

IPv6 end client measurement

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Setting the scene

- Adding IPv6 to your website may have risks
 - Will your clients still be able to 'see' you?
 - What % of clients will experience issues?
- Finding out in advance what to expect is useful
 - A way to measure end-user behavior
 - Without affecting your own website investment
- Measuring failure is hard!
 - Website logs only measure successful connections



Adding IPv6 to your website may have risks

- Windows hosts experience problems with dual-stack (IPv4, IPv6) DNS records
 - May refuse to connect to the IPv4 address
- Some hosts cannot process IPv6 DNS properly
 - Not supported in all DHCP backed configurations
- 'Partial IPv6' problems
 - Locally IPv6 enabled, no IPv6 route to global Internet
- Loss of eyeballs = Loss of revenue?
 - When your core business presents via the web, what risks to loss of web access are you willing to take?

Finding out in advance what to expect

- Find a way to measure client behavior without having to add IPv6 to your website
 - Leverage cross-site URL fetches
- Integrate measurements into existing tracking methods, and analytics framework
 - Avoids key business intelligence leakage to third parties
 - No new tools needed

Measuring failure is hard!

- Web logs record completed TCP/IP events
 - Even 4xx and 5xx responses in logs are completed valid TCP/IP sessions
- What about the people who failed to connect?
 - Not in access- or error- logs
- Only partially visible on-the-wire
 - Characteristic missing 'SYN/ACK' sequence in TCP signals failure to complete a 2-way handshake
- But (inside a time limit) client knows what worked or failed: and can report back.

APNIC's web measurement system

- Built on google 'analytics' method
 - Javascript, highly portable
 - Asynchronous, runs in the background
 - after page render already complete
 - Uses DNS wildcards, uncacheable
- Data integrated into google analytics reports
 - Graphs of 'events' to monitor IPv4, IPv6 and dual-stack
- Configurable by website manager
 - Sample or every connection, extra tests etc

Measuring by 1x1 invisible pixels

- Javascript requests sequence of 1x1 pixel images
 - Images fetched but not included in the DOM so not displayed
 - Image fetches take place after DOM render,
 - do not add delay to page view, invisible
 - (may be seen in browser status bar, error report windows)
 - Javascript callback records success/time
- Image fetches from unique DNS names
 - Every client is a fresh name, no cached state
 - Nothing in DNS name identifies your website, unique number to distinguish testcases in APNIC weblogs only
- Client reports timing, connect failures
 - to your analytics report as a results/summary field
 - Can account for 'unable to connect' TCP/IP failure



What is tested?

- Basic test set is dual-stack, IPv4, IPv6
 - Dual stack enabled DNS behind all fetches
- Additional (optional) tests
 - IPv6 literal
 - (bypasses many IPv6 suppression settings)
 - IPv6 DNS
 - (can be visible to user, stress-tests DNS)
 - Tunnel detection
 - URLs only reachable from Teredo and 6to4 source IP addresses
- Results reported over IPv4 only URL to APNIC
 - Aggregate stats reporting, trends etc. Anonymous

Adding the measurement



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Home

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IPv6 Capability Tracker

If you are interested in testing your clients' IPv6 capabilities, you can use the APNIC Labs Google Analytics Tracking Code.

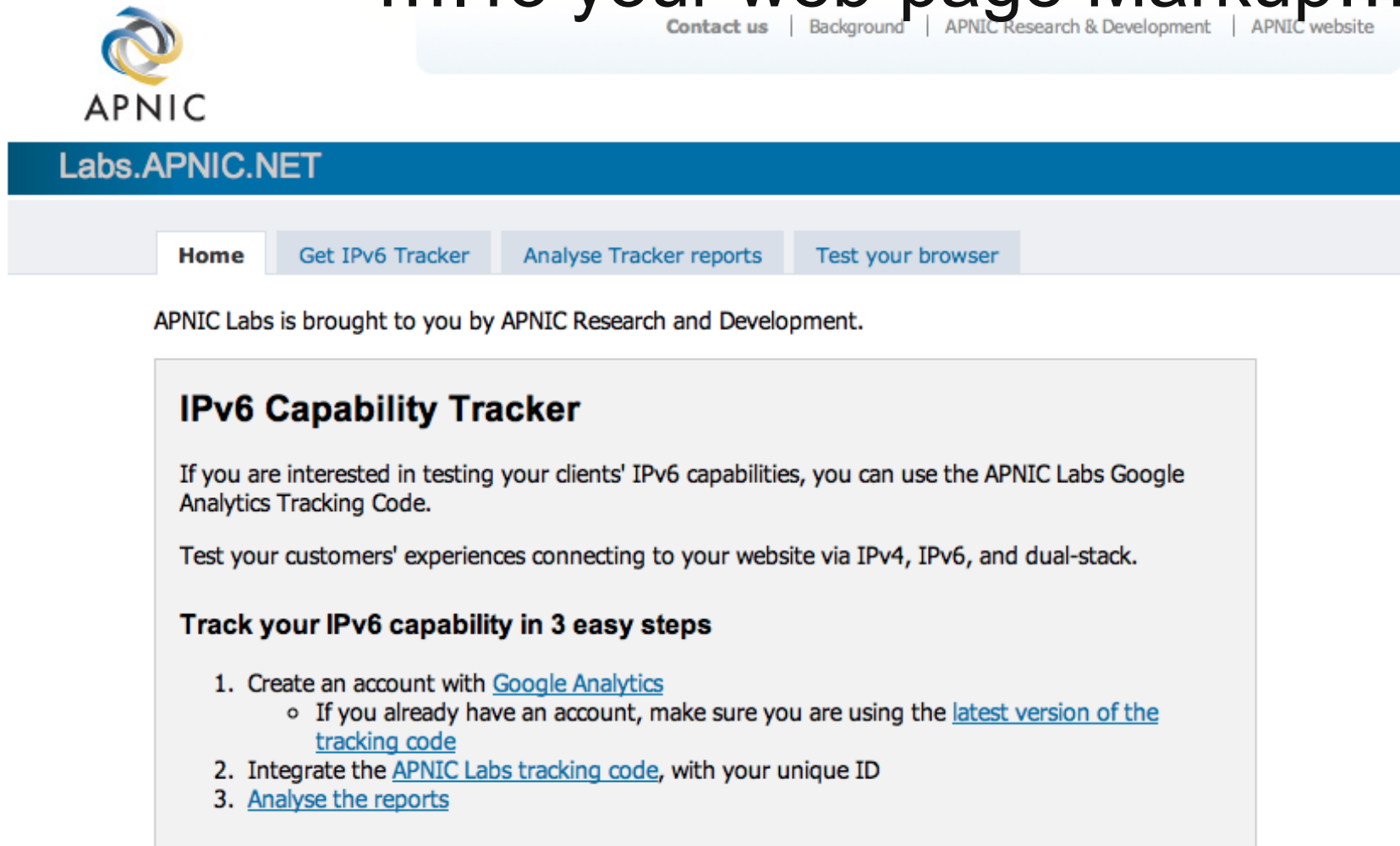
Test your customers' experiences connecting to your website via IPv4, IPv6, and dual-stack.

Track your IPv6 capability in 3 easy steps

1. Create an account with [Google Analytics](#)
 - If you already have an account, make sure you are using the [latest version of the tracking code](#)
2. Integrate the [APNIC Labs tracking code](#), with your unique ID
3. [Analyse the reports](#)

Adding the measurement

....To your web-page Markup....



The screenshot shows the APNIC Labs website interface. At the top left is the APNIC logo. Below it is a blue banner with the text "Labs.APNIC.NET". A navigation bar contains four links: "Home", "Get IPv6 Tracker", "Analyse Tracker reports", and "Test your browser". Below the navigation bar is a text line: "APNIC Labs is brought to you by APNIC Research and Development." The main content area features a section titled "IPv6 Capability Tracker" with a paragraph about using Google Analytics Tracking Code. Below this is a sub-section titled "Track your IPv6 capability in 3 easy steps" with a numbered list of instructions.

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Adding the measurement

....To your web-page Markup....



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```

1 <!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xhtml1"
2 <html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
3   <head>
4     <title>Labs.APNIC.net </title>
5     <link rel="stylesheet" type="text/css" href="/template-files/labs.css" media="all"
6     <style type="text/css">
7       pre{font-size:10px;white-space:pre-wrap;}
8     </style>
9
10
11  </head>
12  <body id="page1">
13    <div id="wrapper">
14      <div id="page">
15        <div id="header">
16          <div id="logo">
17            <a href="http://www.apnic.net">
20            <ul>
21              <li class="first"><a href="/help.shtml">Contact us</a></li>
22              <li><a href="/background.shtml">Background</a></li>
23              <li><a href="http://www.apnic.net/research">APNIC Research &am
24              <li><a href="http://www.apnic.net">APNIC website</a></li>
25            </ul>
26
27          </div><!--utilities-->
28          <div id="tools">
29            <div><!--tools-->

```

Adding the measurement

Find your 'Google Analytics' Block (or add one)

```
111 <script type="text/javascript">
112
113   var _gaq = _gaq || [];
114   _gaq.push(['_setAccount', 'UA-597837-5']);
115   _gaq.push(['_trackPageview']);
116
117   (function() {
118     var ga = document.createElement('script'); ga.type = 'text/javascript'; ga.async = true;
119     ga.src = ('https:' == document.location.protocol ? 'https://ssl' : 'http://www') + '.google-analytics.com/ga.js';
120     var s = document.getElementsByTagName('script')[0]; s.parentNode.insertBefore(ga, s);
121   })();
122
```

Adding the measurement

Add the 'APNIC' analytics block

```
111 <script type="text/javascript">
112
113   var _gaq = _gaq || [];
114   _gaq.push(['_setAccount', 'UA-597837-5']);
115   _gaq.push(['_trackPageview']);
116
117   (function() {
118     var ga = document.createElement('script'); ga.type = 'text/javascript'; ga.async = true;
119     ga.src = ('https:' == document.location.protocol ? 'https://ssl' : 'http://www') + '.google-analytics.com/ga.js';
120     var s = document.getElementsByTagName('script')[0]; s.parentNode.insertBefore(ga, s);
121   })();
122
123   // enable the APNIC IPProtoTest and feed google analytics events
124   if ('http:' == document.location.protocol) {
125     var ipproto_user = '438694';
126
127     (function() {
128       var iga = document.createElement('script'); iga.type = 'text/javascript'; iga.async = true;
129       iga.src = 'http://www.labs.apnic.net/ipprototest.js';
130       var is = document.getElementsByTagName('script')[0]; is.parentNode.insertBefore(iga, is);
131     })();
132   }
133 </script>
```

And login to Analytics!

Google Analytics

Change Language: US English

HOME

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Improve your site and increase marketing ROI.

Google wants you to attract more of the traffic you are looking for, and help you turn more visitors into customers.

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Sign in with your
Google Account

Email:

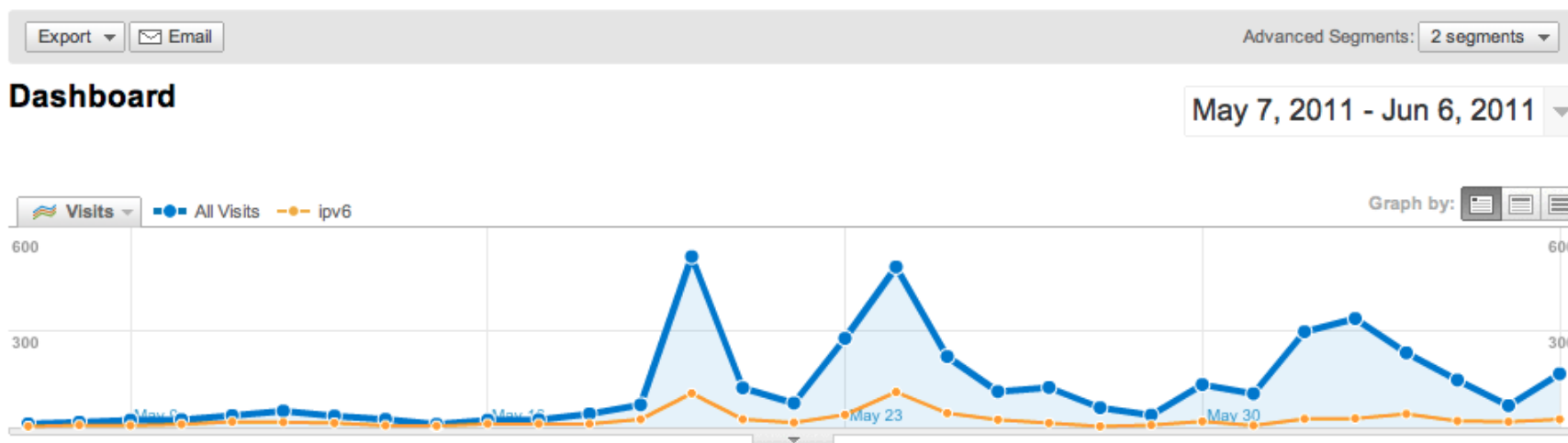
ex: pat@example.com

Password:

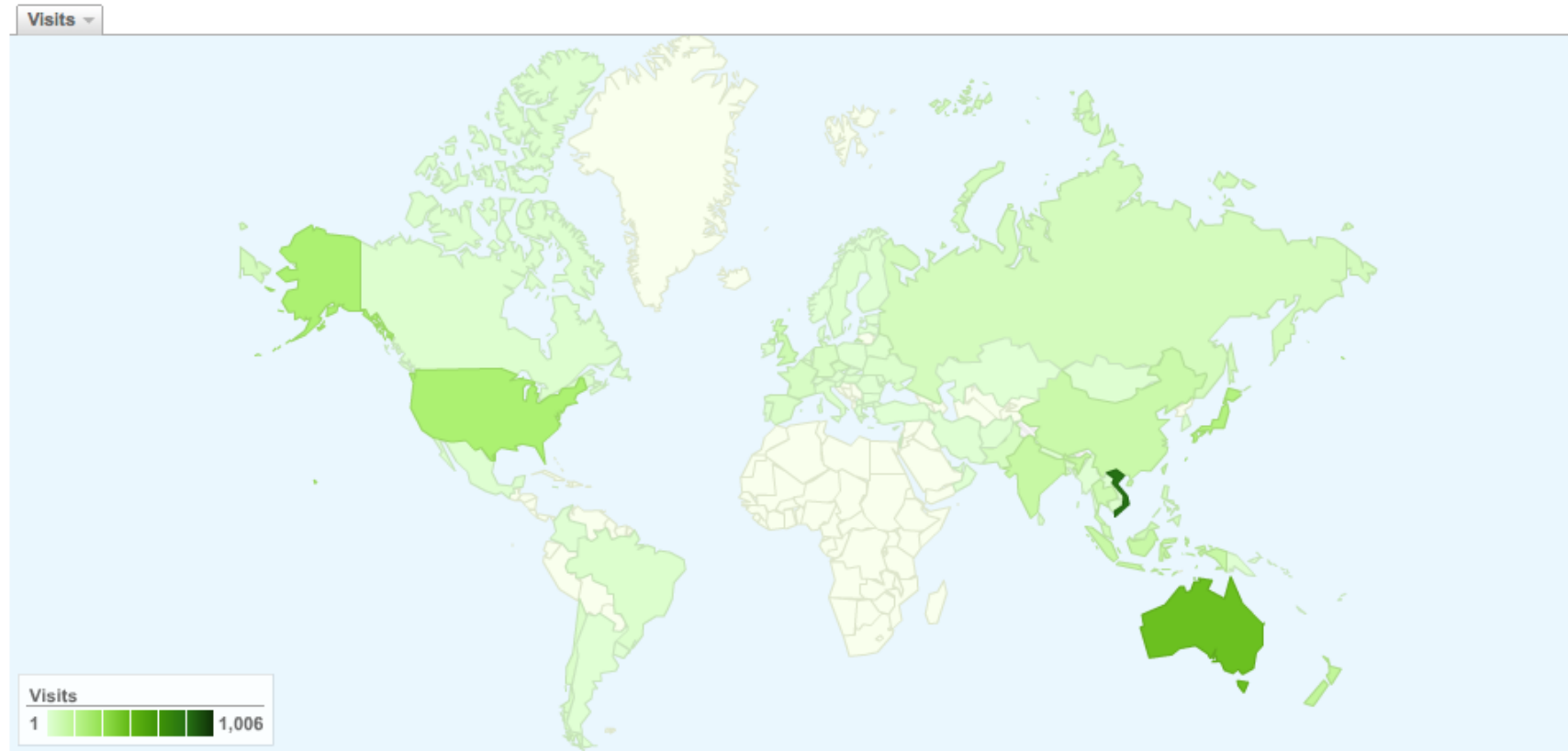
☒ Stay signed in

[Can't access your account?](#)

Results in Analytics



Results in Analytics



3,943 visits came from 87 countries/territories in the "All Visits" segment

Results in Analytics

	% of Total	7.04%	-17.55%	-29.31%	11.81%	-100.00%
7.	Indonesia					
	All Visits	135	2.63	00:02:27	70.37%	14.81%
	ipv6	23	4.22	00:05:29	78.26%	0.00%
	% of Total	17.04%	60.38%	123.56%	11.21%	-100.00%
8.	China					
	All Visits	123	1.84	00:01:28	92.68%	41.46%
	ipv6	8	3.00	00:03:29	87.50%	0.00%
	% of Total	6.50%	63.27%	138.36%	-5.59%	-100.00%
9.	Thailand					
	All Visits	99	2.13	00:01:35	49.49%	33.33%
	ipv6	11	3.73	00:02:25	72.73%	0.00%
	% of Total	11.11%	74.88%	52.09%	46.94%	-100.00%
10.	United Kingdom					
	All Visits	98	1.96	00:01:15	55.10%	27.55%
	ipv6	30	2.33	00:02:30	50.00%	0.00%
	% of Total	30.61%	19.10%	100.89%	-9.26%	-100.00%

Results in Analytics

	% of Total	7.04%	-17.55%	-29.31%	11.81%	-100.00%
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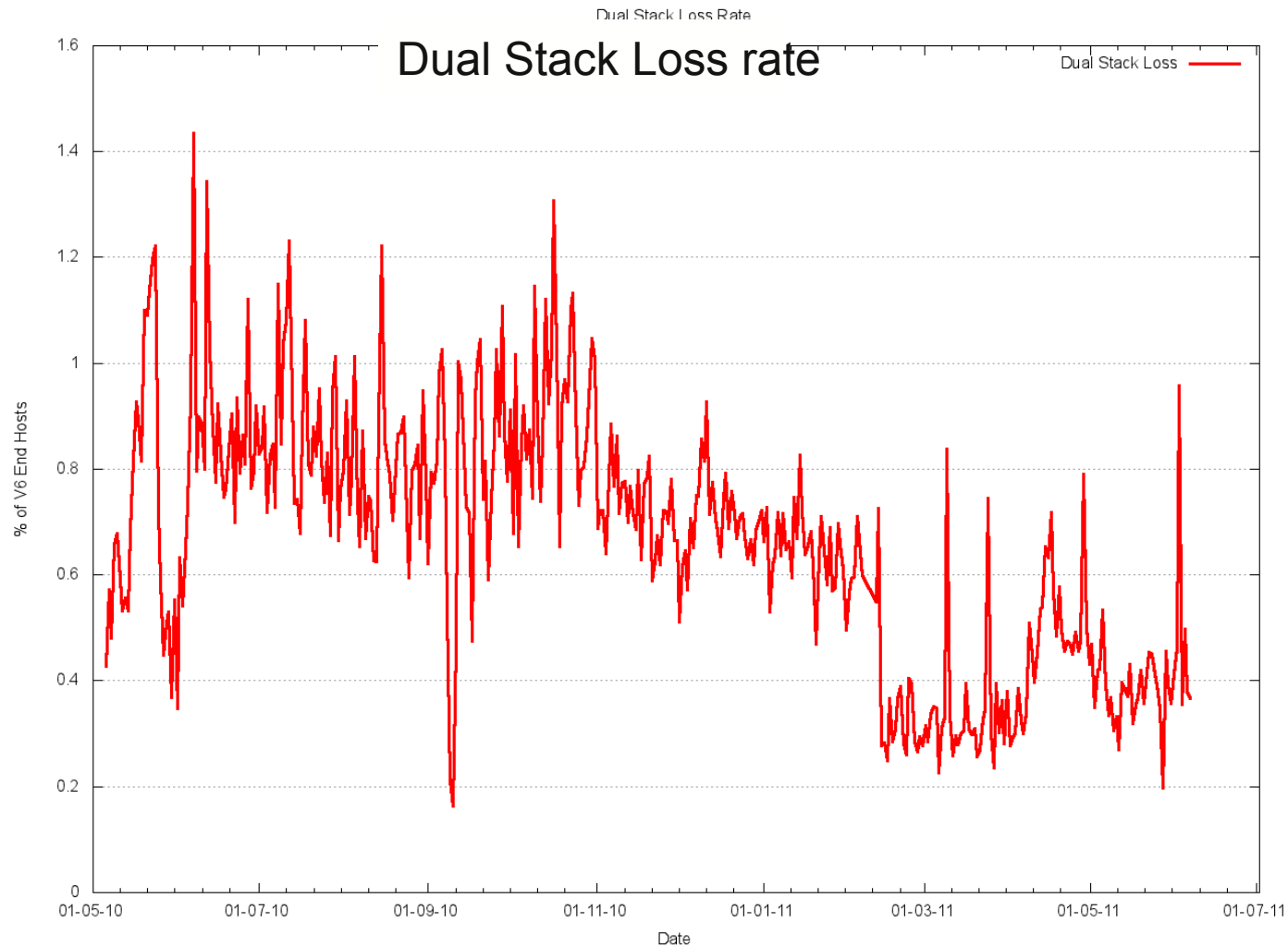
APNIC Aggregate Results

- APNIC is collating measurement results online at

`http://www.potaroo.net/stats/1x1/`

- Along with some interesting specific-site sub reports

APNIC Aggregate Results

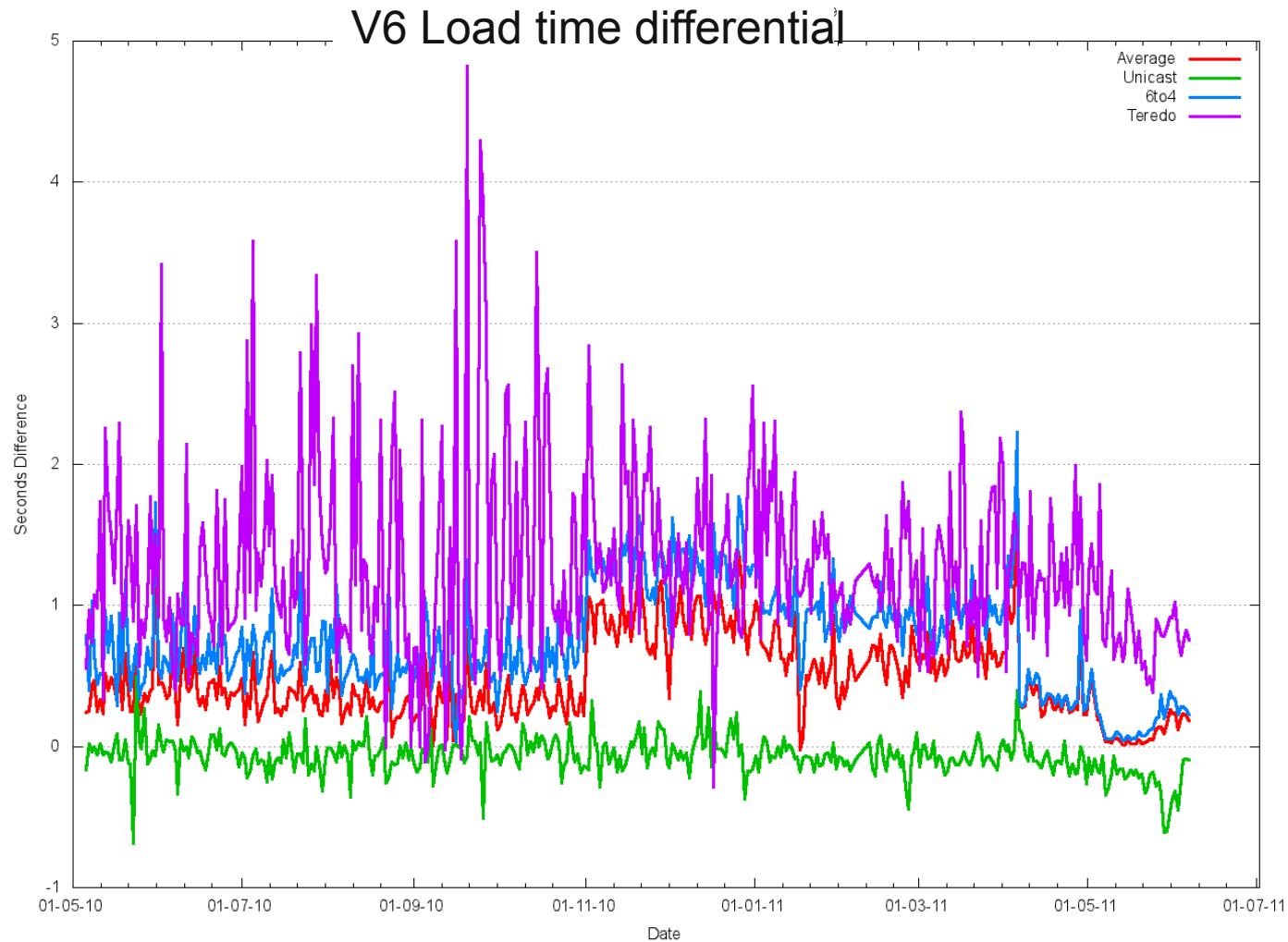




Dual Stack Loss

- 4 in 1000 clients are unable to fetch a web URL if presented with a dual-stack DNS name
- Older (windows XP) hosts, browsers
- If you are in a mission-critical role, something to think about,
 - but not necessarily a reason to hold off on IPv6 deployment
 - Consider comparisons to other loss rates caused by un-related problems
 - Noisy links, adblockers, congestion/packetloss

APNIC Aggregate Results



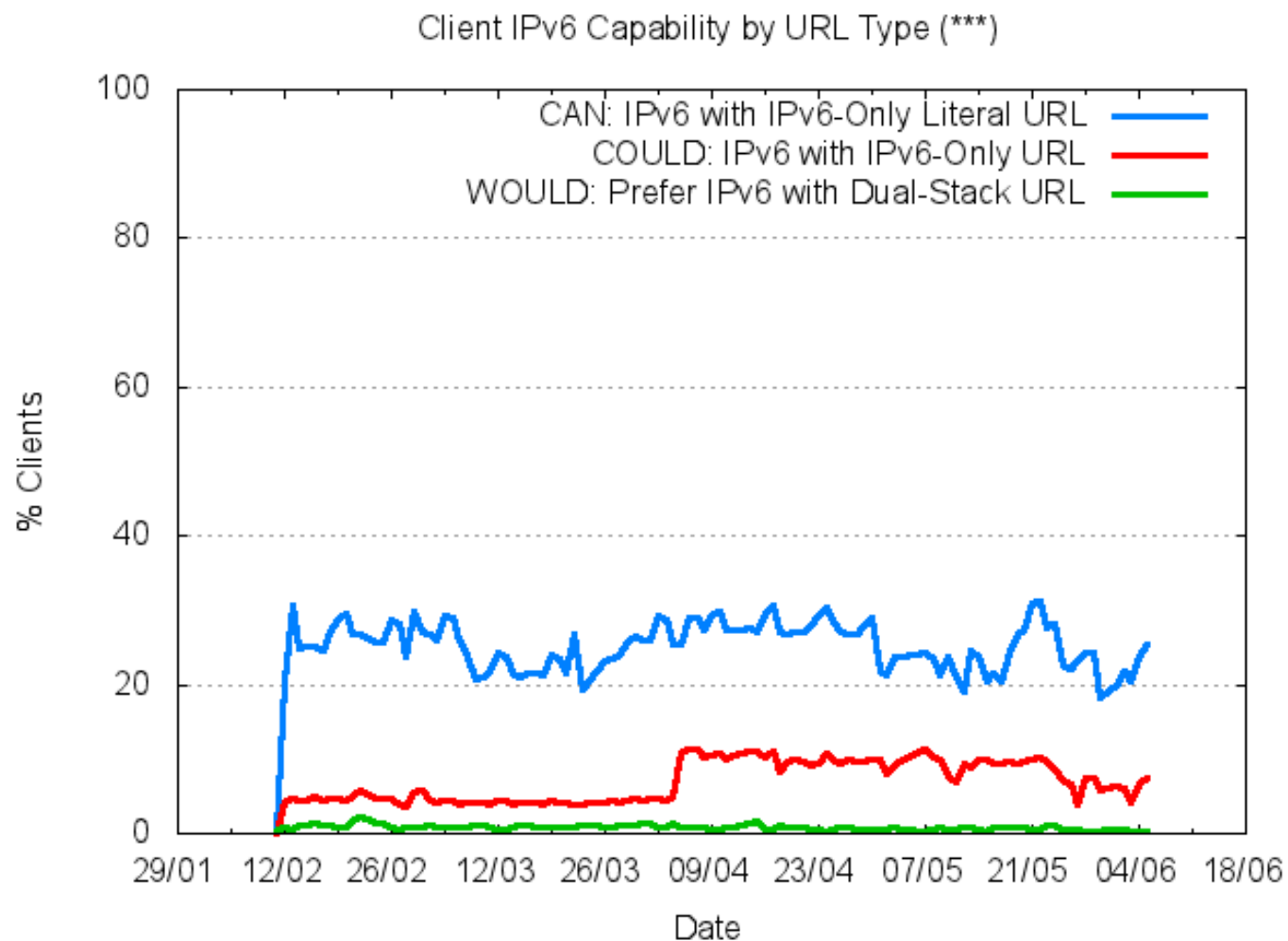
V6 Load time differential

- IPv6 is not necessarily slower than IPv4 on average
 - Sub-1sec additional delay, sometimes faster
- Tunneled IPv6 can be significantly slower
 - Tunnel establishment costs, sub-optimal routing can add multi-second delay
 - Teredo significantly slower
 - Another indication 'ad hoc' tunnels are bad.

‘Can’ vs ‘Will’

- IPv6 de-preferenced in DNS, browser
 - Teredo/6to4 lower preference than IPv4
- But.. If you bypass DNS and give a literal IPv6 address in a URL, you can explore who actually CAN do IPv6, if they try.
 - If you try a bit harder, who CAN use IPv6?

'Can' vs 'Will'



20% IPv6 capable!

- Increases Teredo/6to4 Tunnel connection rate
 - Higher failure rate follows, so demonstrates issues in automatic tunneling
- Encouraging signs end-user hosts now increasingly able to use IPv6, if deployed

Interested?

- **HTTP://labs.apnic.net/**
 - Complete instructions on how to add markup to your website
 - ‘Test your own IPv6’ feature displayed too!
- Aggregated results updated daily
- Other measurement methods being explored
 - Will be updated on the labs.apnic.net site.