

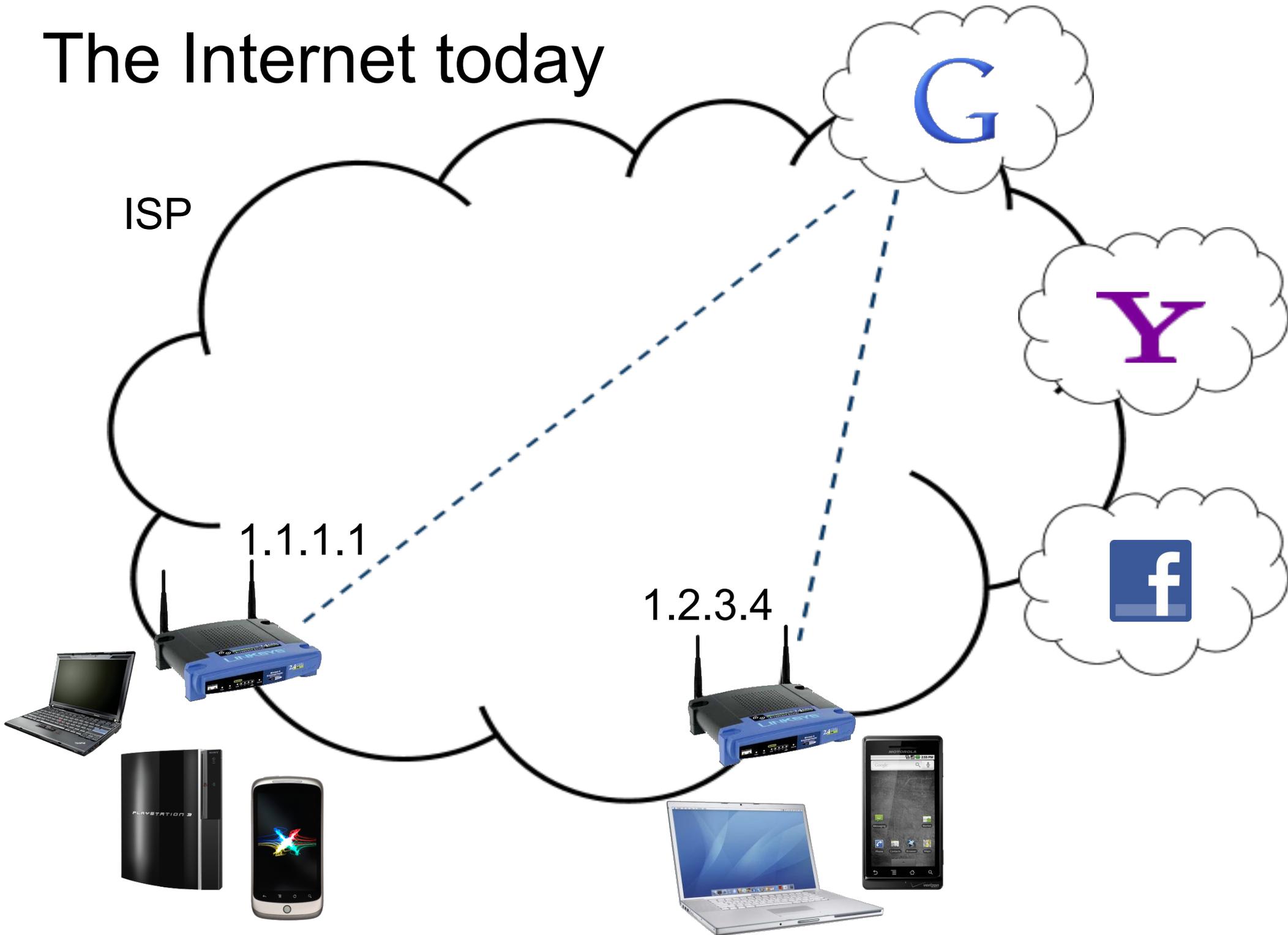


World IPv6 Day

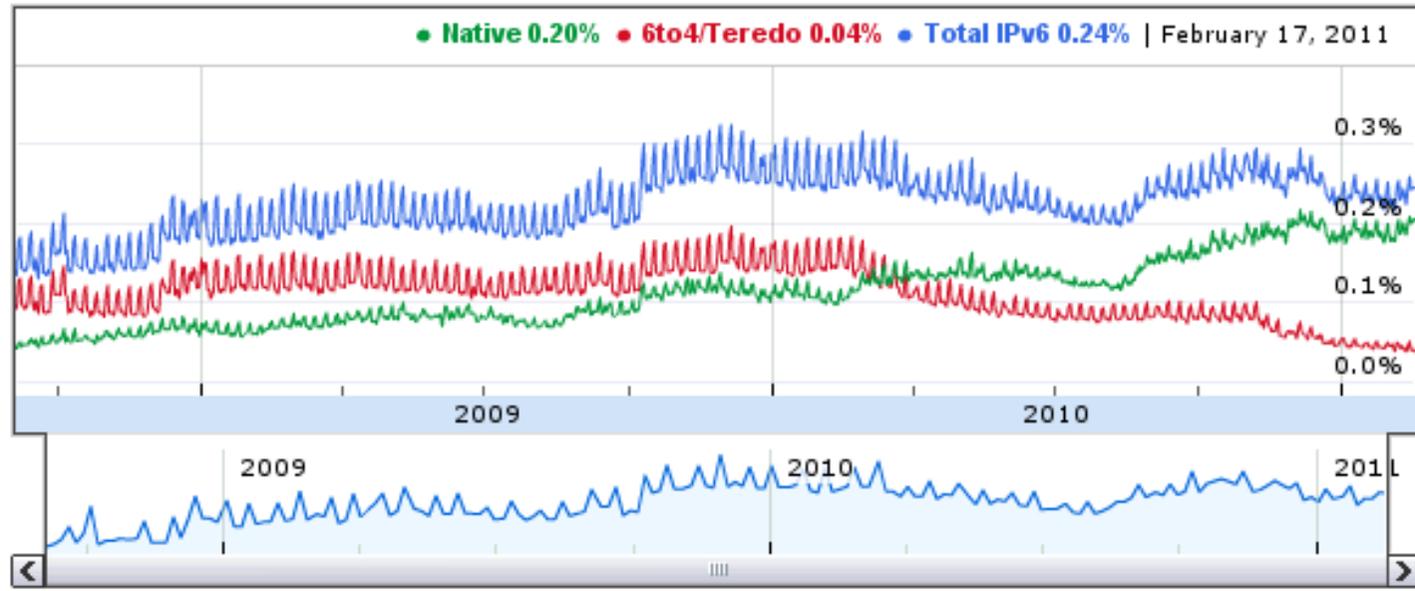
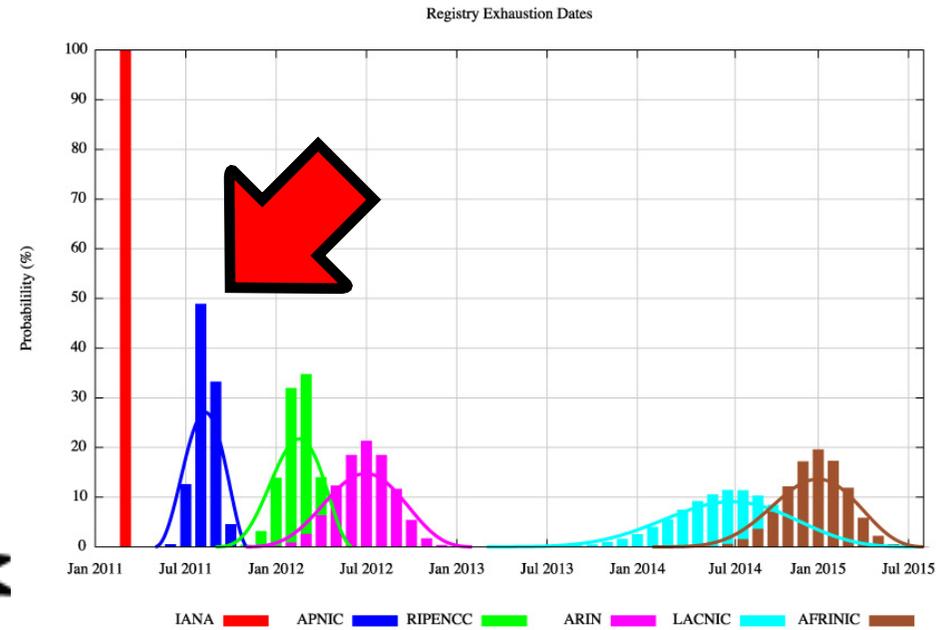
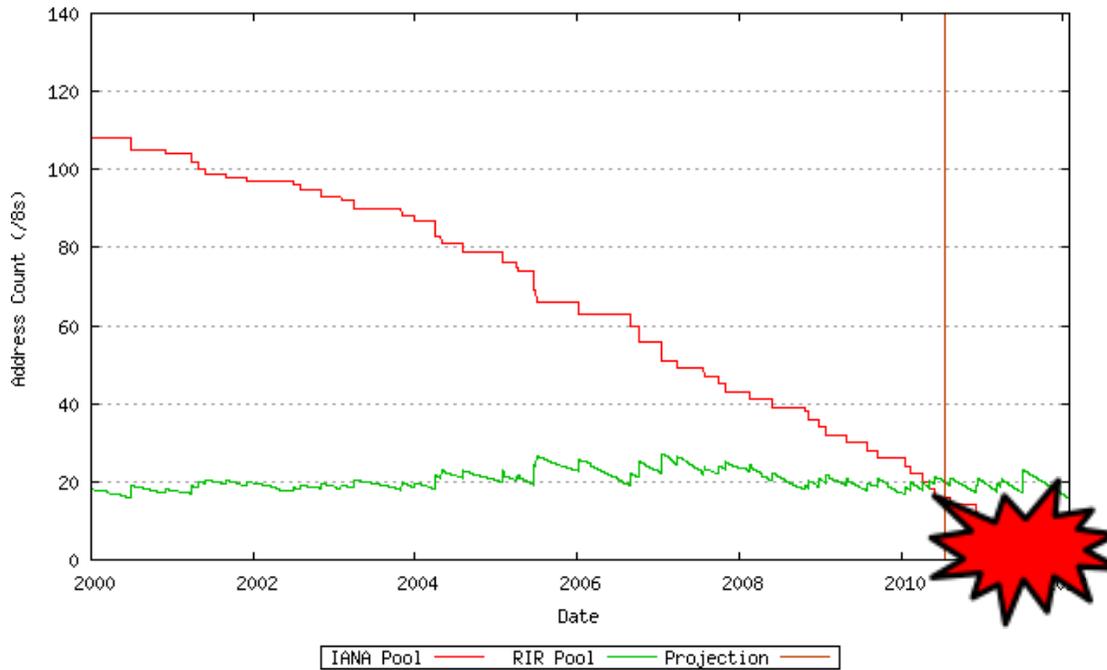
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What's the problem?

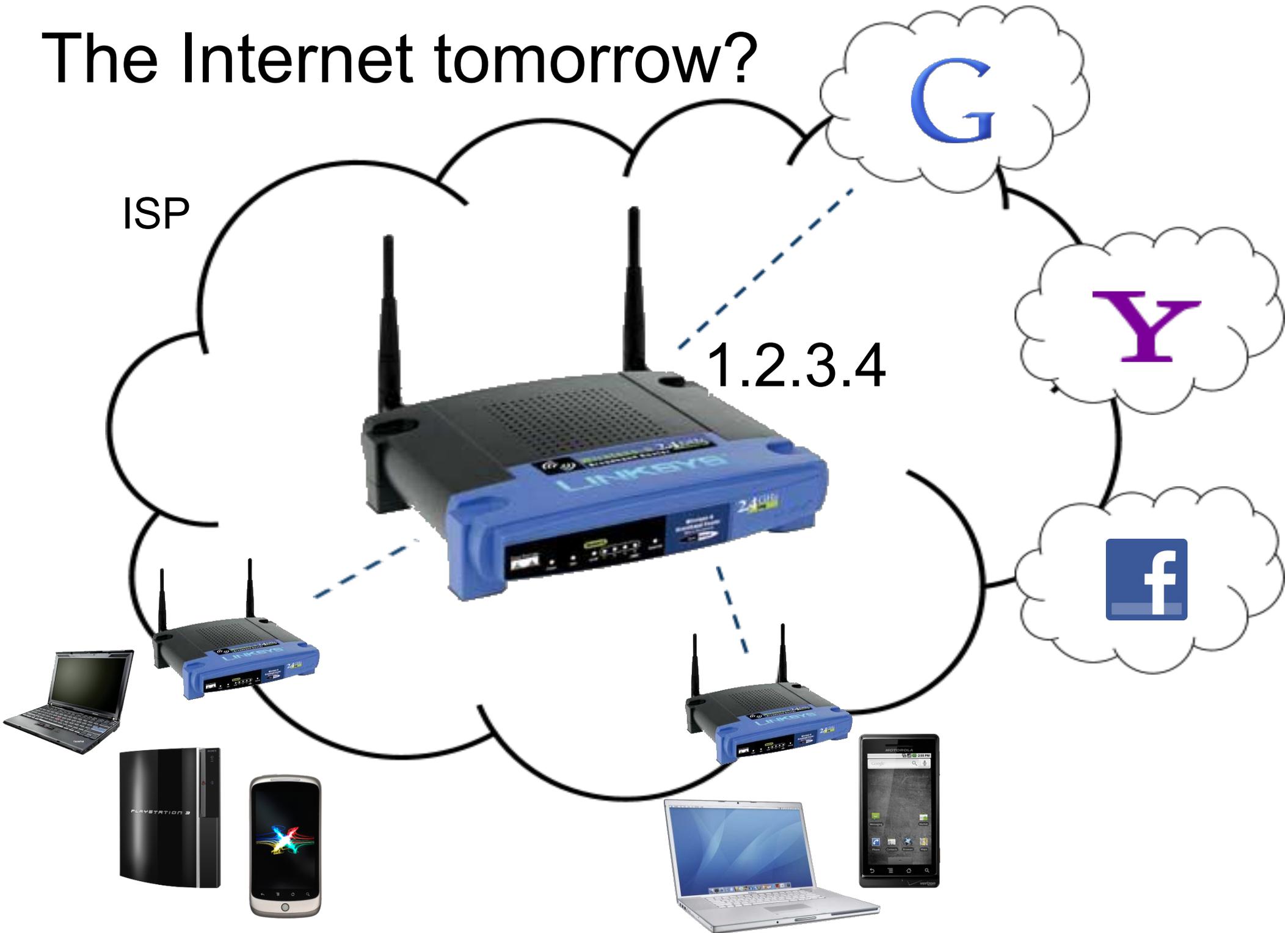
The Internet today



No more IPv4... but no IPv6 yet either



The Internet tomorrow?



More specifically...

- We need to move to IPv6
 - ... but to do that IPv6 must provide same quality as IPv4
- Unfortunately, there are problems
 - Brokenness in home networks
 - Incomplete IPv6 backbone interconnections
 - Access network scaling
 - Lack of IPv6 CPE standards

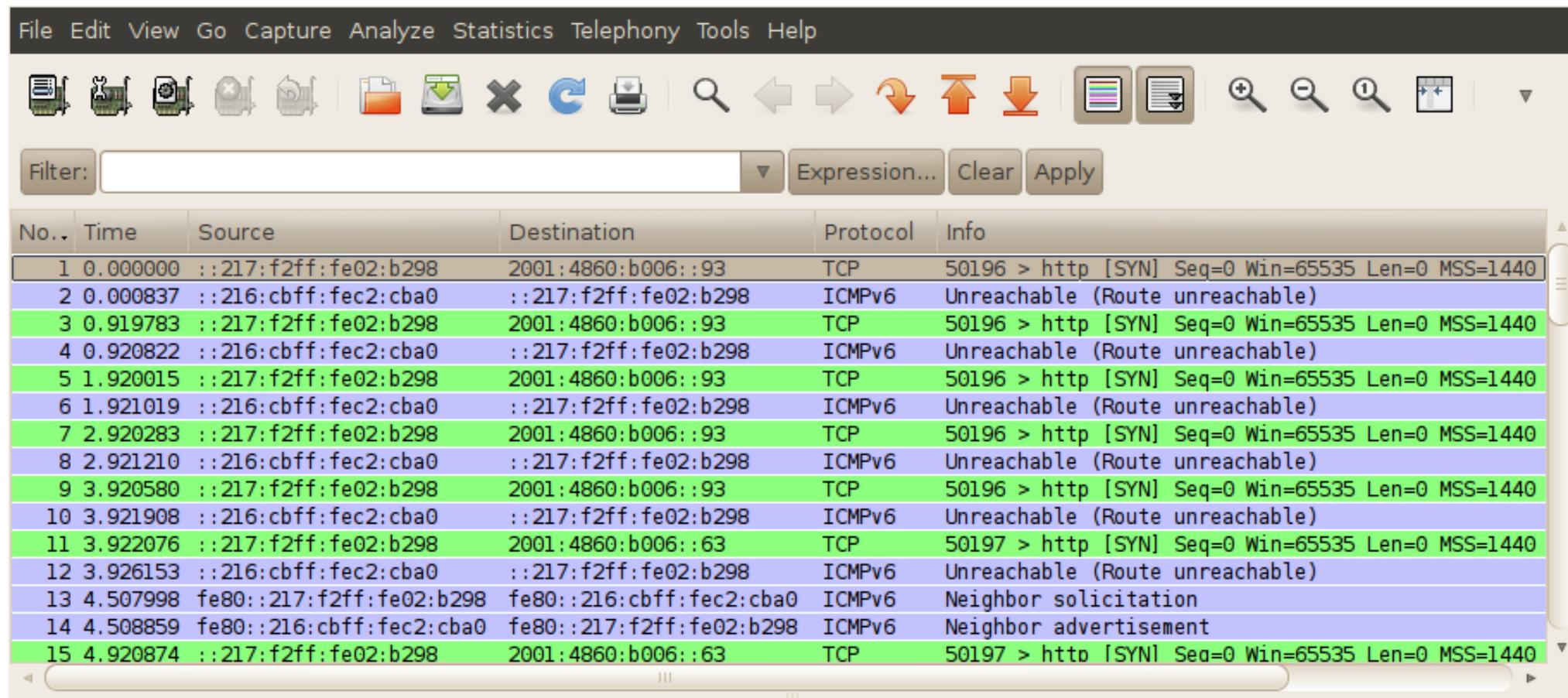
IPv6 Brokenness

- Many OSes and browsers try IPv6 first, then IPv4
- If the host has malfunctioning IPv6, fallback is very slow
 - Windows: 20 seconds
 - OS X: 4 or 75 seconds
 - Linux: instant or 3 minutes
- This is **for each connection**
 - A full website will take **minutes** to load
- Unacceptable for websites like Google
 - Would you like to wait 20s for every Google search?
 - Would you like to wait 2 minutes before using maps?

What's the impact?

- Several parties have been measuring impact
 - Google, Yahoo, Facebook, Tore Anderson
 - Measurement via hidden images / javascript
- Approximately 0.03% of users have this problem
 - If you have 1B users, 0.03% is 300k
- ~90% of this is due to Mac OS X

My favourite example



The screenshot shows a Wireshark capture of network traffic. The interface includes a menu bar (File, Edit, View, Go, Capture, Analyze, Statistics, Telephony, Tools, Help), a toolbar with various icons, and a filter field. The main display area shows a list of 15 captured packets. The packets alternate between TCP SYN attempts and ICMPv6 unreachable responses. The TCP SYN packets are from source ::217:f2ff:fe02:b298 to destination 2001:4860:b006::93 (or ::63). The ICMPv6 unreachable responses are from source ::216:cbff:fec2:cba0 to the same destinations. The SYN packets have Seq=0, Win=65535, Len=0, and MSS=1440. The ICMPv6 responses are labeled 'Unreachable (Route unreachable)'. The capture ends with a Neighbor advertisement from fe80::216:cbff:fec2:cba0 to fe80::217:f2ff:fe02:b298.

No.	Time	Source	Destination	Protocol	Info
1	0.000000	::217:f2ff:fe02:b298	2001:4860:b006::93	TCP	50196 > http [SYN] Seq=0 Win=65535 Len=0 MSS=1440
2	0.000837	::216:cbff:fec2:cba0	::217:f2ff:fe02:b298	ICMPv6	Unreachable (Route unreachable)
3	0.919783	::217:f2ff:fe02:b298	2001:4860:b006::93	TCP	50196 > http [SYN] Seq=0 Win=65535 Len=0 MSS=1440
4	0.920822	::216:cbff:fec2:cba0	::217:f2ff:fe02:b298	ICMPv6	Unreachable (Route unreachable)
5	1.920015	::217:f2ff:fe02:b298	2001:4860:b006::93	TCP	50196 > http [SYN] Seq=0 Win=65535 Len=0 MSS=1440
6	1.921019	::216:cbff:fec2:cba0	::217:f2ff:fe02:b298	ICMPv6	Unreachable (Route unreachable)
7	2.920283	::217:f2ff:fe02:b298	2001:4860:b006::93	TCP	50196 > http [SYN] Seq=0 Win=65535 Len=0 MSS=1440
8	2.921210	::216:cbff:fec2:cba0	::217:f2ff:fe02:b298	ICMPv6	Unreachable (Route unreachable)
9	3.920580	::217:f2ff:fe02:b298	2001:4860:b006::93	TCP	50196 > http [SYN] Seq=0 Win=65535 Len=0 MSS=1440
10	3.921908	::216:cbff:fec2:cba0	::217:f2ff:fe02:b298	ICMPv6	Unreachable (Route unreachable)
11	3.922076	::217:f2ff:fe02:b298	2001:4860:b006::63	TCP	50197 > http [SYN] Seq=0 Win=65535 Len=0 MSS=1440
12	3.926153	::216:cbff:fec2:cba0	::217:f2ff:fe02:b298	ICMPv6	Unreachable (Route unreachable)
13	4.507998	fe80::217:f2ff:fe02:b298	fe80::216:cbff:fec2:cba0	ICMPv6	Neighbor solicitation
14	4.508859	fe80::216:cbff:fec2:cba0	fe80::217:f2ff:fe02:b298	ICMPv6	Neighbor advertisement
15	4.920874	::217:f2ff:fe02:b298	2001:4860:b006::63	TCP	50197 > http [SYN] Seq=0 Win=65535 Len=0 MSS=1440

- Home gateway sending out an RA of ::/64
- Host ignoring the unreachables
- 24-second timeout

Lorenzo Colitti

Fixing IPv6 brokenness

- Fixing home routers: impractical
 - Need router upgrade
 - Firmware often not upgradable
 - Users don't typically upgrade home gateways
 - Even if they did, hard to know what the problem is
- Fixing hosts: possible
 - Workarounds in individual applications (e.g., Chrome)
 - To fix all apps, need OS upgrade
 - OS upgrade can also work around router problems
- Only possible fix is in OS and applications

Interconnection

- Some backbone operators don't have IPv6 interconnections with each other
 - My home IPv6 connection can't reach some ISPs
- This can break dual-stack websites
 - It's as if the user had broken IPv6
 - 20-75 timeout on every connection

Access network scaling

- The 0.03% brokenness figure is for very low traffic
- What will happen if we turn IPv6 on at scale?
- From a large IPv6 deployment:
 - "Are you throttling IPv6 traffic to us?"
 - No, a router in the path was software forwarding
- When www.biglobe.ne.jp went dual-stack a few years ago
 - Instant 5% drop in page views
 - Walled garden network saturation?

World IPv6 Day

Basic Idea

- There are problems, but we're running out of time
- Need to find out if IPv6 really is the solution and will scale
- One-day test when major websites go dual-stack
 - Fix known problems before the day
 - Help users fix brokenness problem
 - Reveal any unforeseen problems (e.g. scaling issues)
- If all goes well:
 - The sky will not have fallen
 - We'll know IPv6 can work
 - Content can go to IPv6, and access can follow

World IPv6 Day

- ISOC-sponsored event
- June 8, 2011
 - 0000 UTC - 2359 UTC
- Major players publish AAAA records for their main websites
 - Facebook, Google, Yahoo, Cisco, ...
 - Open to anyone who wants to participate
- For Google:
 - Google, YouTube, Blogger, Gmail, ... all over IPv6
 - Effectively, turn on Google over IPv6 for the Internet

Before World IPv6 Day

- Media announcements
- Messaging for broken users
 - "You might experience connection problems next week, click here to test your connection"
- Messaging for all users
 - "Tomorrow is World IPv6 Day. Make sure you're ready"
- Point users at www.test-ipv6.com

Discovering the problem: test-ipv6.com



The screenshot shows a web browser window with the URL test-ipv6.com. The page has a navigation bar with links for 'Test IPv6', 'FAQ', 'IPv6 Day', 'Changes/ToDo', and 'Stats'. The main heading is 'Test your IPv6 connectivity.' Below this is a sub-navigation bar with 'Summary', 'Tests Ran', 'Technical Info', and 'Share Results / Contact'. The 'Summary' section contains five items: IPv4 address (98.210.108.75), IPv6 address (2001:470:1f05:9a6:221:6aff:fe7f:1756) and service (he.net. or tunnelbroker.net), a note about World IPv6 Day (June 8th, 2011) with 'No problems are anticipated for you', a congratulatory message about IPv4 and IPv6 connectivity, and a note about DNS server IPv6 access. Below this is a section titled 'Your readiness scores' with two 10/10 scores: one for IPv4 stability and readiness, and one for IPv6 stability and readiness. A link to 'test data' is provided, along with a note that the server side IPv6 readiness stats are updated. The footer includes the date 'Last Updated 31-Jan-2011', a link to the 'contact form', and a copyright notice for Jason Fesler.

TEST IPv6 Test your IPv6. x +

test-ipv6.com

Test IPv6 FAQ IPv6 Day Changes/ToDo Stats

Test your IPv6 connectivity.

Summary Tests Ran Technical Info Share Results / Contact

-  Your IPv4 address on the public internet appears to be 98.210.108.75
-  Your IPv6 address on the public internet appears to be 2001:470:1f05:9a6:221:6aff:fe7f:1756
Your IPv6 service appears to be: he.net. or tunnelbroker.net
-  [World IPv6 day](#) is June 8th, 2011. **No problems are anticipated for you** with this browser, at this location. [\[more info\]](#)
-  Congratulations! You appear to have both IPv4 and IPv6 internet working. If a publisher publishes to IPv6, your browser will connect using IPv6. Your browser prefers IPv6 over IPv4 when given the choice (this is the expected outcome).
-  Your DNS server (possibly run by your ISP) appears to have IPv6 internet access.

Your readiness scores

10/10 for your IPv4 stability and readiness, when publishers offer both IPv4 and IPv6

10/10 for your IPv6 stability and readiness, when publishers are forced to go IPv6 only

Click to see [test data](#)

(Updated server side IPv6 readiness stats)

Last Updated 31-Jan-2011. Use the [contact form](#) if anything appears to be broken.

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After World IPv6 Day

- Every past IPv6 Day has resulted in IPv6 being left on
 - Heise in Germany
 - VG and the APDM papers in Norway
- The current plan is to turn AAAA records off at 2359 UTC
 - If everything goes well, one or more participants might want to leave IPv6 on
- If IPv6 stays on, will your network be ready?
 - Don't put in place a temporary solution!

How you can participate

- Websites
 - Dual-stack your website on the day
 - If everything works well, consider leaving it on
- CDN / hosting companies
 - Allow your customers to participate
- Access providers
 - Provide commercial IPv6 services
 - Help your users with broken IPv6 resolve the problem
 - Measurement
 - Support

If you participate, please do it right

- Do not deploy non-production quality IPv6 just for one day
 - Provides the perception that IPv6 is unreliable
 - IPv6 is not unreliable
 - Bad deployments are unreliable
 - This is worse than no IPv6 at all
- Please take the time to do it right
- Ask yourself:
 - Would you be willing to leave it on?
 - If someone else leaves IPv6 on, will it fall over?
 - If not, ask yourself if it's worth the time to do it

IPv6 home router test plan

Home router IPv6 support

- Home router support for IPv6 varies widely
- Not easy for manufacturers to decide what to implement
 - Many deployment models
 - Autoconf vs DHCPv6, PPPoE, Tunneling, ...
 - Many transition technologies
 - 6rd, DS-Lite, 6to4...
 - Too many standards
 - IETF CE router draft, BBF TR-124, etc.
- IPv6 deployment must not make the Internet less reliable!
 - Don't break connectivity if delegated prefix changes
 - Don't allow IPv4 to work but IPv6 to be broken

IPv6 CPE test plan

- Merge IPv6 CE router draft and TR-124
 - Make suggestions to make things more robust
 - Submit errata to BBF and IETF
- Develop a test plan on top of IPv6 Ready Phase II
 - Take to cable, ADSL, and FTTH operators for review
 - Work with RG vendors to help test
 - Work with IPv6 forum on an IPv6-ready router logo?
- Stretch goal: have a logo ready by IPv6 Day
 - "Your connection has problems with IPv6. If you are buying a new router, buy one with this logo on it"



Questions?

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