Sharing a single IPv4 address among many broadband customers

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Disclaimer

- This is still research work and does not necessarily reflect what Comcast is or will be doing.

Problem Statement

- The Internet is running out of IPv4 addresses

- The "Internet" edges are IPv4
  - Most hosts in the home today (Win 9.x, XP,…) are IPv4 and will never be upgraded to work in an IPv6-only environment
  - content servers (Web, Mail,…) hosted by many different parties will take a long time to upgrade to IPv6

- Service providers are in between
  - the plumbing in the middle may be the "easier" part to fix first
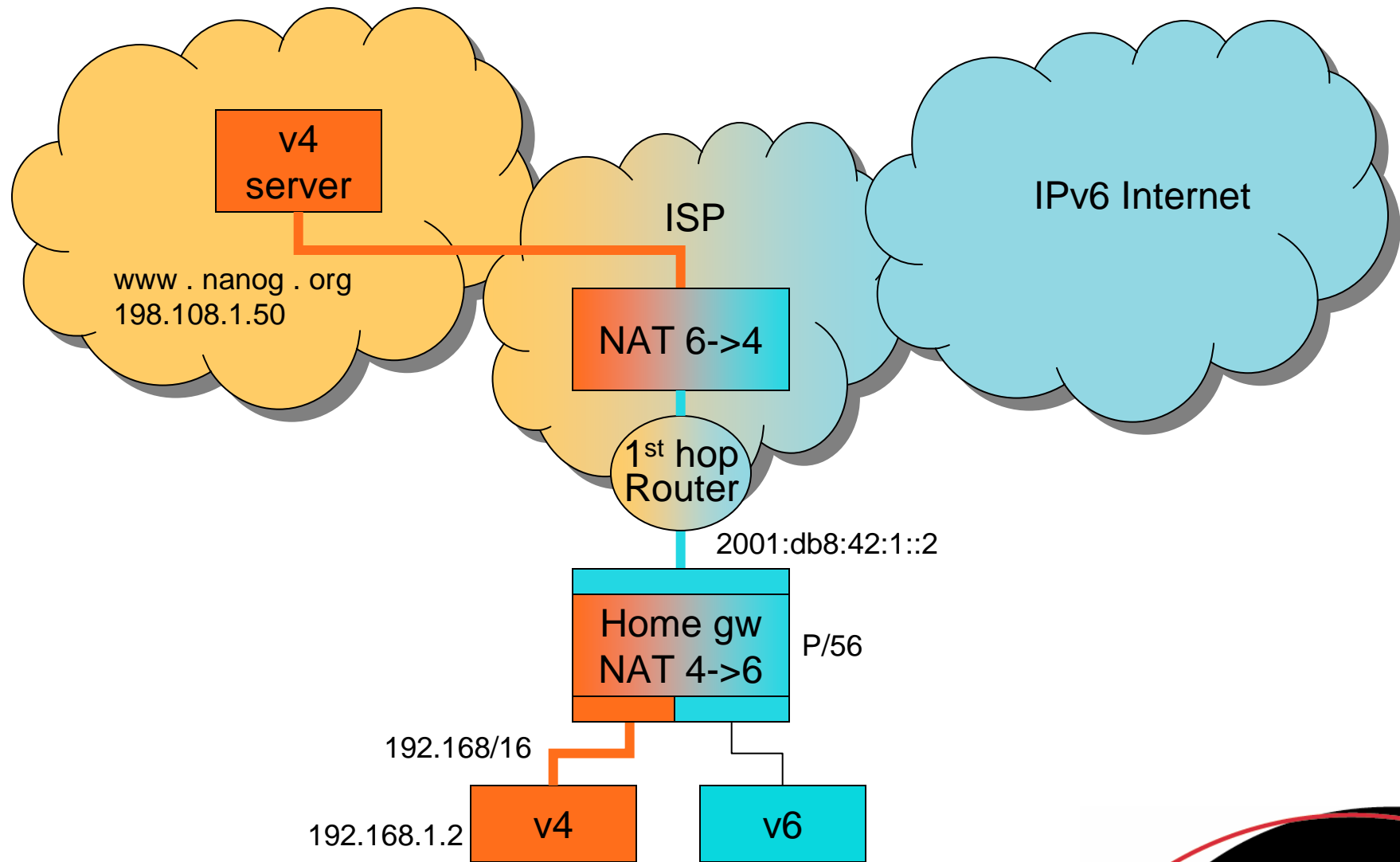
Short Term Avenue

- Move from one IPv4 address allocated per customer to one IPv4 address per N customers

- Enable 'legacy' IPv4 devices (eg Win 9x) to keep talking to the IPv4 Internet (Web, Mail,…)

- Introduce IPv6 in the house for new devices and/or new services as a longer term evolution

- Assumption: IPv6 deployed (or deployable) inside the service provider network

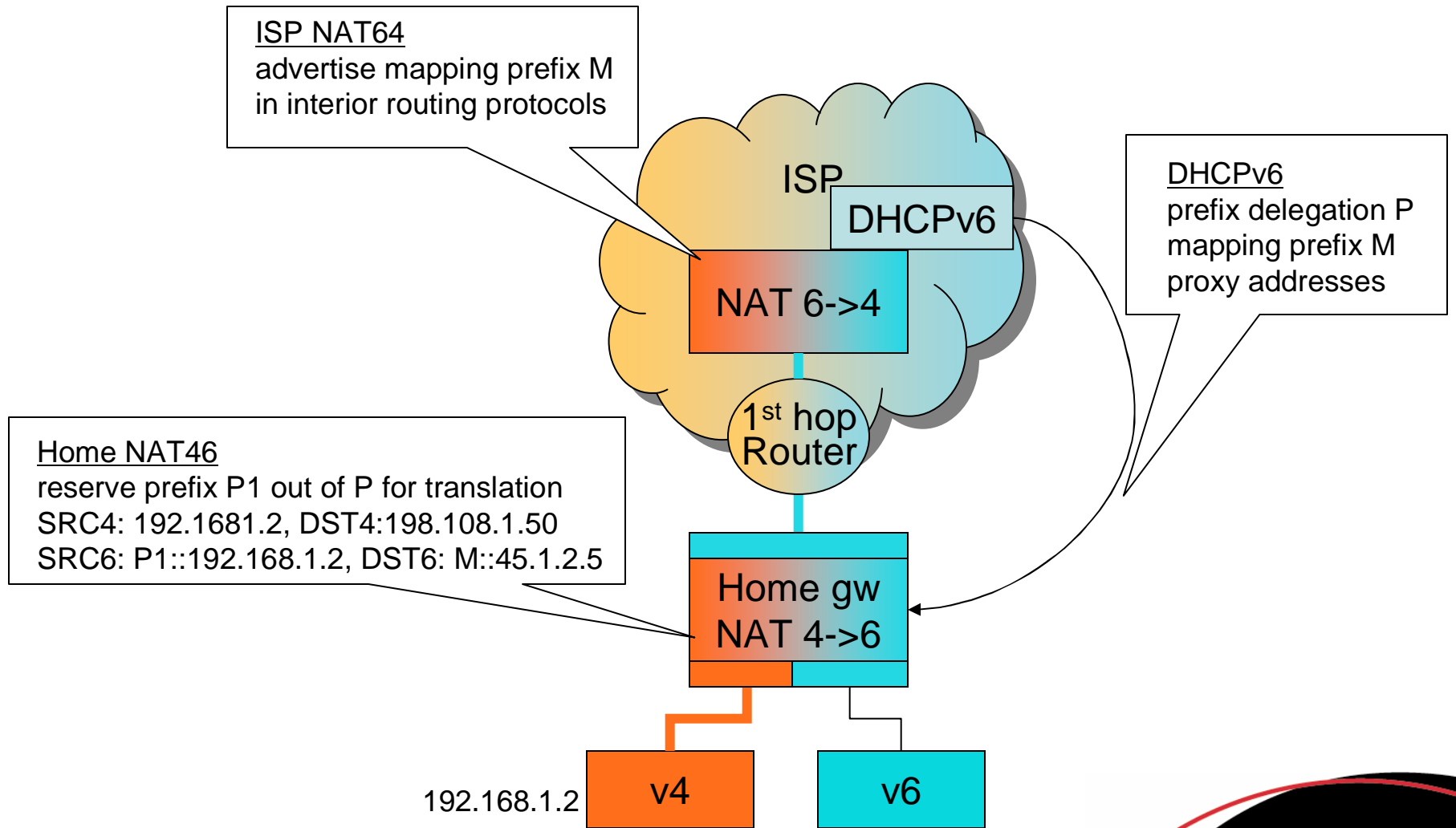(comcast.

How to Implement This?

- ## Customers could be provisioned only with IPv6
  - – <u>potentially</u> offered as a different tier of service
  - – assume "upgraded" home Internet Gateway Device
  - – /56 prefix, no global IPv4 on the WAN IGD port

- ## Double NAT for legacy home devices
  - – legacy home devices will get RFC1918 addresses assigned by the home gateway
  - – those addresses will be translated to IPv6 by the home gateway…
  - – …and translated back to IPv4 within the service provider network

- ## Native IPv6 service is offered for new devices

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Architecture Overview: Double Nat v4 -> v6 -> v4

ISP NAT 6->4 Discovery: DHCPv6 Configuration

ISP NAT64
advertise mapping prefix M
in interior routing protocols

ISP
DHCPv6

NAT 6->4

1st hop
Router

DHCPv6
prefix delegation P
mapping prefix M
proxy addresses

Home NAT46
reserve prefix P1 out of P for translation
SRC4: 192.1681.2, DST4:198.108.1.50
SRC6: P1::192.168.1.2, DST6: M::45.1.2.5

Home gw
NAT 4->6

192.168.1.2

v4

v6

Special Considerations

- DNS
  - Just like any other apps, will be translated
  - alternative: DNS proxy within the home gw

- MTU adaptation
  - IPv4 pMTUd between NAT 6->4 and IPv4 servers
  - Force lower MTU on legacy host side

- Will <u>NOT</u> work for all apps, but for most

- NO worse than regular IPv4 NAT today

FAQ

- Why not use v4/v6 tunneling instead of NAT?
  - tunneling would require a v4 address, which we may not have, not even in the 10/8 range

- Why not simply use double IPv4 NAT?
  - same as above, 10/8 is too small for large deployments

- Why not deploy the home v6-only and translate directly to v4 in the home gateway?
  - Will not help the legacy Win 9x boxes in the home

- What about new v6-only host trying to reach the v4 Internet?
  - one problem at a time! Such device do not really exist today….
  - suggestion: use v6/v4 proxies in ISP network

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