



IPv6 integration for ISP

- Concepts
- The Facts
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IPv6 Transport: many solutions ...

- Native
- Automatic tunnels (6to4)
- Configured tunnels (Tunnel Broker, Softwire)

Manage IPv6 addresses

- Delegate IPv6 prefix to clients
- **ISP will evolve from Address management to Prefix management**



6to4 (RFC 3056)

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Automatic IPv6 tunnels over IPv4

- Allow sites interconnection through an IPv4-only ISP
- Automatic => less management overhead compared to configure tunnels
- Transport using 6over4 technique

Special Address plan :

- Global IPv6 prefix build from IPv4 public address => No IPv6 provisioning for ISP
- Clients get a /48 prefix to address subnets

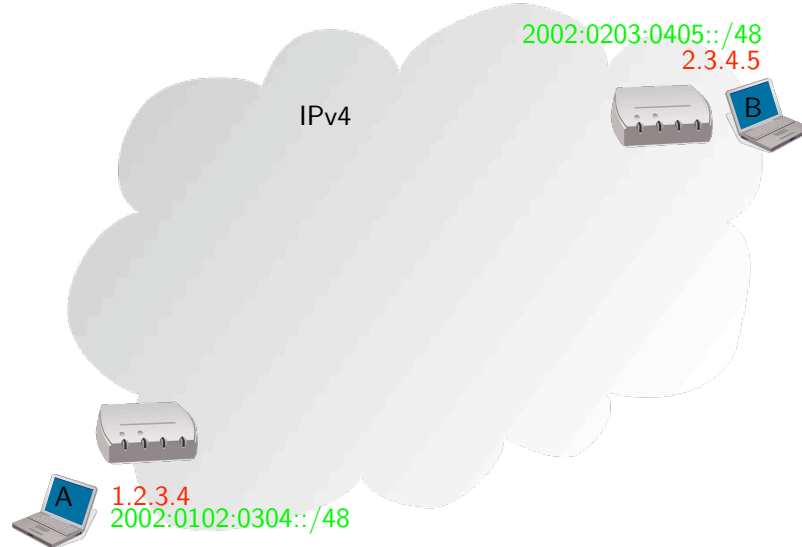
0 16 48 64 128





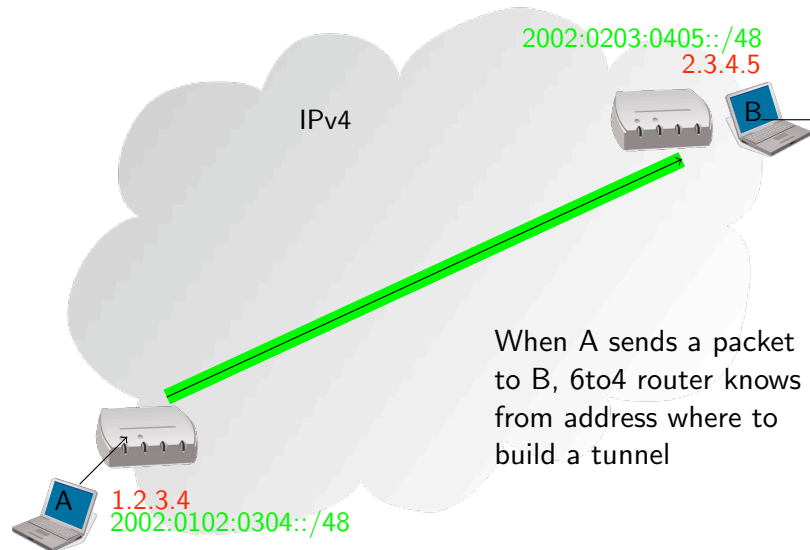
6to4 Architecture between 2 sites

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6to4 Architecture between 2 sites

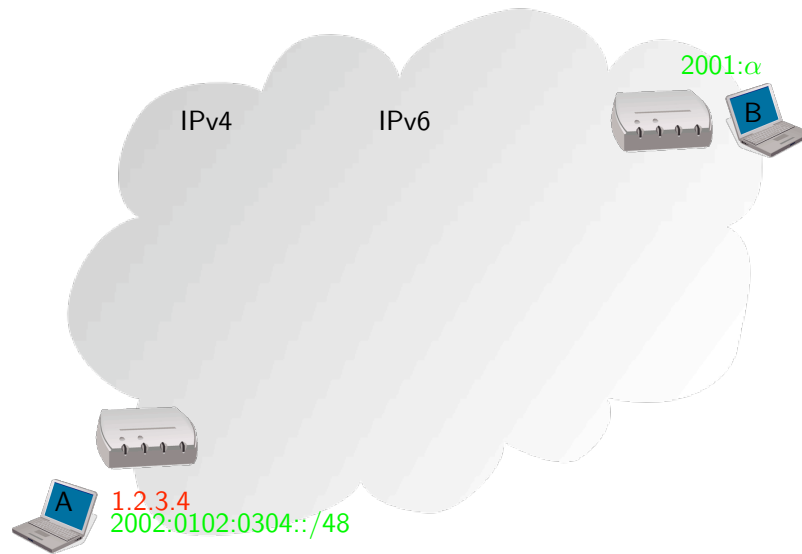
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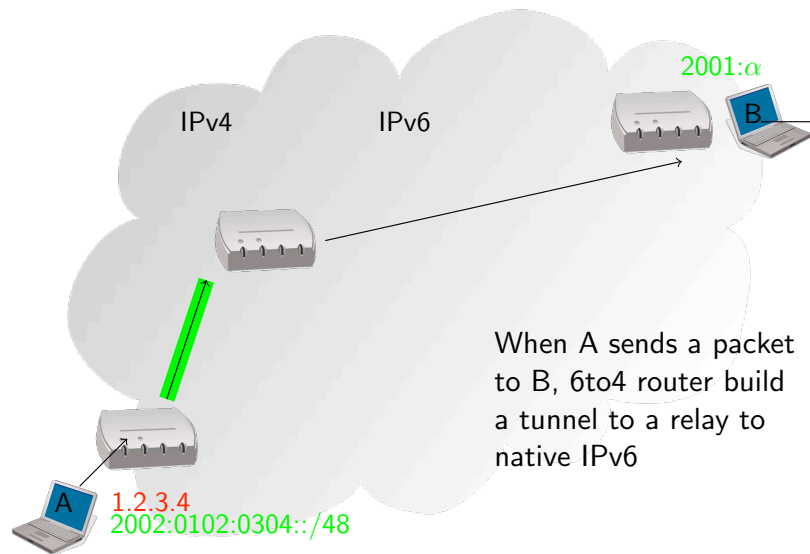
6to4 to connect with native IPv6

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6to4 relays

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Relays to be reach with anycast addresses

- On IPv4 side: 192.88.99.1
- On IPv6 side: 2002:c058:6301::/48

Packets are routed to the closest 6to4 relays



6to4 Issues and limitations

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Security issues

- ISP operating the relay should accept all clients ...
- Risk of spoofing
- 6to4 relays can be targeted by DoS attacks

Performance issues

- Long path to reach a relay (17 hops from french ISPs ...)
- 6to4 may lead to assymetrical routing

6to4 is not considered as a global solution.



Tunnel Broker

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Tunnel Broker = 6over4 with client authentication

- TSP (*Tunnel Setup Protocol*) : XMLRPC-like protocol to set up tunnel parameters (authentication, delegated prefix, etc.)
- can delegate arbitrary prefixes
- use IPv6/IPv4 when public addresses available, IPv6/UDP/IPv4 for NAT-traversal
- IETF draft, commercial implementation by Hexago (free client and account)

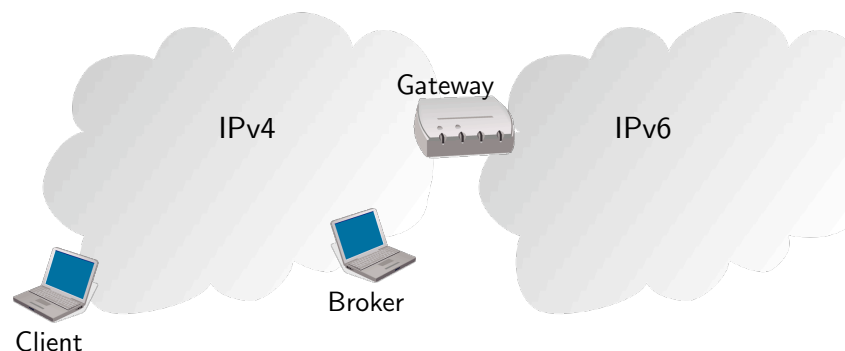
Currently deployed by RENATER

<http://tunnel-broker.renater.fr/>



Tunnel Broker Architecture

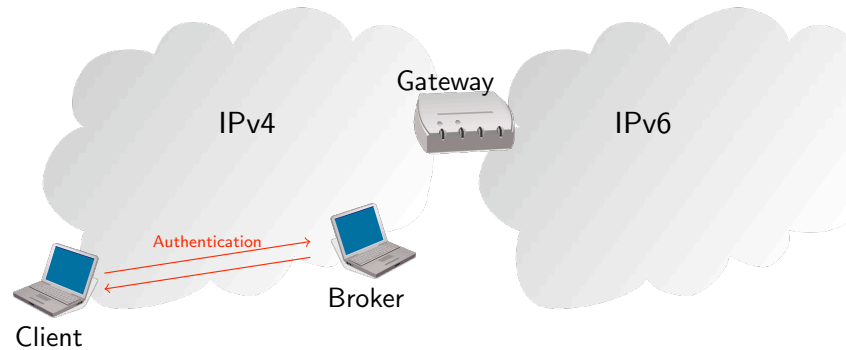
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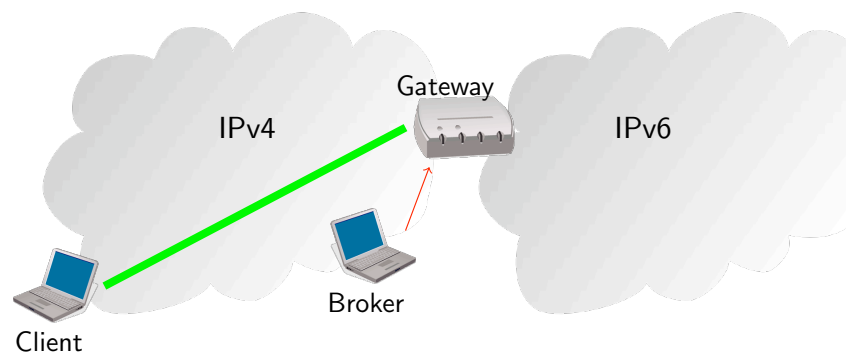


Client authenticates to Broker and get Gateway parameters



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Client initiates IPv6 tunnel over IPv4 or UDP to Gateway



Softwires

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IETF solution to transport and manage IPvX over IPvY.

Two scenarios discussed in the problem statement :

- Mesh problem : IPv4 over IPv6 in core network
 - Problem raised by chinese research network CERNET2
 - Connect IPv4 island across an IPv6 only backbone
 - Solution: MPLS tunnels
- Hub-and-spoke problem : IPv6 over IPv4 for Home Network
 - Problem raised by NTT, Comcast and Point6
 - Connect IPv6 Home network over IPv4 only DSL connection
 - Solution: L2TP tunnels

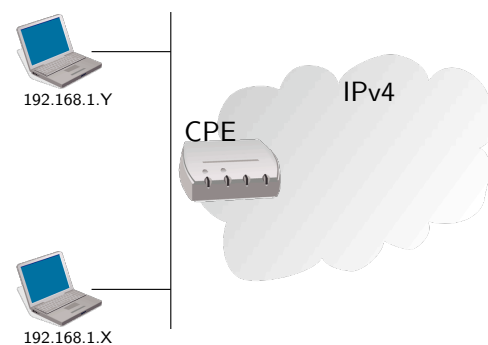
Currently deployed by RENATER and Point6

<http://point6.net/box/>



Softwires: H&S Architecture

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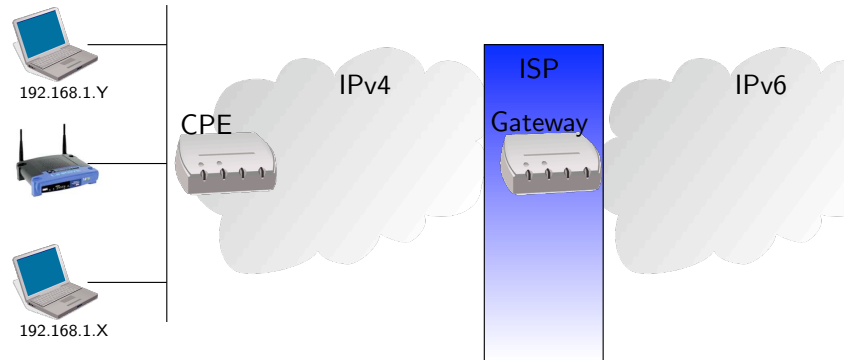
Current DSL ISPs connect Home Network with 1 IPv4 address:

- Clients are behind a NAT Box
- Services hard to deploy at home



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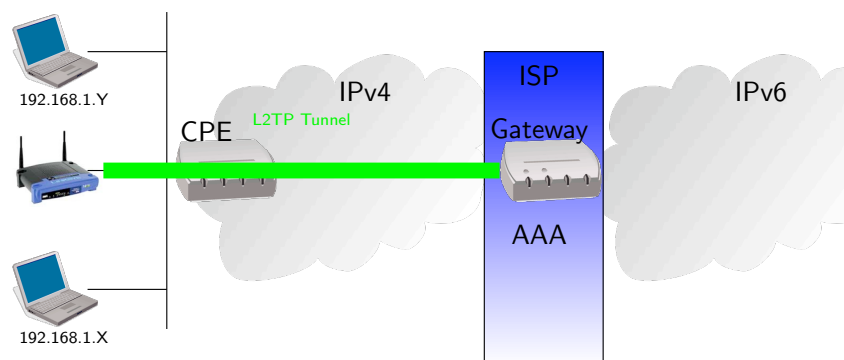
Idea: Build a virtual ISP for IPv6 :

- Provide clients with a non-intrusive CPE box for IPv6
- Deploy a Gateway to connect with IPv6 network



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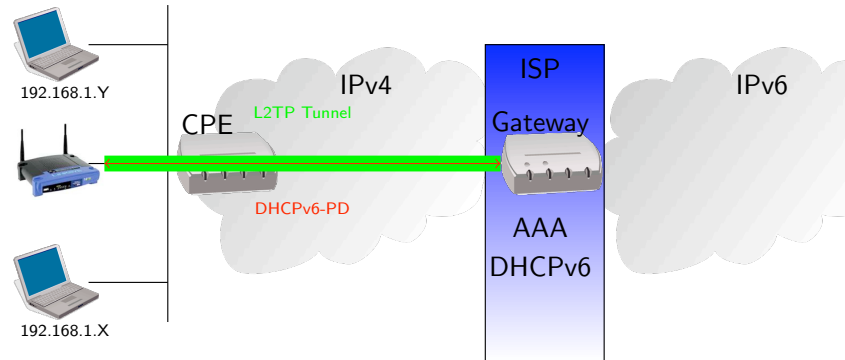
Tunneling with L2TP protocol :

- UDP encapsulation for NAT-traversal
- PPP connection for user authentication using AAA



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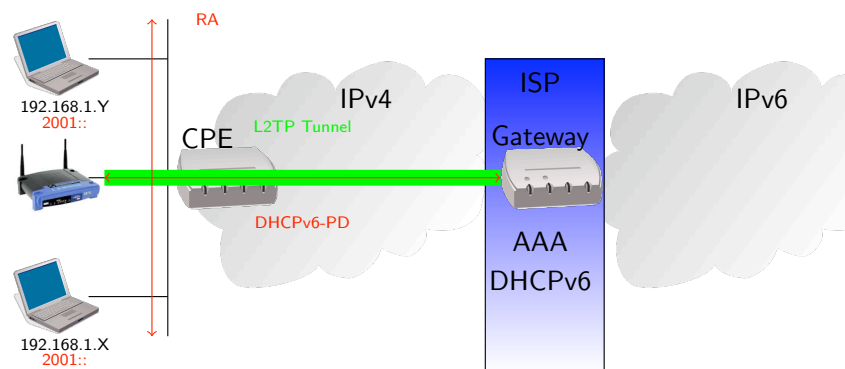
IPv6 prefix for Home Network provided by DHCPv6

- Standard prefix delegation
- Link with AAA for prefix management



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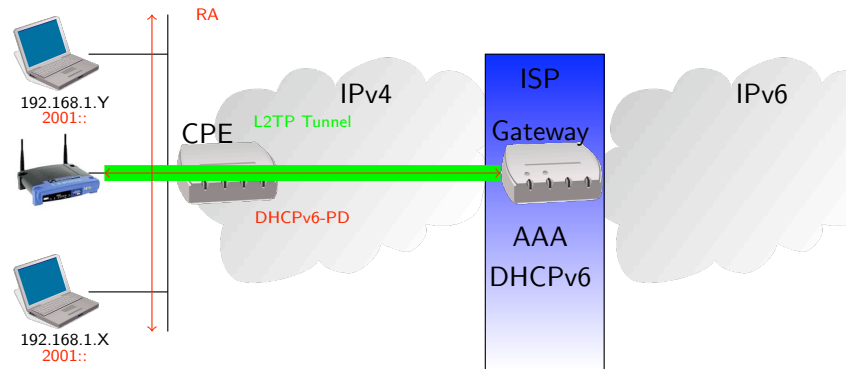
IPv6 addresses distributed with auto-configuration

- Softwire box is the IPv6 default router for the Home Network
- Non-intrusive router



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Transition Plan

- Softwire box features to be merged with IPv4 CPE
- Virtual ISP features to be moved into official ISP
- Tunnel to be replaced by native connection