ISC AFTR: One Path to IPv4-IPv6 Co-existence

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We've all heard the news....

- Unallocated IPv4 is running out
  - Current prediction at potaroo.net: 1st May, 2012
  - Functionally already gone for large network operators
- Applications aren't IPv6-enabled
- Content providers are mixed at best
- ISPs/access providers have to bridge the gap

IPv4-IPv6 co-existence

- A variety of technologies being discussed
- Some people think we'll just do more IPv4 NAT, or NAT64/DNS64, or Host-based dual-stack
- We're here to talk about dual-stack lite: https://datatracker.ietf.org/doc/draft-ietf-softwire-dual-stack-lite/

A quick zoo of use cases

- Is IPv6 irrelevant to you, or “Somebody Else's Problem?”
  - NAT44 is basically more of the same.
  - NAT-PT, 6to4 relays, tunnelbrokers, etc. become your users' problem
- Are you building IPv6 in at the edges, but keeping IPv4 at the core?
  - NAT64/DNS64
  - can be complex to operate, may not have to be

A quick zoo, continued

- Can you maintain good connectivity for both, particularly as a content provider?
  - conventional dual-stack, or user-facing equivalent
  - note some interesting “tricks” being explored for choosing when to “risk” IPv6 transport
- Are you building IPv6 into your core, but have to assume IPv4 out beyond the CPE?
  - dual-stack lite sits here

Dual stack lite

- Allows IPv4 applications behind IPv6 CPE to communicate with IPv4 servers and peers over IPv6 infrastructure
- One AFTR ("Address Family Transition Router") can handle many clients
  - Tunnel over IPv6 infrastructure
  - NAT to IPv4
- The client side is simple and lightweight

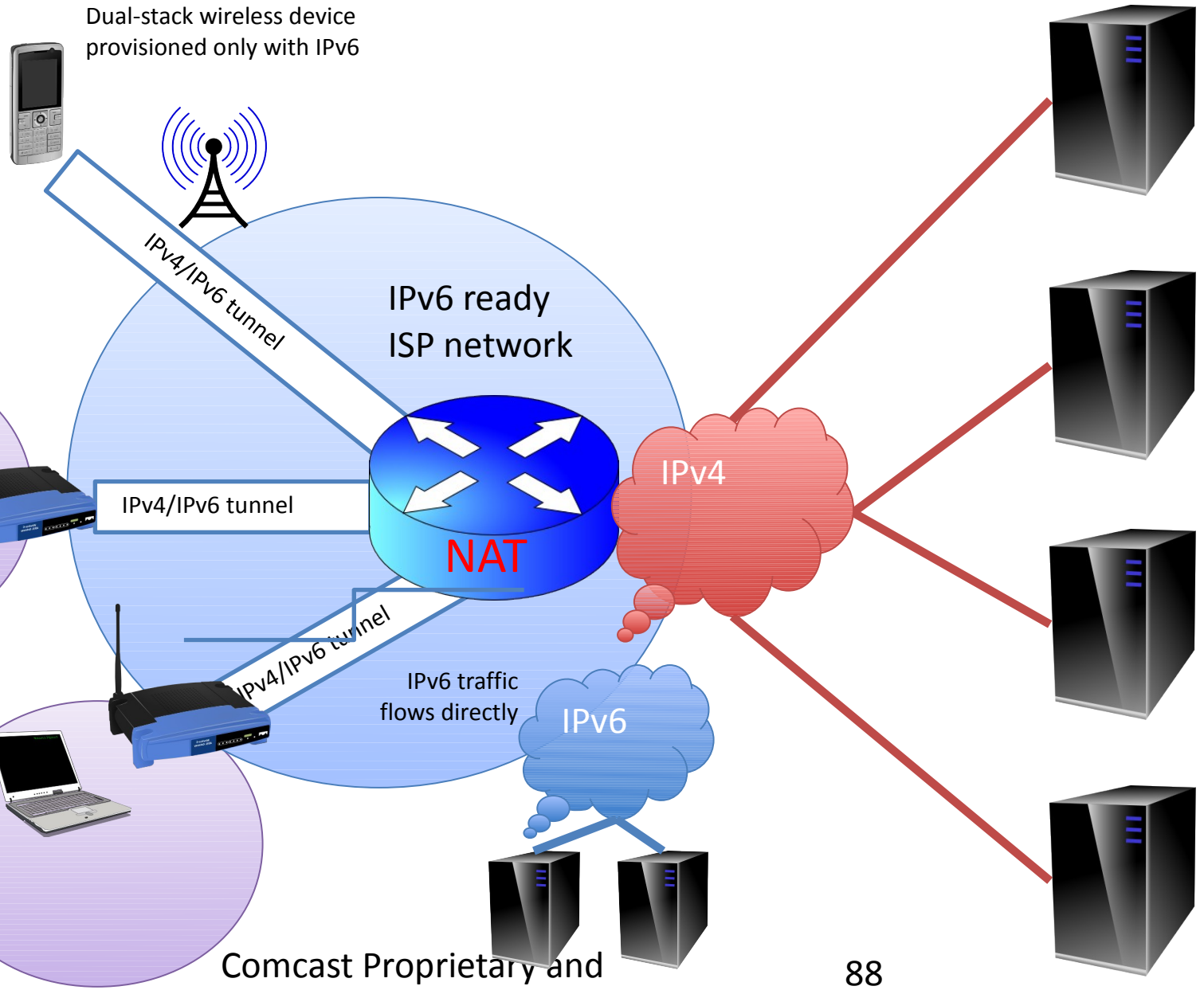
DS-lite strategy

Native IPv6 + IPv4 overlay service over IPv6

(when IPv4 addresses are no longer available)

The NAT function is moved from the home gateways to a box in the service provider network:

Only one level of NAT



Comcast Proprietary and Confidential

Basic structure of a DS-lite installation: B4

- The CPE runs the client end of the multipoint-to-point tunnel (“B4”)
  - A DHCP option supplies the target address
  - this can be changed as easily as any other DHCP-managed parameter
- Encapsulation of IPv4 packets based on {addr, port}
- Port mappings are maintained here
- Port reservation extensions are under discussion

Basic structure, con't: AFTR

- Tunnel concentrator, more or less
- Decapsulates incoming IPv4-in-IPv6 packets
  - Native IPv6 has passed through unaltered
  - straightforward, intended to be fast
- "Conventional" NAT with shared IPv4 address
  - Manages port mappings/reservations
  - Can support static or dynamic use of limited IPv4 addresses

How it works

- Network sees both IPv4 and IPv6 in use:
  - One IPv6 delegation for the customer site
  - One IPv4 delegation for the AFTR
- Customer sees “business as usual”
  - IPv6-aware applications can use IPv6
  - IPv4-only applications Just Work
- Control points are shared:
  - CPE controls resource requests
  - Carrier can manage scaling, etc.

An open source implementation

- ISC with support from Comcast has released an open source implementation of dual-stack lite
- Runs on commodity hardware
- Distribution is:
  - Client side DHCP with functionality to set up tunnel (the “B4” element in the spec)
  - Server side tunnel concentrator/NAT (the “AFTR” element in the spec)
- http://www.isc.org/software/aftr

Future of AFTR

- Next release later this year
  - uPnP for more integrated port reservation/management
  - Performance!
  - Work within the IETF to support choosing among multiple AFTRs by a B4
- Carriers of all sizes should find this useful technology to cross that gap between the end of unallocated IPv4 and deployment of IPv6.

Try it out!

- Dual-stack lite is just one of the tools in the kit.
- We think the use case goes way beyond large access networks
  - If you're growing a network and can only get IPv6 addresses,
  - And you have an installed base of IPv4 end nodes....

We want to hear from you

- The usual open source mechanisms:
  - Mailing lists
  - AFTR Forum
- Look for us here, IETF, RIR meetings....
- Drop me or our product manager a line:
  - Suzanne Woolf (woolf@isc.org)
  - Larissa Shapiro (larissas@isc.org)