I'm from the IETF and I'm here to help you
or
Scenarios for IPv6 Deployment

draft-carpenter-v6ops-isp-scenarios

Brian Carpenter
The University of Auckland
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Outline

- The Great Disillusionment
- What the IETF has been up to in the last year
  - tunnels++
  - NAT++
  - operations
- What I'm trying to do with my colleague/sponsor in Huawei Research
- Request for your help

Reality breaks in,
as always

- Since the IETF first considered deployment scenarios, the original expectation that IPv6 would deploy before IPv4 ran out has proved wrong.

- This changes the available transition models.

- More need for interworking than ever expected. The only commercially sane assumption is that v6 clients will need to access v4 services indefinitely.

- This has been driving IETF work for a couple of years.

Tunnels: the SOFTWIRE WG

- "discovery, control and encapsulation methods for connecting IPv4 networks across IPv6 networks and IPv6 networks across IPv4 networks in a way that will encourage multiple, inter-operable implementations."

- Dual Stack Lite - share IPv4 addresses among customers by combining IPv4-in-IPv6 and NAT. Driven by Comcast broadband model.

- 6rd - blend of 6to4 and ISATAP providing automatic tunneling of IPv6-in-IPv4 to ISP subscribers. Deployed by Freenet.FR

- Older mesh and hub+spoke models also documented, using GRE, IP-in-IP, L2TPv3, IPsec and MPLS.
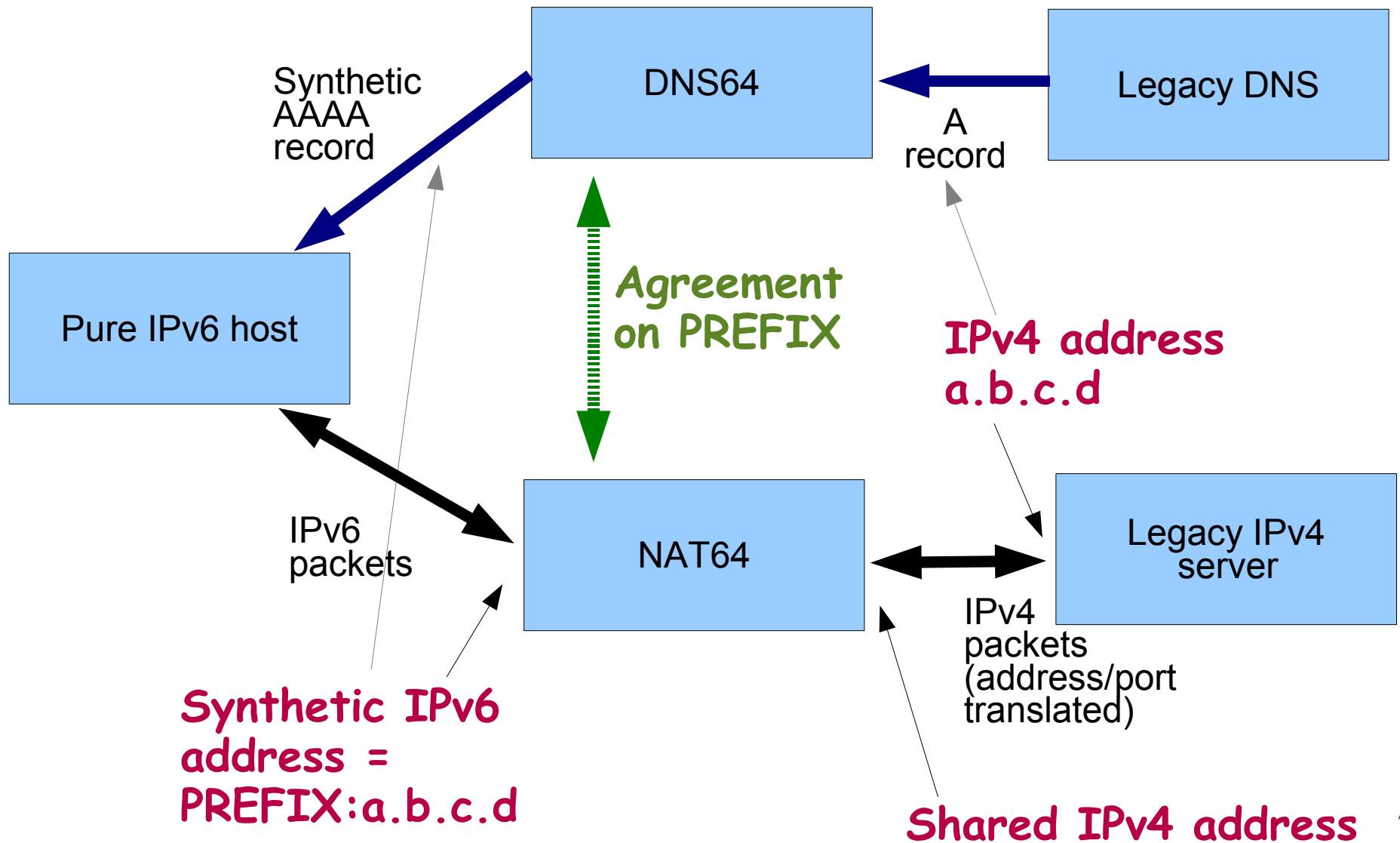
Ain't misBEHAVing: NAT64

- *Reminder:* the old NAT-PT specification was deprecated, mainly due to irreconcilable differences with DNS.

- However, many operators (especially in the mobile "LTE" world) are convinced that they will soon have millions of IPv6-only subscribers needing access to legacy IPv4-only services.
{Argument about exactly what the economic incentives are deleted - but just imagine selling mobiles that can't reach PayPal.}

- Therefore, the BEHAVE WG has taken up the NAT64 challenge.

NAT64 only solves one problem

- IPv6-only client (no v4 address, no v4 connectivity) needs to initiate communication with an IPv4-only server.

  - As stated, this requirement cannot be met by the conventional dual stack approach.

  - Whatever *you* may believe, some ISPs believe this is vital, and their suppliers believe they'd like the business.

- NAT64 doesn't tackle any other cases.

- NAT64 comes with a separate DNS64 magic box

  - NAT-PT came with a built-in DNS ALG

Components

Synthetic AAAA record

DNS64

Legacy DNS

A record

Pure IPv6 host

Agreement on PREFIX

IPv4 address a.b.c.d

IPv6 packets

NAT64

Legacy IPv4 server

IPv4 packets (address/port translated)

Synthetic IPv6 address = PREFIX:a.b.c.d

Shared IPv4 address

7

Sequence of events

- The IPv6 host uses DNS64 as its regular DNS service to look up servers.
    - For native IPv6 hosts, DNS64 returns normal AAAA records.
    - For hosts with A records only, DNS64 concatenates the agreed PREFIX and the IPv4 address from the A record, and synthesises an AAAA record.

- The IPv6 host just sends normal packets to the synthetic address, which is routed to the NAT64.
    - The NAT64 recognises a new session, extracts the server IPv4 address from the synthetic address, assigns a port on the IPv4 side and other NAT state, and otherwise does its standard NAT thing.

- From an application viewpoint, this looks pretty much like old fashioned NAT44.

What is the PREFIX?

- PREFIX is likely to be a /96 (leaving 32 for the IPv4 address)

- Could be locally assigned (one operator controls IPv6 host, NAT64 and DNS64)

- Could be a globally defined WKP (well known prefix)

  – What happens if a synthetic address "escapes" from the scope of the NAT64/DNS64 pair?

Documents in development

- draft-ietf-behave-v6v4-framework
- draft-ietf-behave-address-format
- draft-ietf-behave-v6v4-xlate (stateless translation)
- draft-ietf-behave-v6v4-xlate-stateful (NAT64 itself)
- draft-ietf-behave-dns64
- draft-ietf-behave-ftp64
- draft-penno-behave-64-analysis

V6OPS activity

- "The IPv6 Operations Working Group (v6ops) develops guidelines for the operation of a shared IPv4/IPv6 Internet..."

- Current work includes:

  – Requirements for CPE routers

  – IPv6 Deployment in Internet Exchange Points

  – Incremental Carrier-Grade NAT (CGN) for IPv6 Transition

  – ISP scenarios generally. Personally, I'm working with Sheng Jiang of Huawei on ...

Emerging Service Provider Scenarios for IPv6 Deployment
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- It's several years since the IETF last worked on ISP deployment scenarios

- Since then numerous ISPs have gained real deployment experience

  - and other ISPs have started active planning

- In the last 2 years there has been a real change in ISP requirements

  - Enormous activity in SOFTWIRE, BEHAVE etc.

- We believe that it's time for another systematic look at ISP scenarios

Planned approach

- Publish a skeleton draft to indicate our intentions *(done)*

- Identify a set of ISPs willing to provide input *(started)*

- Develop and issue a questionnaire to all ISPs willing to answer it
(started, target for replies ASAP)

- Analyse replies and draw conclusions in the draft *(target for draft 3/2010)*

Planned outline of draft

- Review of existing documents
- Review of ISP experience, plans and requirements
- Lessons from experience and planning
- Suggested scenarios
  - *Note* - probably not formal recommendations
- Gap analysis
- Security Considerations

Existing documents identified so far

- RFC 4029, Scenarios and Analysis for Introducing IPv6 into ISP Networks - *useful, but things have changed*

- Access technologies - *useful, but no overview*
  - RFC 4779, ISP IPv6 Deployment Scenarios in Broadband Access Networks
  - RFC 5181, IPv6 Deployment Scenarios in 802.16 Networks
  - RFC 5121, Transmission of IPv6 via the IPv6 Convergence Sublayer over IEEE 802.16 Networks
  - draft-ietf-16ng-ip-over-ethernet-over-802-dot-16

- Security - *not an ISP view*
  - RFC 4942, IPv6 Transition/Co-existence Security Considerations
  - RFC 4864, Local Network Protection for IPv6

- RFC 5211, An Internet Transition Plan - *strategic view only*

Outline of questionnaire

- Confidentiality wanted?
- General questions about IP service
- Questions about requirements for IPv6 service
- Questions about status and plans for IPv6 service
- Questions about individual IPv6 technology choices

If you're an ISP, or want to be an ISP, please answer the questionnaire!

- Find it at:
  http://www.cs.auckland.ac.nz/~brian/ISP-v6-QQ.html

- No frustrating form to fill in, just use your favourite text editor and email it back to us.

- We will keep your reply strictly confidential and we will publish only combined results. We will not identify information about individual ISPs in any published results. If you request it, we will not mention you or the ISP in the acknowledgments.

brian.e.carpenter @ gmail.com

shengjiang @ huawei.com