When “others” measure the DNS

Who is doing it? How are they doing?

Why does it matter to operators?

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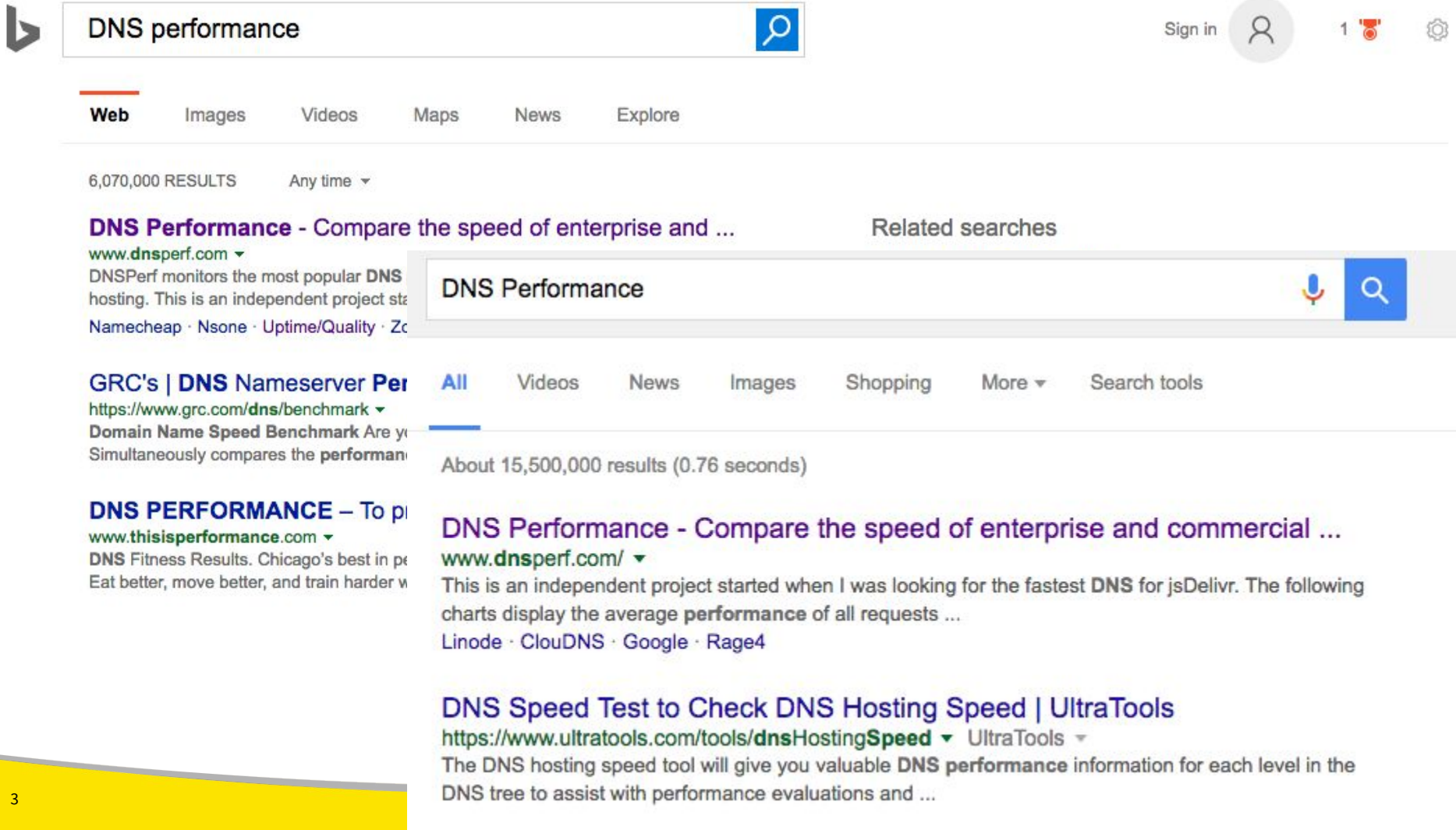
DNS OARC 2016 Dallas

Introduction

- Everyone in this room operates infrastructure related to or performs research on the DNS
- A majority of operators measure / monitor their DNS infrastructure
  - Response time, query load and profile
  - Packet Loss by provider
  - Host health
- When individuals, organizations, or enterprises are making decisions about hosting their own DNS infrastructure or purchasing it from a third party what do they do?
  - Talk to their finance department about OpEx vs. CapEx?
  - Ask on a mailing list?
  - Google / Bing / DuckDuckGo search?


DNS performance
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Videos
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Explore
6,070,000 RESULTS
Any time
DNS Performance - Compare the speed of enterprise and ...
www.dnsperf.com
DNSPerf monitors the most popular DNS
hosting. This is an independent project sta
Namecheap · Nsone · Uptime/Quality · Zo
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DNS Performance
All
Videos
News
Images
Shopping
More
Search tools
About 15,500,000 results (0.76 seconds)
DNS Performance - Compare the speed of enterprise and commercial ...
www.dnsperf.com/
This is an independent project started when I was looking for the fastest DNS for jsDelivr. The following charts display the average performance of all requests ...
Linode · ClouDNS · Google · Rage4
DNS Speed Test to Check DNS Hosting Speed | UltraTools
https://www.ultratools.com/tools/dnsHostingSpeed
UltraTools
The DNS hosting speed tool will give you valuable DNS performance information for each level in the DNS tree to assist with performance evaluations and ...

Ask On A Mailing List

Peter Beckman <beckman@angryox.com>

to Ryan, nanog

I highly recommend DNS Made Easy. Super fast, extremely reliable (100% up time in the last 10-12 years excluding an 8 hour period 4-5 years ago where they got DDOSed, no issues since), very affordable.

#2 fastest for July: http://www.solvedns.com/dns-comparison/2016/07

Has been #1 several months this year.

Beckman

...

Peter Beckman — Internet Guy
beckman@angryox.com — http://www.angryox.com/

Who is measuring?

Aside from the measurement tools we all know and love

- DNSMon / RIPE Atlas
- NLNOG RING

A number of free and enterprise DNS performance metrics companies have been getting attention

Catchpoint

SolveDNS

CloudHarmony / Panopta

DNSPerf

TurboBytes Pulse

Why does it matter to operators?

Customers / Users ask questions

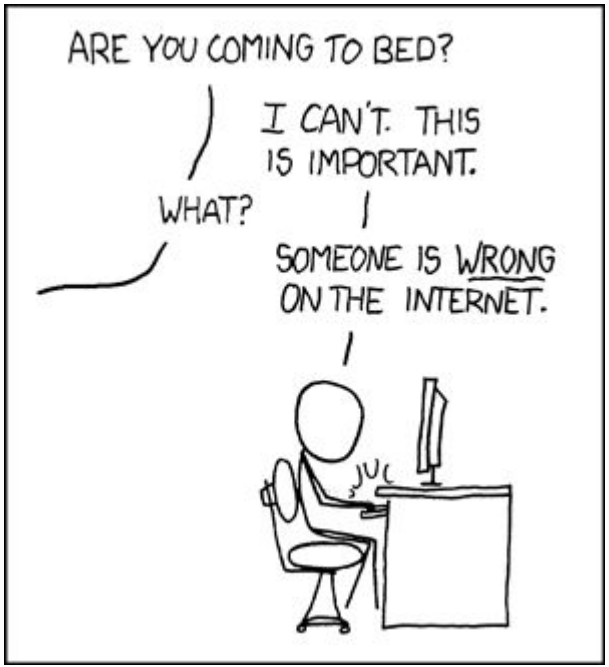
> “Why aren’t you #1?”
>
> “Provider X is beating you … I saw it on randomwebsite.com”
>
> “I am making a DNS decision and I saw this website … “

More measurements offer operators the ability to contrast other approaches and architectures

> This requires us to:
>
> 1. Become aware that other tools and platforms exist
> 2. Read the docs / details and reach out to the platform operators for any missing bits
> 3. Evaluate the approach compare to your current practices

These measurements represent observations of the infrastructure we all work to build and support.

To the single metric based decision maker ...



	Ranking 1	Ranking 2
Provider 1	**1**	**5**
Provider 2	**4**	**2**
Provider 3	**5**	**4**
Provider 4	**7**	**17**
Provider 5	**14**	**10**
Provider 6	**16**	**9**
Provider 7	**20**	**15**

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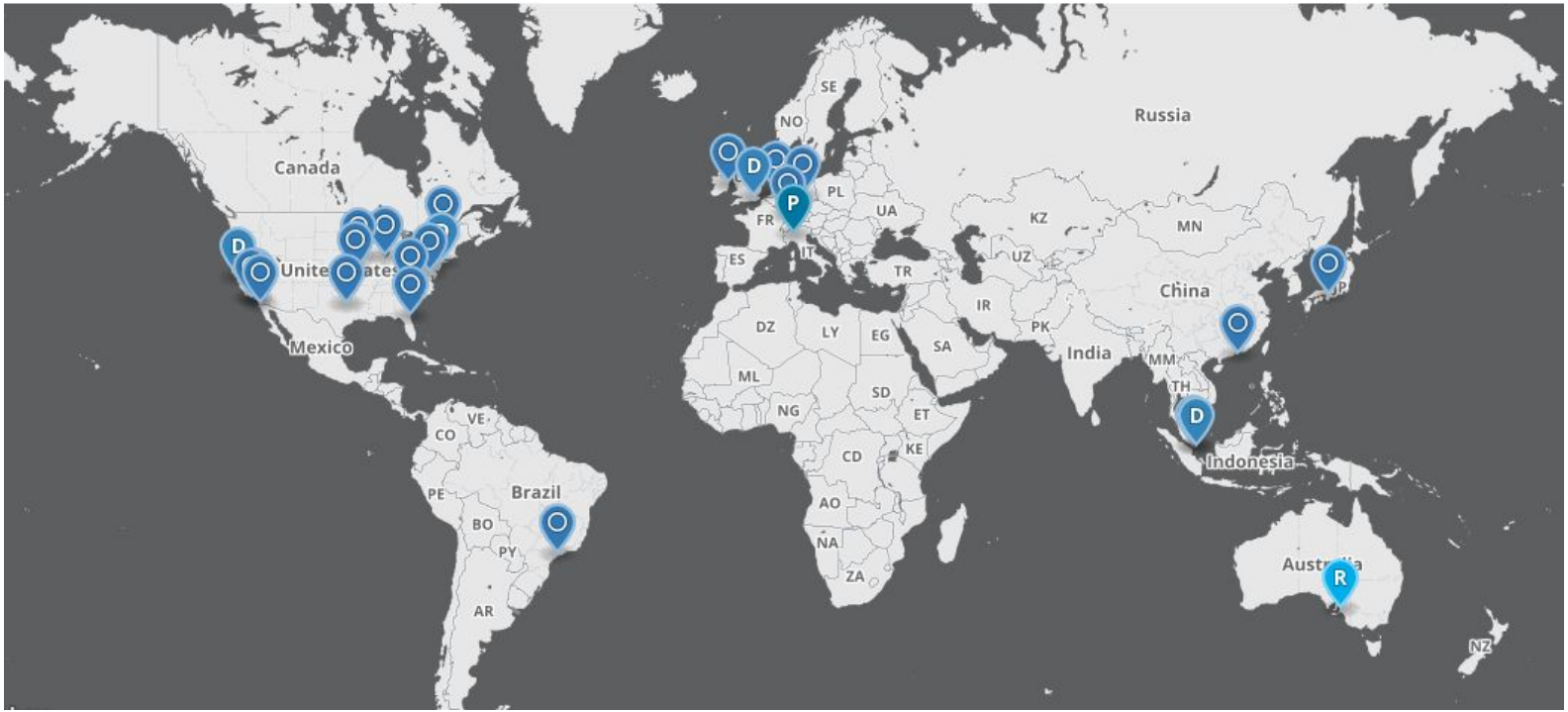
Varying Published Results - “Query Time”

Name	Service #1	Service #2	Diff
DNSMadeEasy	22.27	2.52	19.75
Dyn	24.49	8	16.49
CloudFlare	10.45	8.81	1.64
CDNetworks	34.18	14.05	20.13
Netriplex	59.42	16.64	42.78
VerisignDNS	54.29	18.97	35.32
He.net	43.36	22.57	20.79

Name	Service #1	Service #2	Diff
UltraDNS	54.88	23.41	31.47
DNSimple	53.06	34.1	18.96
Google	44.97	34.86	10.11
Akamai	75.06	37.07	37.99
Rackspace	95.4	72.46	22.94
EasyDNS	99.29	79.12	20.17


The Platforms

Free Service #1



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Free Service #1

a) 25 measurement collection points
   i) 13 US
   ii) 1 South America
   iii) 6 Europe
   iv) 4 Asia (2 Singapore, 1 China, 1 Japan)
   v) 1 Oceania (Australia)

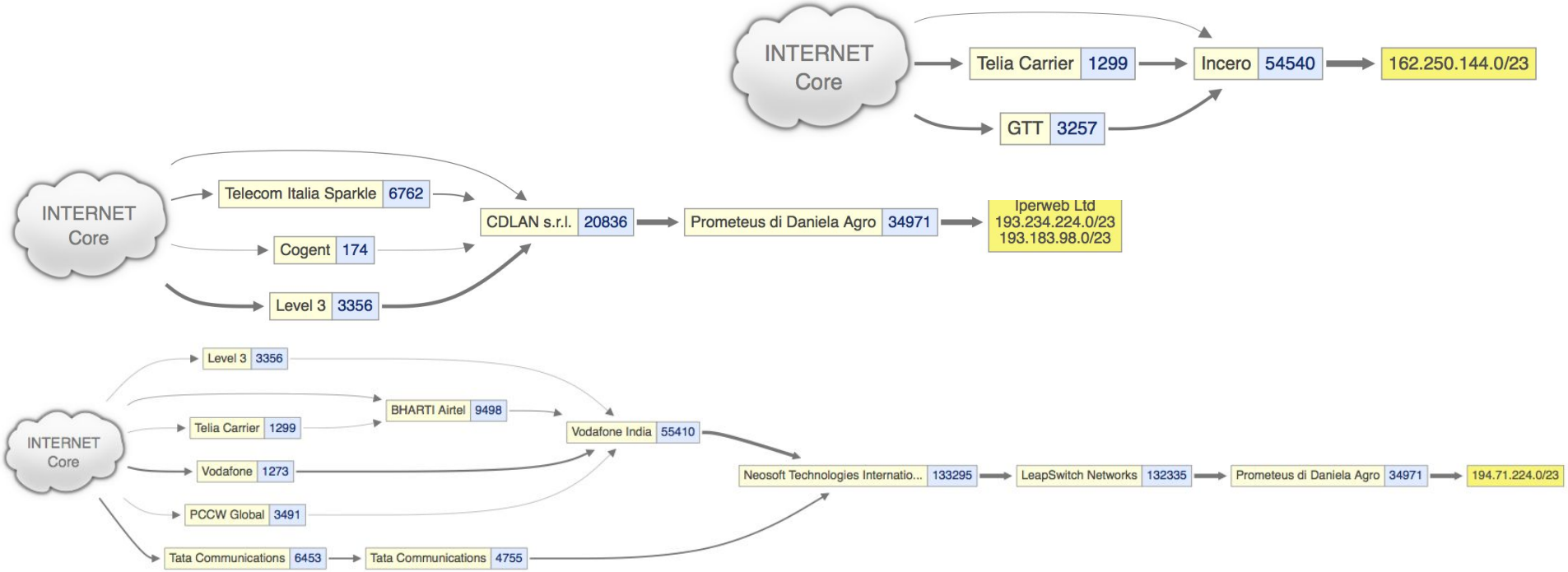
b) Overview of Measurement Method
   i) For Each NS Record: dig -4 +norecurse +time=2 +tries=1 @<Nameserver Domain>
      (1) Average the query response times returned to generate single data point
      (2) Some thought went into defaults as time default is 5 and tries is 3
   ii) Each DNS provider is tested every 15 minutes
   iii) 2 seconds timeout is set
      (1) If a query takes longer then that query gets ignored

Clarifying the Measurement

Infrastructure to Infrastructure

- This is measuring the time it takes for the authoritative resolver to receive a request and return an answer to a cloud provider / VPS / datacenter … etc
  - We see CDNs query authoritative servers directly … but does this performance data provide what the average buyer is looking for?
  - Or is the consumer looking for insight into the time dns resolution *could* take in the event of a recursive cache miss?

Diverse Array of Upstreams and Networks



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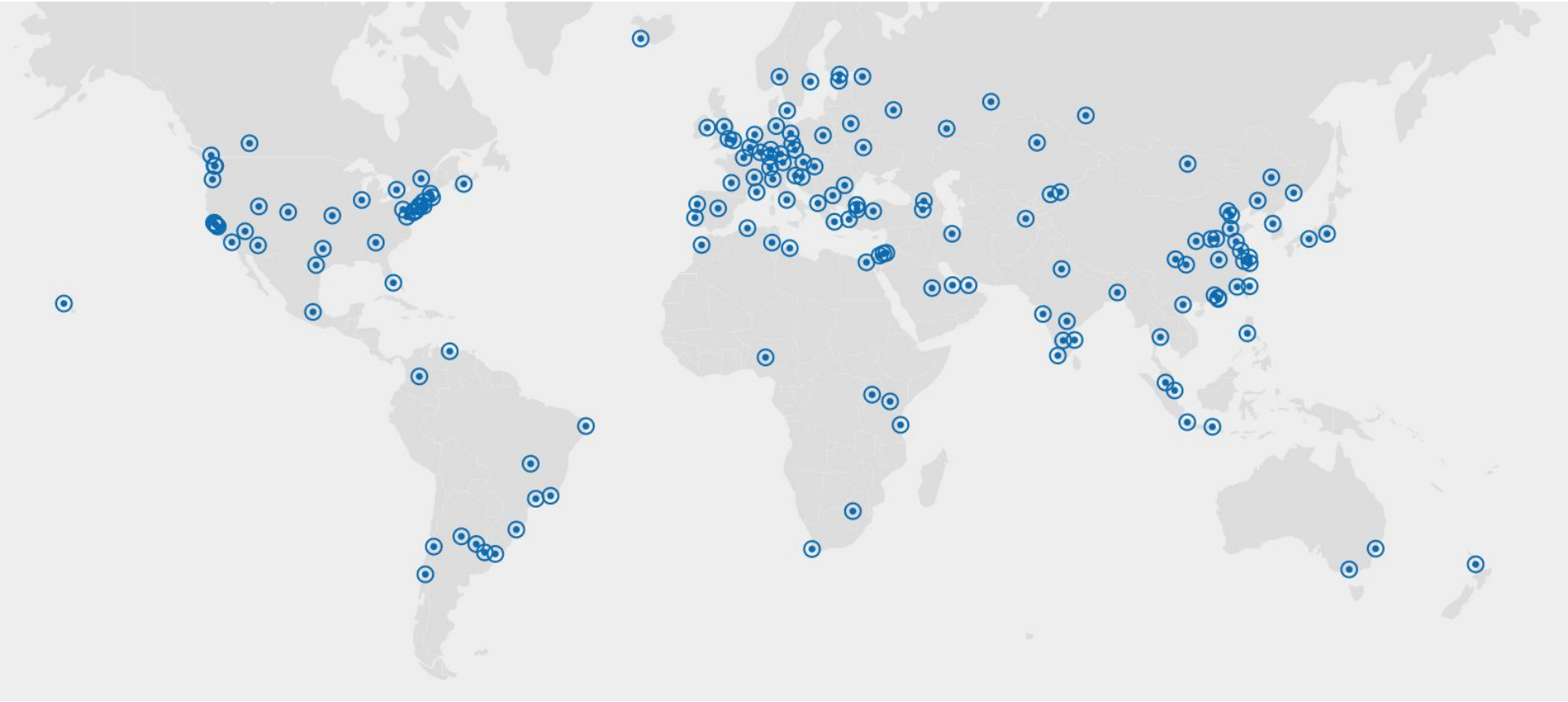
Free Service #2

a) Measurement Locations
   i) Europe (London and Amsterdam)
   ii) Asia (Singapore)
   iii) North America (Los Angeles, Dallas, New York, San Francisco)

b) Measurement
   i) Users visit the site hosting the DNS testing tool.
   ii) DNS timings taken using the PHP Library Net_DNS2
   iii) At the end of the month they generate a report by provider (all name servers):
      (1) the average speed
      (2) the minimum speed
      (3) the maximum speed
      (4) the standard deviation (SD)
      (5) the 95% confidence interval around the mean.

c) The maximum duration is 1 second after which our lookup times out. So if a name server times out, it took 1 second for the dns lookup.



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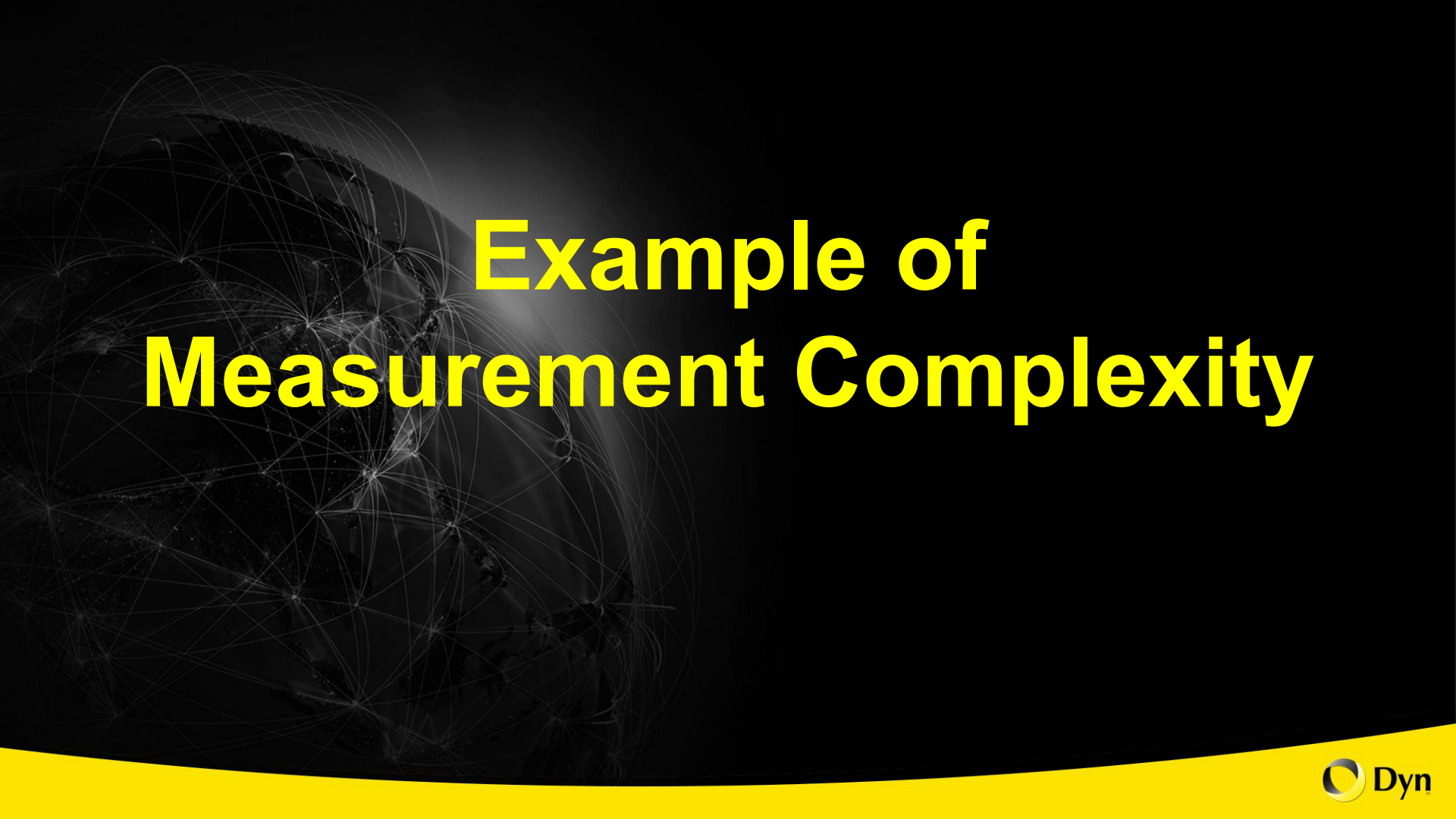
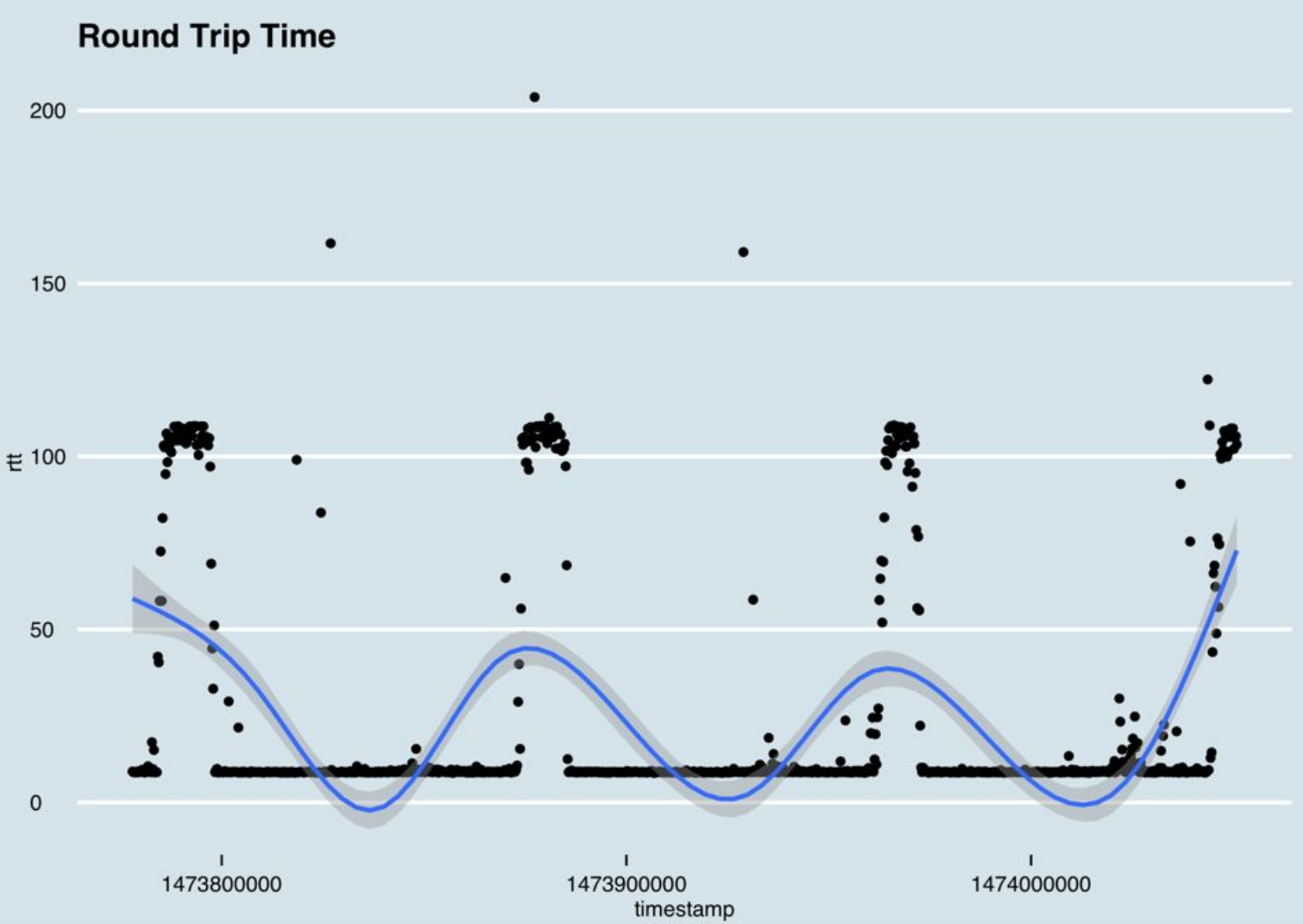
Enterprise Service #1

a) Measurement Infrastructure
   i) > 500 Nodes of different classifications
      (1) Backbone, Mobile Wireless, IPv6
   ii) Measurements taken with proprietary tooling
b) Measurements
   i) Probes issued 3 times every 1,500ms
   ii) If no answer is returned after the 3rd attempt, then the test marked failure.
   iii) DNS timeout at around 4,500ms.
c) Lack of response is recorded as a 1,500ms response time

Enterprise Service #2

a) Measurement Platform
    i) Third Party Platform
        (1) 50 Nodes globally distributed
        (2) Measuring with https://github.com/rthalley/dnspython
            (a) Have options for recursive and non-recursive measurements
    ii) 250 Independent Test Servers
    iii) RIPE Atlas Measurements
b) DNS performance tests every 5 minutes test failures are logged and tagged separately
c) DNS timeout set for 30 seconds”


Example of
Measurement Complexity


Round Trip Time
200
150
100
50
0
rtt
1473800000
1473900000
1474000000
timestamp

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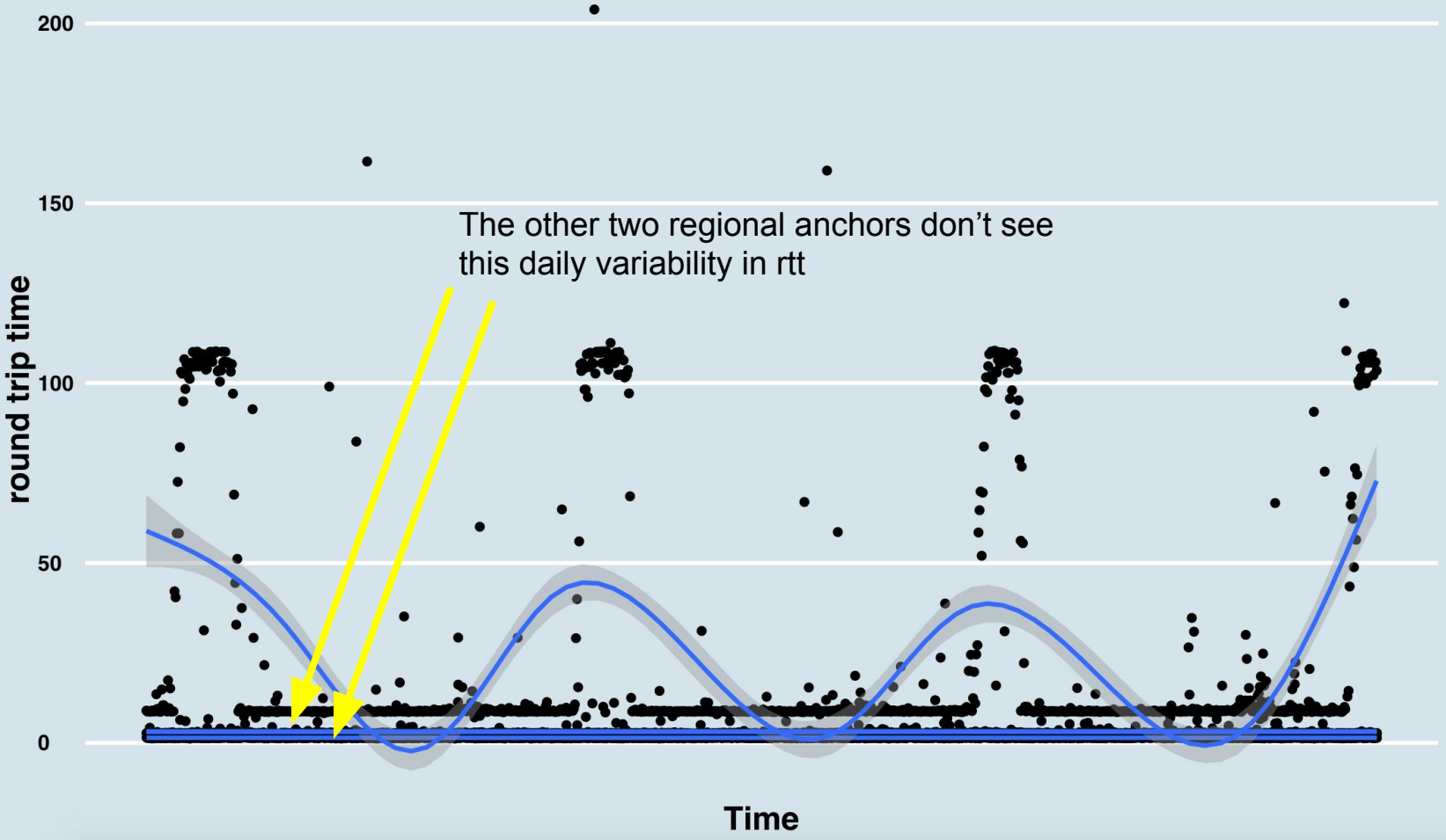
Round Trip Time - Anchor to Nameserver



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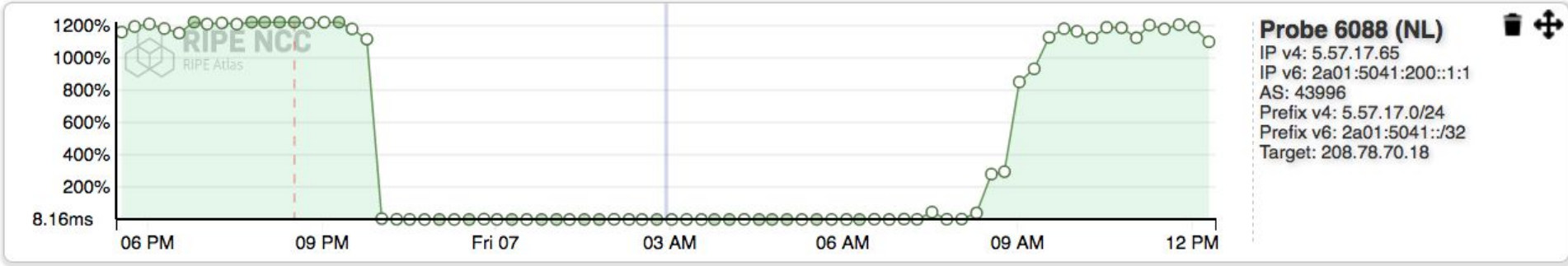
This issue is the path …

Traceroute to 208.78.70.18 (208.78.70.18), 48 byte packets

1	5.57.17.70	AS43996	0.331ms	0.296ms	0.282ms			
2	195.22.213.2	ae4-504.amster32.ams.seabone.net	AS6762	0.798ms	0.654ms	0.635ms		
3	195.219.146.129	bi-ae-23-0.tcore1.AD1-Amsterdam.as6453.net	AS6453	108.088ms	107.931ms	107.708ms		
4	80.231.152.25	if-ae-11-2.tcore2.AV2-Amsterdam.as6453.net	AS6453	104.899ms	105.294ms	104.957ms		
5	80.231.152.102	AS6453	103.964ms	107.144ms	108.08ms			
6 *	162.88.93.6	hivecast-77-nlams.as15135.net	AS33517	107.922ms	107.603ms			
7	208.78.70.18	ns1.p18.dynect.net	AS33517	106.975ms	108.228ms	107.951ms		



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Observed Issues

1) Measurement Granularity
   a) Frequency of measurement and sampling methodology
   b) Averaging
      i) For how many providers does the averaging have a negative impact?
         (1) Is the average representative of real world observations of performance?
2) Network Awareness / Packet Loss
   a) All DNS providers in a region shown having increasing response times in unison
      i) Points to potential local or upstream network issues
   b) If it is being identified how should it be represented / recorded?
      i) Throw away the sample? Log as timeout value?
3) Proximity controls
   a) Where measurements are taken from and what are they measuring?
4) Assumption about timeouts
   a) Free Platforms use a range of timeout values from 1 to 2 seconds
   b) Enterprise Platforms use timeout values from 4.5 to 10 seconds

Guidance

- What needs to be done to attribute failure?
  - One provider cleverly notes that pings should be issued alongside the DNS probes to monitor packet loss
  - The Sparkle / Tata example shows traceroute provides great insight
  - Additional probing drastically increases cost of monitoring (in the case of RIPE Atlas)
- How important is the distinction between probe to authoritative measurements vs. probe to recursive measurements?
  - Does this boil down to a combination of record TTL, local recursive vs. off network resolver and network performance between these specific components?
- How do operators want to define availability?
  - If one of the servers in the NS set isn't responding, but the others are how should this be classified?
- What is the consensus on a timeout threshold for a DNS query?
  - Hopefully not needed :)


Thank You!