Happy Eyeballs: Successful Introduction of New Technology to HTTP

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Why?

- There's a problem to select IPv4/IPv6/TCP/SCTP
- Important to keep the same URL
  - You can retrieve the copy of these slides at http2sctp://www.ipv7.dwing.org/
- Existing application behaviour needs to be improved
V4 vs. V6: AAAA not enough?

- Routing issues for tunneled IPv6 with some sites
- Some sites put ::1 into AAAA record
- IPv4 may be faster than IPv6... or not...
- “accidental IPv6”

http://www.employees.org/~dwing/plot-speed.png
Proposal

- Try everything – IPv4, IPv6, SCTP, TCP
  - A little bit like ICE
- But be careful in doing so
  - Be persistent but not rude
  - Have the “Plan B” ready
    - Fallback to IPv4 TCP
IPv4 vs. IPv6: a tortoise and a hare

- P = IPv4/IPv6 preference
  - P<0 => prefer IPv4
  - P>0 => prefer IPv6
    • delay the other by 10*abs(P) ms
- If the favourite wins
  - Favourite was IPv4: decrement P
  - Favourite was IPv6: increment P
- If the favourite loses – plan B
  - Half P’s absolute value
- If the winner is fast enough, the loser might not even need to start
IPv4 vs. IPv6: graphical view

- Prefer IPv4 first
- Simultaneous
- Prefer IPv6 first

1. Increment P on IPv6 success
2. Halve on failure

Decrement P on IPv4 success

Steps:
1. 1
2. 2
3. 3
4. 4
1.5
SCTP vs. TCP

- **Pref**: Per-destination transport preference; Default = “BOTH”
- Pref is SCTP or BOTH: fork SCTP connection attempt
  - If IPv4: try SCTP over UDP in parallel too
  - Allow max(SWAIT, TCP connect time) for SCTP to maybe complete
  - If SCTP succeeded Pref = SCTP; else Pref = TCP (‘Plan B’)
  - Why: SCTP is better than TCP
- Pref is TCP or BOTH: fork TCP connection attempt
  - If TCP succeeded earlier than SCTP, the app may use TCP this time.
Tests

- TCPv4 vs. TCPv6
  - Pthreads-based library that exports function to return an in-progress fd that becomes writable as soon as one of the threads completes connection.
  - Links browser
    [http://link.s.sourceforge.net/](http://link.s.sourceforge.net/) - simplest to modify (single-threaded design)
Other new technologies

- Multipath TCP
- Other applications
  - Instant messaging
Discussion

- ... do you agree there is a problem?
  - Half-working IPv6 is bad
  - Middleboxes

- ... do you agree the URI should be the same?
  - Users share URIs on mail, IMs, FB, phone

- ...