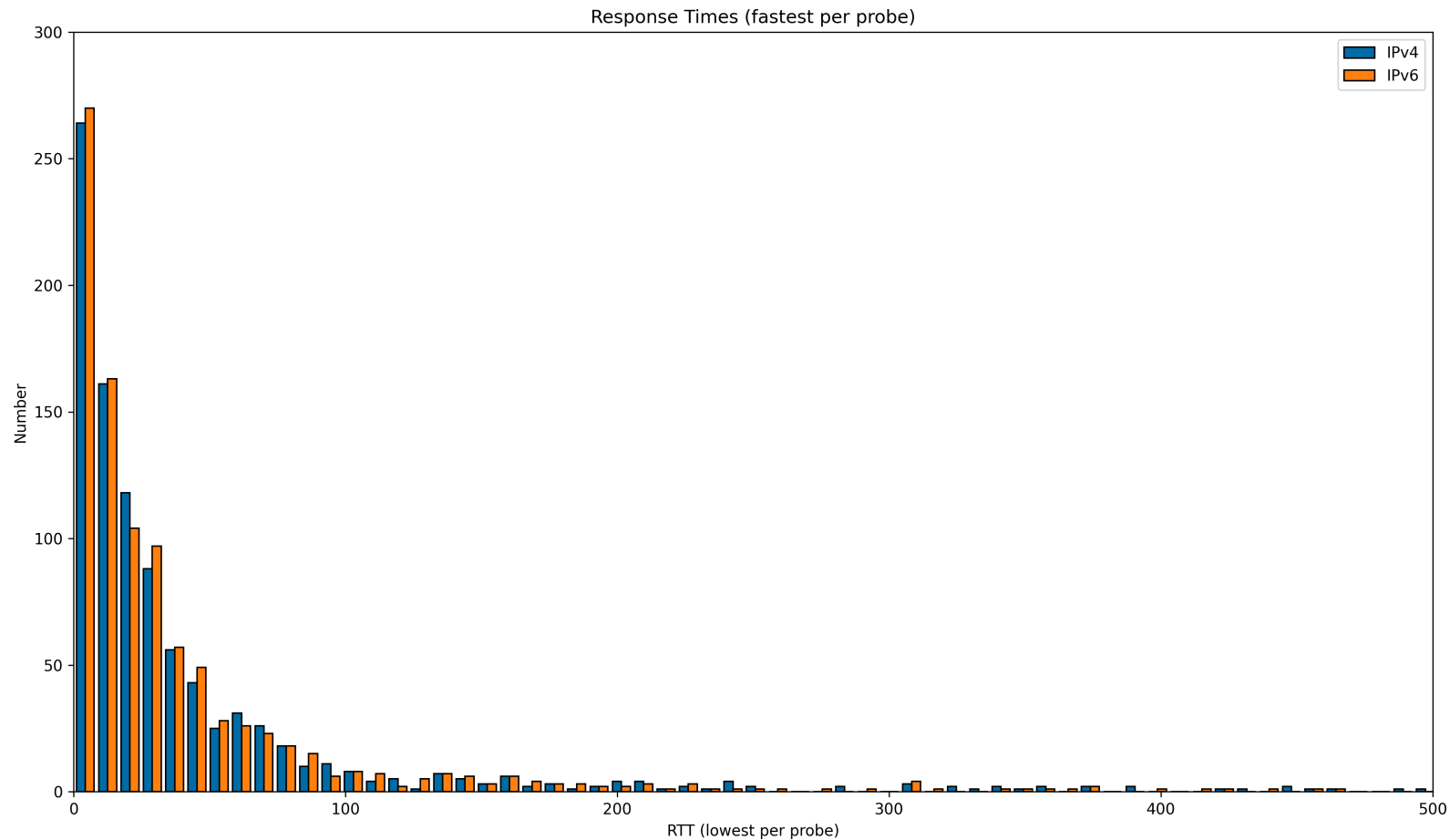
IPv6 mean: 87.724 milliseconds

2.5 millisecond difference, like 3%; within
measurement variation

But... many networks provide multiple DNS resolvers.
RIPE Atlas checks all of them. No standard way to
choose between them, but *likely* they are arranged so
that clients use the fastest of them.

Let's see what things look like only using the fastest!

Results



Analysis &
Observation
Redux

Fastest per probe is much faster (lots of answers less than 10 milliseconds).

IPv6 not as much better from this view.

“Fastest per probe” might or might not represent what actual users get.

IPv6-Only Availability

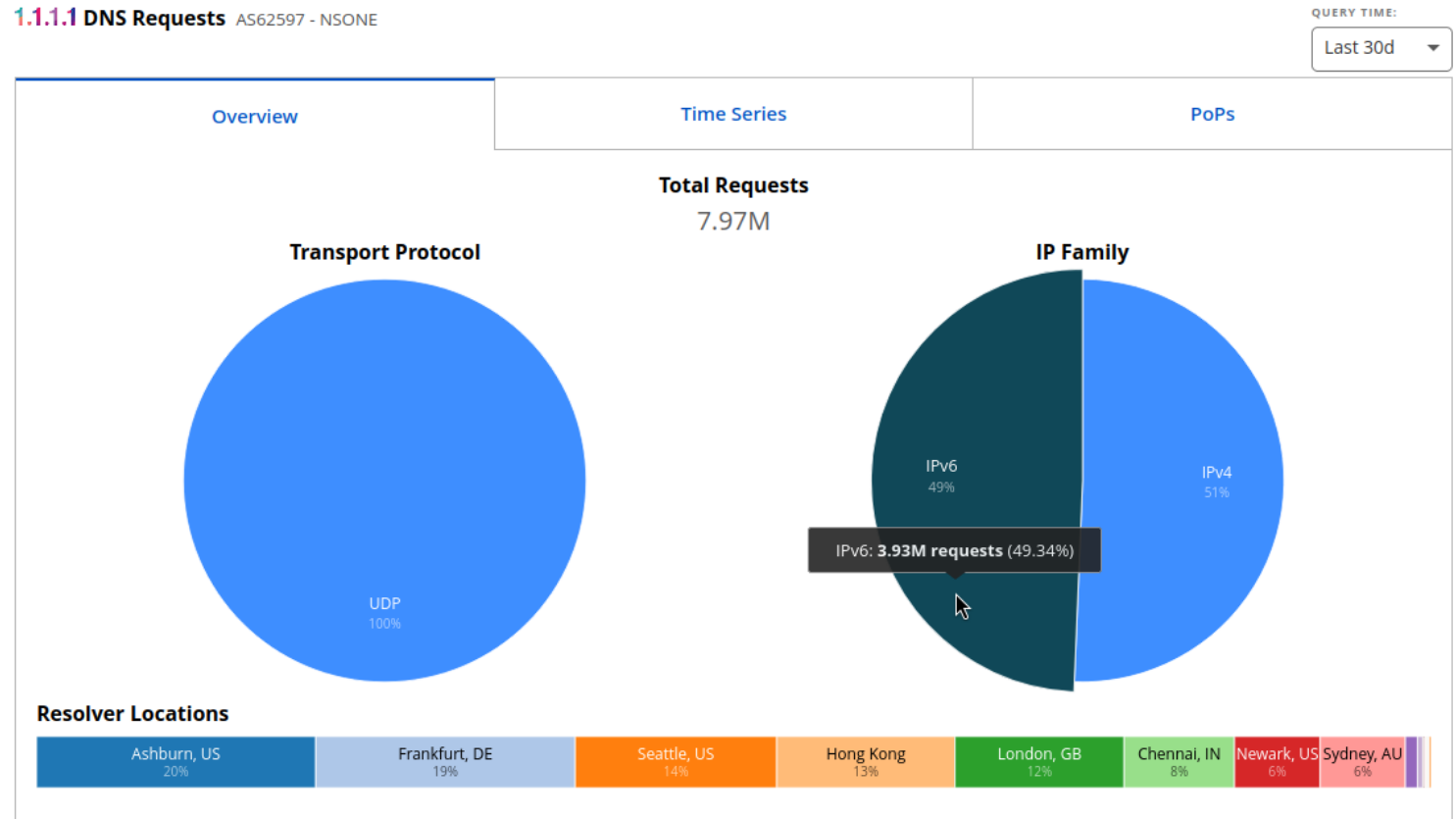
Most shocking result is that it seems as if IPv6-only service is very close to as reliable as IPv4-only.

938 of 967 measurements correct for IPv4 (97%)

930 of 970 measurements correct for IPv6 (96%).

Is it time to run IPv6-only authority servers?!?!

The View from 1.1.1.1

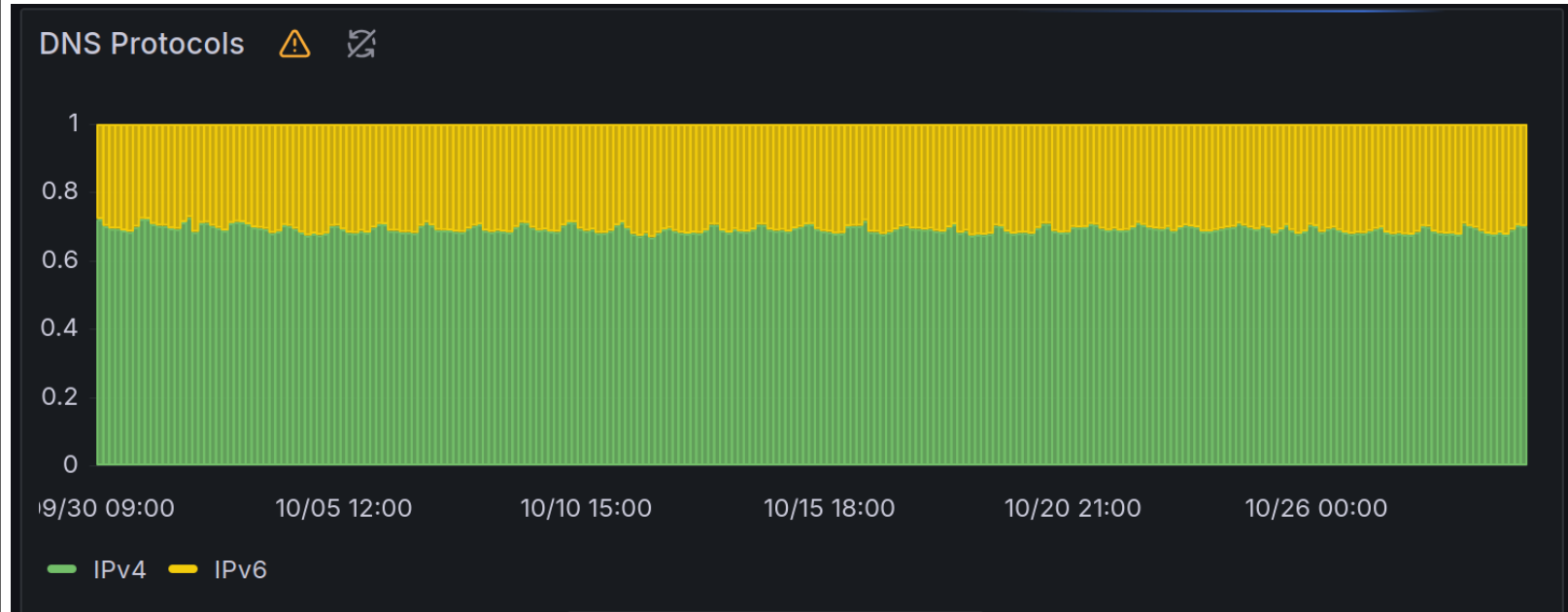


Address Family Equality

We see basically identical query volumes from Cloudflare, based on their reporting.

So... IPv4 and IPv6 are the same?!?! Awesome.

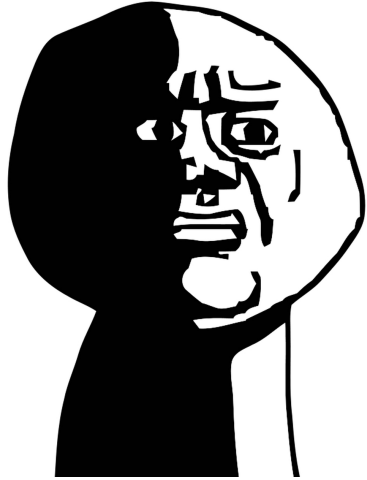
The View from IBM NS1 Connect



Address Family Inequality

From ***ALL*** queries, measured from the IBM NS1 Connect edge, we see roughly twice as many IPv4 queries as IPv6 queries.

Hypotheses



Cloudflare and IBM NS1 Connect both have good IPv6 edges. Parity makes sense.

RIPE Atlas probes sit in locations where people care about the network, so have decent resolvers.

IBM NS1 Connect has a lot of enterprise customers, and their customers probably use a lot of creaking old enterprise setups which barely have working IPv4 DNS, much less IPv6 DNS.

IPv6-Only
Authoritative
DNS
Next Steps

Try fewer A
records in NS
RRset for some
zones?

Offer IPv6-only
edge for
customers who
do not need
IPv4? Do such
customers
exist?

Give incentives
like more
records or
queries for
customers on
IPv6 only edge?

Selling the Future

As of today, there is no business reason to consider IPv6-only authoritative DNS servers. Buying few IPv4 prefixes is not a huge expense.

Providing an option for IPv6-only could provide more data for when IPv6-only authoritative may be a more serious option.

Also note that IPv6 *could* be of real value, for example in isolating customers in shared environments by providing unique addresses for names in the NS RRset.

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