Measuring IPv6 Performance

DE-CIX, Frankfurt

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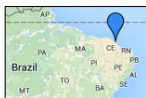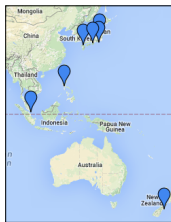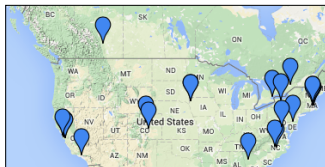# Measurement Trial

Measuring IPv6
Performance

Measurement Trial

TCP connect times
Trends
Who connects faster?

Happy Eyeballs
Lowering HE Timer

NETWORK TYPE	#
RESIDENTIAL	55
NREN / RESEARCH	11
BUSINESS / DATACENTER	09
OPERATOR LAB	04
IXP	01

RIR	#
RIPE	42
ARIN	29
APNIC	07
AFRINIC	01
LACNIC	01

We measure from 80 dual-stacked SamKnows [1] probes.

Outline

Measuring IPv6 Performance

TCP Connect Times   YouTube   Happy Eyeballs   Web Similarity

Bajpai *et al.* [5, 6]   Ahsan *et al.* [2]   Bajpai *et al.* [3, 4]   Eravuchira *et al.* [*]

* entries are papers currently under review

TCP connect times | Trends (2013 - 2016)

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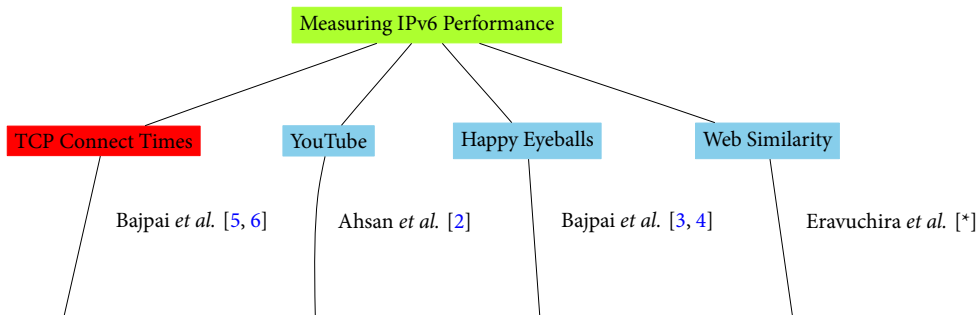Lowering HE Timer

$$\Delta s_a(u) = t_4(u) - t_6(u)$$

where $t(u)$ is the time taken to establish TCP connection to website u.
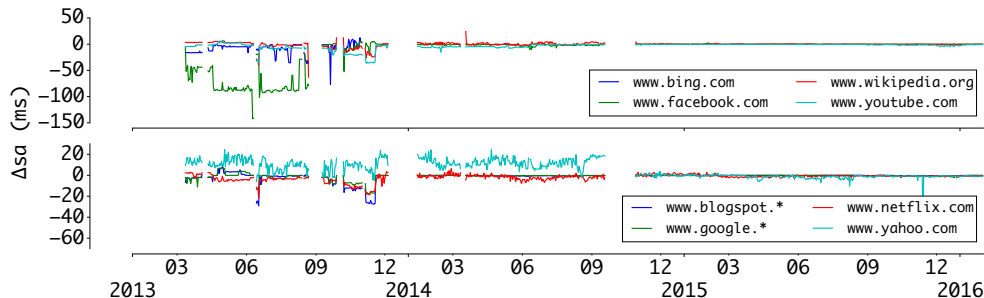

- TCP connect times to popular websites over IPv6 have improved over time.

TCP connect times | Who connects faster?

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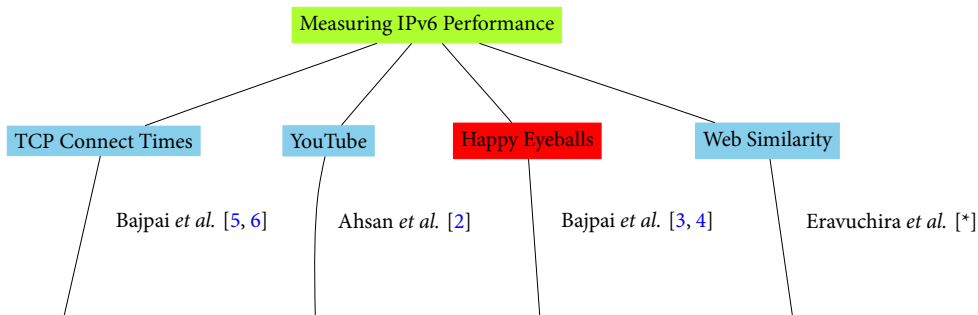Happy Eyeballs
Lowering HE Timer

ALEXA top 10K websites (as of Feb 2016):

- ▶ 15% are faster over IPv6.

- ▶ 88% of the rest are atmost 1 ms slower.

- ▶ 5% are atleast 10 ms slower.

- ▶ 1% are atleast 100 ms slower.
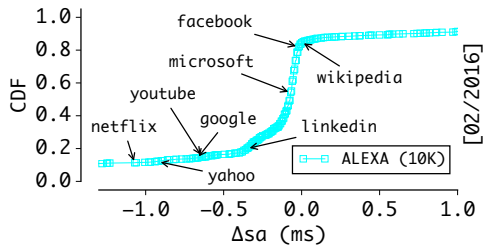
For more details see [5] (NETWORKING '15):

- ▶ Comparing CDN clusters over IPv4 and IPv6.
- ▶ Content Caches largely absent over IPv6.
- ▶ Google CDN blacklists some DNS resolvers over IPv6.

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Happy Eyeballs | Lowering HE Timer

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Lowering HE Timer

- A 300 ms HE timer value leaves 2% chance for IPv4.
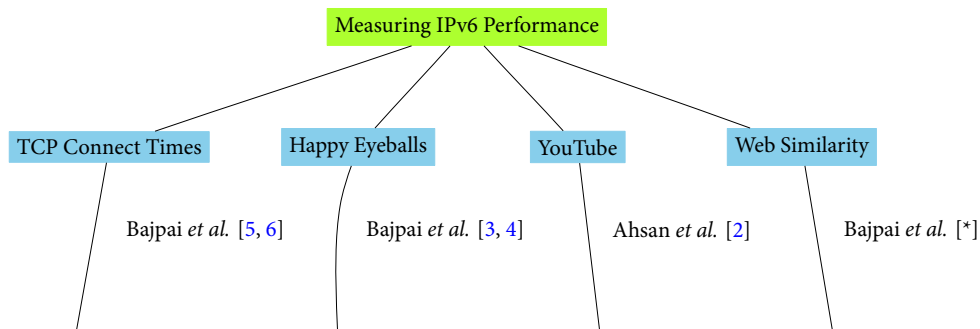
- 99% of top 10K ALEXA prefer IPv6 98% of time.
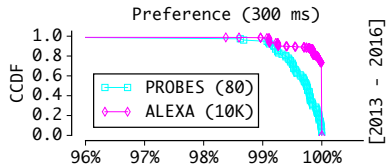
- Lowering to 150 ms retains preference levels over IPv6.
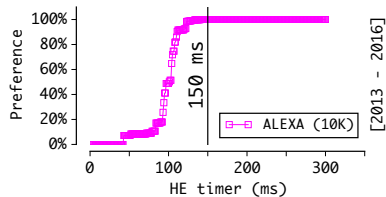
For more details see [3, 4]:

Thanks!

Measuring IPv6
Performance

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Measuring IPv6 Performance

TCP Connect Times

Happy Eyeballs

YouTube

Web Similarity

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Appendix

Appendix | References I

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Lowering HE Timer

[1] V. Bajpai and J. Schönwälder, "A survey on internet performance measurement platforms and related standardization efforts," *IEEE Communications Surveys and Tutorials*, vol. 17, no. 3, pp. 1313–1341, 2015. [Online]. Available: http://dx.doi.org/10.1109/COMST.2015.2418435

[2] S. Ahsan, V. Bajpai, J. Ott, and J. Schönwälder, "Measuring YouTube from Dual-Stacked Hosts," in *Passive and Active Measurement - 16th International Conference, PAM 2015, New York, NY, USA, March 19-20, 2015, Proceedings*, 2015, pp. 249–261. [Online]. Available: http://dx.doi.org/10.1007/978-3-319-15509-8_19

[3] V. Bajpai and J. Schönwälder, "Understanding the impact of network infrastructure changes using large-scale measurement platforms," in *Emerging Management Mechanisms for the Future Internet - 7th IFIP WG 6.6 International Conference on Autonomous Infrastructure, Management, and Security, AIMS 2013, Barcelona, Spain, June 25-28, 2013. Proceedings*, 2013, pp. 41–44. [Online]. Available: http://dx.doi.org/10.1007/978-3-642-38998-6_5

[4] V. Bajpai and J. Schönwälder, "Measuring the Effects of Happy Eyeballs," Internet-Draft draft-bajpai-happy-01, Jul. 2013. [Online]. Available: http://tools.ietf.org/html/draft-bajpai-happy-01

[5] V. Bajpai and J. Schönwälder, "IPv4 versus IPv6 - who connects faster?" in *Proceedings of the 14th IFIP Networking Conference, Networking 2015, Toulouse, France, 20-22 May, 2015*, 2015, pp. 1–9. [Online]. Available: http://dx.doi.org/10.1109/IFIPNetworking.2015.7145323

[6] ——, "Measuring TCP connection establishment times of dual-stacked web services," in *Proceedings of the 9th International Conference on Network and Service Management, CNSM 2013, Zurich, Switzerland, October 14-18, 2013*, 2013, pp. 130–133. [Online]. Available: http://dx.doi.org/10.1109/CNSM.2013.6727822