E-mail services over IPv6

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Agenda

1. About Neběží.cz/DoesNotWork.eu
2. IPv6 E-mail checker
3. RFC 2821 vs. RFC 5321 vs. Gmail
4. E-mail test statistics
5. Receiving mail from IPv6-only domain

Neběží.cz

- Personal contribution to the World IPv6 launch.
- One of approximately 10 .CZ domains publishing only AAAA record.
- Lightweight design, hosted on 2 EUR/month VPS.
- Displays information about IPv4 capability and preference.

Neběží.cz after launch

- Page provides feedback e-mail address `info@nebezi.cz`, made as a simple mail relay on webserver.
- Most people were not able to reach us, used backup e-mail address `info@ipv4.nebezi.cz`.
- Added auto-replying mail checker `test@nebezi.cz`.
- Added English version at `http://www.doesnotwork.eu`.

IPv6 E-mail checker

- Created using procmail and Reply-o-Matic.
- 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.
- We are now testing only ability 1 to be sure that autoreply will reach the sender.
- Checking of abilities 2, 3, and 4 is planned.

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Return path e-mail checker options

- Write own simple IPv6 only MTA.
  - ✓ Verbose workflow logging, which can be e-mailed to sender afterwards.
  - ✓ Could be triggered by received e-mail, do its work and exit, ie. no running daemon.
  - ✗ Complex to implement.
  - ✗ Problems with greylisting (No queue in simple MTA).
- Run standard, separate IPv6-only MTA, parse bounces which it would made.
  - ✓ Works with greylisting and other corner cases of SMTP.
  - ✗ Resource demanding (Another daemon, possibly on separate IPv6 address.)
  - ✗ Asynchronous workflow, failure log only in bounce messages, which should be parsed and returned in somewhat user-friendly way to the original sender.

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RFC 2821 vs. RFC 5321

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.“

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Gmail MX handling

- At the beginning, there was no MX record, only AAAA.
- GMail bounced such mail immediatelly, saying that there is „No MX record.“
- Then, self-referring MX record was added:

```
nebezi.cz.  IN  MX 0 nebezi.cz.
```

- After that, Gmail holds message in queue for 3 days, bouncing every 24 hours with following failure:

```
DNS Error: DNS server returned answer with no data
```

Some statistics

- We don't know, how many attempts failed to deliver mail, as they left no sign (only in DNS).
- So far 100 test-mails succesfully received from 88 different domains.
- 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 is IPv6 ready, cannot deliver to IPv6-only network.

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Receiving mail from IPv6-only domain

- Here comes the mail server setup, anti-spam and anti-virus software.
- There is no standard behavior, every anti-* software use its own methods.
- Most of them cannot deal with IPv6. Some implementations just pass it through without check, others just pretend that IPv6 does not exist:

```
$ telnet smtp2.ms.mff.cuni.cz 25
Trying 2001:718:1e03:801::5...
Connected to smtp2.ms.mff.cuni.cz.
Escape character is '^]'.
220 smtp2.ms.mff.cuni.cz ESMTP Sendmail 8.14.5/8.14.5; Tue, 2 Oct 2012 10:15:30 +0200 (CEST)
HELO doesnotwork.eu
250-smtp2.ms.mff.cuni.cz Hello vm.oskarcz.net [IPv6:2a01:430:d:0:2cc:9eff:fe24:7e1a], pleased to meet you
MAIL FROM: ondrej@doesnotwork.eu
553 5.5.4 ondrej@doesnotwork.eu... Sender's best MX (nebezi.cz.) has no IP.
          Please contact your network administrator for futher assistance.
```

Mail forwarding issues

- Although Gmail is not able to send mail to IPv6, we actually received some succesfull test from domain gmail.com.

⇒ Many users (still!) uses ISP-provided relay SMTP server for all outgoing mail, possibly breaking DKIM or SPF.

- Even if SMTP server receives a mail from IPv6-only domain succesfully, the mailbox user can usually request forwarding to some other e-mail address.

⇒ Mail can be rejected (or, worse, silently dropped) when forwarded to final destination.

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IPv4 relay for IPv6-only server

- In the near future, more and more ISPs will deploy Carrier Grade NAT devices for broadband connections.
- MTA on your home server/NAS/whatever will not have a public routable IPv4 address, therefore could not send outgoing e-mails to many destinations.
- Possible solution is to set up a IPv4-enabled relay with lower priority:

```
v6onlyserver   IN AAAA 2001:db8::1
               IN MX   10 v6onlyserver
               IN MX   20 relayserver

relayserver    IN A      192.0.2.1
```

- The relay server should have (at least) a list of valid recipients to avoid backscattering spam.

Conclusion

- As e-mail by design does not need end to end connectivity, not so many administrators are enabling IPv6 mail services.
- Postfix MTA support IPv6 very well, but support is disabled by default.
- Content-analyzing anti-spam solutions should be IP version agnostic.
- Spam on IPv6 is not an issue nowadays, but it can change instantly, as broadband IPv6 connections are beeing deployed worldwide.

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Conclusion

Any questions?