Post IPv4 “completion”

Sharing IPv4 addresses

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The Internet must support continued, un-interrupted growth regardless of IPv4 address availability

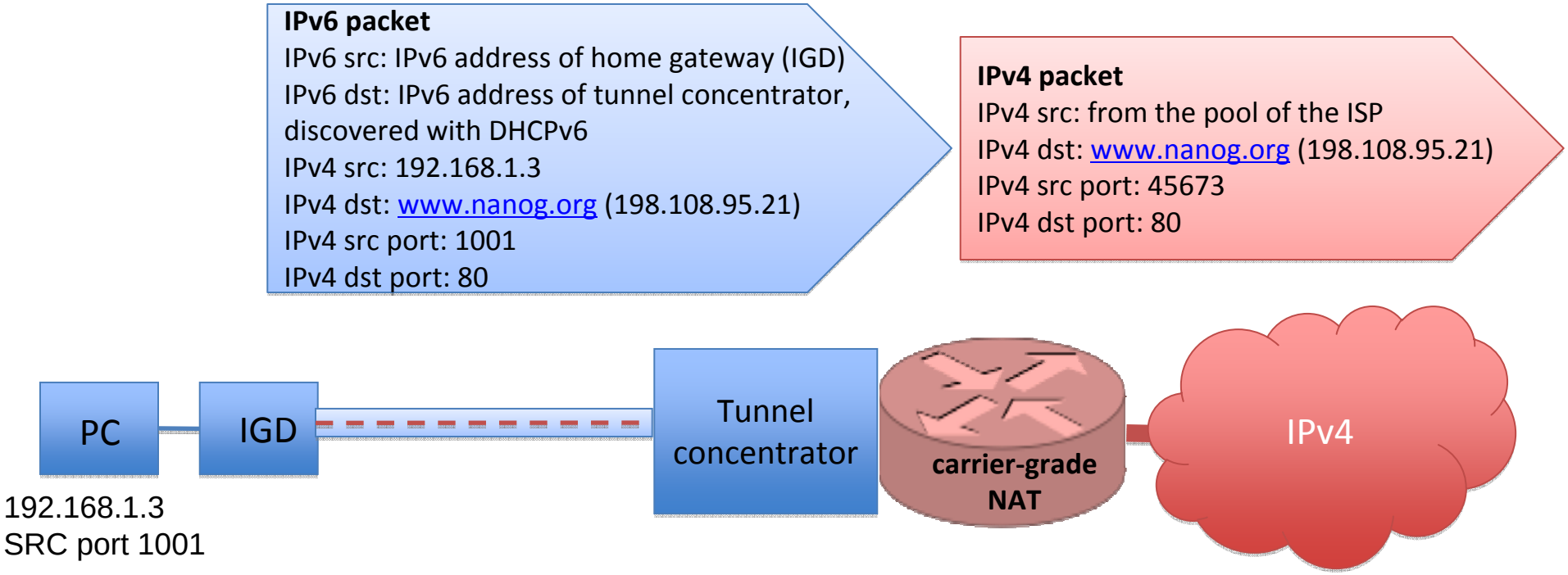
- DISCLAIMER:

  Comcast has not made any decisions to deploy any of the following technologies.

Dual-Stack lite (DS-lite)

Combining two well-know technologies:
NAT + Tunneling

Gateway-based scenario:
IGD are provisioned with IPv6-only + IPv4 support for the homer PC from a carrier-grade NAT

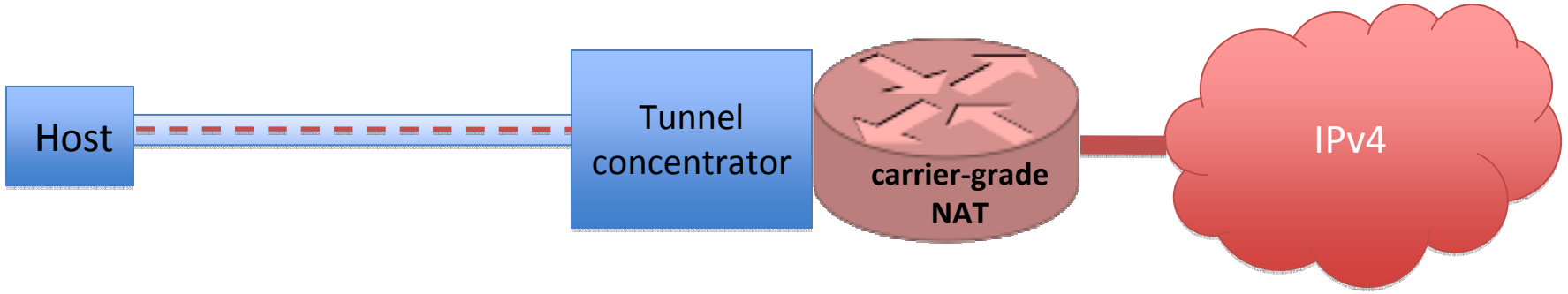


NAT binding
IN:
IPv6 src: IPv6 address of IGD + 192.168.1.3 + port1001
OUT:
IPv4 src address: from pool of the ISP + port: 45673

End-node scenario:
Dual-stack capable end-nodes are provisioned with IPv6-only + IPv4 support from a carrier-grade NAT

IPv6 packet
IPv6 src: IPv6 address of end-node
IPv6 dst: IPv6 address of tunnel concentrator, discovered with DHCPv6
IPv4 src: well known IPv4 address: (IANA defined)
IPv4 dst: www.nanog.org (198.108.95.21)
IPv4 src port: 1001
IPv4 dst port: 80

IPv4 packet
IPv4 src: from the pool of the ISP
IPv4 dst: www.nanog.org (198.108.95.21)
IPv4 src port: 45673
IPv4 dst port: 80



NAT binding
IN:
IPv6 address of end node + well known IPv4 address of end-node (IANA defined) + port1001
OUT:
IPv4 src address: from pool of the ISP + port: 45673

DS-lite Status

- IETF
  - Latest draft:
    - draft-durand-softwire-dual-stack-lite-00.txt
  - IETF softwire wg has just been re-chartered to standardize DS-lite.
    - Target 1Q2009…
- Implementations
  - IGD: Open source code for a Linksys router
  - CGN: Vendor code, open source project started

Tunnel-based solution

- Running a tunnel between the end-node or the IGD and the CGN open the door to several new things, simply by pointing the tunnel to the right place:
  - Placement of CGN where it makes sense
  - Horizontal scaling of CGN
  - Use of 3rd party CGN (virtual ISP)
  - …

Open issue 1: port distribution

- CGN are not be the best place to implement ALGs
  - "The issue is not so much the placement of the NAT but the control of it" (Randy Bush).
  - Enable the end-node or the IGD to perform the ALG function, by reserving ports in the CGN
    - Dynamic: port mapping protocol between IGD & CGN (eg NAT-PMP)
    - Static: limited manual port reservation (web page?)

- Things to avoid (IMHO)
  - Complexity & delays in IETF effort (SAM, A+P)
  - redefining DHCPv4 to allocate port numbers (SAM, A+P)
  - Importing the IPv4 routing table into IPv6 (A+P)
  - An inefficient port allocation scheme (SAM, A+P)

Open Issue 2: UPnP

- Apps that insist on running on a well-known port number (or port range) using UPnP to signal the home gateway
- Better semantic (NAP-PMP): ask for any mapping IPv4 address/port number
- This is true for any IPv4 address sharing mechanism, eg Double NAT, A+P, NAT64,…

Open Issue 3

- Logging IP address + time stamp is no longer enough to deal with abuse / lawful intercept.
- There is a need to adapt tools to log port numbers as well as IP addresses.
- This is true for any IPv4 address sharing mechanism, eg Double NAT, A+P, NAT64,…