

# Implementing native IPv6 on DSL

‘Inventing the wheel’



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# Who is XS4ALL

XS4ALL

- One of the oldest ISPs in the Netherlands
- Founded May 1st 1993
- Originally as a not for profit
- Origins in the hacking community
- Currently 100% subsidiary of KPN NV
- Approx 300.000 DSL subscribers
- Residential and small business



# A bit on history



XS4ALL



# We go back a long time

XS4ALL

## 6bone pTLA 3FFE:8280::/28 allocated to XS4ALL-NL

Bob Fink [fink@es.net](mailto:fink@es.net)

*Tue, 02 Oct 2001 12:30:03 -0700*

XS4ALL-NL in The Netherlands has been allocated pTLA 3FFE:8280::/28 having finished its 2-week review period.

<<http://whois.6bone.net/cgi-bin/whois?XS4ALL-NL>>

Note that it will take a short while for their pTLA inet6num entry to appear in the 6bone registry as they have to create it themselves. However, their registration is listed on:

<[http://www.6bone.net/6bone\\_pTLA\\_list.html](http://www.6bone.net/6bone_pTLA_list.html)>

To create a reverse DNS registration for pTLAs, please send the prefix allocated above, and a list of at least two authoritative nameservers, to either [bmanning@isi.edu](mailto:bmanning@isi.edu) or [hostmaster@ep.net](mailto:hostmaster@ep.net).

Thanks,

Bob

*(And before that running on 2001:6e0:20a::/48 via INTOUCH-NL)*

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# Original services

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- Access via 6-in-4 tunnel server
- Public shell server which was dual stacked
- Usenet service (free via [newszilla6.xs4all.nl](http://newszilla6.xs4all.nl))

# Access in the early days (2001)

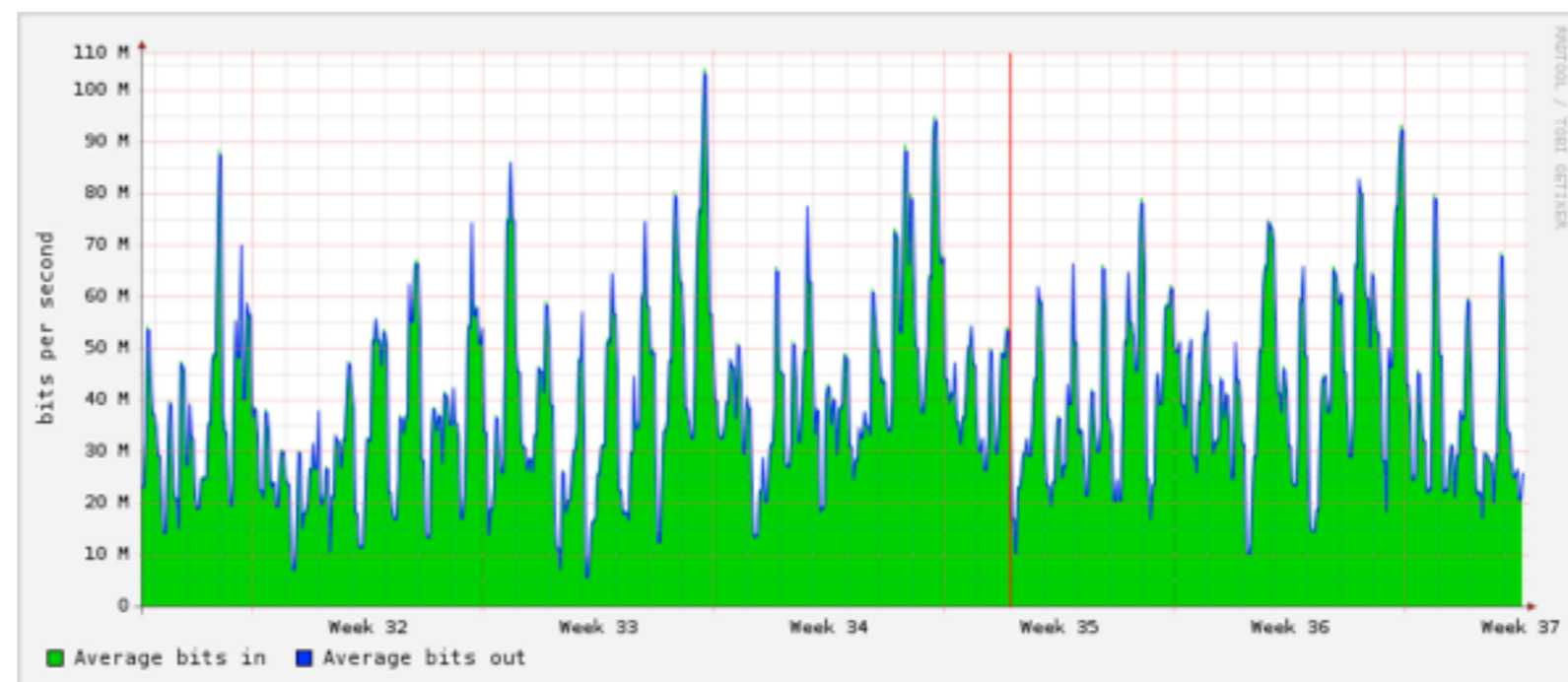
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- Central router (BRAS) Cisco 7206
- CPE: Thomson speedtouch 5xx series
- PPPoA -> PPTP towards a linux box
- All static config and routing
- It worked on 2 lines (employees)

# Tunnel server

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- Number of interfaces exceeded what BSD would handle
- Caused by interface table being a linked list
- Switched to Linux which uses a hash
- Current 2100 configured, 600 live (average)
- Traffic just above 100 megabit/s



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# Switching to native



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# DSL Infrastructure

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- We buy a wholesale product from KPN
- Delivered as ATM PVC per customer
- Or as 802.1q vlan with multiple customers
- Towards the customer it's always PPPoA
- DSLAM translates into PPPoE where needed
- Connections terminated on Juniper E-series

# Design principles

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- Automatic provisioning and delivery
- CPE config should be fully automatic
- 1 dual stack PPP session
- Provide the customer with multiple subnets
- Addresses should be easy to trace to a single customer
- No subnets shared between customers
- PPP 'unnumbered', running on link local only

# Challenges

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- No CPE available (2008)
- No standards or description what's needed
- Cisco SOHO (8xx) partly worked
- JUNOSe had a few nasty bugs
- No business case

# Fighting them

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- Wrote a description of what a CPE should do
- Upgrade the BRAS because of another bug
- Explain to people there is a reason for it:
  - It's not about having a business case for IPv6
  - It's about not having one without IPv6
  - IPv6 is the basis for further growth !

# The project which wasn't a project

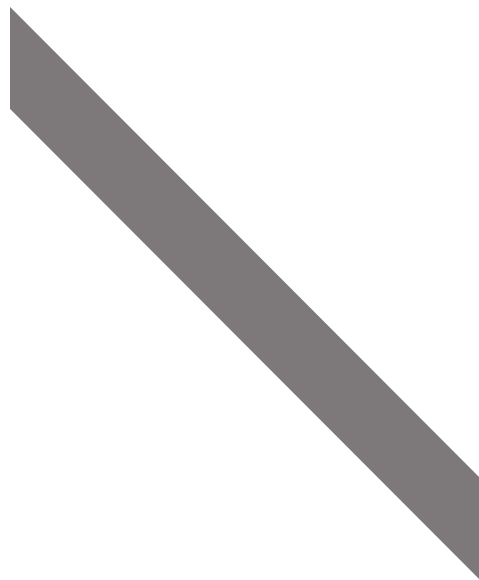
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- We never got any resources formally assigned
- Everything was done using 'spare time'
- We picked up the slack in other projects
- Lot of work was done as part of other jobs
  - New installations
  - Planned maintenance



# Limited cost

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- Almost no dedicated resources used
  - Roughly 1.5 FTE
  - Much easier if you start early
- 



# The introduction



XS4ALL



# The 'product'

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- Customers can opt-in for dual-stack
- Available on all current ADSL and VDSL services
- Not available on legacy products
- Not available on DHCP lines :(
- Covers 80% of the install base
- 6in4 tunnels are still available
- v6 capable modems available for most customers when signing up for a new 12 month contract





# Keep it simple

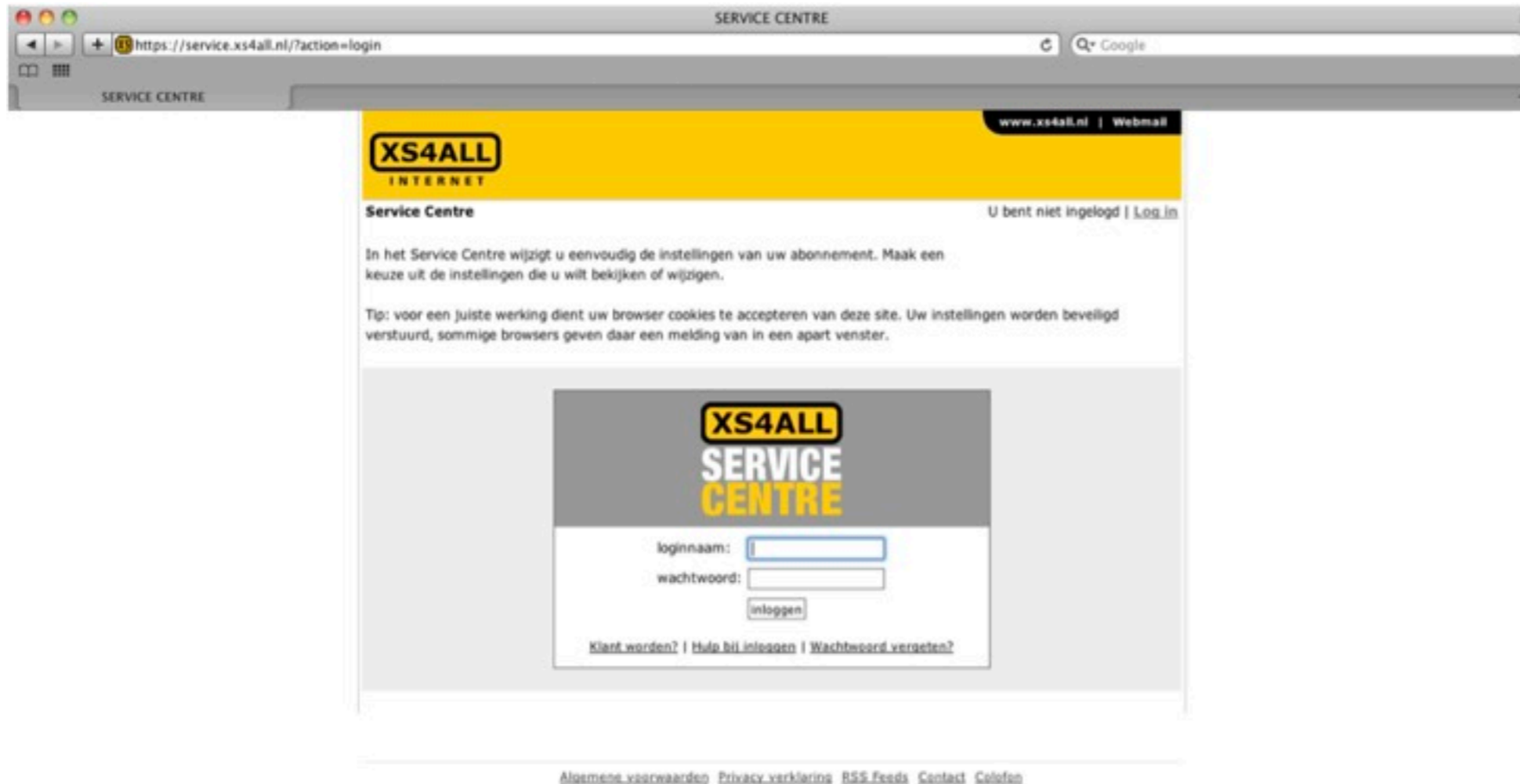


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- Push the button
  - Install a new modem
  - Or flash it to new firmware
  - Be done :)
- 

# Activating it...(1/4)

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# Activating it...(2/4)

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www.xs4all.nl | Webmail

**XS4ALL**  
INTERNET

Service Centre Ingelogd als | Log uit

In het Service Centre wijzigt u eenvoudig de instellingen van uw abonnement. Maak een keuze uit de instellingen die u wilt bekijken of wijzigen.

Tip: voor een juiste werking dient uw browser cookies te accepteren van deze site. Uw instellingen worden beveiligd verstuurd, sommige browsers geven daar een melding van in een apart venster.

### E-mail

- e-mailadressen
- spamfilter
- virusfilter
- batched SMTP
- e-mailbeantwoorder
- doorsturen van e-mail
- wachtwoord mailbox

[Ga verder naar E-mail](#)

### Bellen

- belabonnement
- aanvragen
- nieuw nummer
- dienst wijzigen
- instellingen
- VoIP wachtwoord
- voicemail pincode

[Ga verder naar Bellen](#)

### Website & Eigen server

- homepage zichtbaar
- website overzicht
- back-up
- database
- toegang & permissies
- colocation

[Stel uw homepage, website of eigen server in](#)

### Persoonlijke gegevens

- uw wachtwoorden
- XS4ALL Contactprofiel
- uw facturen
- nieuwsbrief
- contactpersonen & financiële gegevens
- uw contracten

[Ga verder naar Persoonlijke gegevens](#)

### Verhuizen

- internetverbinding verhuizen
- adresgegevens wijzigen

[Ga verder naar Verhuizen](#)

### Internettoegang

- hostnaam
- poortbeveiliging
- IPv6

[Ga verder naar internettoegang](#)

### Extra

- beveiligingssoftware
- experimentele diensten **XTRA**
- weblog
- wiki
- DNS configuratie

[Ga verder naar Extra](#)

<- New :)

# Activating it...(3/4)

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## IPV6

XS4ALL geeft IPv6 adressen uit naast uw IPv4 adres. Met de nieuwe IPv6-reeks zijn in tegenstelling tot de oude IPv4 adressen tot in de verre toekomst genoeg IP-adressen beschikbaar. Meer informatie op de [IPv6 pagina](#).

Indien u geen IPv6 meer wilt schakel IPv6 dan uit in het modem.

- [Index](#)
- [E-mail](#)
- [Bellen](#)
- [Website & Eigen server](#)
- [Persoonlijke gegevens](#)
- [Verhuizen](#)
- [Extra](#)
- [Internet-toegang](#)

### Verbindingen

| Gebruikersnaam | IPV4 adres | IPV6 adres |
|----------------|------------|------------|
| njal           | 82.95.204. | geen       |

Activeer IPV6

**The button**

# Activating it...(4/4)

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## IPV6

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  - [Extra](#)
  - [Internet-toegang](#)

### Verbindingen

IPV6 adres geactiveerd.

| <b>Gebruikersnaam</b>    | <b>IPV4 adres</b>               | <b>IPV6 adres</b>                      |
|--------------------------|---------------------------------|--|
| nja <input type="text"/> | 82.95.204. <input type="text"/> | 2001:980:1 <input type="text"/> e::/48 |

# Why opt-in ?

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- Safety because of the unknowns
- Support needs to get experience
- Still requires beta firmware in the CPE
- Bottom line: we want people to be aware of it



# The results so far



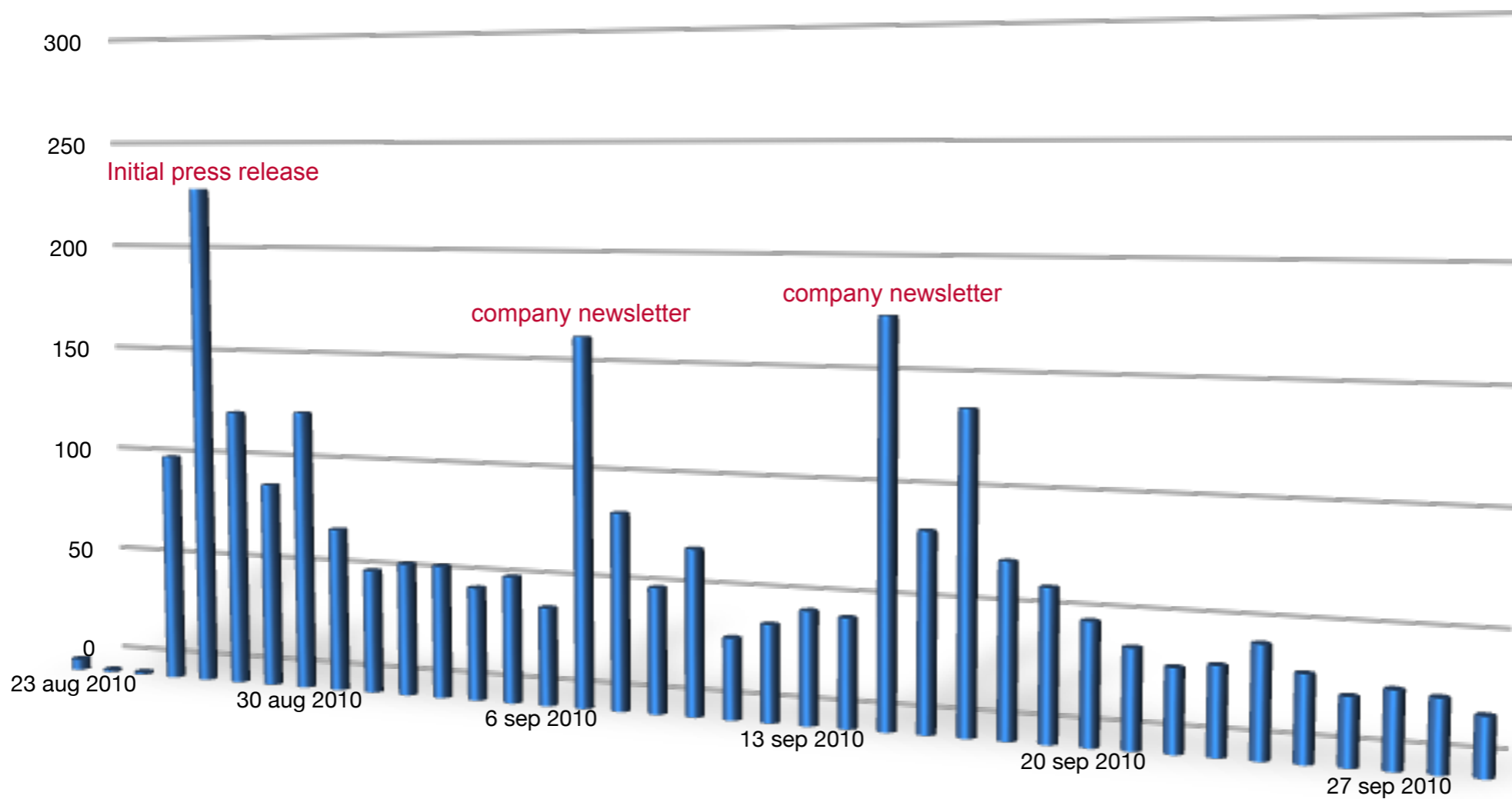
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# Activations

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Number of IPv6 activations



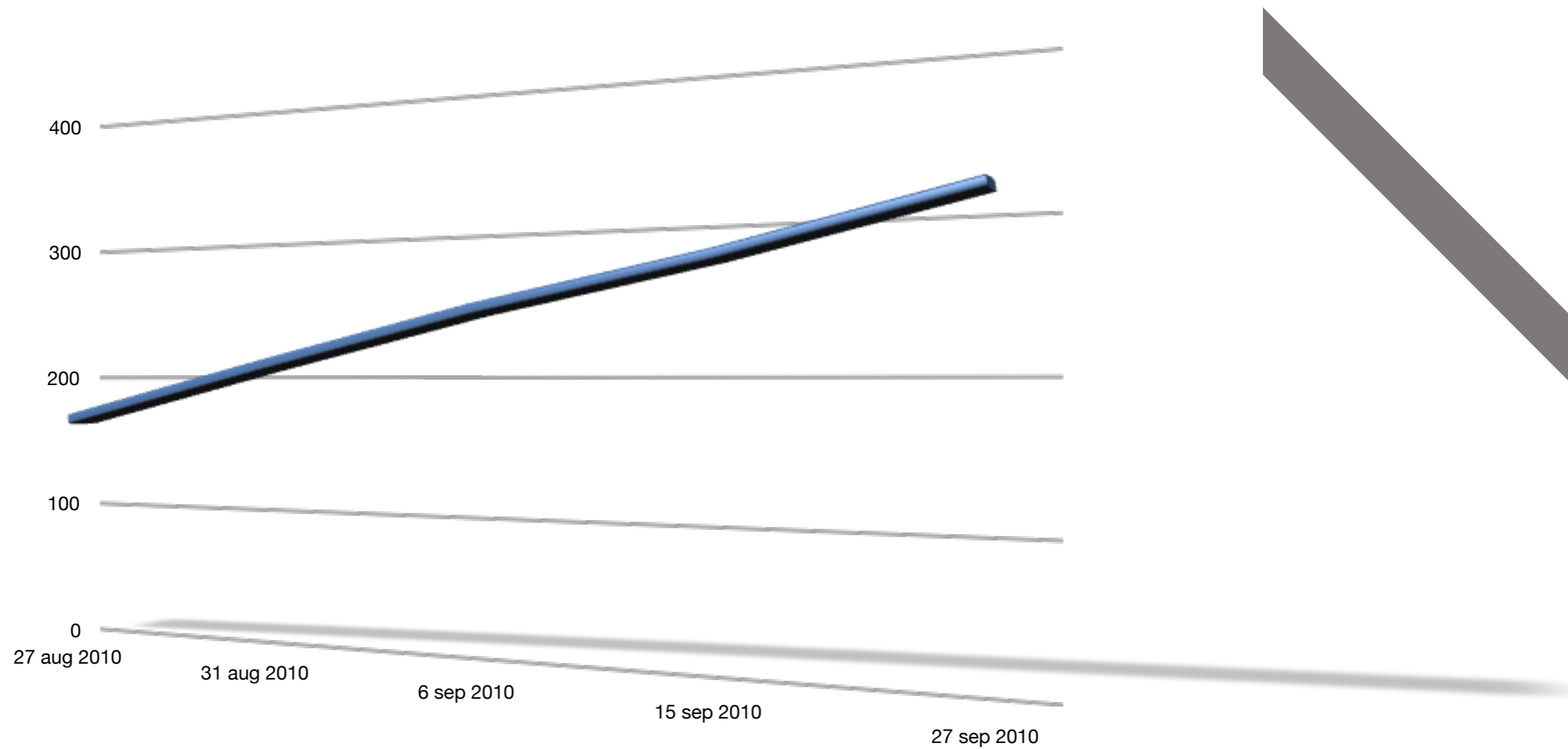
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# Customers online

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Number of active leases

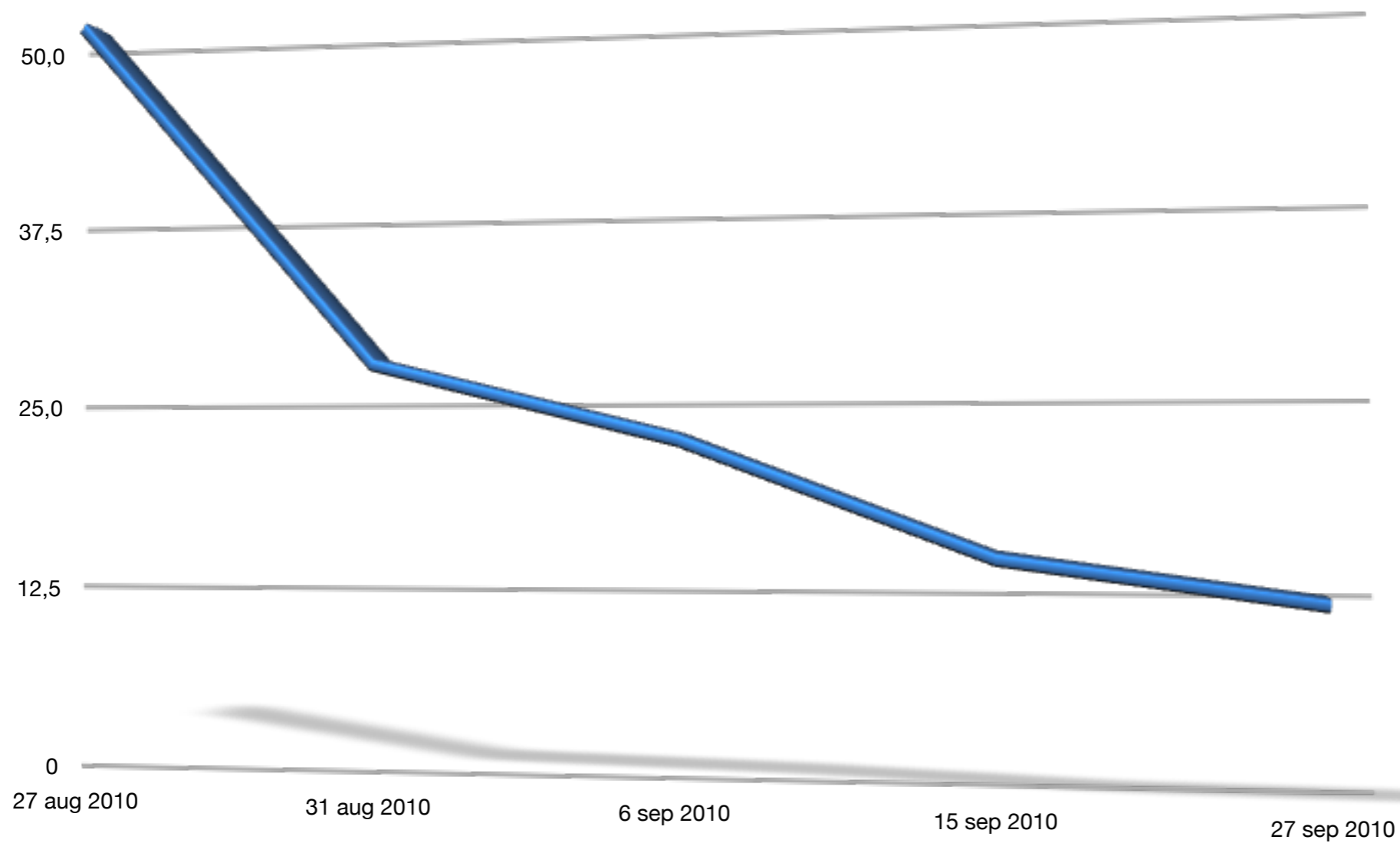


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# Active vs online

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Percentage of customers online



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# Probable causes

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- Logistics, takes time to ship a new CPE
- Beta firmware for the 7340 broke on ADSL
- VDSL works, so did the first beta image
- CPE defaults to 6to4 tunnels
- People only realize they need a new CPE after they pushed the button

# People don't know what it is

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- Over 2000 people don't have a working IPv6 connection although they asked for it
- We only received a few support calls
- People clearly don't recognize it's broken
- This will change :(

# The wishlist

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- Fix reverse DNS
- Production firmware running IPv6
- Make dual stack the default for new installs

# The challenges

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- Contact all initial users and get them to install new firmware
- Scaling this up by a factor 100
- Sudden shifts in traffic
- Make sure we fixed it all before we need it!!!

# Questions ?



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meer internet.