An Update to Happy Eyeballs

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draft-pauly-v6ops-happy-eyeballs-update

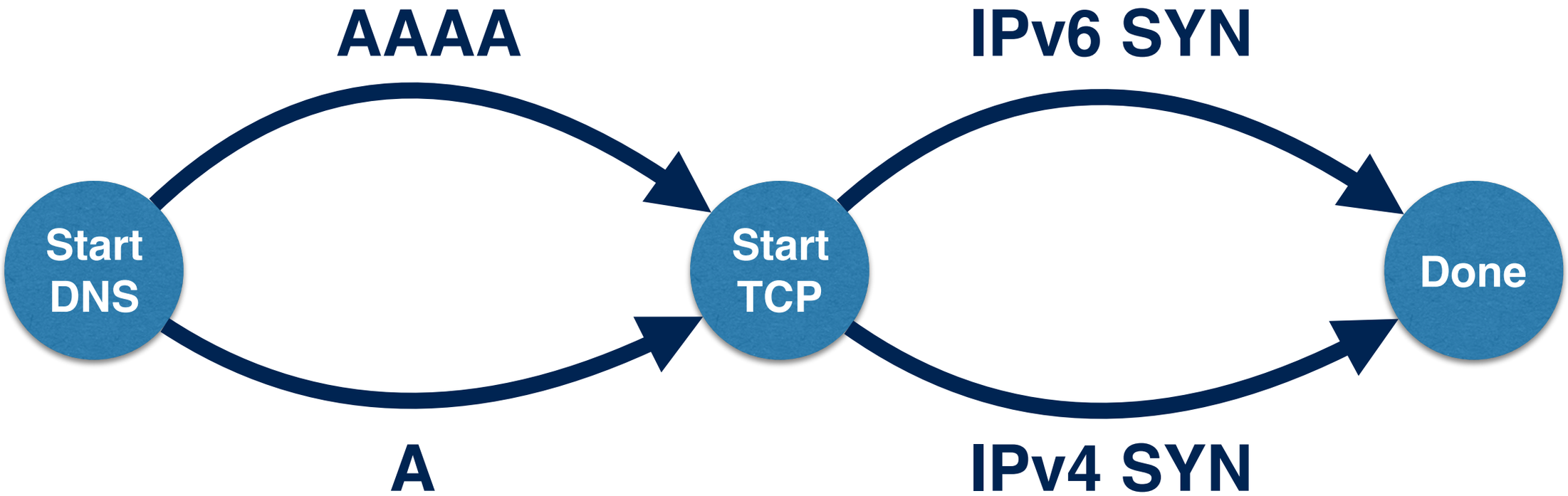
Agenda

- Hostname Resolution
- Measurements
- Underlying DNS Transport
- Sorting Addresses
- Connection Attempts
- DNS Updates
- Next Steps

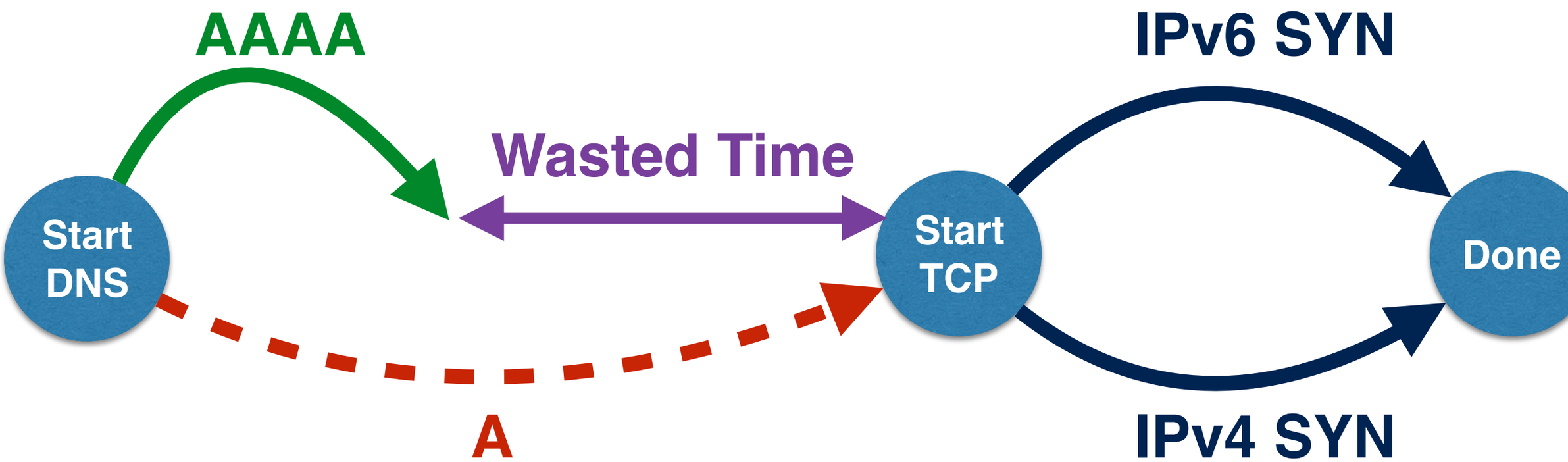
Hostname Resolution

- RFC 6555 does not describe how to query DNS
  - example mentions `getaddrinfo()`

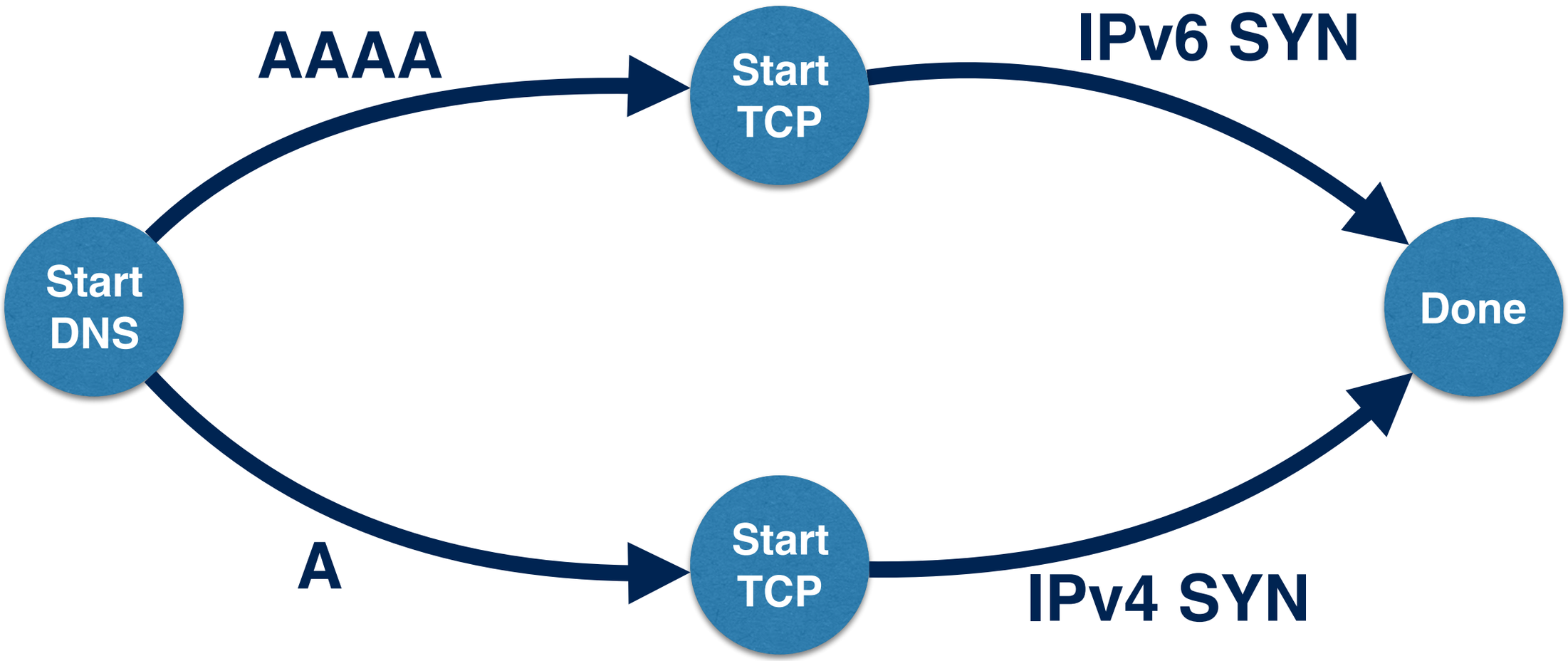
Hostname Resolution
`getaddrinfo()`



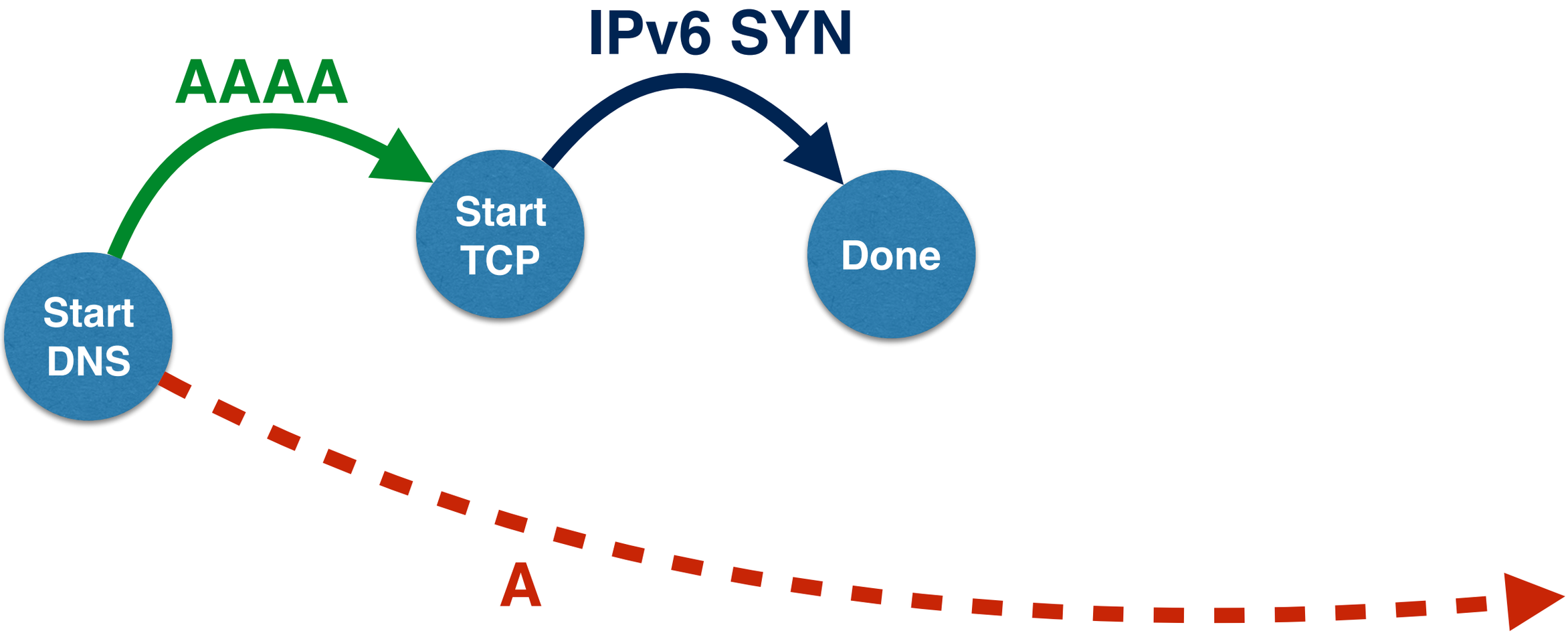
Hostname Resolution
`getaddrinfo()`



Hostname Resolution Asynchronous



Hostname Resolution Asynchronous



Hostname Resolution

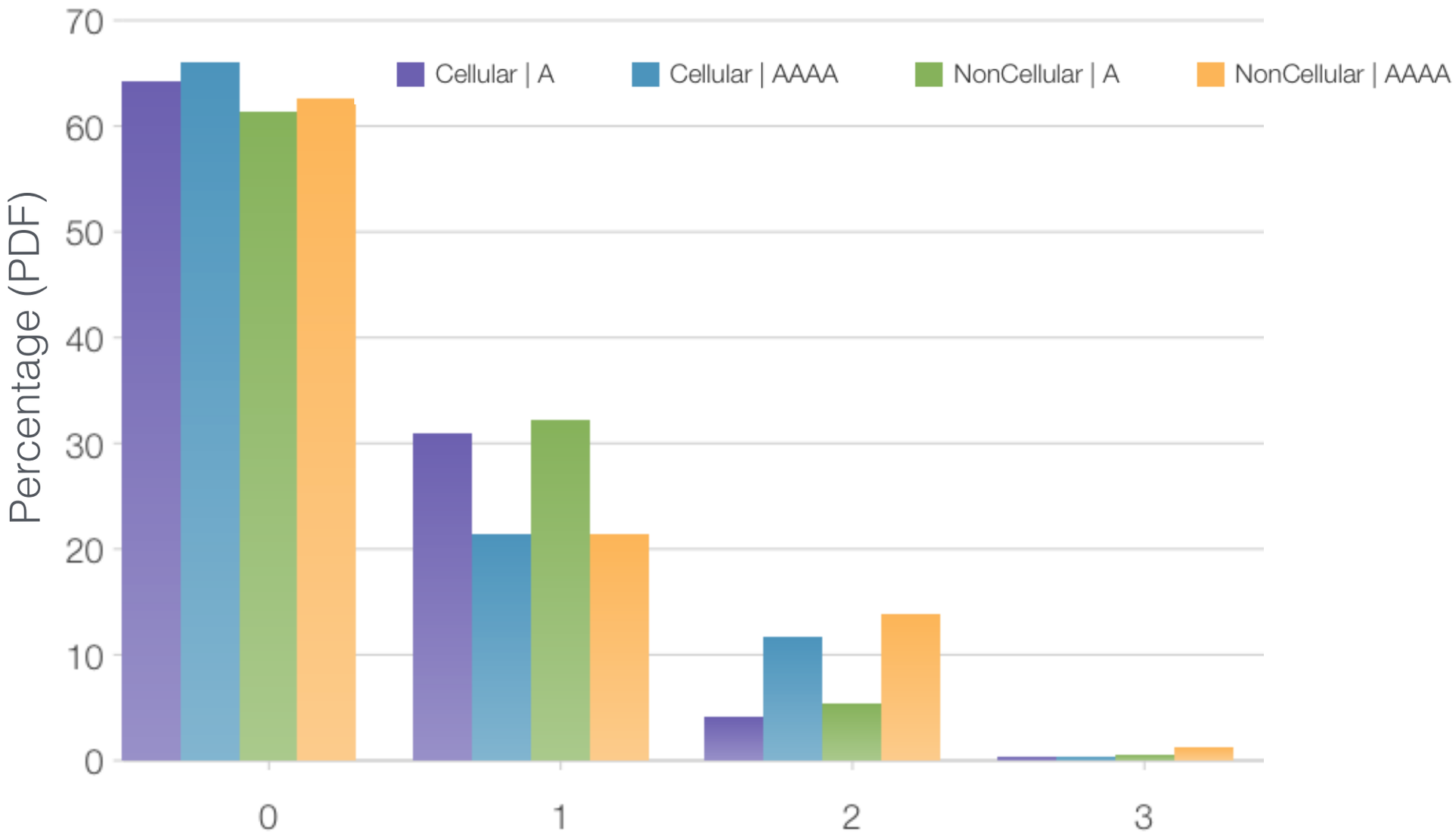
- AAAA received first → start IPv6 SYN
  - A records added to list when received
- A received first → start 50ms timer
  - AAAA received before then → start IPv6 SYN
  - timer fires → start IPv4 SYN

Hostname Resolution

- Why is this important?
  - DNS timeouts / retransmissions are common
  - Synchronous networking calls on a single thread are not compatible with Happy Eyeballs

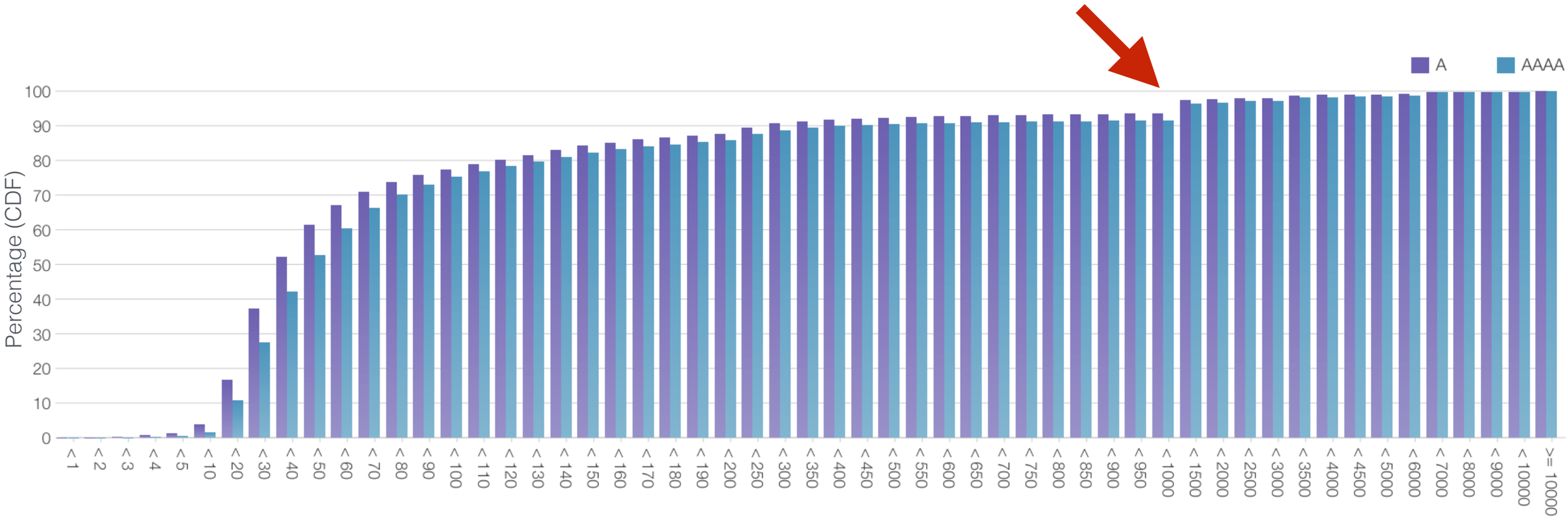
Measurements

Number of Queries Sent per DNS Question



Measurements

DNS Response Latency (ms)



Underlying DNS Transport

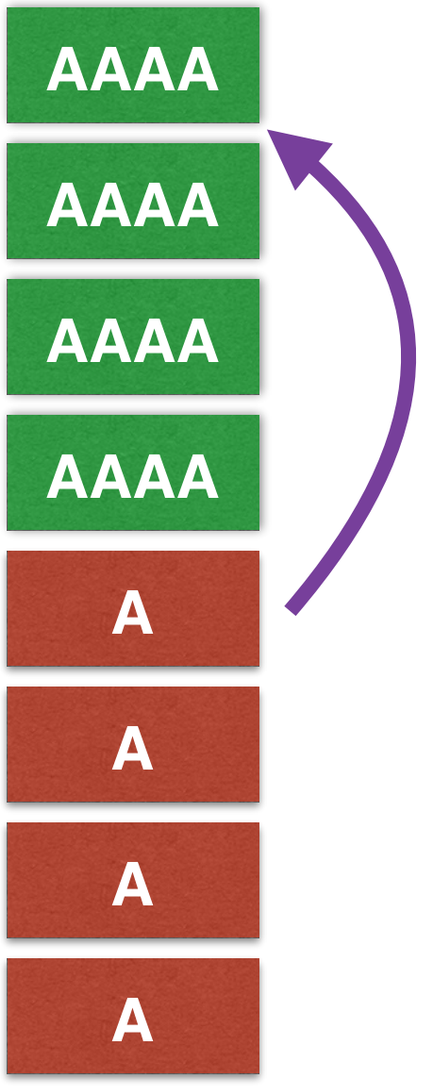
- Prefer IPv6 when sending DNS queries
- Both A and AAAA
- Some networks will have IPv6 DNS closer to user

Sorting Addresses

- Destination Address Selection — RFC 6724
- Rule 8.5 — leverage historical data
  - RTT
  - Used addresses

Sorting Addresses

RFC 6724

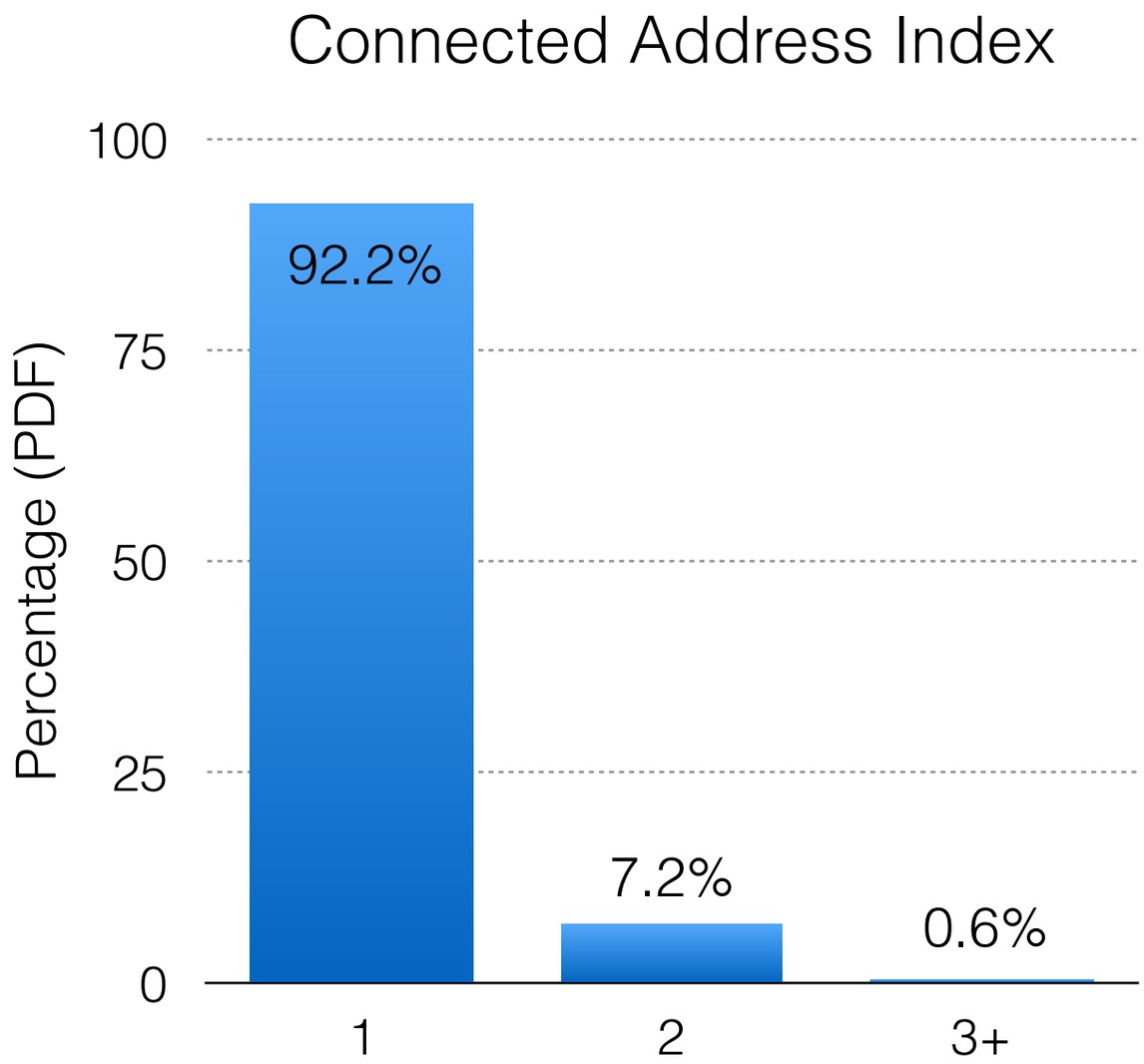


Updated Happy Eyeballs

Connection Attempts

- Walk entire list of addresses
- Start next attempt after $\mu_{RTT} + 4\sigma_{RTT}$

Connection Attempts



DNS Updates

- DNS results are dynamic
  - Asynchronous DNS
  - Long-lived queries / DNS push
  - TTL expiry
- React accordingly
  - Insert new addresses into sorted list
  - Remove deleted addresses only if not started yet

Next Steps

- Several possible approaches:
  - Update RFC 6555 (Standards Track)
  - New standard with different name
  - Informational