World IPv6 Day Observations
www.WorldIPv6Day.org

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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

Ready for the future of the Internet?

Yes, looks like you’re using IPv6 already.
Welcome to the future of the Internet!

Learn more about IPv6, or read about World IPv6 Day.
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
- 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
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)
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)

Tears, congratulations as Atlantis lands, shuttle program ends

Storyline
An action-thriller about a writer who takes an experimental drug that allows him to use 100 percent of his mind. As one man evolves into the perfect version of himself, forces more corrupt than he can imagine mark him for assassination. Out-of-work writer Eddie Morra’s (Cooper) rejection by girlfriend Lindy (Abbie Cornish) confirms his belief that he has zero future. That all vanishes the day an old friend introduces Eddie to NZT, a designer pharmaceutical that makes him laser focused and more confident than any man alive.
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

**LInyraImages**
'I'll soon be throwing this macbook out the window! Work you fool. Twitter is good so is FlickR but I want other websites too!' 5 hours ago

**LInyraImages**
@paulbrown1143 Ah just read about it. So that's why FB and google etc won't properly work for me. I hope anyhow! 5 hours ago

**LInyraImages**
@saeedNokia Thinks it is due to International IPv6 day. Dunno why i'm the only one affected but it makes sense with the sites not working. 4 hours ago

**donnlee** donnlee
@LInyraImages test your connection: test-ipv6.com 1 hour ago

**LInyraImages**
Woohey I have defeated this IPV6 thing! 1 hour ago
Yahoo!
World IPv6 Day Debrief

Igor Gashinsky
Principal Architect
Yahoo!
July 25th, 2011
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
10 Front Page Serving Sites
Seven IPv6 Proxy Locations
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

World share of IPv6 traffic

Share of IPv6 traffic

Time of day Wed Jun 8, GMT
Per-hour Region Breakdown
IPv6 users by Country
IPv6 users by Country/OS
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
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.
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

www.tid.es
Info.telefonica.es
www.teleprensa.telefonica.com

Telefónica Research & Development
W6D: ISPs key areas to focus

- Corp. Trial (IPv6 to employees):
  - Got IPv6 Enabled?
  - Employees didn’t notice

- Long Tail / Enterprise

- Websites/Hosting

- Trials

- Awareness

- Explain W6D in our countries

- Involve partners, suppliers

- Call for v6 in Biz Plans

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

DNS
Routing
Security
Measuring
Operations

Employees

NO
25%

YES
75%

Got IPv6 Enabled?

Employees didn’t notice

W6D Heroes

Participating Content Providers

RIRs

Participating ISPs

Vendors

Supporting us

Internet Society

Key experts

W6D provided synchronization

W6D enabled R-T Open-collaboration

Telefónica Research & Development
Cisco Enterprise Technical Advisory Board Survey

“When are you planning to deploy IPv6 in production?”

**July 2010**

- No plans: 40%
- 24 months: 32%
- 12 months: 10%
- 6 months: 10%
- In Progress: 10%

**April 2011**

- No plans: 25%
- 24 months: 10%
- 12 months: 20%
- 6 months: 10%
- In Progress: 35%

*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

Dual Stack Alpha DMZ

IPv4 Production DMZ

IP addresses:
- www.cisco.com 198.133.219.25
- www.cisco.com 72.163.4.161
- DNS
$$\text{dig } +\text{short} \text{ AAAA www.cisco.com}$$

$$2001:420:80:1:c:15c0:d06:f00d$$
What we saw...

- 1.11% of all traffic to/from [www.cisco.com](http://www.cisco.com) was IPv6
- Zero [www.cisco.com](http://www.cisco.com) support cases attributed to World Day

PS: [www.scansafe.com](http://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!)