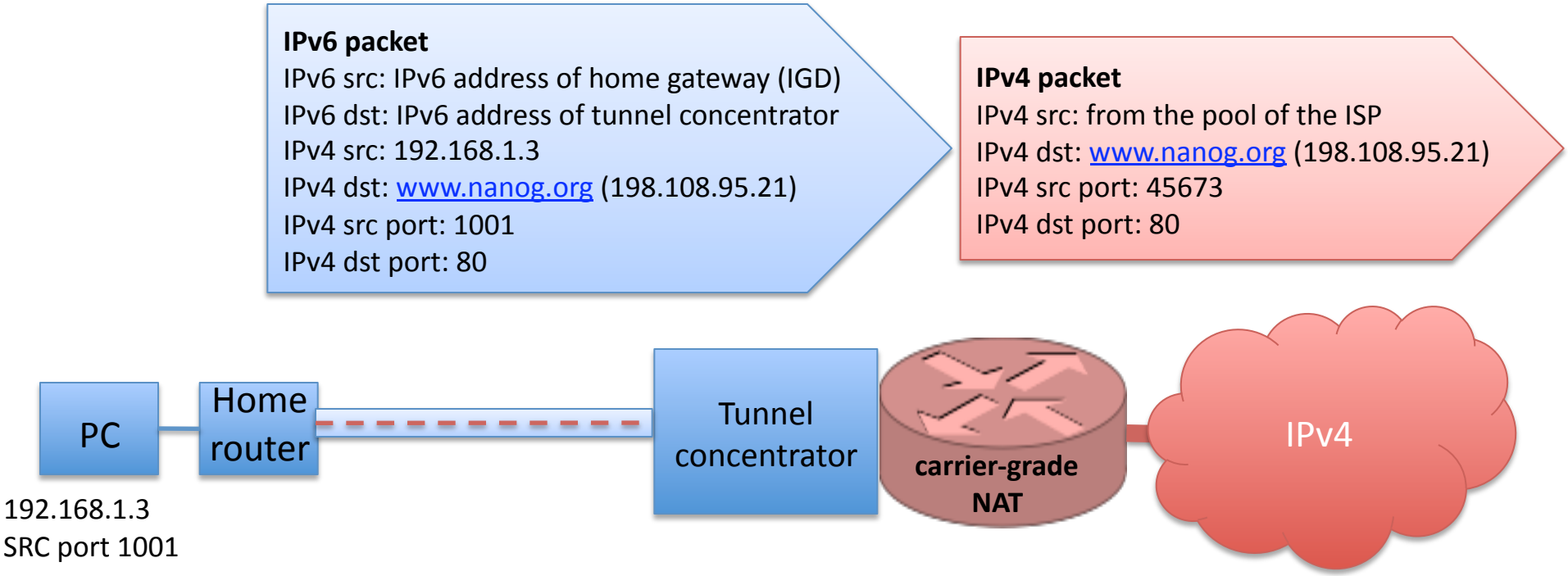
Dual-stack lite

draft-durand-softwire-dual-stack-lite-01

A. Durand, R. Droms,

B. Haberman, J. Woodyatt

Router-based scenario:
Home router is provisioned with IPv6 on WAN and tunnel concentrator address; provides IPv4 transport for the home PC

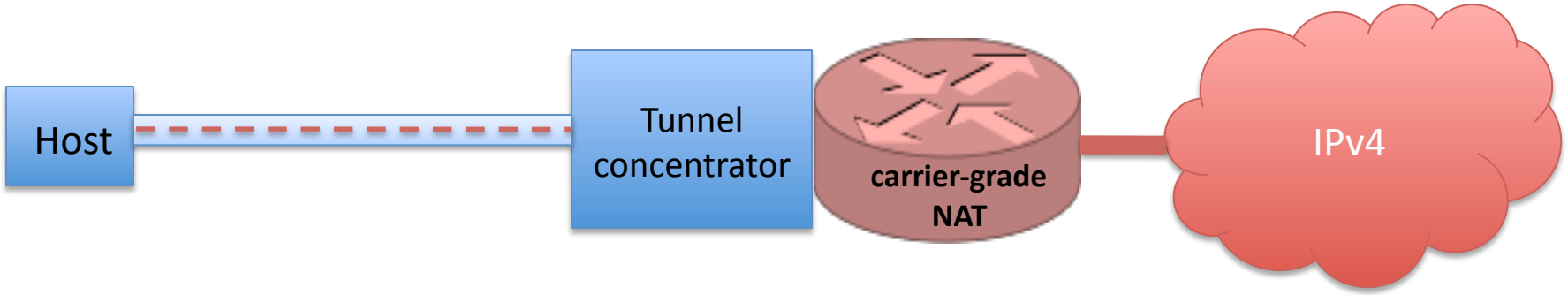


NAT binding
INSIDE:
IPv6 src: IPv6 address of home router + 192.168.1.3 + port 1001
OUTSIDE:
IPv4 src address: from pool of the ISP + port 45673

Host-based scenario:
Dual-stack capable host is provisioned with IPv6 and tunnel concentrator address; IPv4 in host stack for applications

IPv6 packet
IPv6 src: IPv6 address of host
IPv6 dst: IPv6 address of tunnel concentrator
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 host + well known IPv4 address of end-node (IANA defined) + port 1001
OUT:
IPv4 src address: from pool of the ISP + port 45673

Changes since Dublin

- Merge of DS-lite & S-NAT
- CGN considerations
  - Port allocation discussion
    - No cookie cutter port allocation per customer for efficiency
    - control given to user on incoming ports (web page, DHCP…)
  - ALG discussion
  - 3rd party CGN
- Encapsulation (to be developed)
- Interface initialization (to be developed)
- IANA section to reserve a /30 IPv4 address block

Future developments

- Clarify encapsulation
  - IP/IP minimum to implement if no control is required
  - Use softwire encap is any control is needed
- Reference port distribution work
- Reference tunnel endpoint DHCP option
- Reference interface encapsulation draft
  - to be written
- Define IANA reserved addresses

DS-lite Status

- IETF
  - Latest draft:
    - `draft-durand-softwire-dual-stack-lite-01.txt` (missed `-00` deadline for WG work item)
    - Editorial changes to rev `-00`
  - IETF softwire WG has just been re-chartered to standardize DS-lite.
    - Target 1Q2009…
- Implementations
  - Router: Open source code (Open-WRT) for a Linksys router
  - CGN: Vendor code, open source project started

Tunnel-based solution

- Running a tunnel between the host or the home router and the CGN opens the door to several new things, simply by pointing the tunnel to the right place:
  - Placement of CGN where it makes sense
  - Use of well-known tunnel protocol (IP-in-IP)
  - Horizontal scaling of CGN
  - Use of 3rd party CGN (virtual ISP)
  - …

Questions?

Extra Slides

Common issues with address sharing

Things that DS-lite, SAM, A+P, NAT64, IVI & others must consider

Open issue 1: port reservation

- 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?)
    - DHCPv4 option to allocate port numbers
- Port reservation algorithm need to be efficient
  - Difference between max # of port/customer & average # of port/customer

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 (NAT-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.
- Abuse mitigation on server side is more difficult
  - Can no longer put IP address in 'penalty box'

Open issue 4

- All those solution involve tunneling or protocol header translation.
  - They change the packets size.

- How to account for the diminished MTU?

Conclusion

- IPv4 exhaustion is real. Moving to IPv6 is necessary.
  - Multiple layers of IPv4 NAT would make the network increasingly complex. Complexity implies fragility.
- Deploying “classic” dual-stack IPv4&IPv6 to all customers is not sustainable.
  - Provisioning with a global IPv4 address must remain an option (existing customers, value added service,…)
- IPv4 address sharing is required to deploy IPv6 at scale.
  - Such bridging technology need to be standardized and supported by vendors.