

# World IPv6 Day - What did we learn?

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RIPE 63



# RIPE NCC Measurements - World IPv6 Day

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- IPv6 Eyechart and 6to4 (not in this talk)
- Active measurements
  - Sources: 49 vantage points (RIPE TTM, CAIDA Ark, ...)
  - Destinations: 53 participant or already dual-stacked sites
  - From 2011-06-01 to 2011-06-11 we measured
    - DNS: A and/or AAAA records
    - ping(6)/traceroute(6)
    - HTTP over IPv4 and IPv6

# Measurement Vantage Points

▼ CAIDA Ark ▼ RIPE NCC TTM ▼ Other





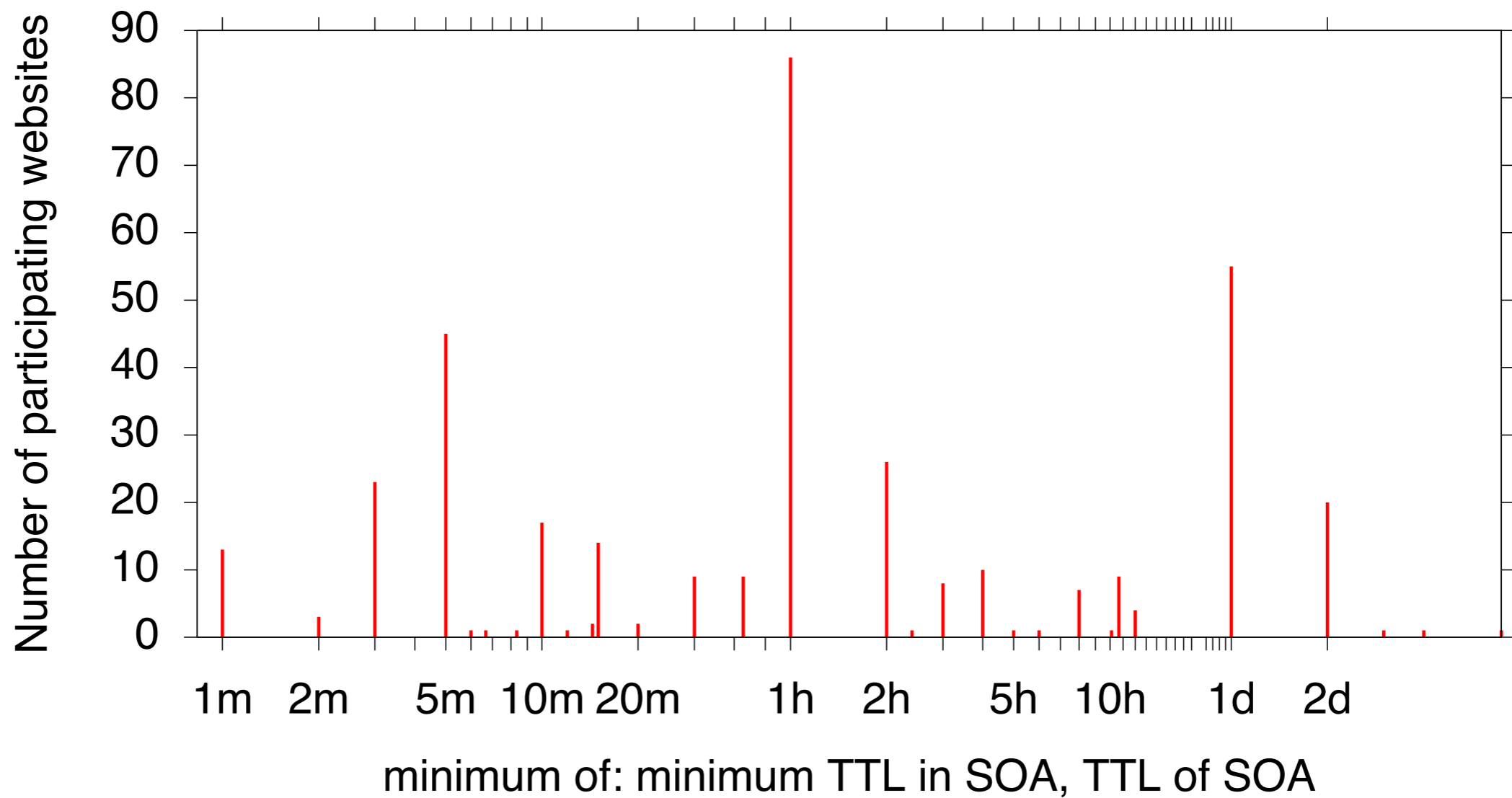
# Lesson: Control

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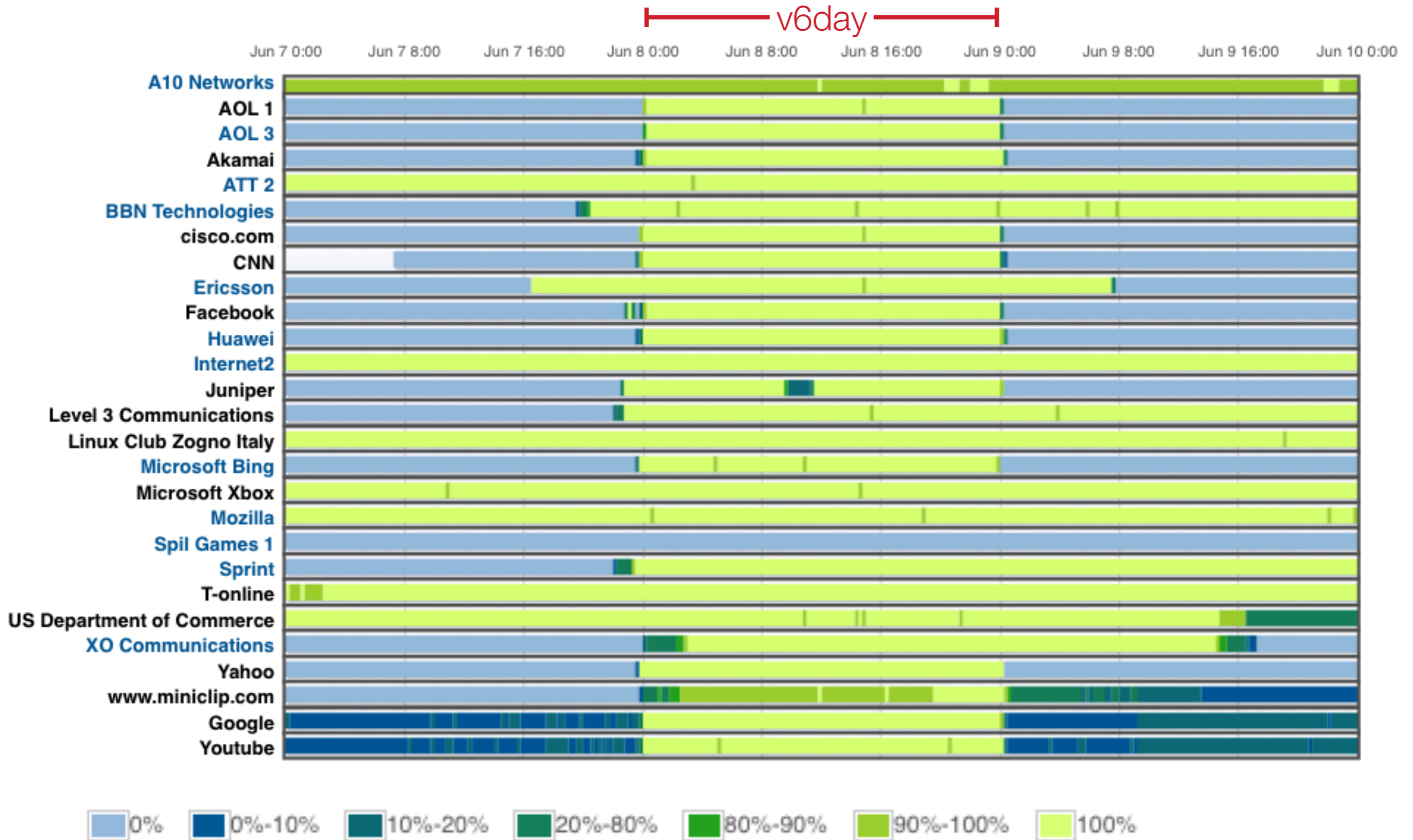
# When Did World IPv6 Day Start?

- Less than 2 days before World IPv6 Day:

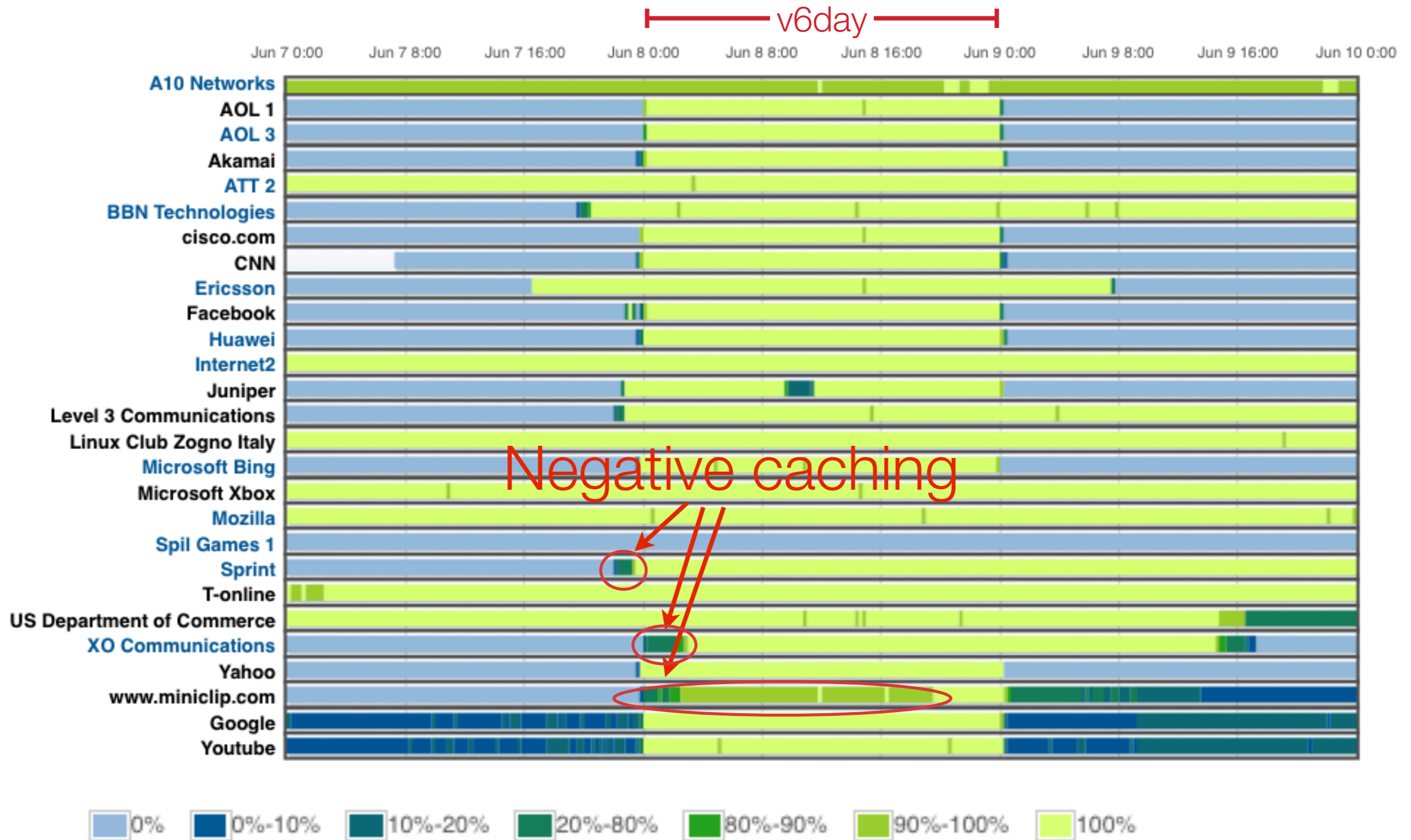
DNS negative caching for websites participating in World IPv6 Day



# Percentage Of Vantage Points Seeing AAAA



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# Control - Lessons Learned

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- Know your on/off switch
  - Control your DNS
- Set low TTL in case of roll-back
- Set low negative TTL
  - By means of minTTL in SOA / TTL of SOA



# Lesson: Test And Monitor

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# You Don't Want This To Happen

On IPv4:

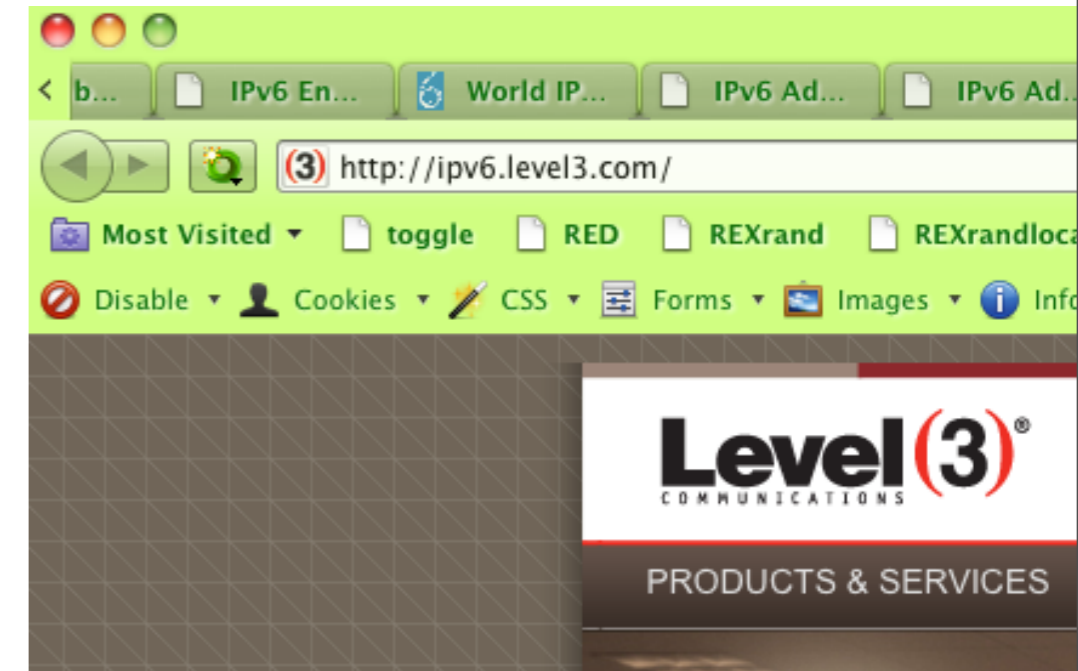


On IPv6:



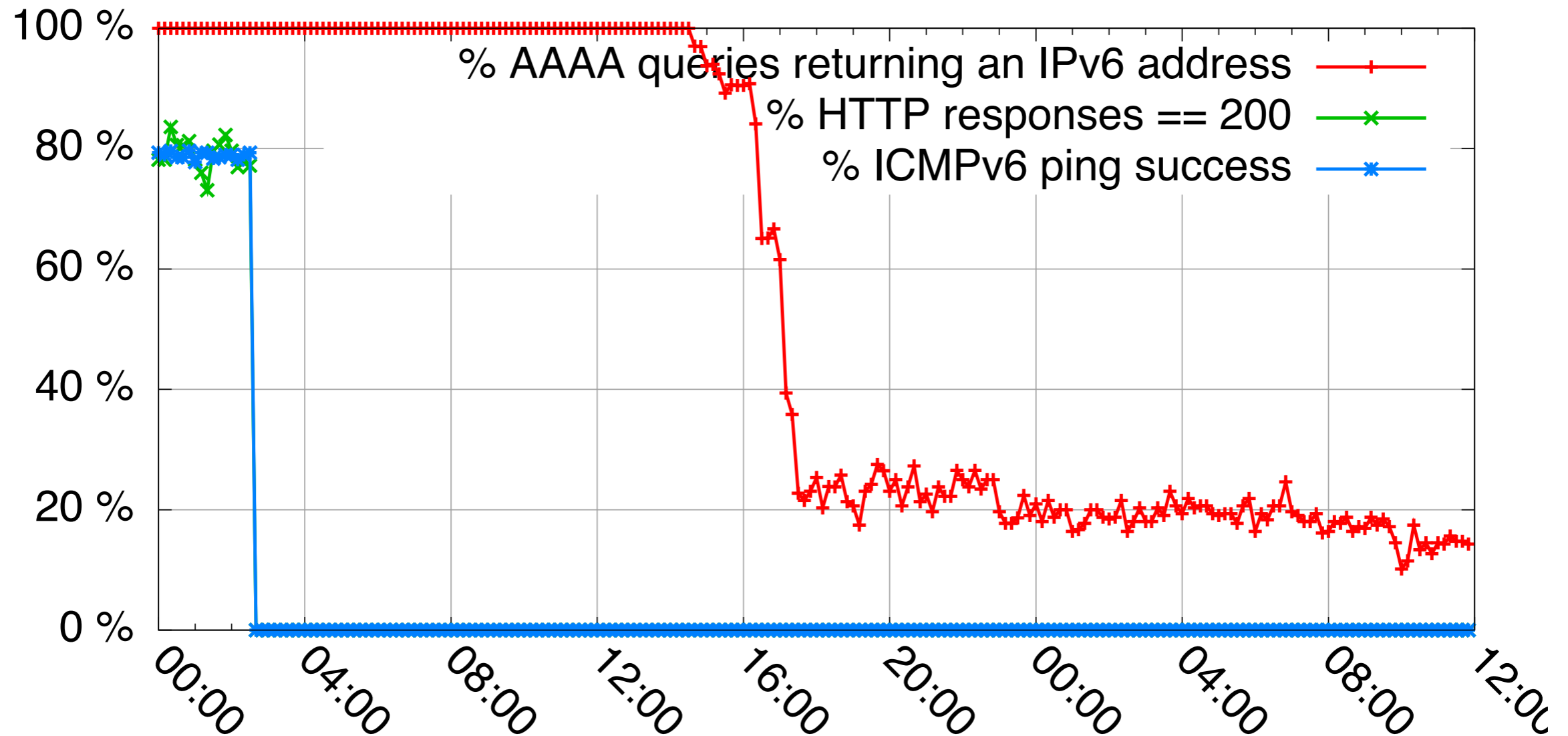
**Not Found**

HTTP Error 404. The requested resource is not found.



# Or This ...

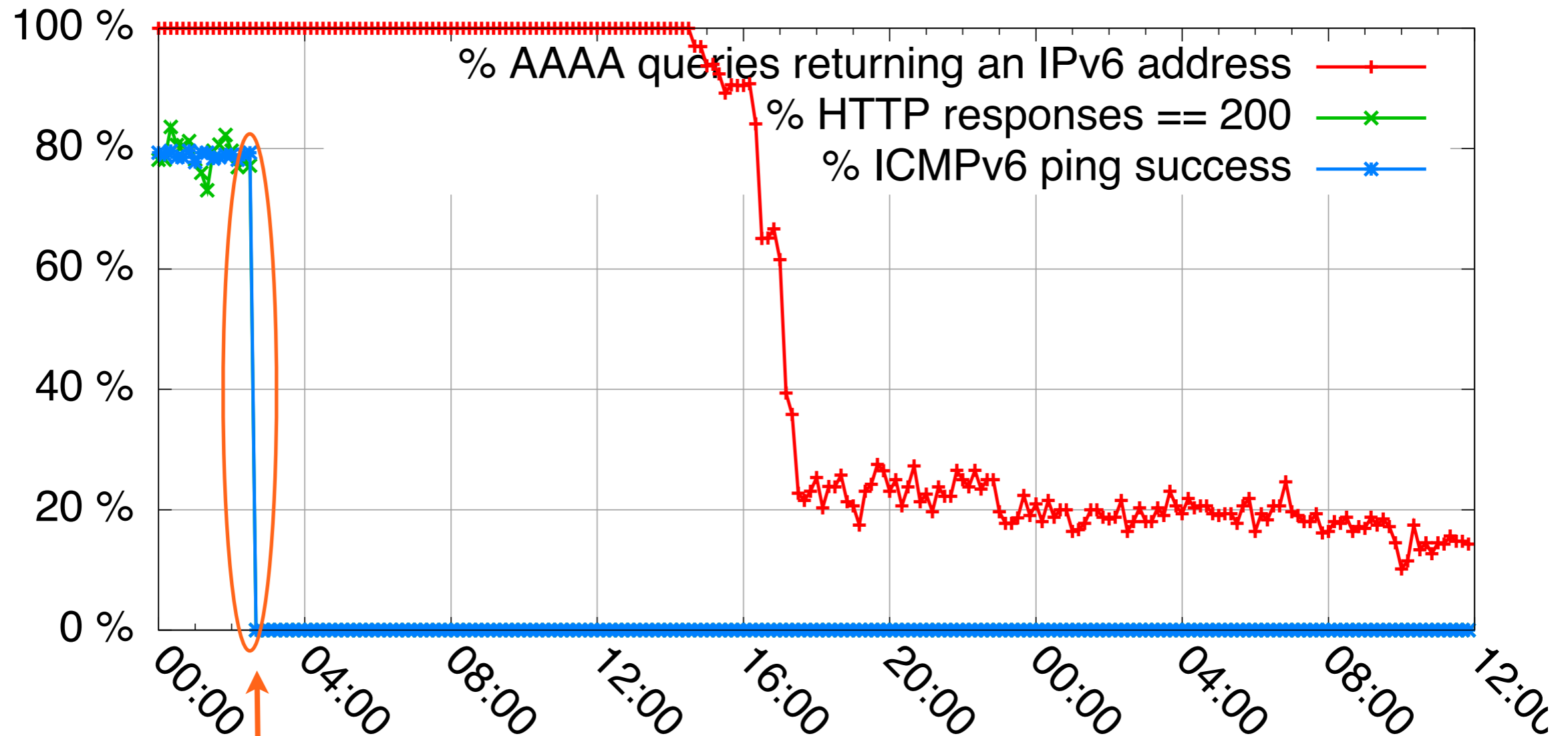
Comparing DNS, ping and HTTP IPv6 measurements to www.commerce.gov from 2011-06-09 0:00 UTC to 2011-06-10 12:00 UTC





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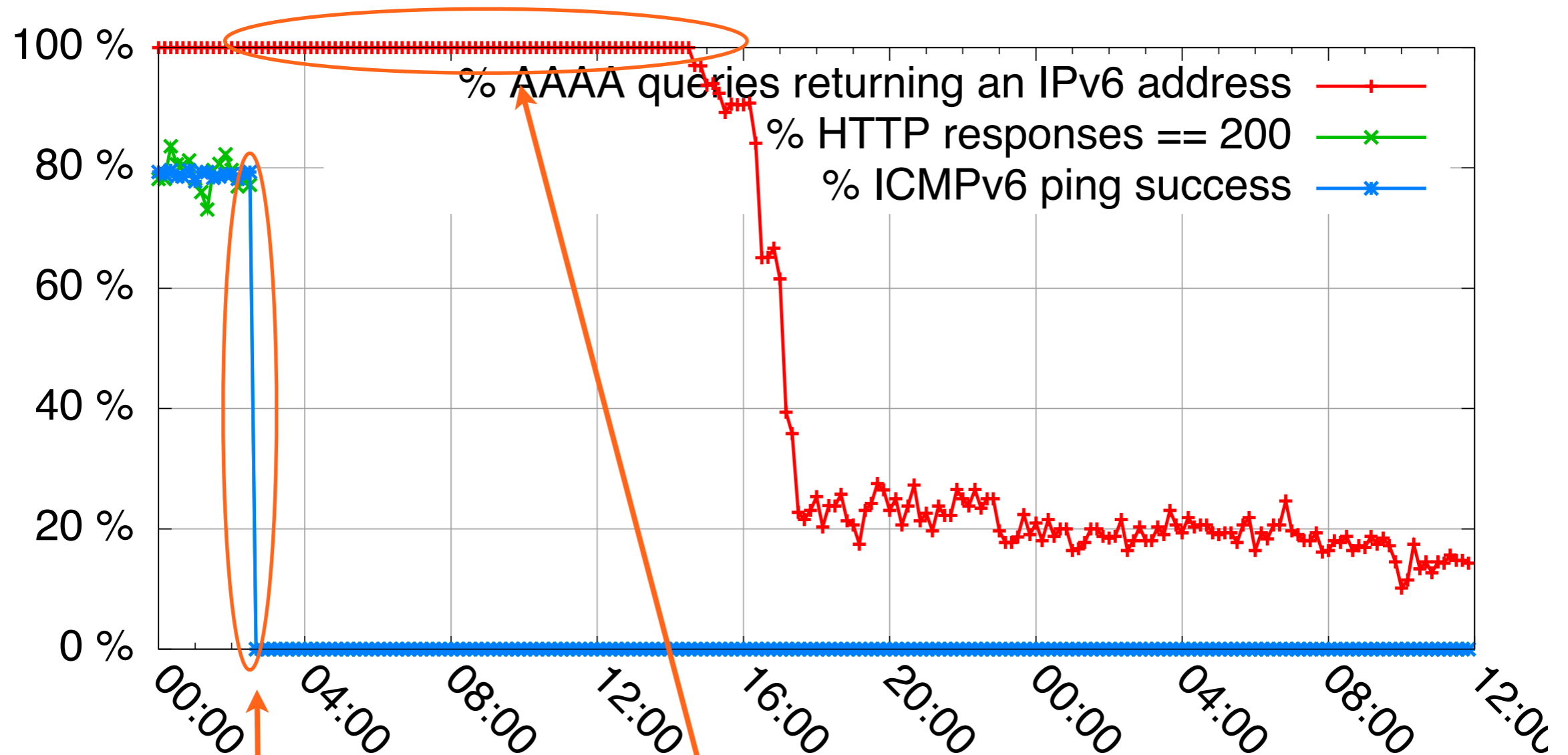
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v6 on www turned off at end of v6day

# Or This ...

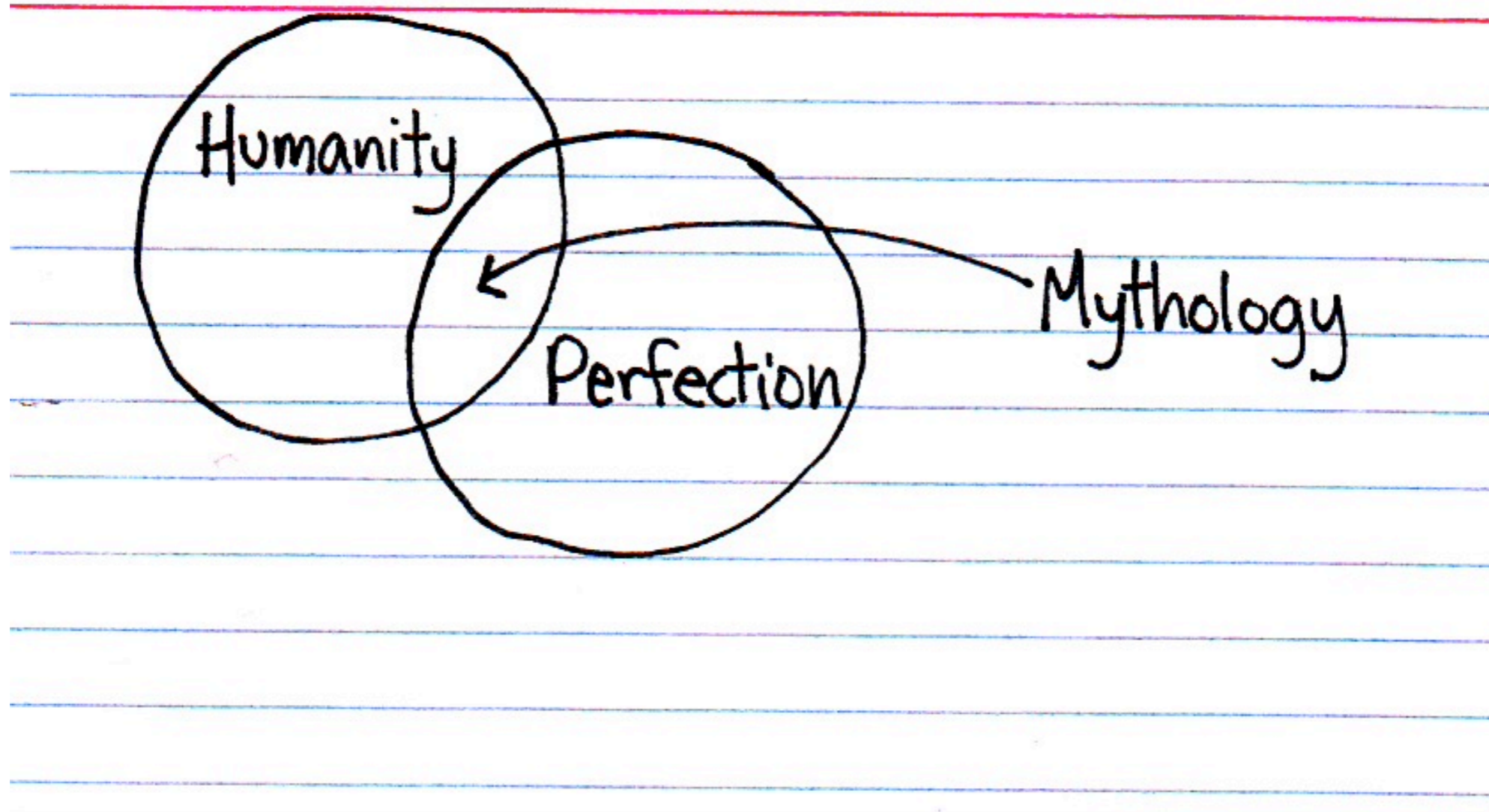
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v6 on www turned off at end of v6day

but v6 service still announced

# Test And Monitor - Lessons Learned



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- Test when deploying something
  - The more real-life, the less likely you !@#\$\$-ed up
- Monitor your infrastructure
- People2people reachability
  - Avoidable situations like Level3 and Dept. Commerce
  - Contact info up to date in RIR databases (whois)
  - Monitor the web (NANOG, \*NOG, Twitter, ...)

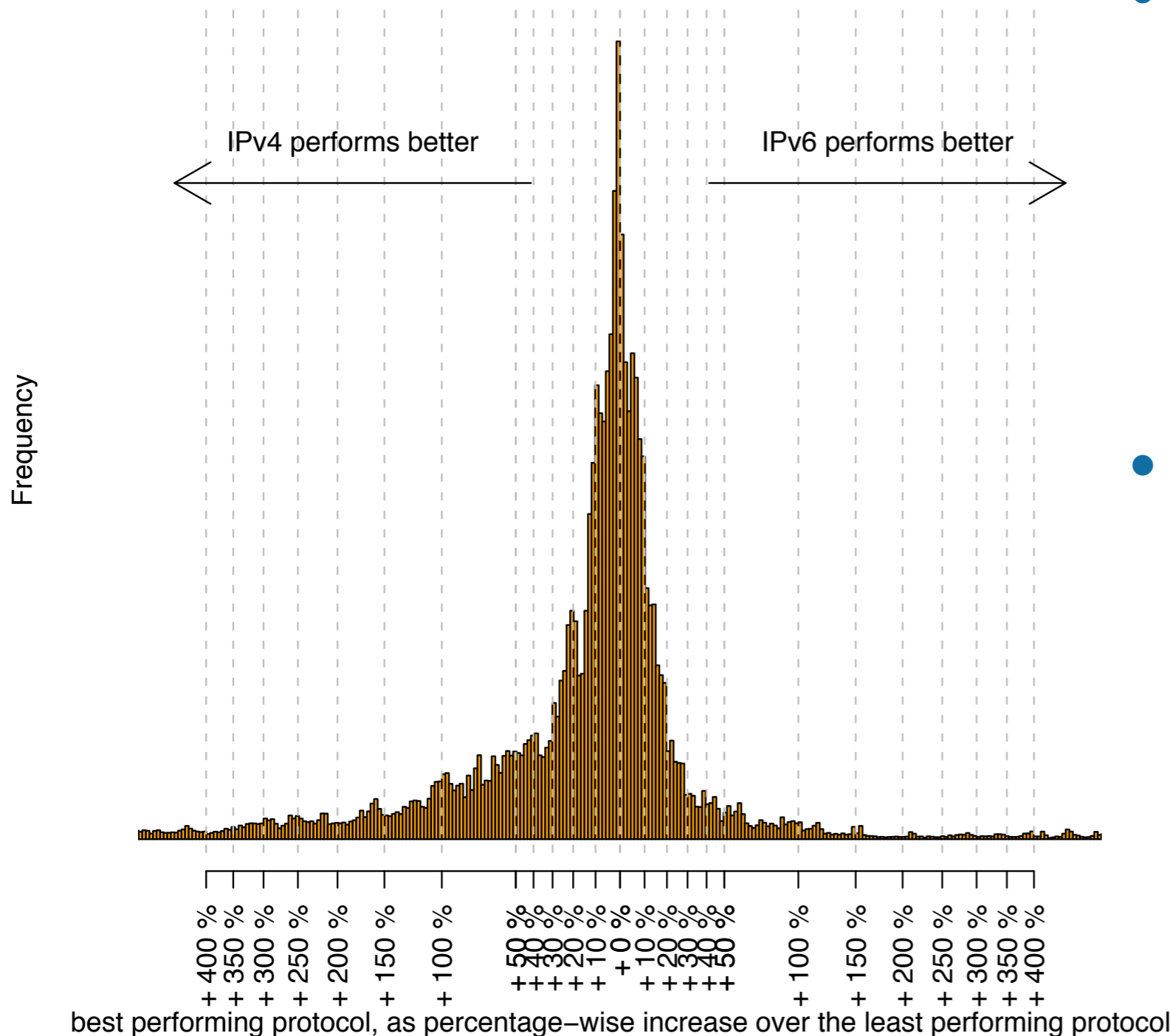


# Global View

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# IPv4/IPv6 Performance On World IPv6 Day

Distribution of IPv4/IPv6 relative performance

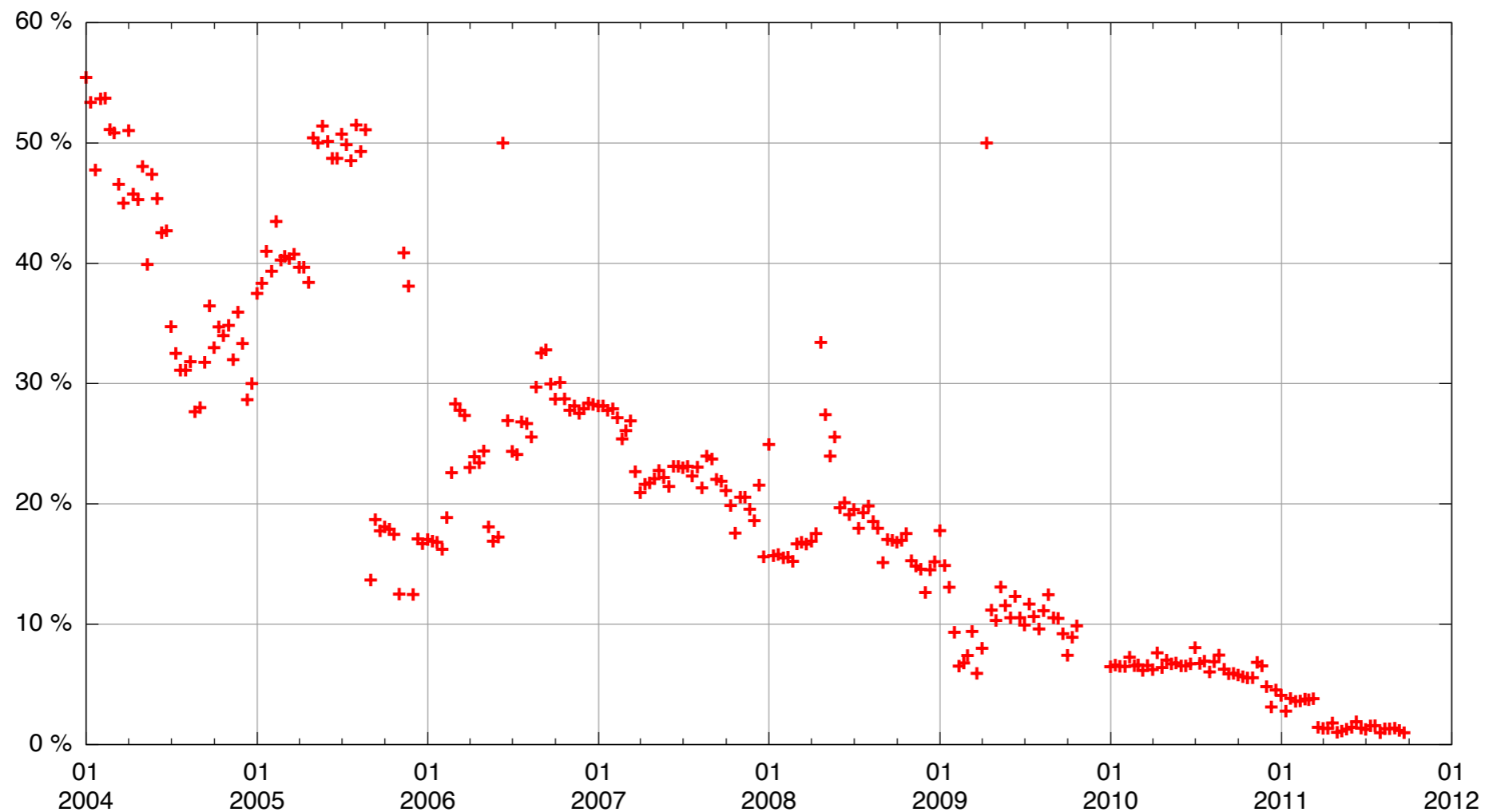


- Bell-shaped
  - centered around 0
  - with fatter IPv4-side (62%)
- Dual-stack = two chances for best performance!
  - Real-time apps can use this (voice/game)

# Performance - Tunnels?

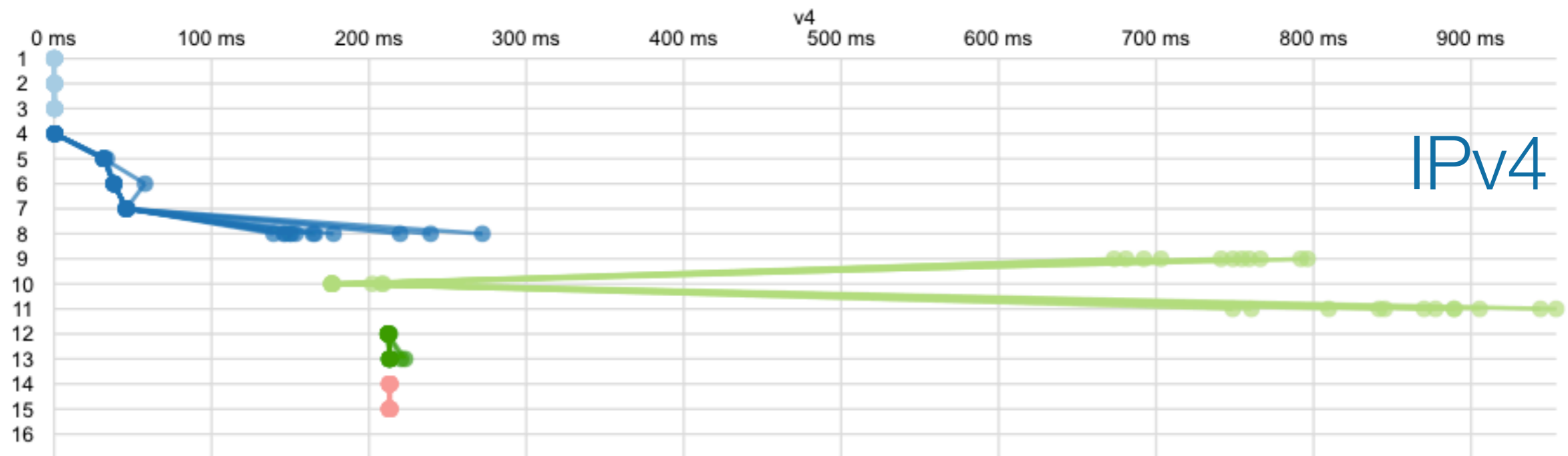
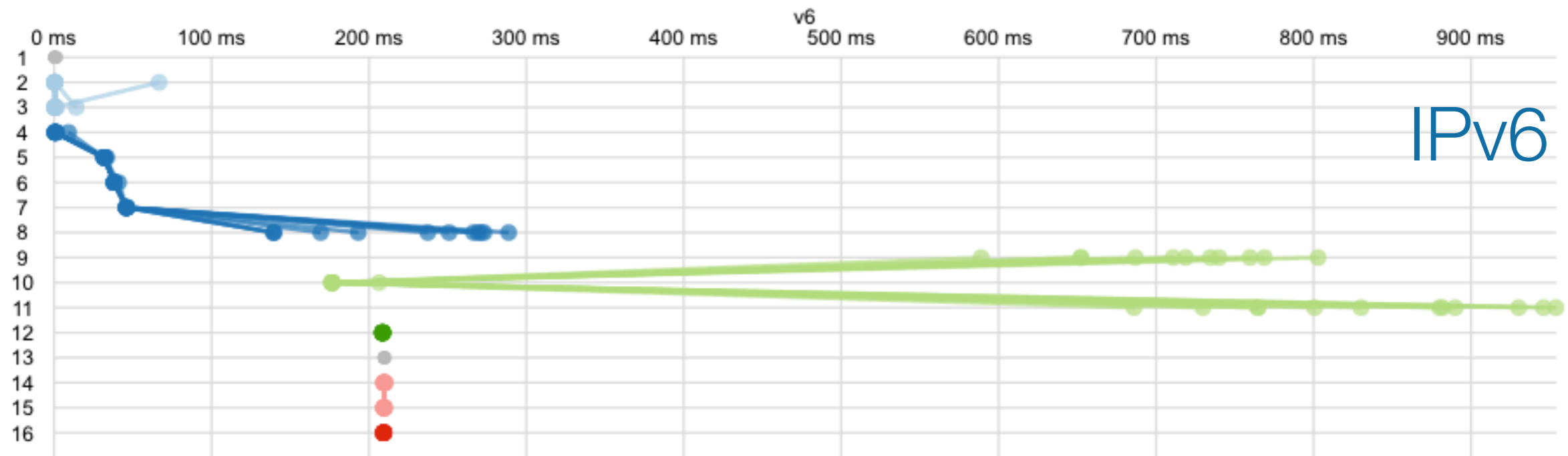
- 9.2% of paths had 1 (or more!) hops with '*tunnel*' in the hostname
- TTM mesh tunnel-discovery: < 2% of paths

Percentage of paths in TTM IPv6 mesh where tunnels are detected



# Performance - Same Path: No Difference

Traceroutes from Univ. in Greece to Univ. in Los Angeles





# Partial Reachability

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- Internet is a collection of interconnecting networks, and can be different on IPv4/IPv6
- Some vantage points couldn't reach all dests.
  - Are our vantage points representative?
    - Working on this: RIPE Atlas
  - Network partitioning, examples we encountered:
    - Level3 - Hurricane Electric
    - Cogent - Hurricane Electric
  - See [http://en.wikipedia.org/wiki/Comparison\\_of\\_IPv6\\_support\\_by\\_major\\_transit\\_providers](http://en.wikipedia.org/wiki/Comparison_of_IPv6_support_by_major_transit_providers)

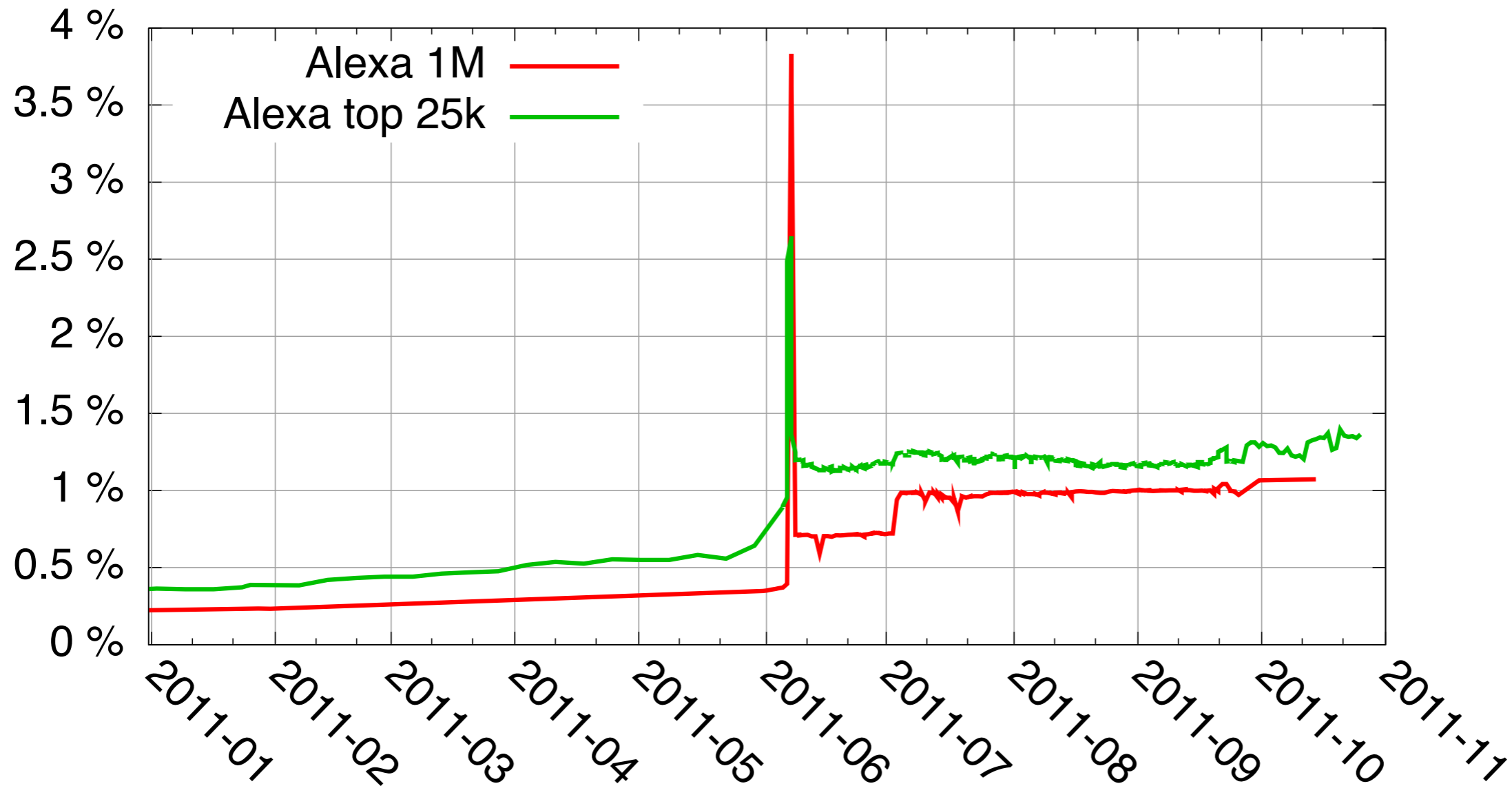
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# Long Term Effects - Content

Percentage of web sites in Alexa 1M that can be reached over IPv6

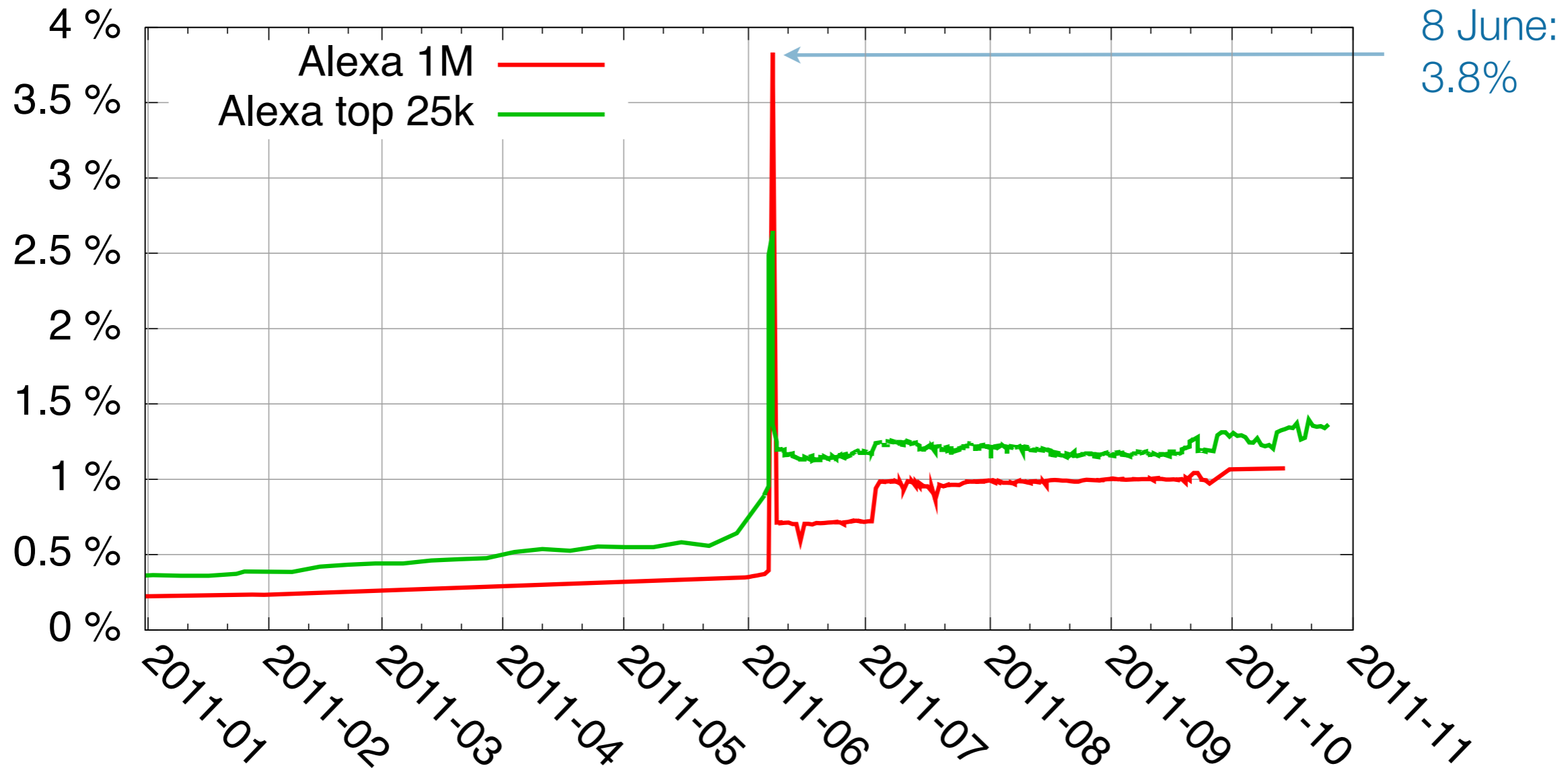


Raw data: Dan Wing

(<http://banjo.employees.org/~dwing/aaaa-stats.html>)

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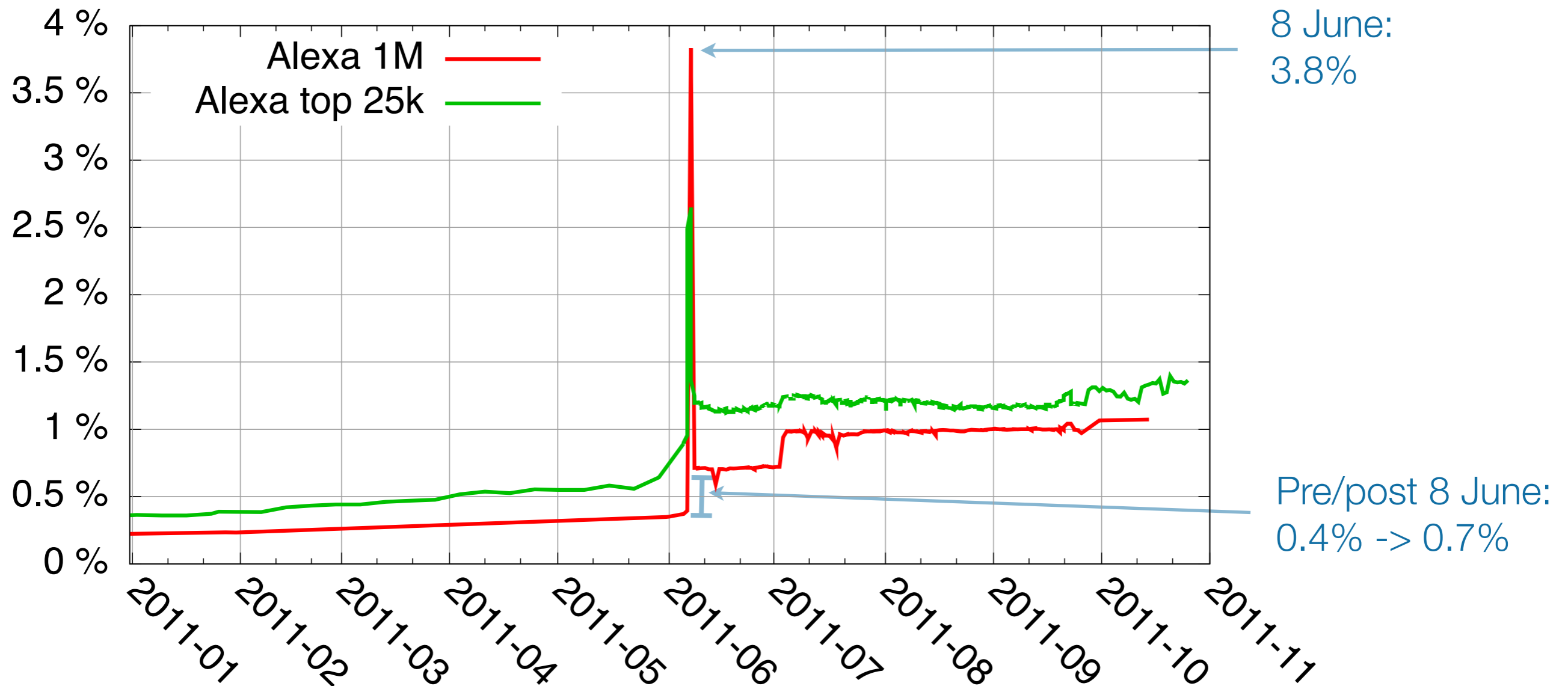


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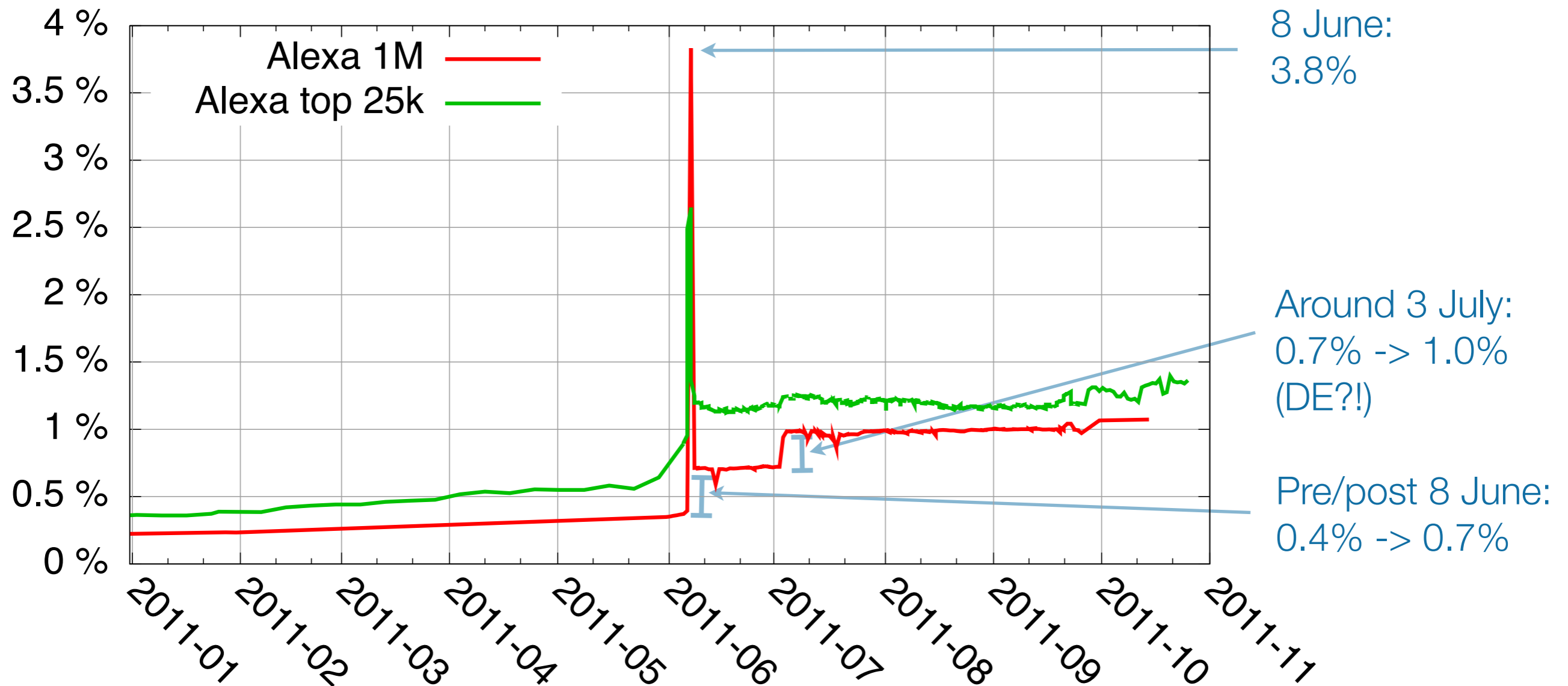
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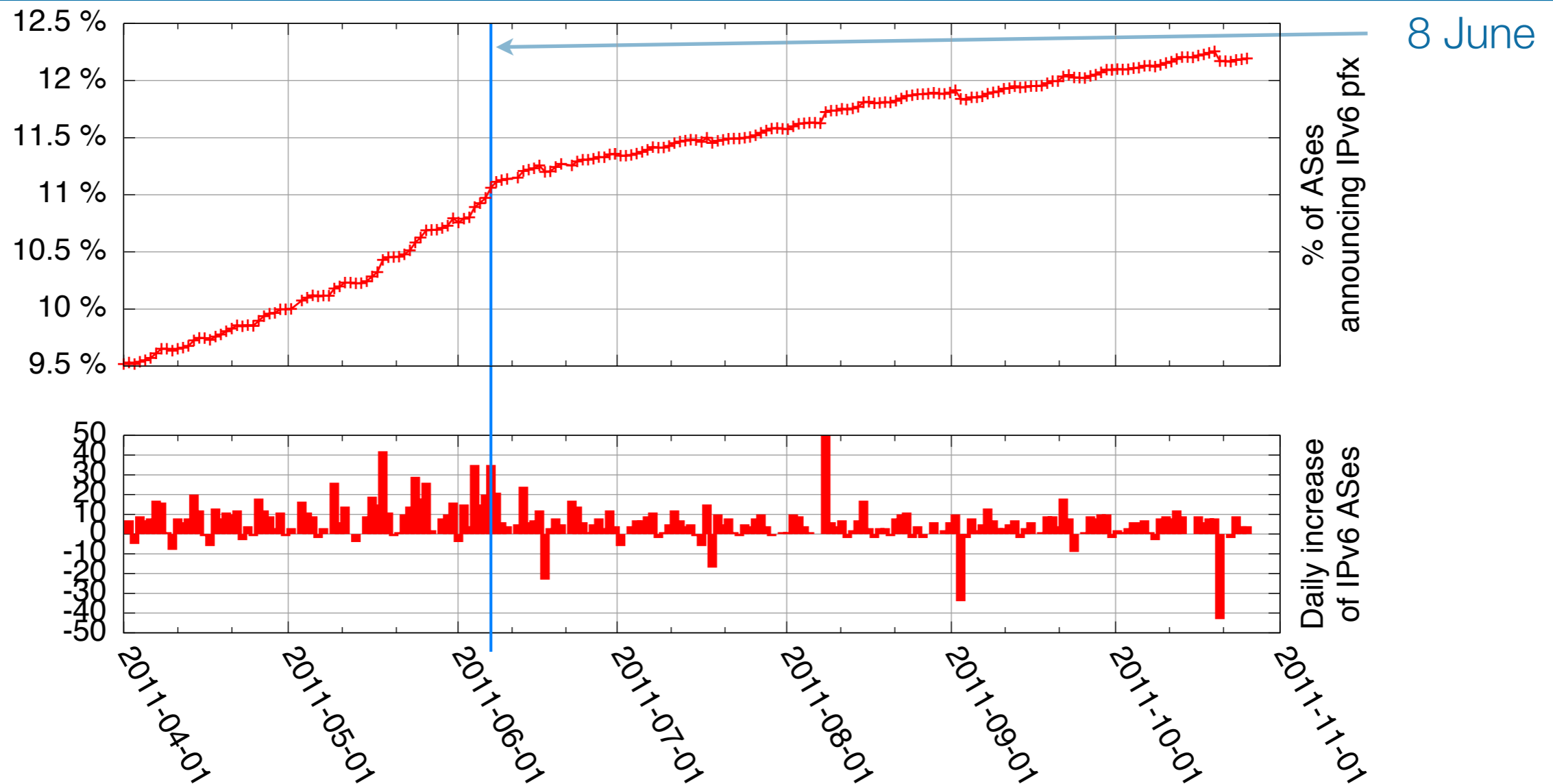
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# Long Term Effects - IPv6 ASes



- Higher growth pre-event: Deployments pushed earlier?
- Lower growth post-event: Summer-vacation? Economy?
- <http://v6asns.ripe.net>

# Conclusions - What We Learned

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- IPv6/dual-stack works just fine, but make sure that
  - It is properly tested and monitored (like IPv4)
  - Your network can reach all others (like IPv4)
- Dual-stack = Two chances for best performance
- Days like this ‘work’
  - Raise awareness
  - Give people a target to work towards
  - We’re ready for a next IPv6(day|week|month|year|∞)

# More Information

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- Web interface to the measurements
  - <http://v6day.ripe.net/>
- Analysis on RIPE Labs
  - <http://labs.ripe.net/ipv6day>
- Raw data availability
  - <http://labs.ripe.net/datarepository/data-sets/ripe-ncc-active-measurements-of-world-ipv6-day-dataset>

Questions?

