- personal contribution to the 2012 World IPv6 launch
- one of approximately 10 .CZ domains publishing only AAAA record
- lightweight static design
- displays information about IPv4 capability and preference
Neběží.cz after launch

- announced during the 2012 IPv6-day conference in Prague
- contact e-mail address with IPv6-only domain
- most people got their e-mail bounced

- added auto-replying mail checker test@doesnotwork.eu.
- added reverse DNS record check
IPv6 E-mail checker

- many (mostly) unrelated abilities to test:
  1. deliver mail to v6-only destination
  2. receive mail over IPv6
  3. receive mail from IPv6-only envelope address
  4. receive mail from IPv6-only in-body From: address

- my solution:
  1. autoresponder triggered by receiving an e-mail to IPv6-only address
  2. respond from IPv4-only domain via dual-stack transport
  3. respond from IPv6-only domain via IPv6-only transport
  4. in case the IPv6-only bounces, the DSN is forwarded to the origin via dual-stack

- feel free to try it at test@doesnotwork.eu
Used components

- Postfix mail server with two personalities
  - one is dual-stacked
  - other is IPv6-only
  - selected by envelope recipient address
- procmail
- simple custom Python script
Processed bounce

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From: DoesNotWork.eu autoreply over IPv4 <test@ipv4.doesnotwork.eu>

Subject: DoesNotWork.eu: You are not receiving e-mails over IPv6!

To: Ondřej Caletka (CESNET, z. s. p. o.)

DKIM: Valid (Signed by ipv4.doesnotwork.eu)

Sorry!

Although you were able to send a message to IPv6-only address, there was a problem delivering reply from that address.

The exact description of the problem observed by our server www.doesnotwork.eu is attached. You can inform your e-mail service provider about the issue.

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DoesNotWork.eu

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Final-Recipient: rfc822;  
Action: failed  
Status: 5.4.4  
Diagnostic-Code: X-Postfix; Host or domain name not found. Name service error for name=mxcluster2.one.com type=AAAA: Host found but no data record of requested type
### RFC 2821
- Proposed standard, 2001
- Defines SMTP over IPv6, IPv6 literals, etc.
- “If no MX records are found, but an A RR is found, the A RR is treated as if it was associated with an implicit MX RR.”

### RFC 5321
- Draft standard, 2008, obsoletes RFC 2821
- “If an empty list of MXs is returned, the address is treated as if it was associated with an implicit MX RR, with a preference of 0, pointing to that host.”
first, only AAAA record for www.doesnotwork.eu, no MX

Gmail bounced immediately, saying that there is “No MX record.”

then, self-referring MX record has been added:
doesnotwork.eu. IN MX 0 www.doesnotwork.eu.

with that, Gmail used to hold the message in queue for 3 days, bouncing every 24 hours with following failure:
DNS Error: DNS server returned answer with no data

this has been fixed around August 2013
(but Gmail does not accept mail over IPv6 without reverse DNS record)

http://postfix.1071664.n5.nabble.com/disable-ipv6-when-sending-to-gmail-tp60672p60673.html
no information about delivery attempts
cca. 100 messages successfully received from 88 different domains
no automatic check of the return path by that time
return path domains lead to 135 different MX destinations, with 113 different IPv4 addresses and 71 different IPv6 addresses
from 71, only 50 actually accepted TCP connect to port 25!
all major freemail services, even if webmail was IPv6 ready, could not deliver to IPv6-only network
no information about delivery attempts
303 test messages received from 217 unique addresses
138 unique domain names
39 IPv6 bounces from 26 different addresses
   34 bounces due to “No AAAA record for MX”
   4 bounces due to “Invalid recipient”
   1 bounce due to “Protocol error”

the problem with servers not listening on IPv6 socket is obviously gone
Receiving mail from IPv6-only domain

$ telnet smtp2.ms.mff.cuni.cz 25
Connected to smtp2.ms.mff.cuni.cz.
Escape character is '^[].'
220 smtp2.ms.mff.cuni.cz ESMTP Sendmail 8.15.2/8.15.2;
    Tue, 25 Oct 2016 00:07:20 +0200 (CEST)
HELO www.doesnotwork.eu
250 smtp2.ms.mff.cuni.cz Hello www.doesnotwork.eu
    [IPv6:2001:1528:132:70::d0e5], pleased to meet you
MAIL FROM: <ondrej@doesnotwork.eu>
553 5.5.4 <ondrej@doesnotwork.eu>... Sender's best MX
    (www.doesnotwork.eu.) has no IP. Please contact
    your network administrator for further assistance.
Securing the IPv6-only website

- how to prove ownership of IPv6-only domain name?
  - StartSSL, WoSign – IPv4-only (and efficiently dead by now)
  - only e-mail and HTTP authentication available
  - solved by temporary adding IPv4 MX to the DNS

- Let’s Encrypt
  - launched in late 2015 – IPv4-only
  - DNS-based ownership validation since 01/2016
  - full IPv6 validation support since 07/2016

- there is deliberately no redirection to HTTPS
  - you can compare results
  - some HTTP accelerators (like Chrome for Android) provide IPv6 gateway as a side effect, but only for HTTP
Testing various “check your webpage” sites

- http://isup.me – tells you that site is down
- https://dane.sys4.de – works since inception
- HTTPS Everywhere – IPv6-only URLs fail in Travis CI
- https://observatory.mozilla.org – launched IPv4-only, partially fixed now
Any questions?

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