iplab

Benchmarking Methodology for IPv6 Transition Technologies

draft-ietf-bmwg-ipv6-tran-tech-benchmarking-02

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DRAFT MOTIVATION: IPV6 TRANSITION

- IPv6 is not backwards compatible
- The Internet will undergo a period through which both protocols will coexist
- Currently only 6% of worldwide Internet users have IPv6 connectivity [1]

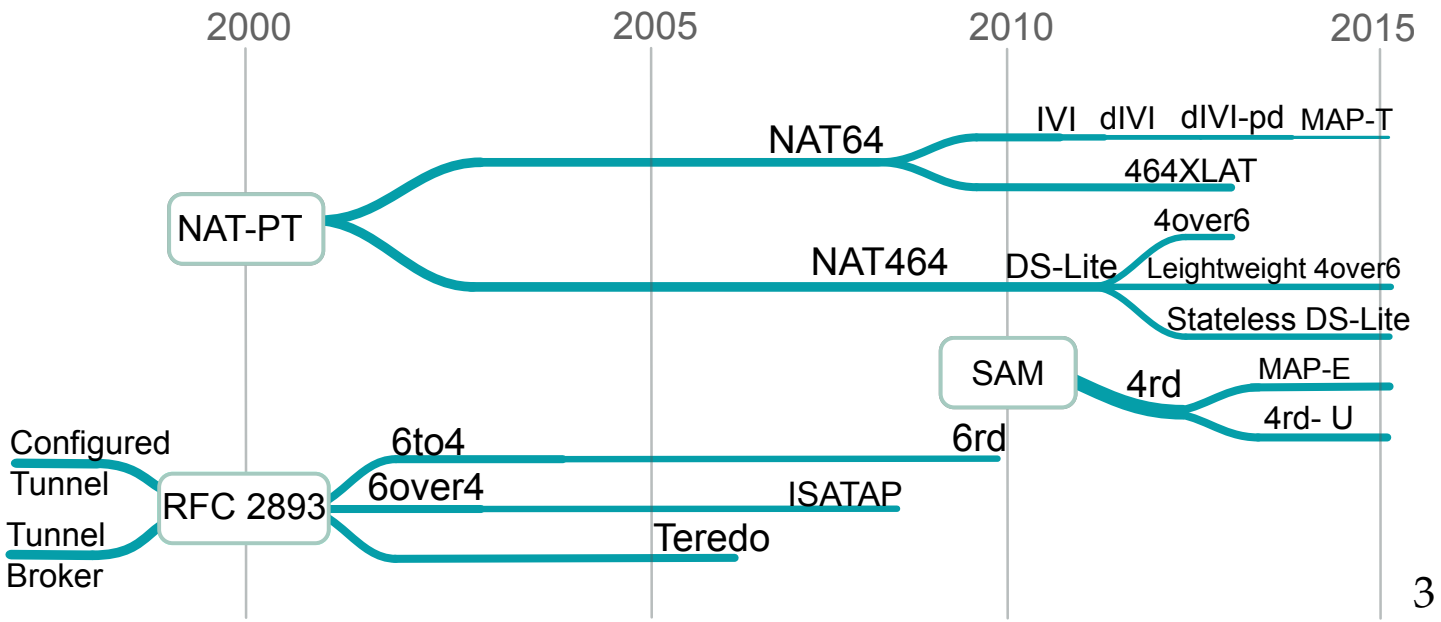
[2]

[1] APNIC. *IPv6 measurements for The World*. Asia-Pacific Network Information Centre, July 2016. URL: http://labs.apnic.net/ipv6-measurement/Regions/.

[2] **Original drawing by Andrew Bell @ www.creaturesinmyhead.com** .

IPV6 TRANSITION TECHNOLOGIES EVOLUTION

- What benchmarks to use?
  - For Dual Stack RFC2544 or RFC5180 are enough
  - How about translation/encapsulation technologies?



[3] **inspired by the APNIC35 presentation "The evolution of IPv6 transition technologies" by Jouni Korhonen.**

GENERIC TRANSITION TECHNOLOGIES ASSOCIATION TABLE

	Generic Category	IPv6Transition Technology
1	Dual-stack	Dual IP Layer Operations [RFC4213]
2	Single translation	NAT64 [RFC6146], IVI [RFC6219]
3	Double translation	464XLAT [RFC6877], MAP-T [RFC7599]
4	Encapsulation	DSLite[RFC6333], MAP-E [RFC7597] Lightweight 4over6 [RFC7596] 6RD [RFC 5569]

DRAFT OVERVIEW

- This draft provides complementary guidelines to RFC2544[4] and RFC5180[5] for evaluating the performance of IPv6 transition technologies
  - generic classification on IPv6 transition technologies → associated test setups
  - calculation formula for the maximum frame rate according to the *frame size overhead*
- Includes a tentative metric for benchmarking scalability
  - scalability as *performance degradation* under the stress of *multiple network flows*
- Proposes supplementary benchmarking tests for *stateful* IPv6 transition technologies in accordance with RFC3511[6]
- Proposes supplementary benchmarking tests for *DNS resolution performance*
  - contributed by Prof. Gábor Lencse [RG profile link]

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[4] S. Bradner and J. McQuaid. *Benchmarking Methodology for Network Interconnect Devices*. United States, 1999.

[5] A. Hamza C. Popoviciu, G. Van de Velde, and D. Dugatkin. *IPv6 Benchmarking Methodology for Network Interconnect Devices*. RFC 5180. Internet Engineering Task Force, 2008.

[6] B. Hickman et al. *Benchmarking Methodology for Firewall Performance*. RFC 3511 (Informational). Internet Engineering Task Force, Apr. 2003. URL: http://www.ietf.org/rfc/rfc3511.txt.

UPDATE OVERVIEW

- Mixed traffic conditions
- NAT44 and NAT66 recommendations
- Histograms as fine grain analysis for Typical Latency and Worst Case Latency
- DNS Resolution Performance
  - No support for DNS46
- Various smaller editorial changes (detailed changelog [link])

MIXED TRAFFIC CONDITIONS

Text added to Section 5.3:

Considering that a transition technology could process both native IPv6 traffic and translated/encapsulated traffic, the following traffic setups are recommended:
i) IPvX only traffic (where the IPvX traffic is to be translated/encapsulated by the DUT)
ii) 90% IPvX traffic and 10% IPvY native traffic
iii) 50% IPvX traffic and 50% IPvY native traffic
iv) 10% IPvX traffic and 90% IPvY native traffic

[7] **following the comments from Tim Chown**.

NAT44 AND NAT66 RECOMMENDATIONS

Text added to Section 11:

Although these technologies are not the primarily scope of this document, the benchmarking methodology associated with single translation technologies as defined in Section 4.1 can be employed to benchmark NAT44 (as defined by [RFC2663] with the behavior described by [RFC7857]) implementations and NAT66 (as defined by [RFC6296]) implementations.

[8] **following the comments from Fred Baker; Tim Chown and Scott Bradner.**

HISTOGRAMS AS FINE GRAIN ANALYSIS OF LATENCY

Text added to Section 7.2:

For a fine grain analysis, the histogram (as exemplified in [RFC5481] Section 4.4) of one of the iterations MAY be displayed as well.

[9] **following the comments from Paul Emmerich; Stenio Fernandes and Jacob Rapp**.

UPDATE: DNS RESOLUTION PERFORMANCE

- No support for DNS46
  - DNSOP thread [link]
  - BMWG thread [link]
- As a consequence, DNS46 recommendations will not be considered by this document
- More about **dns64perf++ [link]** [10]
  - Open source implementation developed by Dániel Bakai in compliance with the specifications of this draft

[10] G. Lencse and D. Bakai. *Design and implementation of a test program for benchmarking DNS64 servers*. under review: IEICE Transactions on Communications. July 2016. URL: http://www.hit.bme.hu/~lencse/publications/IEICE-2016-dns64perfpp-revised.pdf.

NEXT STEPS

- Comments not covered yet
  - Jacob Rapp's suggestion to include a recommendation for the position of the frame identification tags
  - Current idea: recommend including the tags as identification numbers (a sort of UDP sequence number) in the UDP payload of the frames
- Plans to develop a *6transperf* implementation

⋆ Questions for BMWG:

- Were the comments covered well enough?
- 1st WGLC in IETF97?

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