IETF Report: IPv4-IPv6 Co-Existence

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APRICOT 2009
Topics to Talk About

- IPv4 depletion
- IPv6 deployment
- Recent IETF efforts
- The difficult parts
- Call for feedback
Implications of the IPv4 Situation

- Leads to a change in the network business
- Painful discussions on how the remaining addresses are allocated
- Address trading is likely to become a reality
- Impact on how network address translators (NAT) are used and placed
  - One public address per subscriber no longer feasible; have to share addresses
- IPv6 deployment becomes even more crucial
New IPv6 Deployment Tools at the IETF
IPv6 Deployment

- Looking at new needs and additional features (just as with any IETF technology)
- New deployment scenarios identified
  - Unilateral IPv6 deployment
  - IPv4 and address sharing in an IPv6-only access network
- Chartered two new work items in the Internet and Transport areas
- Expecting the RFCs to come out late 2009
Should We Forget Dual-Stack?

- No! The new tools are for new scenarios; existing tools continue to be valid for other cases
- While you see a lot of new tools being built
- This is NOT an indication that the existing tools should no longer be used – Dual Stack works and is the most well-understood way to deploy IPv6 today
- Other existing tools also continue to be valid, e.g., SOFTWIRE mesh solutions
Understanding the IPv6 Deployment Challenges

- Individual adoption is possible, but multiple stakeholders are needed for actual use
  - Application, host, local network, and Internet
- No universal implementation support – appliances, firewalls, etc.
New: Unilateral Deployment

- Translation through a general purpose IP protocol translator or an application proxy
- Enables unilateral deployment
- Some networks use a deprecated tool NAT-PT, leading to a number of problems
- Improved specifications to come out
New: Address Sharing & IPv6-Only Access Networks

- Problem: less than 1 address per subscriber
- Problem: operator domain larger than net10
- SOFTWIRE WG working on a solution
- Employs an IPv6 only network, but uses tunneling to provide IPv4 service
- NAT in the operator domain (address sharing)
The Difficult Parts 1 - Tunnels

- We know how to do tunnels and NATs
- But still some things to work on
  - Tunnel endpoint discovery via DHCP
  - Load balancing/liveness detection
Can we reduce the effects of Carrier Grade NATs (CGNs)?

- Move NAT closer to the user!
- Each user gets a "fraction" of an address, i.e., a port range or a set
- Provider routes on port ranges
The Difficult Parts 3 - Translation

- DNSSEC – mostly solvable if the validating resolver and mapping is in the local DNS server or in the host
- The choice of the prefix that represents IPv4 space in IPv6 space
  - Standardized vs. normal prefix
  - Affects routing tables, load balancing, ...
- Compatibility with address selection rules
  - We should avoid using a translator if a direct IPv6 path exists
The Difficult Parts 3 - Translation

- Should the same rules be followed as in NAT44s (endpoint independence etc)?
- Ongoing discussion about the priorities – what specifications will come out first
  - IPv6-only network to Internet
  - IPv4 Internet to IPv6-only network
  - IPv4-only network to IPv6 Internet
  - ...

The possibility of an IPv6-to-IPv6 translation device has also come up

- Can be done very badly by copying what IPv4 NATs do
- Or more wisely, eliminating 80% of the disadvantages

Not clear yet if this is
- A) a better way to do a bad thing,
- B) solution to BGP scaling & world hunger,
- C) or a blasphemy
Next Steps

- Discussions ongoing in
  - BEHAVE WG (IPv4-IPv6 translation)
    http://tools.ietf.org/wg/behave
  - SOFTWIRE WGs (tunneling + NAT)
    http://tools.ietf.org/wg/softwire
  - SHARA BOF (port range routing)
    http://www.ietf.org/mailman/listinfo/nat66
  - 6AI BOF (IPv6-IPv6 NAT)
    http://www.ietf.org/mailman/listinfo/shara
- IETF-74 in San Francisco, March 22-27
- Please provide feedback