NAT64 operational considerations

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NAT64's usefulness

- Dual stack light provides more backward compatibility with old IPv4 ~~crap~~ stuff

- However, NAT64 breaks the vicious cycle for systems that (prefer to) only use IPv6:

no eyeballs on IPv6, so no content

no content on IPv6, so no eyeballs
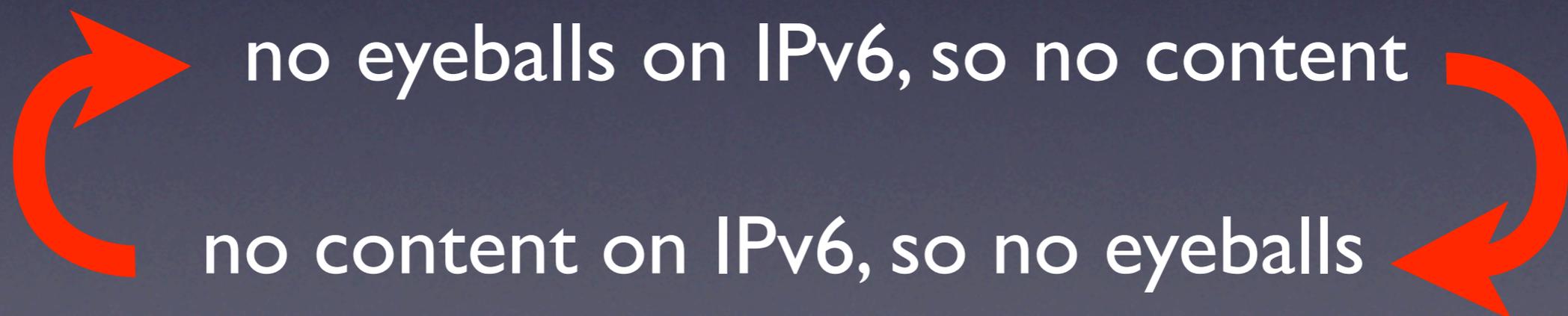
NAT64 prefix tests

- We did some tests

- v4-mapped prefix (::ffff:0:0/96):

  - **if** OSes generate packets, they're IPv4

- v4-compatible prefix (::/96):

  - OSes generate IPv6 packets

NAT64 prefix tests (2)

- Systems implementing RFC 3484:
  - (AFAIK only MacOS doesn't)
  - prefer real IPv6 over mapped/compat
  - but prefer mapped/compat over IPv4
- Mapped requires host changes → out
- Compat (maybe) possible. But the best choice...?

NAT64 prefix choices

- Unicast space (currently in NAT64 draft):
  - more choices for NAT64 placement
- Well-known prefix:
  - no configuration mechanism required
  - faster recovery from NAT64 failures
  - easier to implement NAT64-specific behaviors (less preferred than native IPv4, DNSSEC, IPv4-only apps)

NAT64 placement
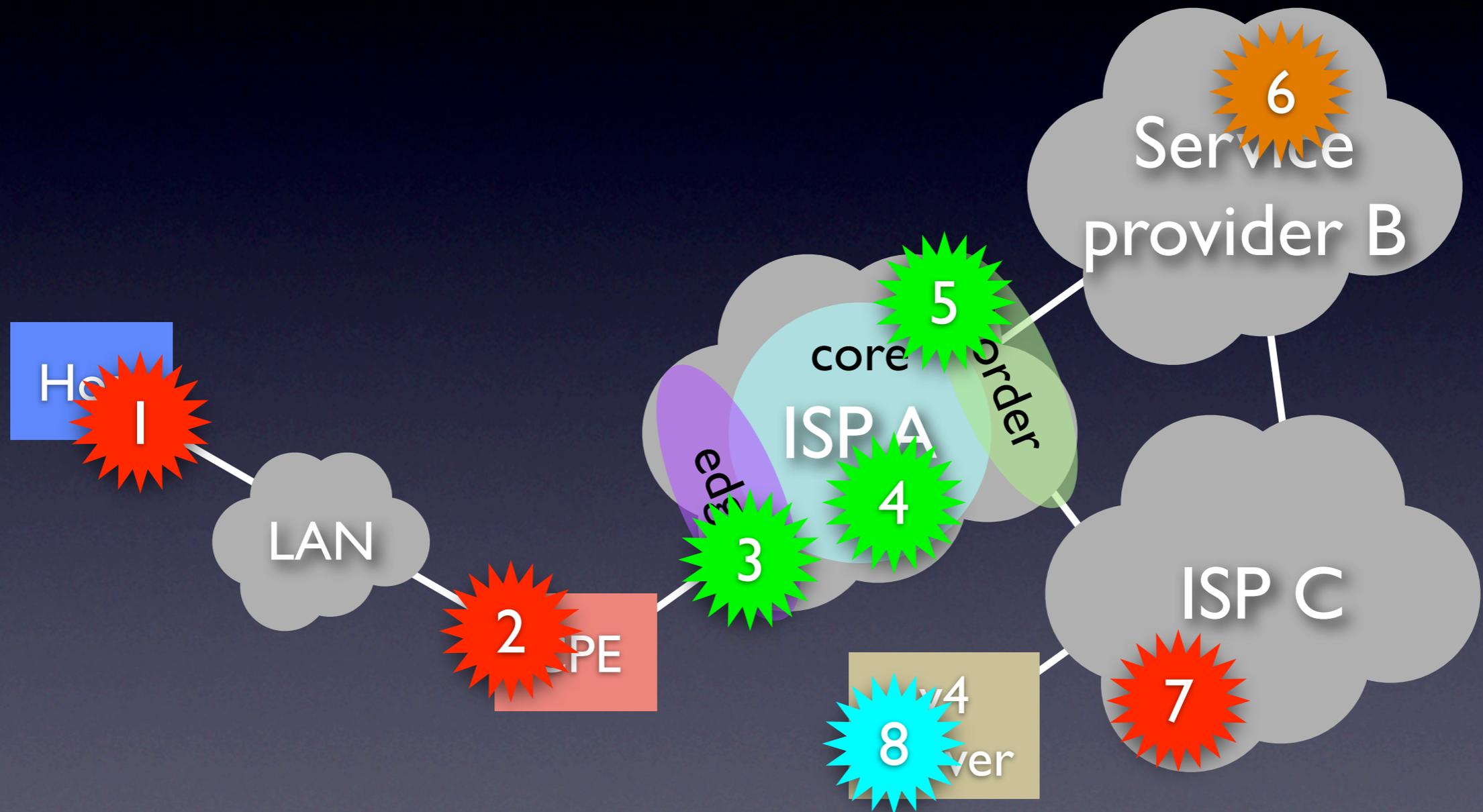
Unworkable: 1, 2, 7

- NAT64 in host (1) or CPE (2):

  - not enough IPv4 addresses to give each customer one

- NAT64 in destination ISP (7):

 - requires importing the IPv4 routing table into IPv6: not acceptable

Special cases: 6 and 8

- NAT64 in third-party service provider (6):
  - needs some kind of authentication, which current proposals don't offer
  - NAT64 prefix must be global unicast
- NAT64 in destination network (8):
  - trivial, use static mapping and publish the AAAA record
  - so looks like normal IPv6 reachability

In source ISP: 3, 4, 5

- ISP offering NAT64 to its customers:
  - ISP presumably has at least *some* IPv4
  - authentication not a big issue
  - can use non-unique well-known address prefix if desirable
  - exact placement a function of IPv4 availability, device size vs amount of traffic and traffic flow optimization

DNS64 placement
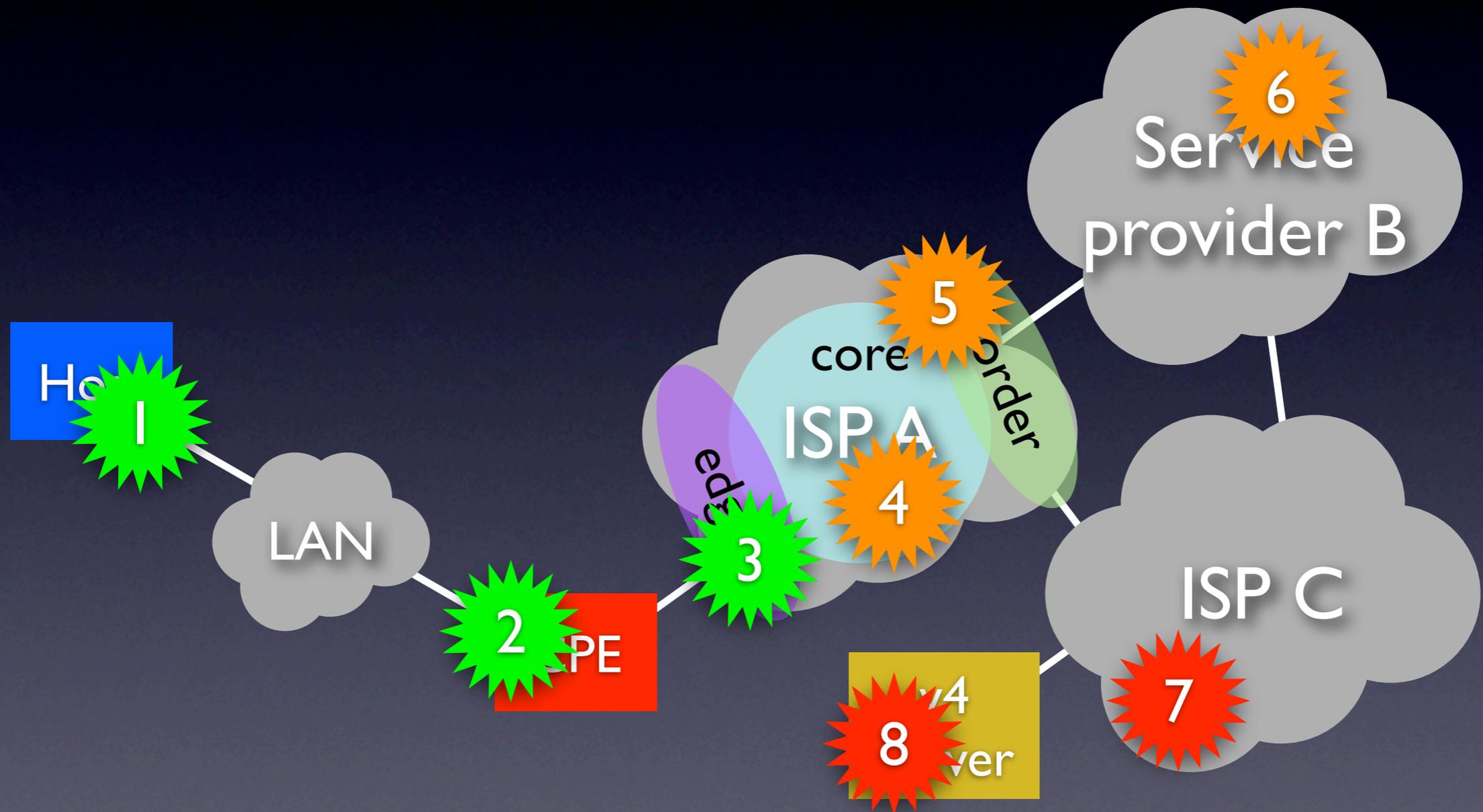
DNS64 in host (1)

- Con:
  - this requires host changes...!
  - unless well-known, NAT64 prefix config
- Pro:
  - (can be) compatible with DNSSEC
  - (can be) compatible with IPv4-only apps
  - no caching/delay issues

DNS64 in CPE (2)

- Con:

  - unless the NAT64 prefix is well-known, a configuration mechanism is needed

- Pro:

  - no caching/delay issues

DNS64 in ISP (3, 4, 5)

- Can be anywhere in the ISP network
  - colocated with NAT64 or otherwise
- But close to users is good for performance
- Must be very careful with leaking of synthetic AAAA records
  - especially to unupgraded dual stack hosts
- Pro: no need to configure customers

DNS64 at other ISP or destination (6, 7, 8)

- At third party NAT64 service provider (6) possible, but reduced performance because of RTT (also for native IPv6 sessions)

- Unrelated ISP (7) or destination (8):

  - makes no sense for global prefix

  - possible with well-known prefix, but what's the point?

Conclusion

- Useful initial approach:
  - place NAT64 *somewhere* in ISP network
  - place DNS64 in ISP net close to user
- Then later optimize:
  - add DNS64 to CPEs and/or hosts
- What kind of NAT64 prefix do we want?