World IPv6 Day Observations

www.WorldIPv6Day.org

Leslie Daigle

Internet Society

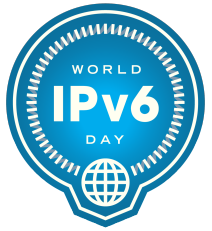
What was World IPv6 Day?

For 24 hours on 8 June 2011 (00h00-23h59 UTC) Facebook, Google, Yahoo! and more than 1000 other websites turned on IPv6 access on their "front door"

Goals:

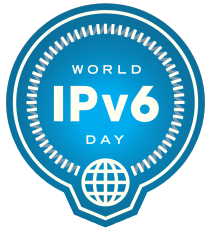
- **Motivate Internet service providers, hardware makers, operating system vendors, Web companies and others to prepare their services for IPv6**
- **Understand what issues still need to be addressed to ensure a successful transition to IPv6 as IPv4 addresses run out.**

While there have been similar notable efforts, World IPv6 Day was the first global, real-world "test-flight" of IPv6, and the largest ever.



Motivations for the World IPv6 Day Event – and impacts

- Breaking the chicken-and-egg problem of IPv6 deployment – networks clearly see that content is getting there
- Improving IPv6 connectivity by understanding outstanding issues faced by a small percentage of users (but significant numbers for large content providers) – more fixes are in flight
- Providing a target date for already planned IPv6 rollouts – people definitely responded to having a date
- Spurring organizations to create a plan for rolling out IPv6 – being like Google, Facebook, and Yahoo! is important
- Catalyzing the kind of collaboration that the Internet has relied upon through its history – people noticed that the Internet industry came together to advance something that is important for the overall long term health of the Internet



Global Response

Initial commitment from websites:

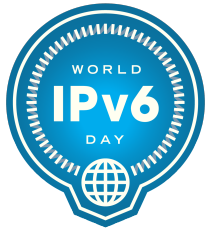
- **Facebook**
- **Google**
- **Yahoo!**

And content delivery networks:

- **Akamai**
- **Limelight Networks**

Interest from websites, ISPs, hosting companies, exchanges, vendors around the world

- More than 1000 organizations contacted us
- 1000s of websites turned on IPv6 for 24 hours



Who turned up IPv6 on June 8?

www.google.com

www.facebook.com

www.youtube.com

www.yahoo.com

www.yahoo.co.jp (#12)

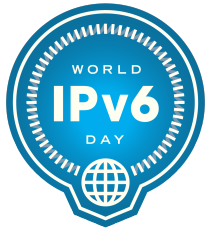
www.bing.com (#21)

www.microsoft.com (#25)

www.bbc.co.uk (#38)

www.cnn.com (#48)

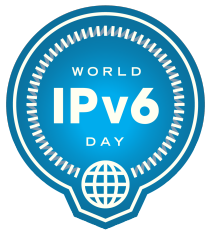
www.aol.com (#55)



If you were in Korea…

www.naver.com (#1)

www.daum.net (#4)



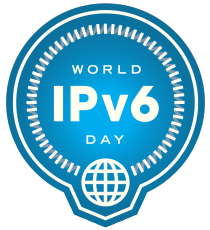
If you were in the Czech Republic….

www.novinky.cz (#6)

www.super.cz (#10)

www.firmy.cz (#21)

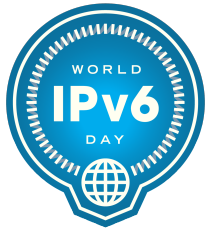
www.mapy.cz (#22)



If you were in Brazil….

www.terra.com.br (#12)

www.ig.com.br (#15)



Hosting companies added thousands of domains, addressing the long tail of websites

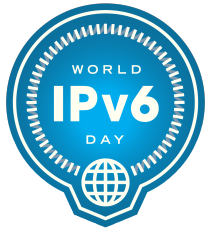
www.host.md (@4500 - permanent)

www.task.com.br (@7000 – left on)

www.df.eu (@700,000)

www.strato.de (@4,000,000 – left on)

… others with 1000s and 10000s of thousands



Broad observations

Participating sites

- Documented through an IPv6 reachability dashboard
  - http://www.worldipv6day.org/participants-dashboard/index.html
- Roughly 2/3rds of the participating sites who contacted us remained on

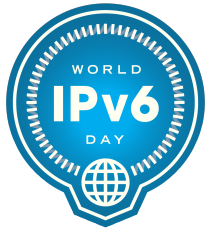
Traffic increased and remained higher

- Ripe Labs measured impact on IPv6 traffic
  - http://labs.ripe.net/Members/emileaben/measuring-world-ipv6-day-long-term-effects

•No large scale breakage

•DDOS fears did not pan out

•*SUCCESS! Moved the needle on IPv6 deployment*



Don’t take it from me… listen to our panelists

Anchor content providers

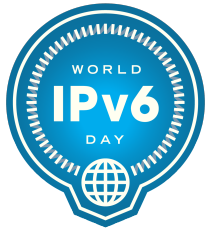
- **Google – Lorenzo Colitti**
- **Facebook – Donn Lee**
- **Yahoo! – Igor Gashinsky**

ISP

- **Telefónica – Carlos Ralli Ucendo**

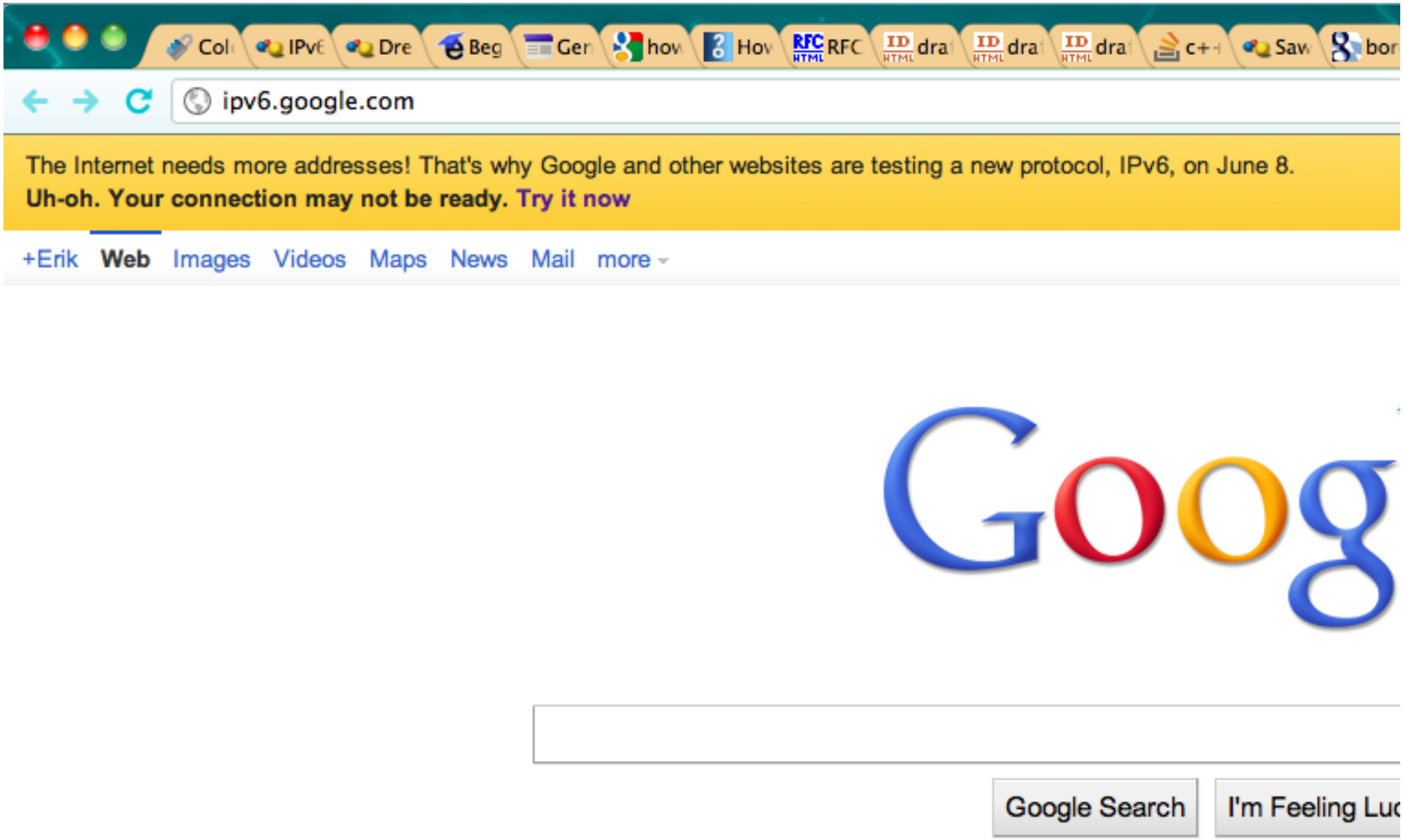
Enterprise

- **Cisco – Mark Townsley**

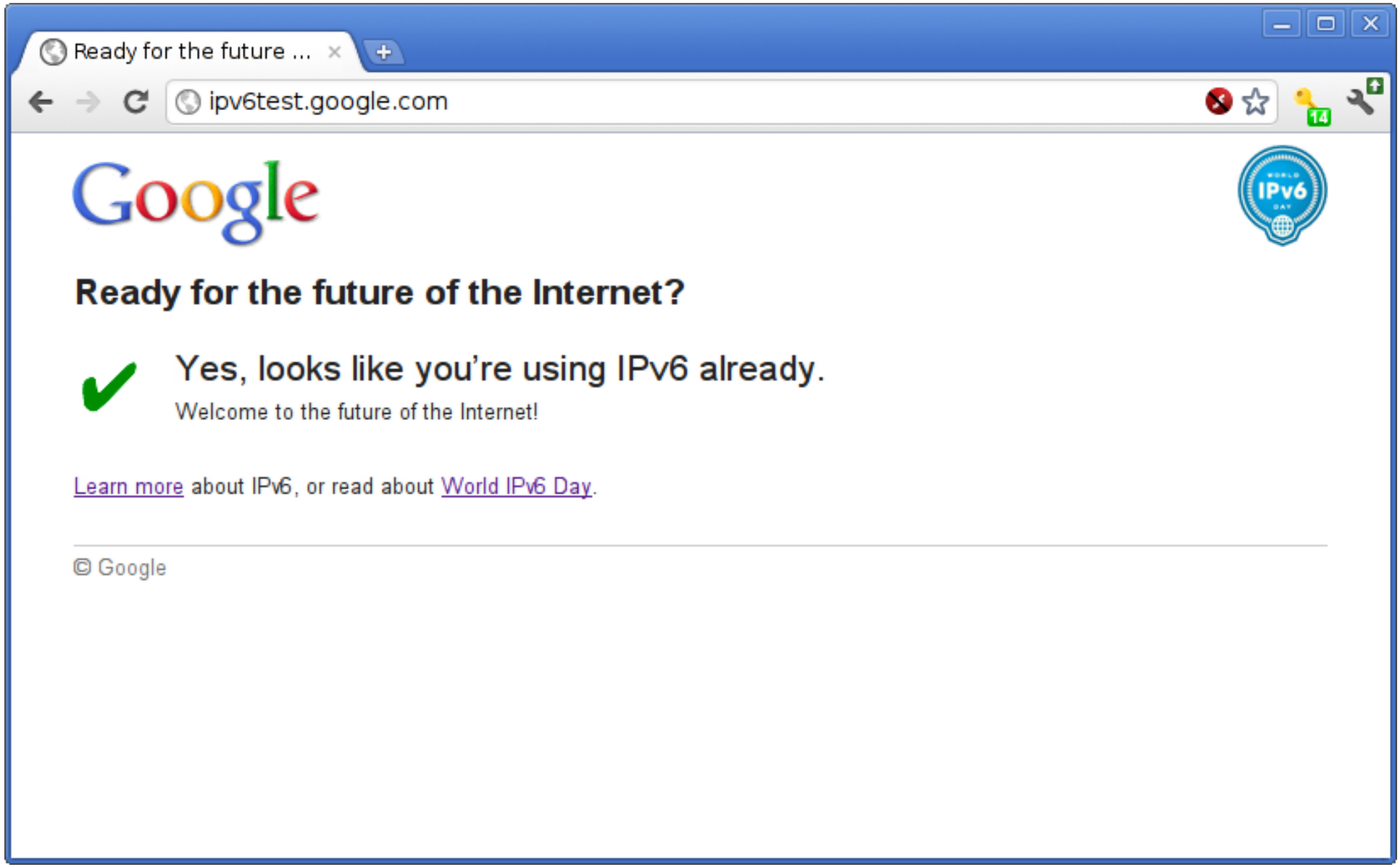


Google

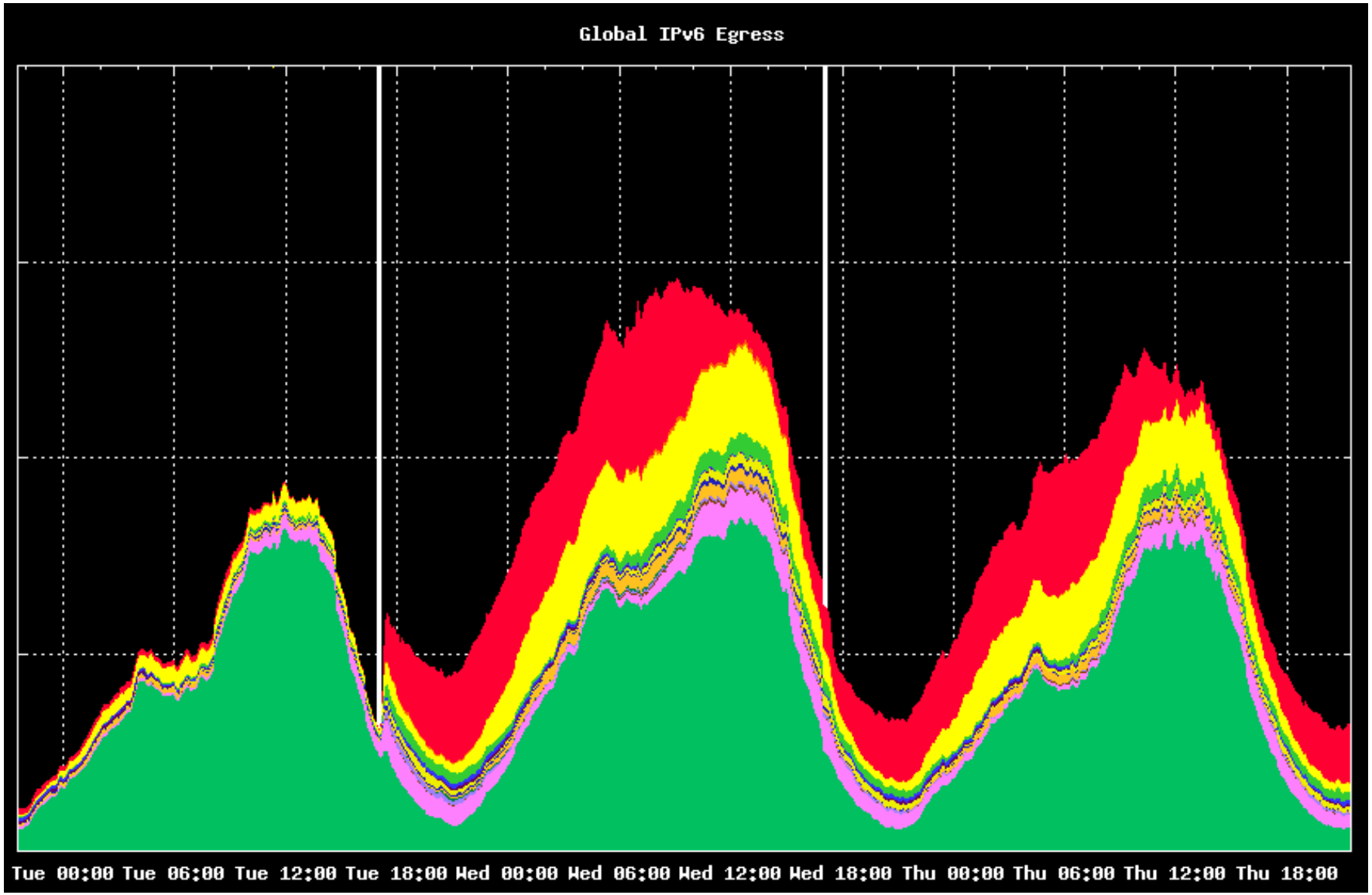
Preparation: warning broken users



Preparation: ipv6test.google.com



On the day: business as usual

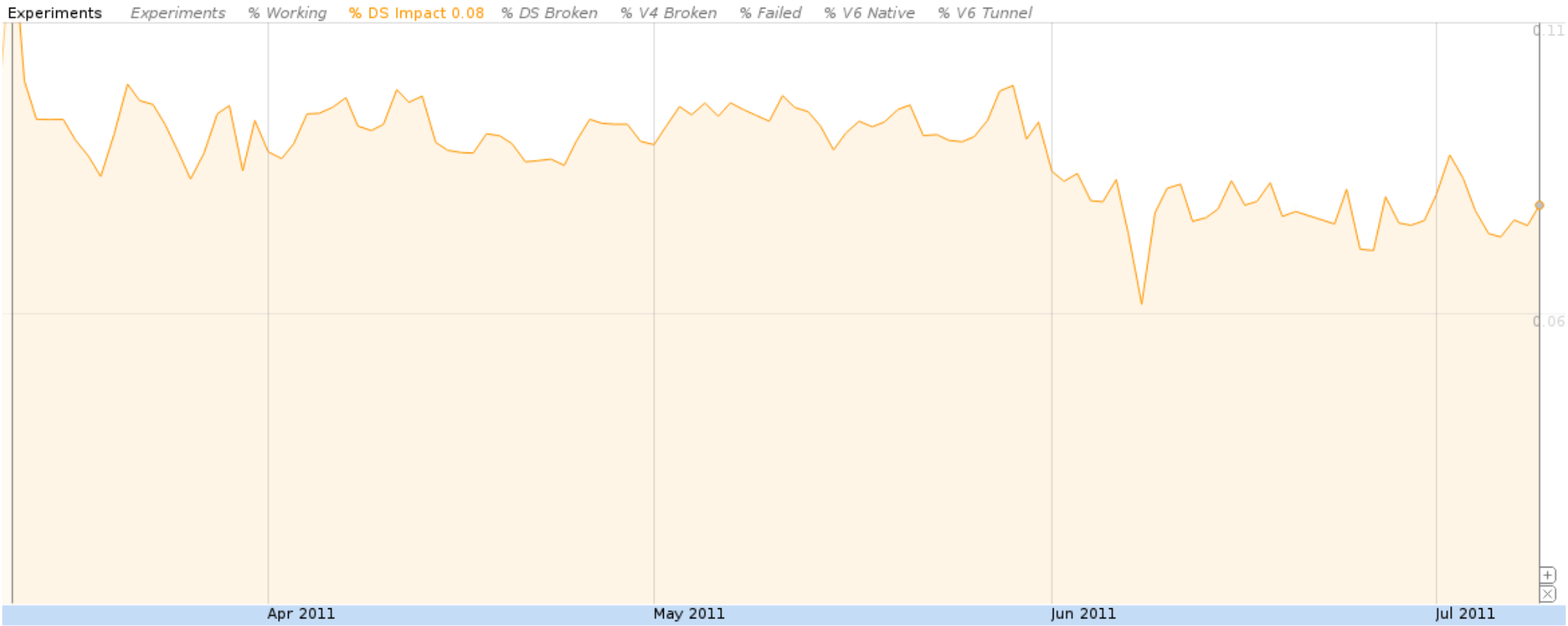


We were already serving 60% of the IPv6 Internet

Technical progress

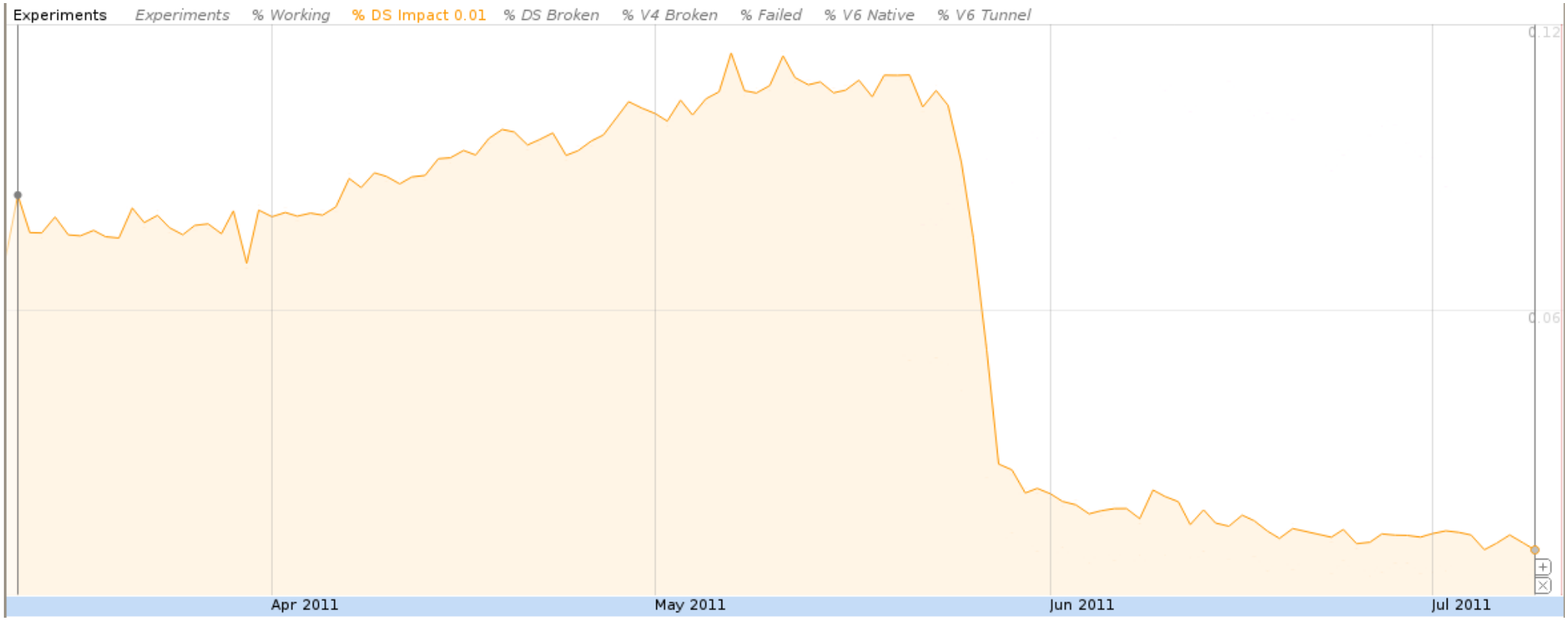
- A number of services became available over IPv6
  - Voice, talk, mobile talk, analytics, tools, ...
  - Google Public DNS - 2001:4860:4860::{8888,8844}
  - Adwords and IMAP/SMTP (soon after the day)
  - Almost all Google services now available over IPv6
- Some services left IPv6 on for everyone
  - YouTube videos, mobile gtalk
- Implemented fast fallback from IPv6 to IPv4 in Chrome

IPv6 brokenness (excluding Chrome)



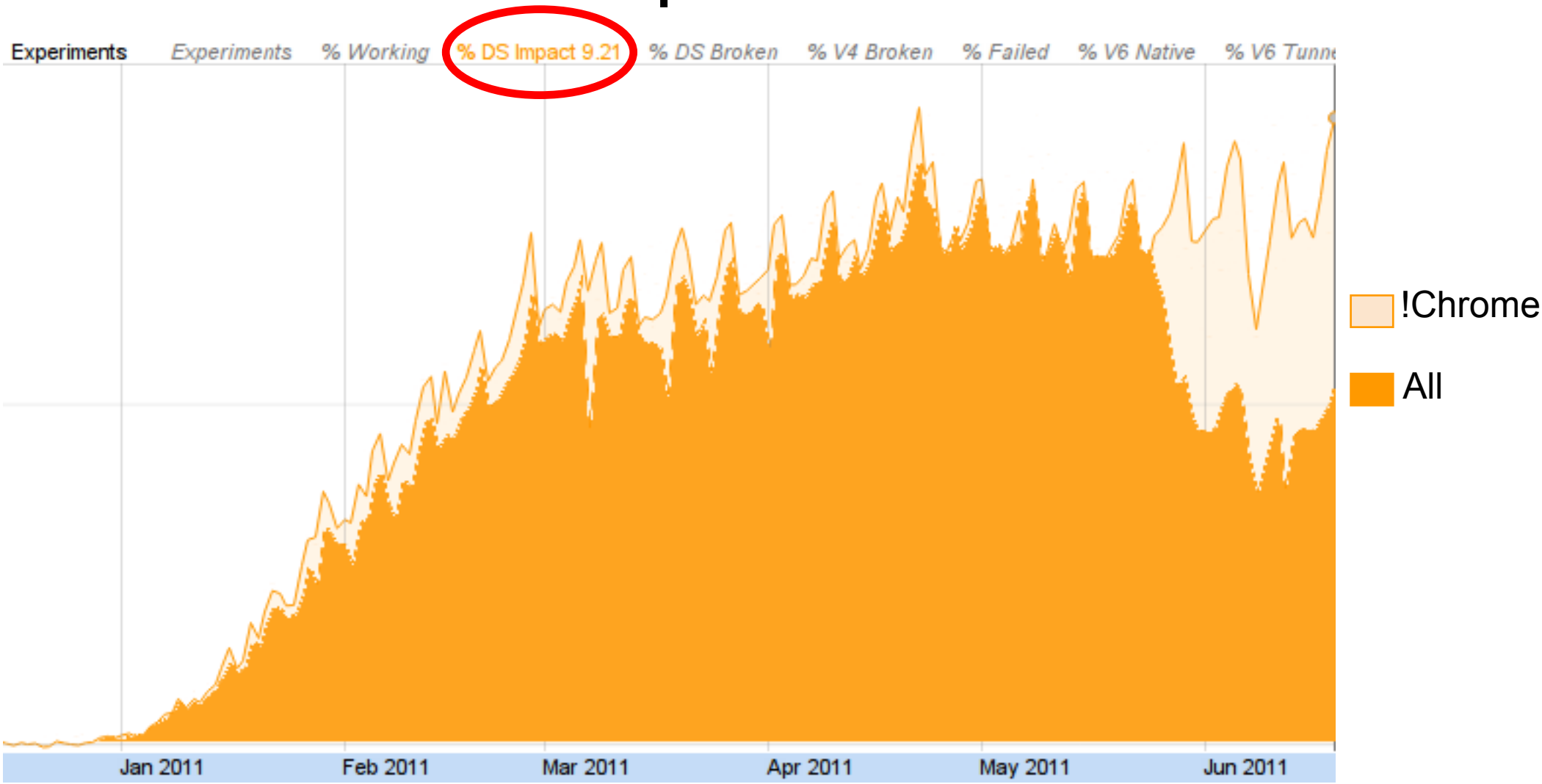
No change around World IPv6 Day

Chrome IPv6 Brokenness



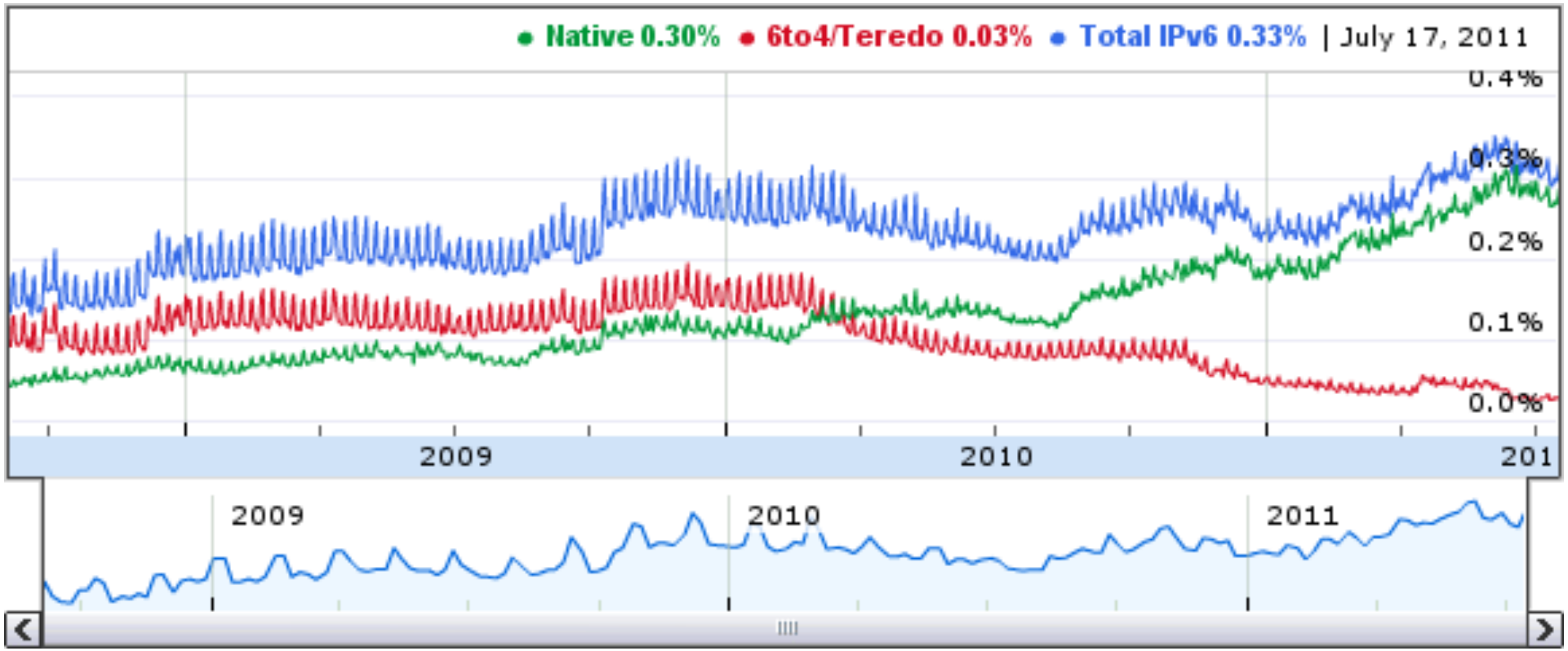
- 80-90% reduction in dual-stack brokenness
- Versions with fast-fallback 99.995% as reliable as IPv4
- Similar behaviour will be in Firefox 7
- Apple also added robustness in OS X Lion
- If IE follows suit, users with recent browsers should be OK

Brokenness hotspots



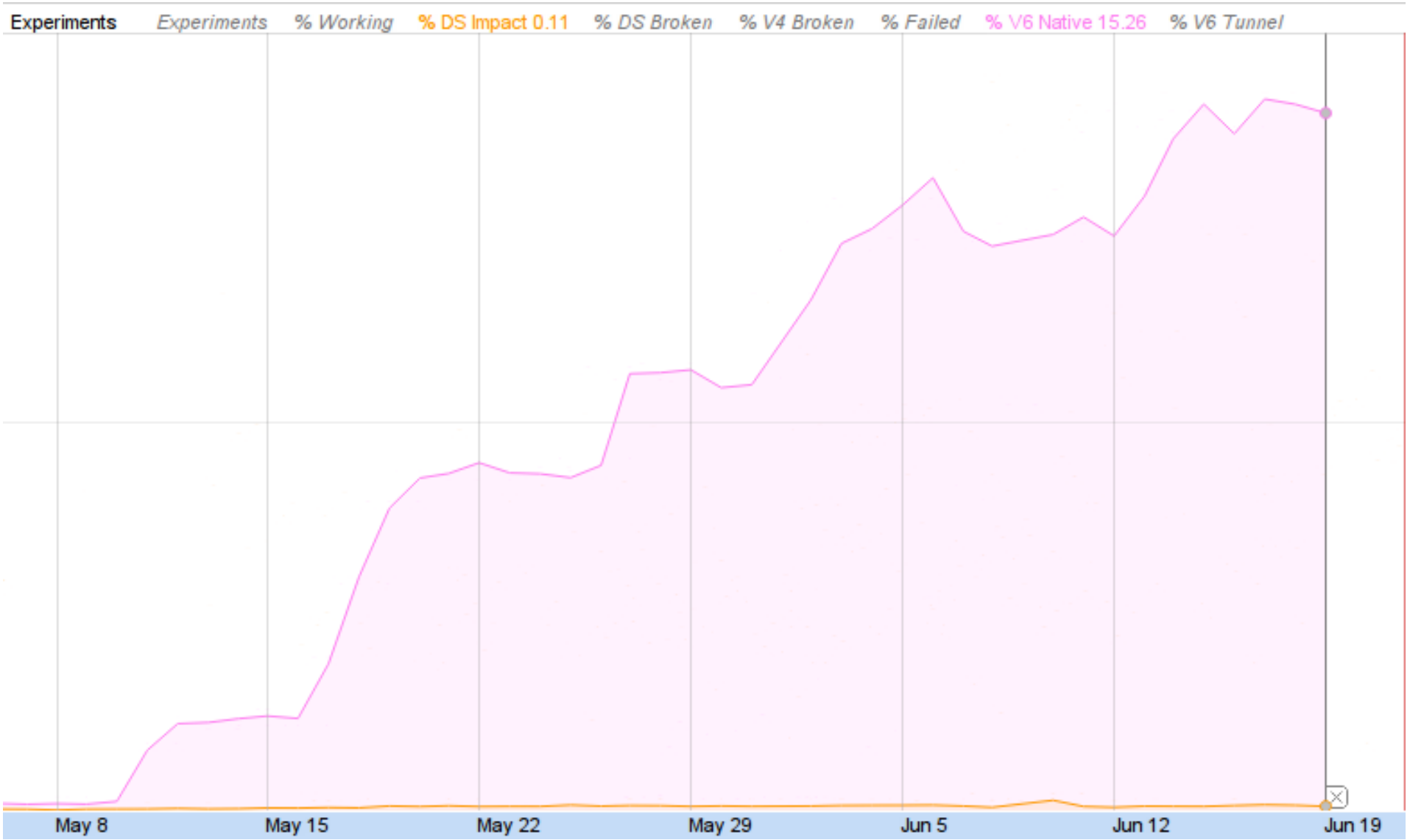
- Top AS has 9% dual-stack failure rate
- Top 5 ASes responsible for almost 50% of brokenness

Adoption



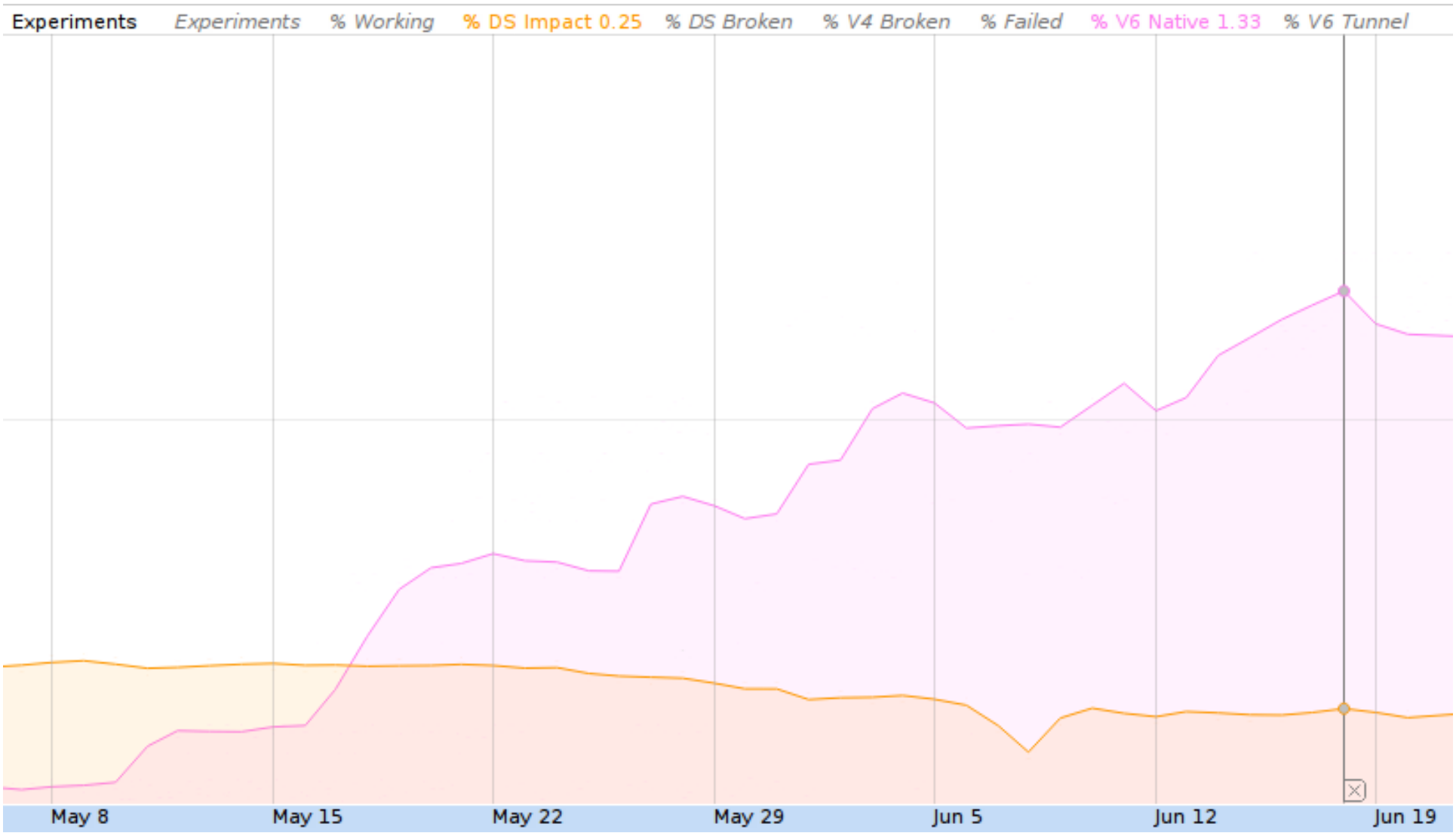
- Still 0.3%
  - France 3.4%, Japan 1.4% (since May)
  - Without France and Japan, 0.1%
  - Japan only joined the game recently

KDDI



- IPv6 to 15% of their users in 5 weeks!
- Just in time for World IPv6 Day

Japan as a whole



- Native users ~= KDDI
- Lots of broken users too. NGN?

Facebook

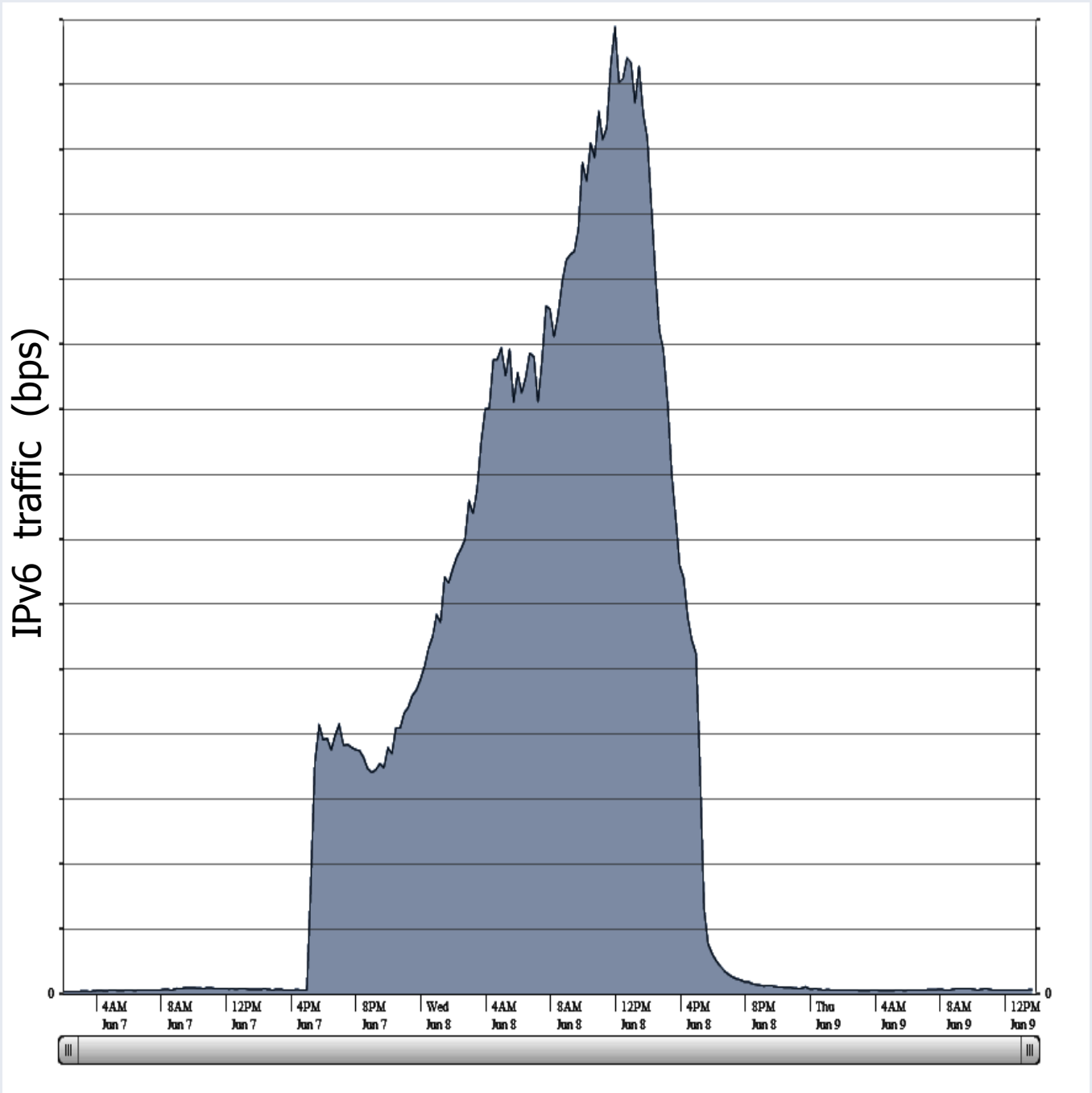
facebook

World IPv6 Day at Facebook

Donn Lee
Network Engineering Team
25 July 2011
IETF 81, Quebec City

Why IPv6 matters to us

- Standard model
- Open, direct access
- Innovation
  - Inclusion, Low barriers to entry
  - Creativity, creation
- Avoids brittleness, complexity of alternate solutions
- Scale for future generations

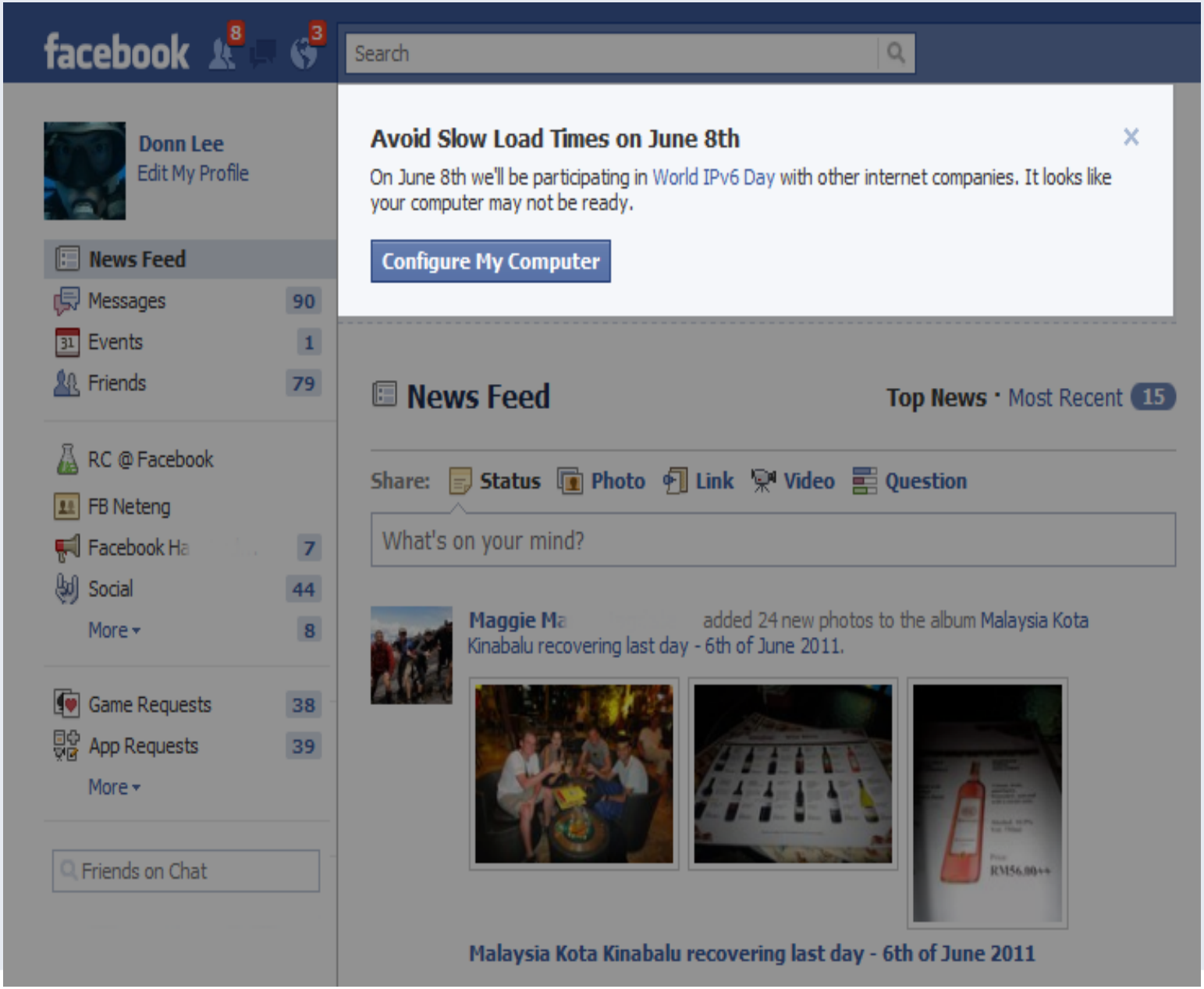

IPv6 traffic (bps)
0
0
4AM Jun 7
8AM Jun 7
12PM Jun 7
4PM Jun 7
8PM Jun 7
Wed Jun 8
4AM Jun 8
8AM Jun 8
12PM Jun 8
4PM Jun 8
8PM Jun 8
Thu Jun 9
4AM Jun 9
8AM Jun 9
12PM Jun 9

Stats

- IPv6 capable users: 0.20%
  - IPv6: 0.16%
  - 6to4: 0.04%
  - Teredo: Nearly zero
- DS brokenness: ~0.02% of users
  - Down from 0.03% pre-W6D
- Via non-intrusive browser testing

W6D 24-hour period: >1 million IPv6 users

Message to broken users

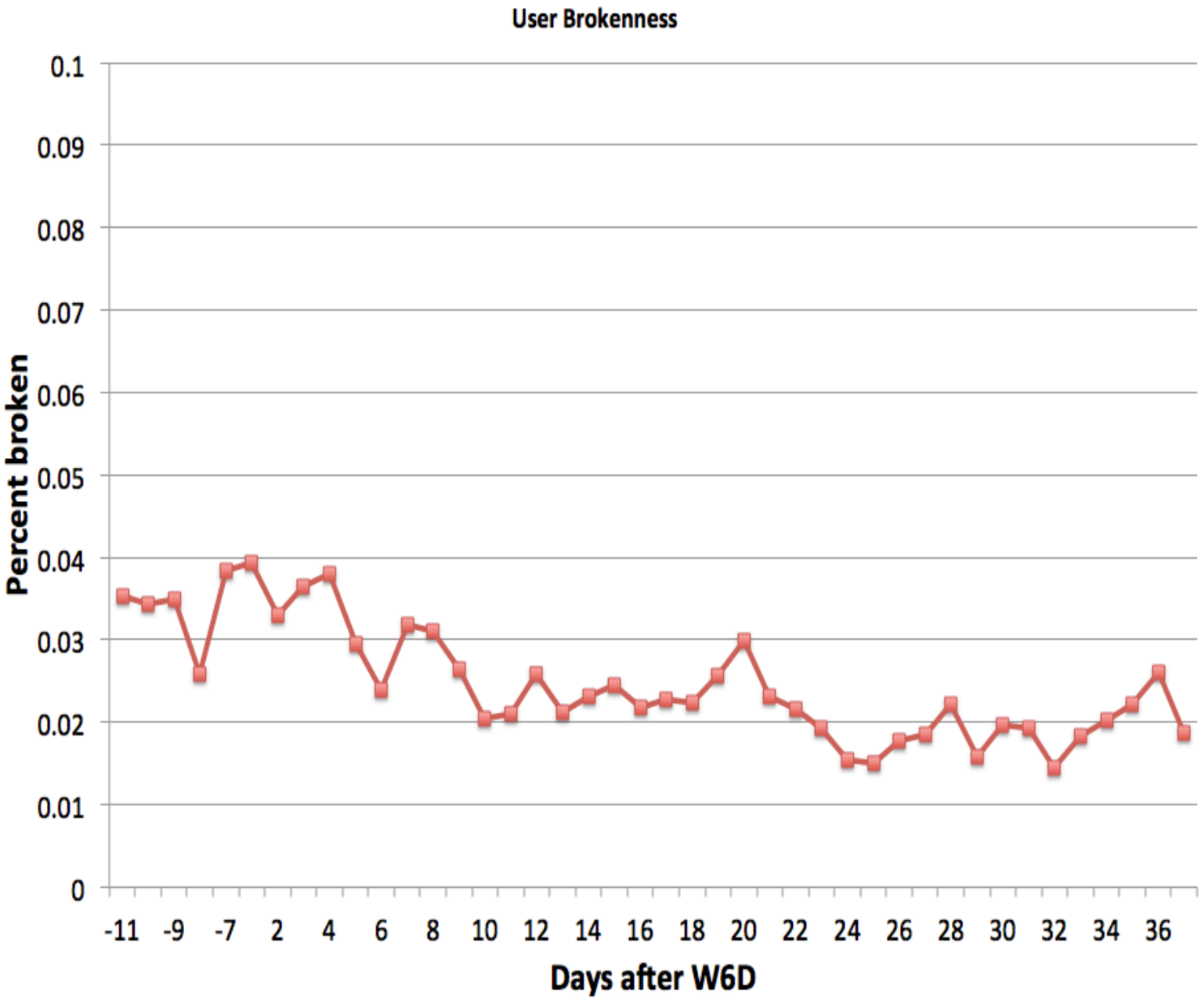


Developers site permanently dual-stacked

```
;; ANSWER SECTION:
developers.facebook.com. 30     IN      AAAA    2620:0:1c00:0:face:b00c:0:4
```

DS to everyone via Facebook Connect (2.5M websites)

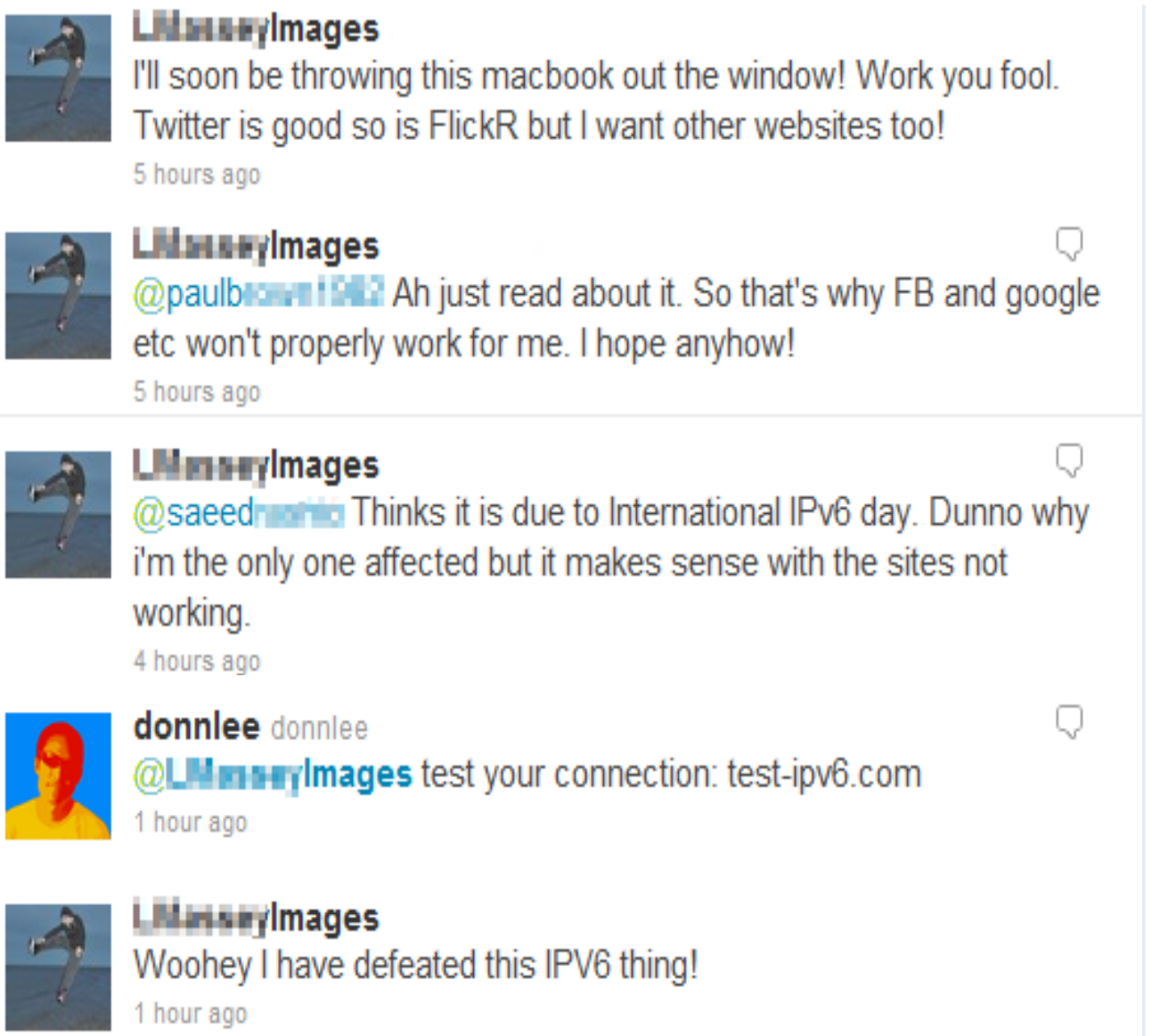
Surprisingly, brokenness seems to be declining



Learnings

- Date on calendar = strong motivator
- 1-hour test boosted confidence
- Adapting tools for v6 is largest effort
- Passionate users
- Nothing to fear
- Difficult for public to understand

Broken user gets fixed



Yahoo!

World IPv6 Day Debrief

Igor Gashinsky
Principal Architect
Yahoo!
July 25th, 2011

YAHOO! CONFIDENTIAL

Why did we do it?

- Promoting IPv6 adoption
  - Breaking chicken/egg paradigm
- Last-ditch effort to help with “broken users” problem
  - Current “breakage stats” are ~ 0.022%
  - 21 months ago this was 0.078%!

Participating Yahoo! Front Page Markets

Yahoo!

10 Front Page Serving Sites

Yahoo!

Seven IPv6 Proxy Locations

Yahoo!

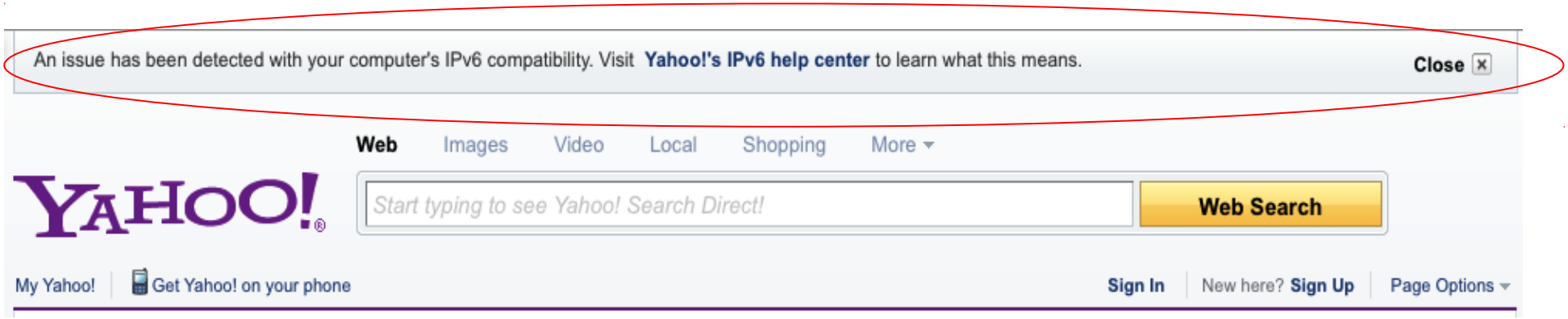
Preparing the Infrastructure

- Turned up 6to4 return tunnel infrastructure in all backbone/serving locations
  - Saw about 140ms performance improvement to 6to4 users as a result
- Dual-stacked our front-end proxy infrastructure
- Modified a *lot* of code (abuse, geo, ad-targeting, etc)
- IPv6 serving capacity over-provisioned x1000

  – All that was actually the easy part…

- Ran 2x 15 minute live tests ahead of time
  – Learned some interesting lessons along the way
  – 5PM is a really bad time to start a test
  – Just because you are monitoring something, doesn't mean that you are monitoring it via IPv6!

Preparing the Users



- User education and outreach
  - Beaconing system in place to detect “broken” users
  - Window shade alert on the Y! front page notifying them
  - IPv6 help pages in 38 languages
  - IPv6 test tool
  - Lots and lots of PR

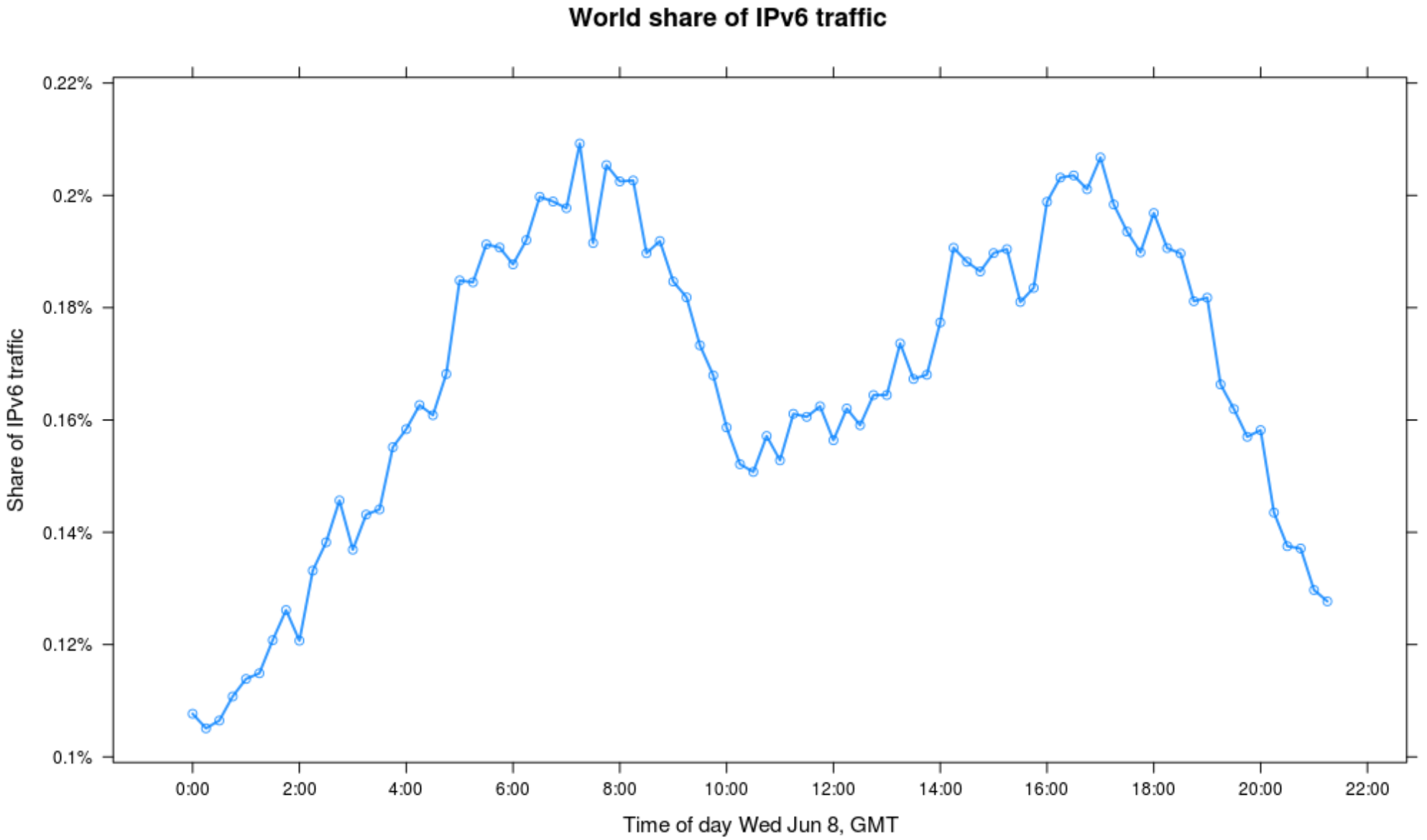
World IPv6 Day, by the numbers

- Over 2.2 Million users served via IPv6
- Over 1 Million visits to Y! IPv6 help pages
- Ratio of users served via IPv6:
- Peak = 0.229%
- Average = 0.168%

- France led the pack with over 3% IPv6-enabled users!
- Thank you Free.fr!
- US was at 0.35%

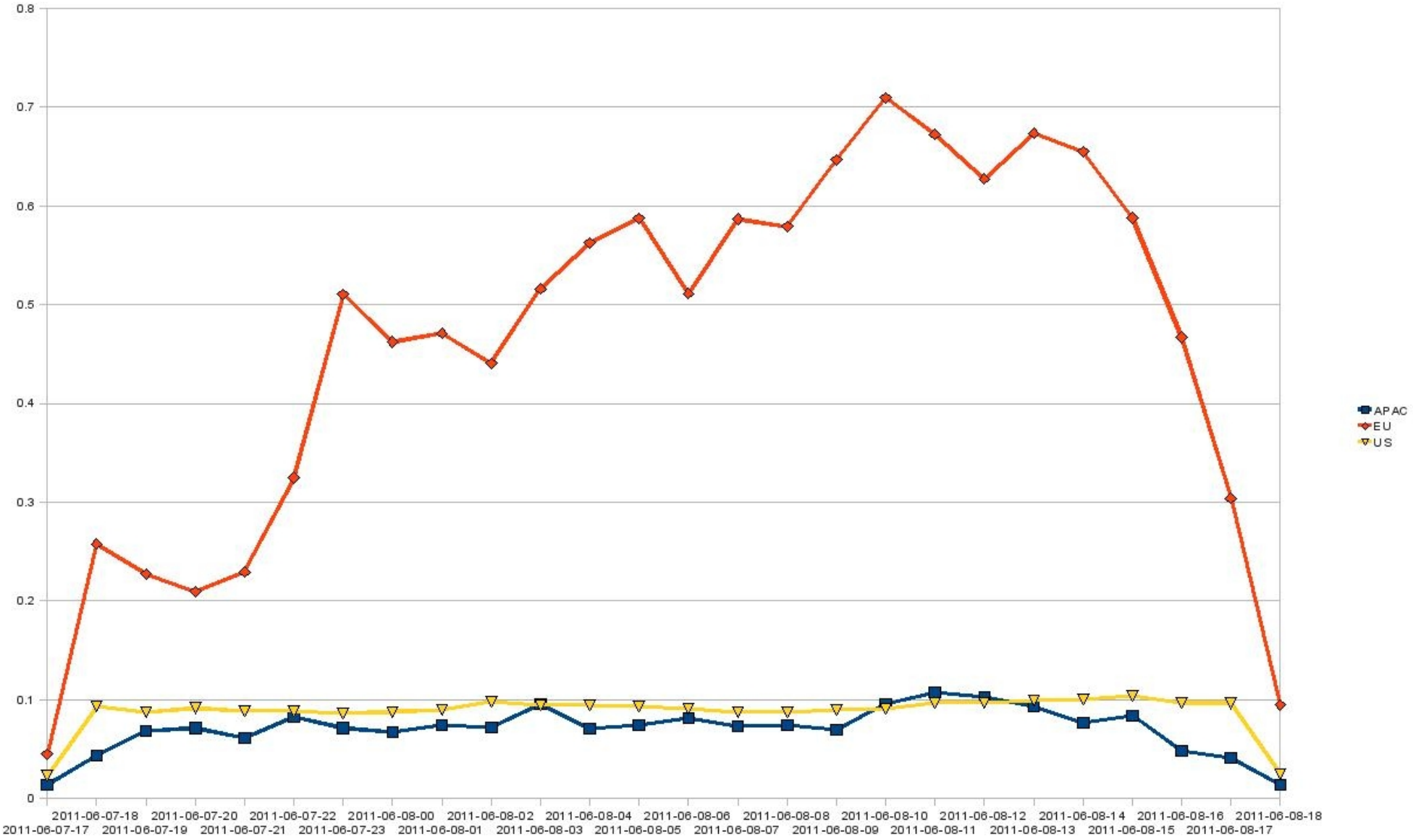
- Breakage stats remained the same (0.022%) □

Per-hour IPv6 Statistics



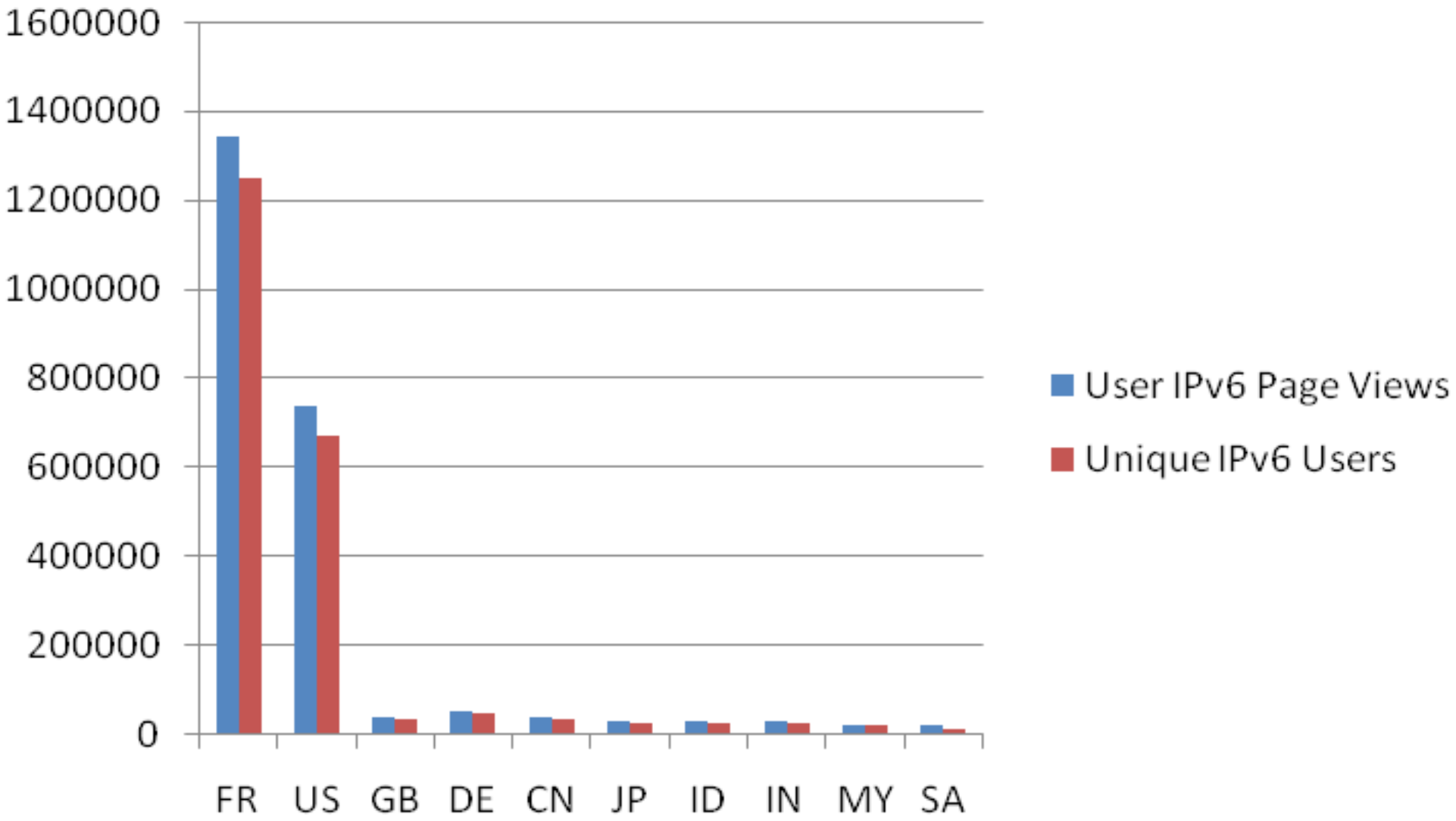
Yahoo!

Per-hour Region Breakdown

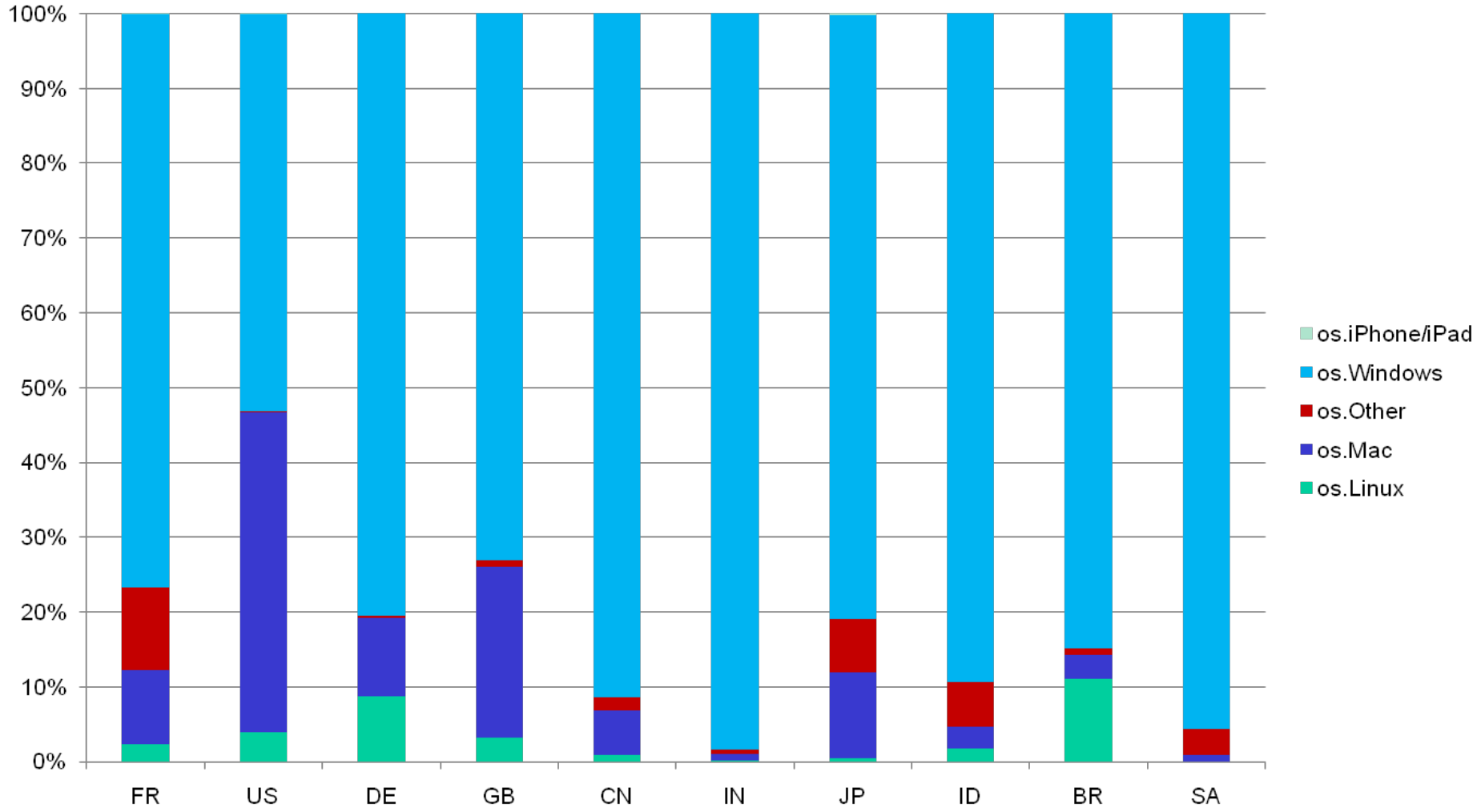


Yahoo!

IPv6 users by Country



IPv6 users by Country/OS



Yahoo!

That was a lot of work for 0.229%!

Telefónica

World IPv6 Day

ISP Insight

July 25th, 2011
IETF#81, Quebec City

Carlos Ralli (@carlosralli)
Telefónica R&D

Telefónica

W6D: ISP motivation to join

Our Customers are thirsty of Contents/Services …

... v4-glass getting like cloudy water due to saturation & complexity ...

… v6-Internet glass is empty of mainstream contents and services …

W6D - A step on the right way. Jump altogether to fill v6 space.

Telefónica

W6D: Our contribution to fill v6 Space

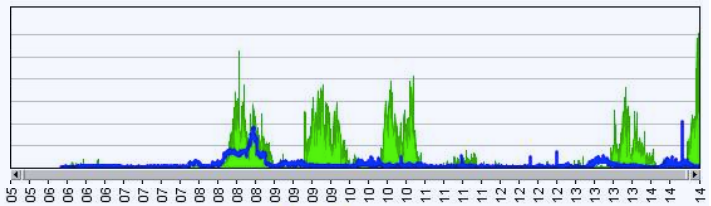
Enabled sites in 2 key countries within our footprint

Brokenness<0,04%
No related CallCenter activity

www.terra.com.br
mail.terra.com.br
noticias.terra.com.br
esportes.terra.com.br
tecnologia.terra.com.br
vidaeestilo.terra.com.br

Telefónica

W6D: ISPs key areas to focus

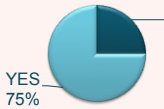


INT'L Traffic x20 , still very low
Later, some other days peaks back

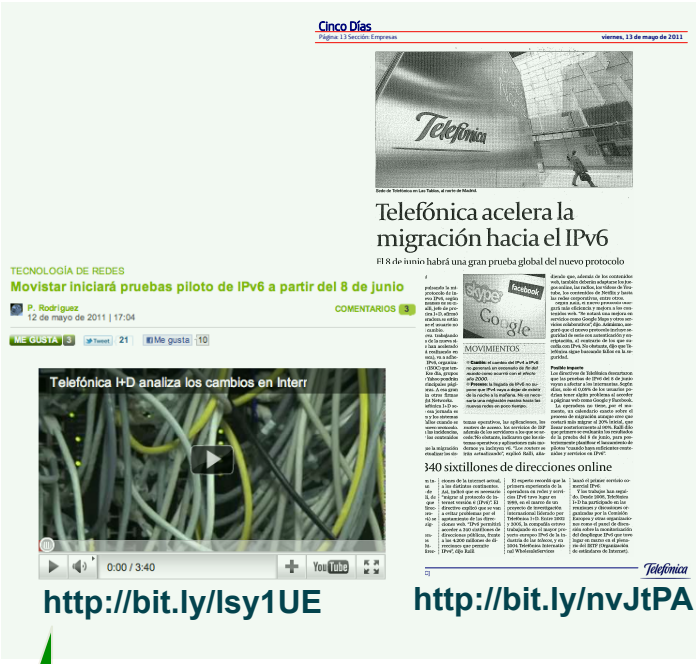
DNS
ROUTING
SECURITY
MEASURING

OPERATIONS

- Corp. Trial (IPv6 to employees):
  Got IPv6 Enabled?



Employees didn't notice



http://bit.ly/lsy1UE

http://bit.ly/nvJtPA

CORPORATE/EVENTS

WEBSITES/HOSTING

~~LONG TAIL / ENTERPRISE~~

TRIALS

AWARENESS

EXPLAIN W6D IN OUR COUNTRIES

INVOLVE PARTNERS, SUPPLIERS

CALL for v6 in BIZ PLANS
http://bit.ly/pssJLi

W6D Heroes

Participating

Content Providers

Participating

ISPs

RIRs

Internet Society

Vendors

Supporting us

IPv6 FORUM

W6D provided synchronization

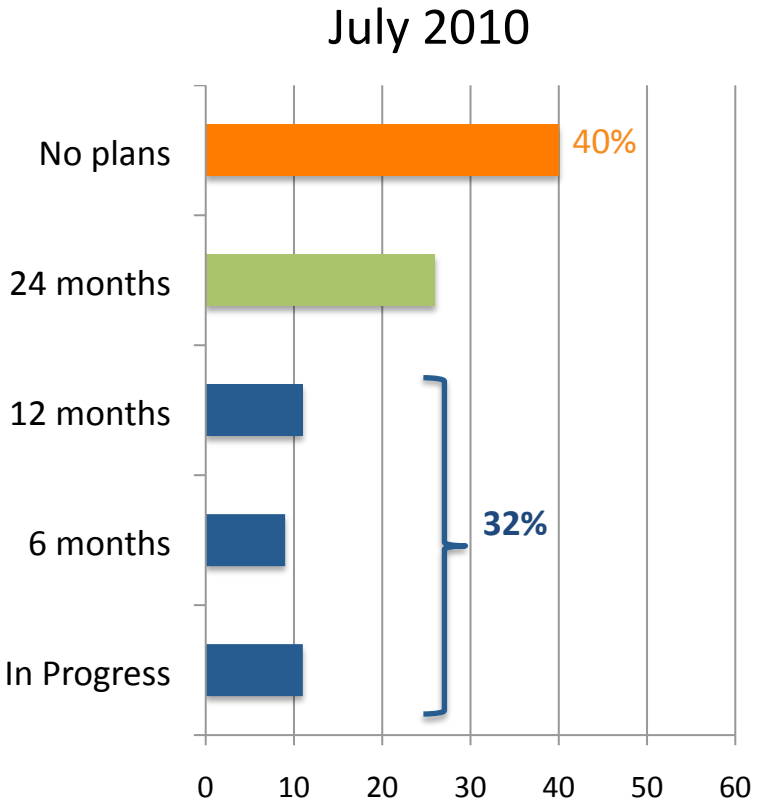
Key experts

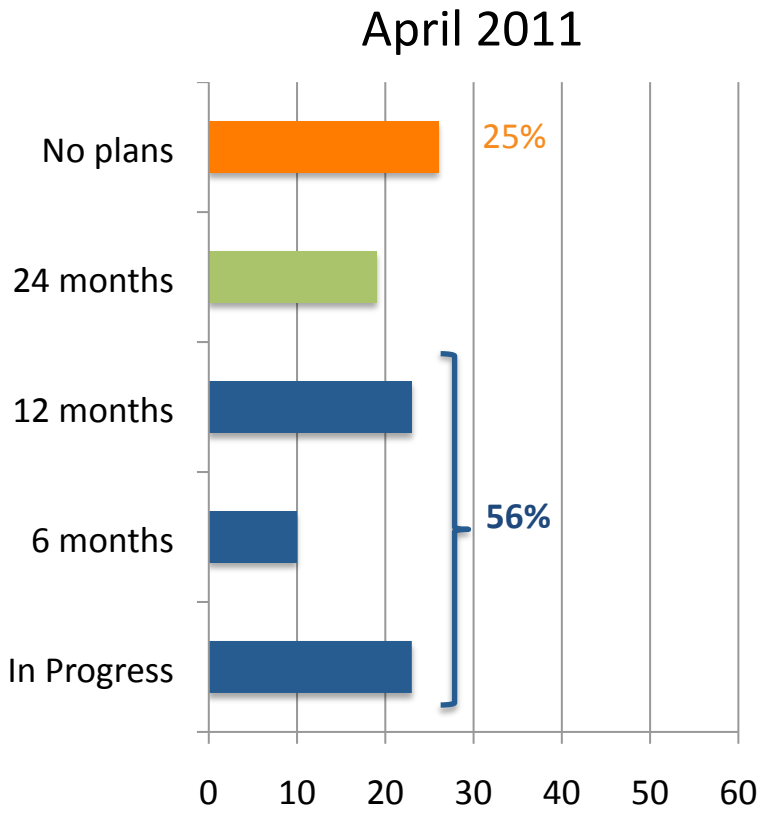
W6D enabled R-T Open-collaboration

Cisco

Cisco Enterprise Technical Advisory Board Survey

"When are you planning to deploy IPv6 in production?"





Primary driver cited is "Internet evolution": 65%

via http://www.cisco.com

- Product info, downloads, documentation, etc.
- 80% of support cases resolved
- 67% of new contracts, 84% of renewals
- 80% of event registrations (Cisco Live, etc)
- 95% of product orders (over $30 Billion USD)

Convincing our CIO…

- IPv6 Leadership and Preparedness

  “dog food”

- IT Implementation Team Confidence

  “we know how to do it”

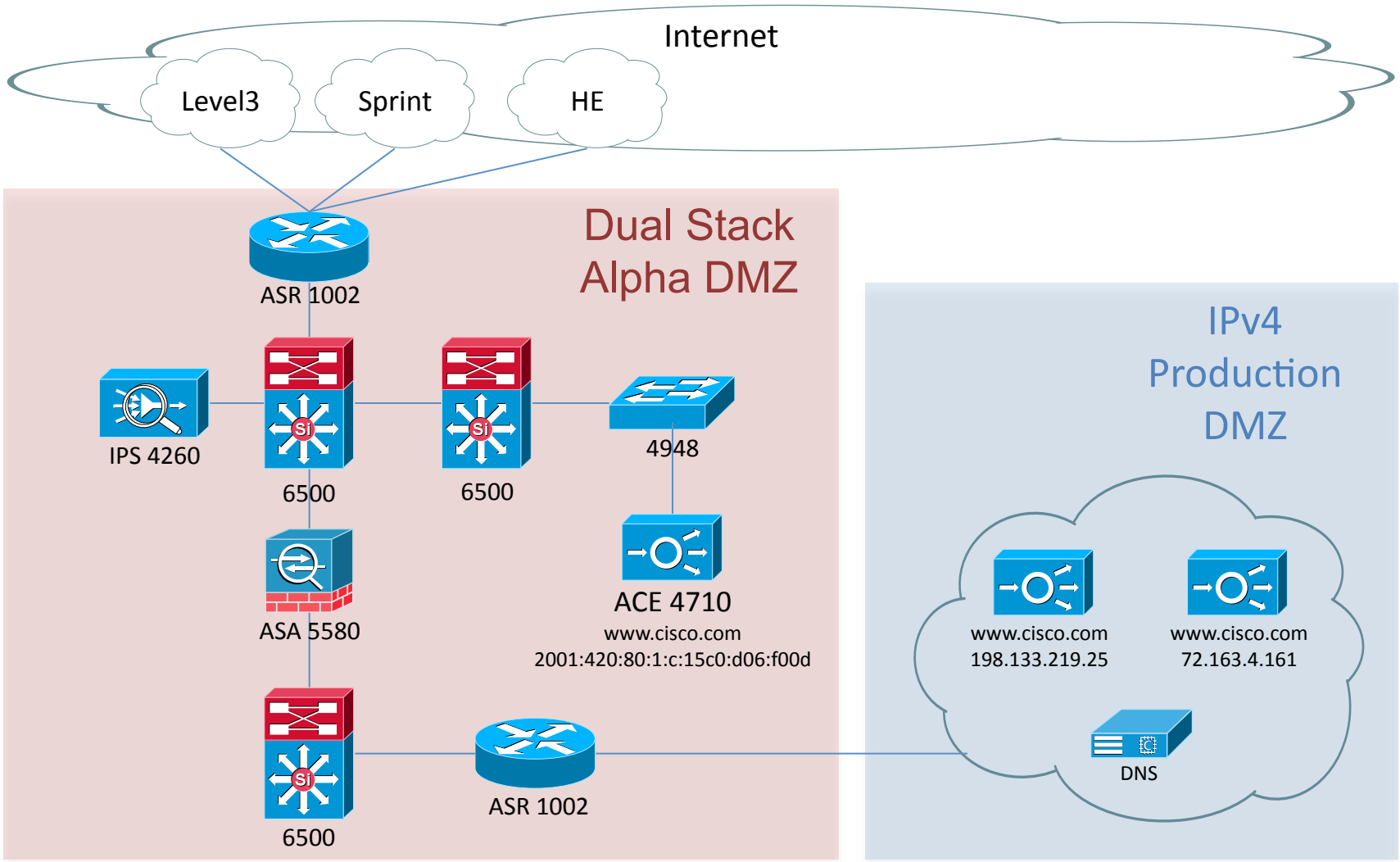
- Acceptable risk evaluation

  “just 24 hours, and we’ll watch it like a hawk”

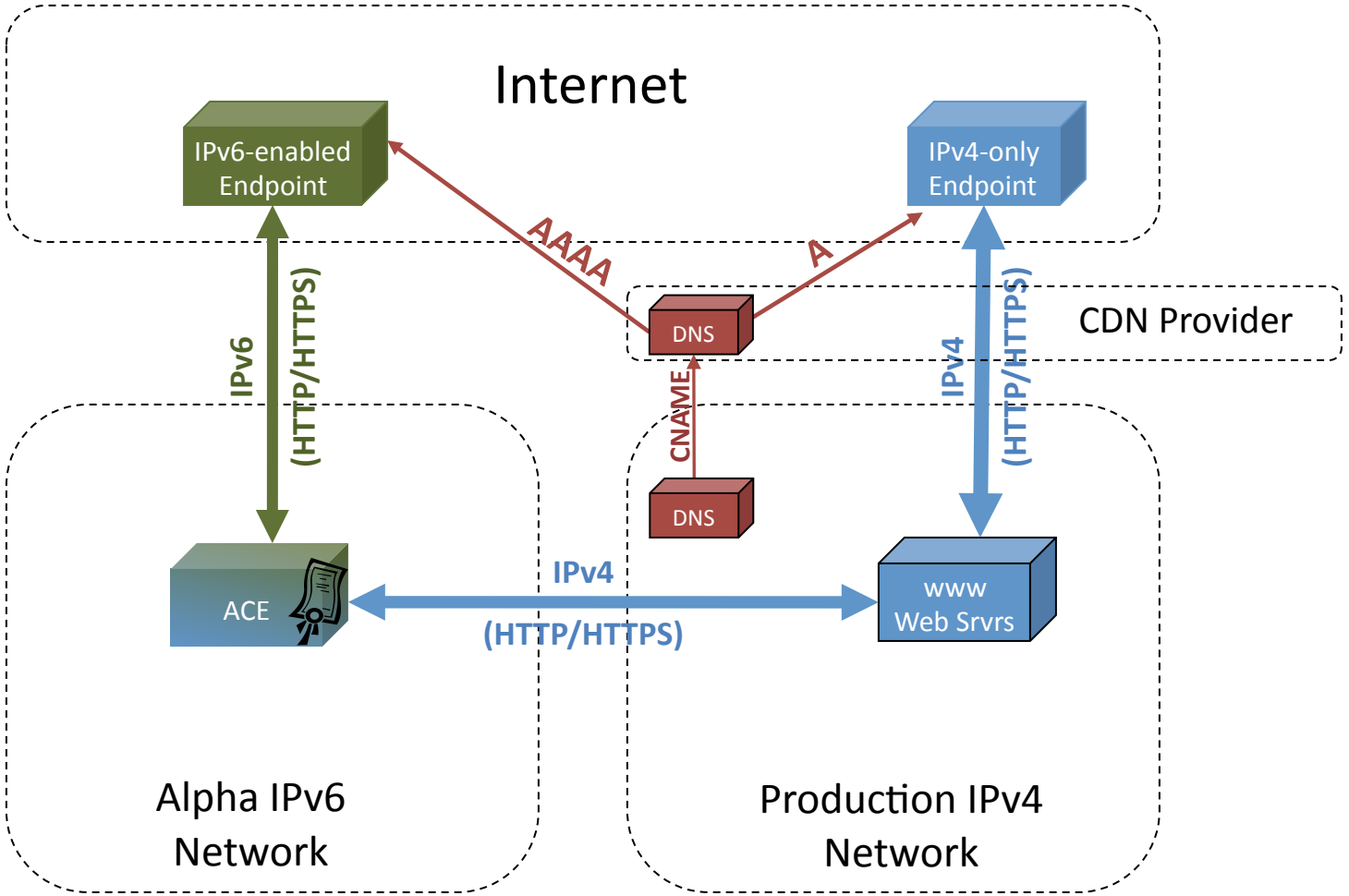
- Unique opportunity for safe experimentation

  “everyone else is doing it”

World IPv6 Day Network Design

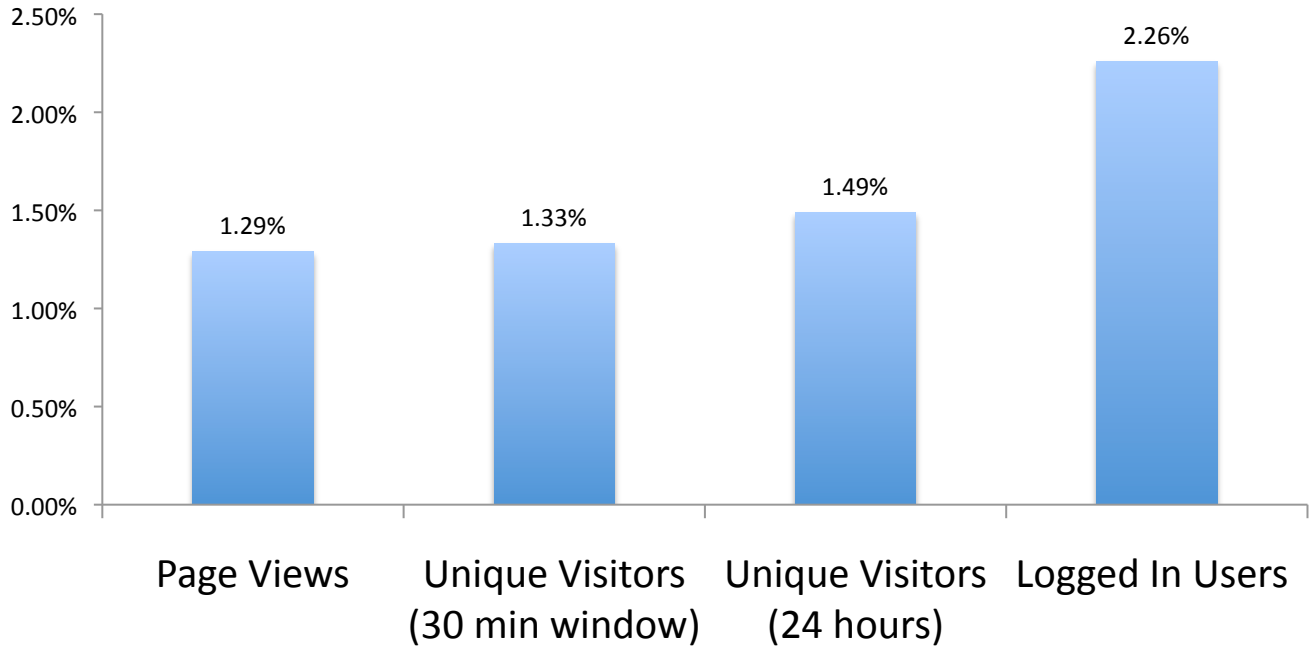


```
$ dig +short AAAA www.cisco.com
2001:420:80:1:c:15c0:d06:f00d
```



What we saw…

- 1.11% of all traffic to/from www.cisco.com was IPv6
- Zero www.cisco.com support cases attributed to World Day



PS: www.scansafe.com is Cisco too, and we kept AAAAs up after June 8

Get your Free Dog Food T-Shirts! (careful of the wombats though!)