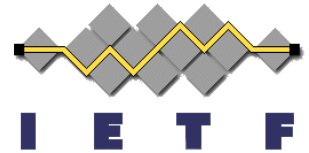


Avoiding NAT64 with dual-stack host for local networks

IETF #80 Behave WG, 29-March-2011

draft-korhonen-edns0-synthesis-flag
draft-savolainen-heuristic-nat64-discovery
draft-korhonen-behave-nat64-learn-analysis

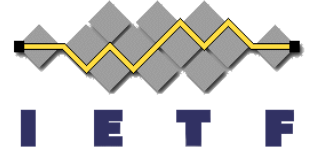
Jouni Korhonen, Teemu Savolainen



Contents

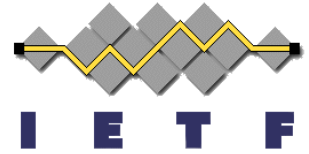
- Updates since IETF#79
 - Analysis draft
 - EDNS0 solution draft
 - Heuristics solution draft
- Experimenting
- Next steps

Update of “Analysis of ... hosts to learn NAT64 prefix”



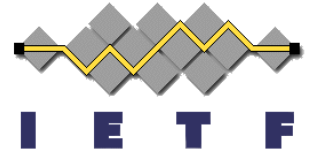
- Issue #4 (The problem of supporting changing NSP) expanded:
 - The NSP learned by the host may become stale for multiple reasons. For example, the host might move to a new network that uses different NSP, thus making the previously learned NSP stale. Also, the NSP used in the network may be changed due administrative reasons, thus again making previously learned NSP stale.
- Issue #5 (The problem of supporting multiple NSPs) expanded:
 - A network may be configured with multiple NSPs for address synthesis. For example, for load-balancing purposes each NAT64 device in the same network could be assigned with their own NSP. It should be noted that learning a single NSP is enough for an end host to successfully perform local IPv6 address synthesis but to avoid NAT64 the end host needs to learn all NSPs used by the access network.

Update of “Analysis of ... hosts to learn NAT64 prefix” cont’d



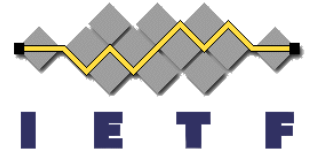
- Added a note & references to referral objects
 - “... synthesized addresses are not distinguishable from public IPv6 addresses...” [ED: this text needs to be revisited]
- Added new discovery mechanisms:
 - Access technology/link layer specific mechanisms.
- Shaped & rearranged our conclusions:
 - “... recommend publishing the Well-Known DNS Name heuristic-based method as an Informational IETF document for applications and host implementers to implement as-is. If Standards Track work is seen beneficial, then our recommendation is the standardization of ENDS0 option..”

Update of “EDNS0 Option ... Record Synthesis and Format”



- DNSSEC considerations added:
 - “... When sending AAAA query for the known name a host MUST set "Checking Disabled (CD)" bit to zero, as otherwise the DNS64 will not perform IPv6 address synthesis..”
- Host behavior clarifications:
 - Check all received AAAAs in case of synthesis.
 - How to handle NXDOMAIN or empty response.
 - Pref64 selection order (NSP:: - Use of the EDNS0 option without the *well-known name*.

Update of “Discovery of ... NAT64 Prefix using a Well-Known Name”



- DNSSEC considerations added – see previous slide.
- Host behavior clarifications – see previous slide (except for EDNS0 specifics).
- Guidelines for IPv4 addresses used in Well-Known Name (e.g. use of 127.127.127.127):
 - For combined connectivity testing purposes the IPv4 address would be a public routable address.. (query for A RR as well).
- Discussion about non-RFC6052 address formats and how to handle them.

Experimenting

- A quick ‘ping64’ hack using both:
 - EDNS0 option aware “resolver”.
 - Heuristics (127.127.127.127 as the IPv4 pattern)
 - ...not all nits from drafts are included though..
- Also EDNS0 modification to DNS64 (Ecdysis’ bind).
- Well.. it works ;-) and was easy & straightforward. Adding support to applications is minor (and if you do heuristics, EDNS0 is not much extra to add).



I can see a ping..

```
Terminal — bash — 85x17
Debug/: sudo ./ping64 -v -6 -u ipv4only.neonsite.net 128.214.222.4
IPv4-only FQDN for heuristics: ipv4only.neonsite.net
IPv4-only FQDN got synthesized: 2001:6e8:2100:1af::7f7f:7f7f
EDNS0 option returned: 0xc000
Destination IPv4.. trying to force synthesis
Pref64 known -> 2001:6e8:2100:1af::/96
Synthesizing -> 2001:6e8:2100:1af::80d6:de04/96
PING 128.214.222.4 (2001:6e8:2100:1af::80d6:de04): 56 data bytes
family: 30, proto: 58
64 bytes from pubweb.it.helsinki.fi: seq=0, hlim=44, rtt=43.696 ms
64 bytes from pubweb.it.helsinki.fi: seq=1, hlim=44, rtt=44.018 ms
^C
Debug/:
```

EDNS0 supported, skip heuristic analysis (wk-fqdn)

```
Terminal — bash — 86x17
Debug/: sudo ./ping64 -6vu ipv4only.neonsite.net www.helsinki.fi
IPv4-only FQDN for heuristics: ipv4only.neonsite.net
IPv4-only FQDN got synthesized: 2001:6e8:2100:1af::7f7f:7f7f
EDNS0 option returned: 0xc000
PING www.helsinki.fi (2001:6e8:2100:1af::80d6:de04): 56 data bytes
family: 30, proto: 58
64 bytes from pubweb.it.helsinki.fi: seq=0, hlim=44, rtt=48.574 ms
^C
Debug/: sudo ./ping64 -6vau ipv4only.neonsite.net www.helsinki.fi
IPv4-only FQDN for heuristics: ipv4only.neonsite.net
IPv4-only FQDN got synthesized: 2001:6e8:2100:1af::7f7f:7f7f
EDNS0 option returned: 0xc000
PING www.helsinki.fi (128.214.222.4): 56 data bytes
family: 2, proto: 1
64 bytes from pubweb.it.helsinki.fi: seq=0, ttl=51, rtt=47.950 ms
^C
Debug/:
```

No IPv4 literal but select between IPv4 or synthesized IPv6

```
Terminal — bash — 85x17
Debug/: sudo ./ping64 -v -6 -u ipv4only.neonsite.net 128.214.222.4
IPv4-only FQDN for heuristics: ipv4only.neonsite.net
IPv4-only FQDN got synthesized: 2001:6e8:2100:1af::7f7f:7f7f
No EDNS0 found.. looking for 127.127.127.127
Destination IPv4.. trying to force synthesis
Pref64 known -> 2001:6e8:2100:1af::/96
Synthesizing -> 2001:6e8:2100:1af::80d6:de04/96
PING 128.214.222.4 (2001:6e8:2100:1af::80d6:de04): 56 data bytes
family: 30, proto: 58
64 bytes from pubweb.it.helsinki.fi: seq=0, hlim=44, rtt=43.311 ms
64 bytes from pubweb.it.helsinki.fi: seq=1, hlim=44, rtt=47.891 ms
64 bytes from pubweb.it.helsinki.fi: seq=2, hlim=44, rtt=44.115 ms
^C
Debug/:
```

EDNS0 not supported, do heuristics analysis (wk-fqdn)

```
Terminal — bash — 85x17
Debug/: sudo ./ping64 -v -6 -u www.hut.fi 128.214.222.4
IPv4-only FQDN for heuristics: www.hut.fi
IPv4-only FQDN got synthesized: 2001:6e8:2100:1af::82e9:e0fe
EDNS0 option returned: 0xc000
Destination IPv4.. trying to force synthesis
Pref64 known -> 2001:6e8:2100:1af::/96
Synthesizing -> 2001:6e8:2100:1af::80d6:de04/96
PING 128.214.222.4 (2001:6e8:2100:1af::80d6:de04): 56 data bytes
family: 30, proto: 58
64 bytes from pubweb.it.helsinki.fi: seq=0, hlim=44, rtt=43.293 ms
64 bytes from pubweb.it.helsinki.fi: seq=1, hlim=44, rtt=43.551 ms
64 bytes from pubweb.it.helsinki.fi: seq=2, hlim=44, rtt=44.011 ms
^C
Debug/:
```

EDNS0 supported, skip heuristics analysis

Next steps?

- Analysis draft... get it finally published?
- Solutions (due April 2011 as per charter)
 - Two proposals on table..
 - Pick one and get it published?