6to4 at Home

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the problem

- our ISP in Urugay has an IPv6 "enabled" network but not IPv6 services for residential customers.

- our servers run v6 natively with that same ISP as upstream provider.

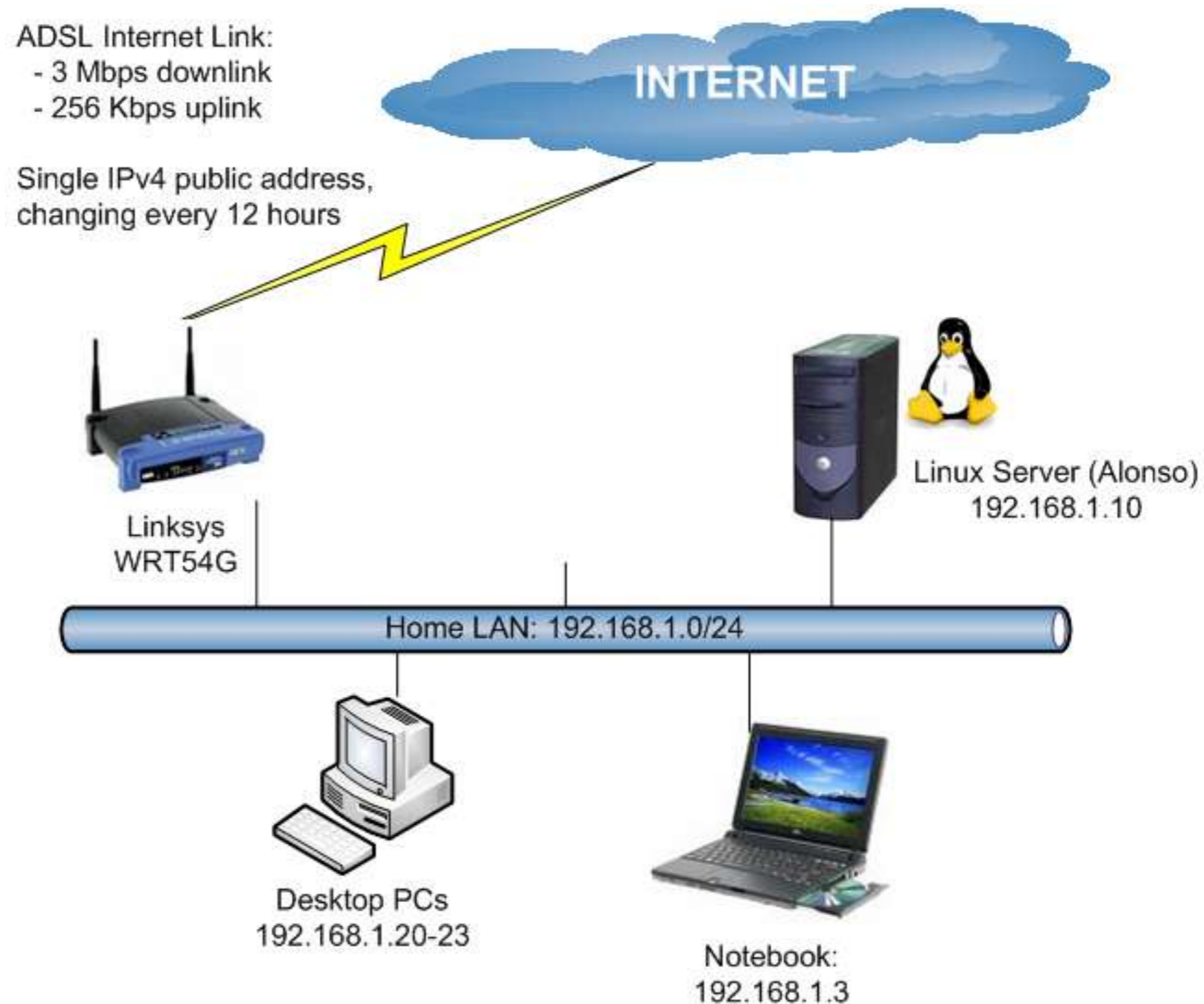- we wanted to experience v6 at home.

two solutions:

- I decided to run IPv6 at a linux box behind the NAT box.

- Roque decided to run IPv6 at the home network gateway itself running DD-WRT.

6to4 at Home: Linux gateway behind the NAT box:

- Scenario:

    - Small home office, 3-4 people working simultaneously, plus 1-2 working remotely during the day

    - Workstations and Linux server behind a Linksys WRT54G v2.2 and ADSL Internet link

    - Good availability expected during long business hours

    - Bricking the Linksys thus not an option! ☺
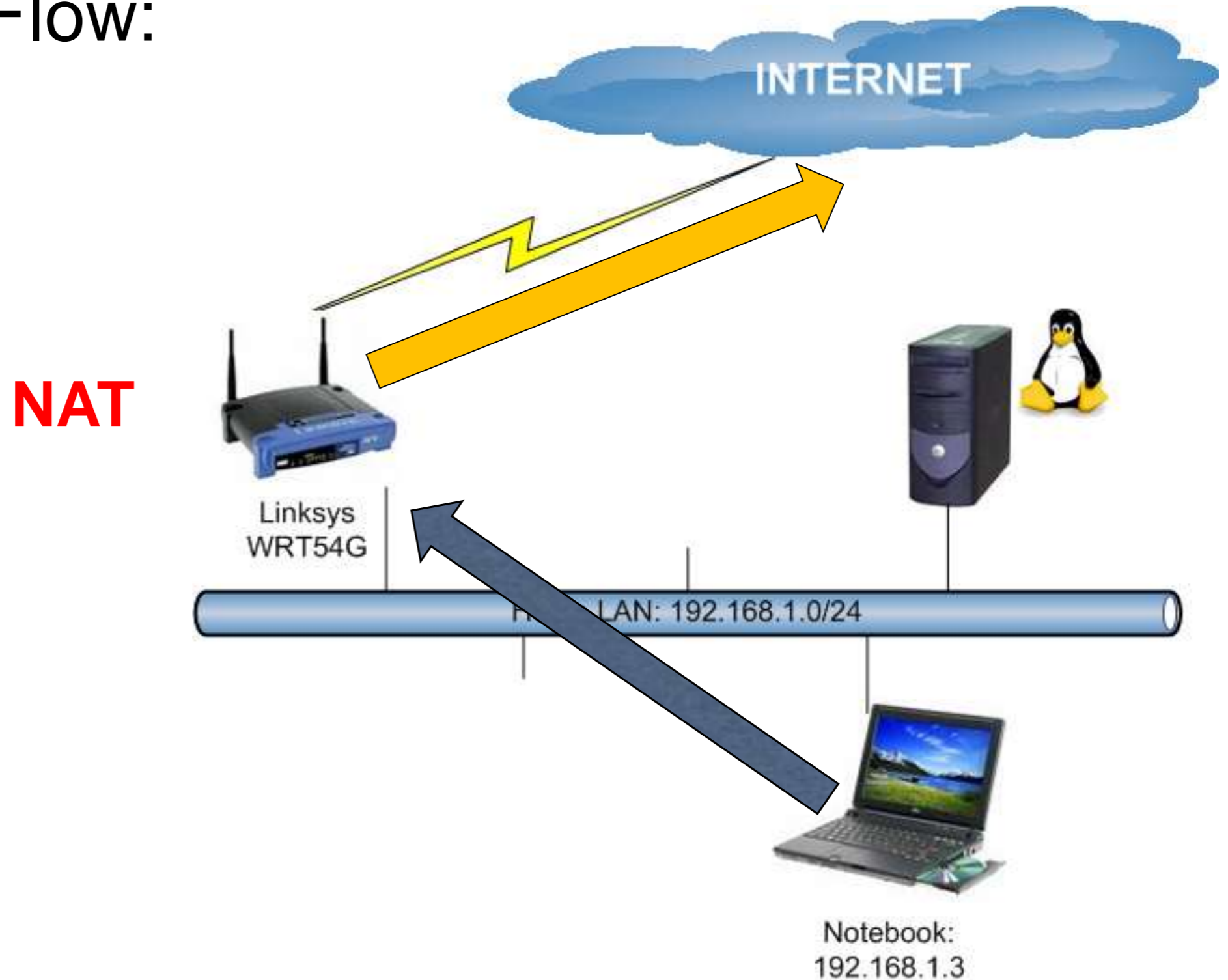
6to4 behind the NAT box (I):

- Network diagram:

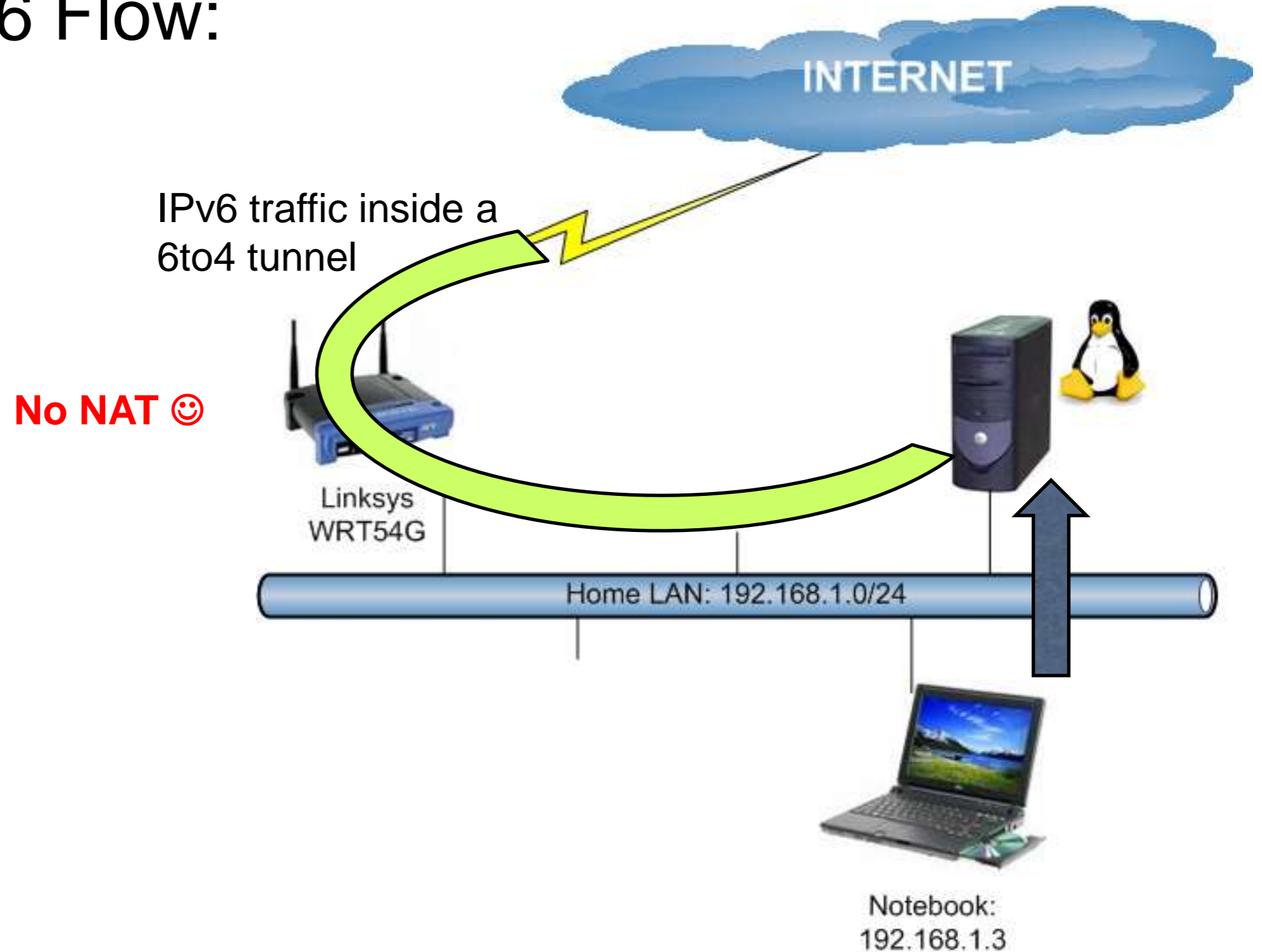ADSL Internet Link:
- 3 Mbps downlink
- 256 Kbps uplink

Single IPv4 public address, changing every 12 hours

INTERNET

Linksys WRT54G

Linux Server (Alonso) 192.168.1.10

Home LAN: 192.168.1.0/24

Desktop PCs 192.168.1.20-23

Notebook: 192.168.1.3

6to4 behind the NAT box (II):

- IPv4 Flow:

6to4 behind the NAT box (II):

- IPv6 Flow:

INTERNET

IPv6 traffic inside a 6to4 tunnel

No NAT ☺

Linksys
WRT54G

Home LAN: 192.168.1.0/24

Notebook:
192.168.1.3

6to4 behind the NAT box (III):

- Linux server:

  - start-up script configured for automatic configuration of the 6to4 interface

  - same script in "cron" for checking address changes.

    - 6to4 restarted whenever a public IPv4 address change is detected

  - Stateless autoconfiguration daemon (radvd) assigning IPv6 addresses to the other hosts in the LAN

- Public IPv4 address got using http://whatismyip.com
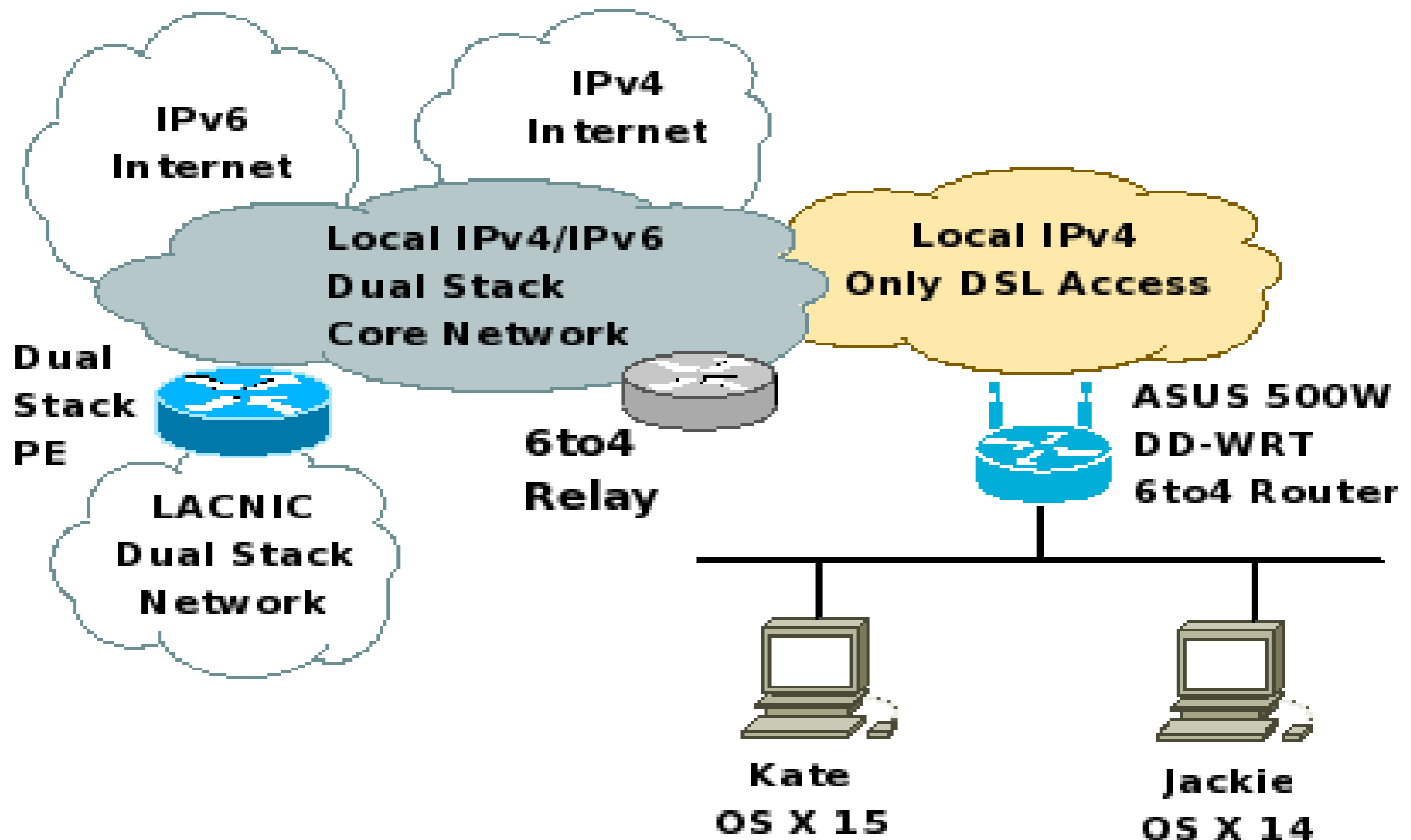
6to4 and DD-WRT

6to4 and DD-WRT

- IPv6 (and particularly 6to4) supported since v22 (voip or standard built).

- However v24 removed IPv6 support...lack of space for new wireless driver was the reason.

- Custom builds can be used, but not official support: http://www.crushedhat.com/downloads/DD-WRT/

6to4 in DD-WRT take 1: Linksys WRT350N

BRICKED!!!!!

6to4 and DD-WRT take II: ASUS WL-500W

- Steps following howto:

  1. Enable IPv6 ---> trivial.

  2. Enable Radvd ---> trivial.

  3. Configure Radvd ---> medium complex.

  4. Configure Initial Script ---> medium complex.

- However, my ISP changes my public address every 12 hours ---> custom cron script that check changes in public addresses.

- No stateful ip6table available...

Dynamic External interface problem.

- the external public IPv4 address change every 12 hours.

- even if I change the Route Adv. message for the new address, the old prefix is still "alive" in the clients --> no connectivity.

- two options:

  1. send also a Route Adv. for old prefix with AdvValidLifetime = 0 when change detected.

  2. re-configure interface radvd with low AdvValidLifetime and MaxRtrAdvInterval.

6to4 experience:

- local access to IPv6 sites connected to same ISP with similar results as in IPv4.

- access to site with good 6to4 relays also pretty good (ex. apnic.net).

- however...do we have a problem with URPF for 192.88.99.1? One relay did gave local access to 6to4 customers but was enable to connect through IPv4 transit providers.

6to4 experience (II)

- Results of a *Totally Unscientific Experiment:*
  - Near-native speed for some sites
    - All IPv6 sites hosted by our ISP
      - (Yeah, all 10 of them, or so ☺)
    - Sixxs, ipv6.google.com
  - Others plainly unreachable
    - V6-enabled Microsoft sites
    - Sites hosted in Brazil, like some of LACNIC's pages

what is the problem with 6to4?

- While 6to4 with a local relay solves the forward path, the return path is unknown ---> ISPs cannot build a business plan based on this.

- 6to4 is auto-configured in many applications even without access to any relay. Please check: draft-nward-6to4-qualification-01.txt

what is the problem with 6to4? (II)

- *When it works, it works great*, but for many sites, it just doesn't

  - Users would quickly get frustrated because some sites would appear unreachable

  - Is it a viable migration path in this situation?

- Why it doesn't always work?

  - Return paths

  - ISPs filtering 6to4 unicast addresses

6rd: IPv6 Rapid deployment.

- It is 6to4 using providers global unicast addresses. Same idea than 6to4 but without using 2002::/16.

- If I have 1x/32 ---> each IPv4 address gets 1x /64. Even when using NAT!.

- I can secure access to relay and solve the return path. I only need to change the CPE software.

- Free.fr implemented 6rd in 4millon users in 4 months.

Conclusions.

- 6to4 works, sometimes and that is the issue.

- There is 6to4 traffic! ISPs installing relays are giving a better service to their users.

- 6rd uses 6to4 principles and allows a rapid deployment of IPv6 in some scenarios with control over both forward and return path.

thank you!

scripts available at:
http://www.uy6tf.org.uy
http://cagnazzo.name/drupal/sites/default/files/6to4-linux-dynip-0.3.tar__0.gz