SixXS – Getting IPv6 to the end-user

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SixXS

- **Service for providing ISPs with a quick way of enabling their user base with IPv6.**
- **Tunnel Broker PoPs, provided by various ISPs around Europe (be,ch,ee,fi,de,ie,it,lu,nl,no,pl,pt,si, se,uk), New Zealand and the United States.**

  Thanks to all the ISPs who are providing these PoPs, without them it would not be possible.
- **FAQ, Wiki and Forum.**
- **15.000++ *active* users and tunnels.**
- **7000++ *active* subnets (/48's).**
- **Only two people running it: Pim & Jeroen**
- **With the help of all the people at the ISPs who make sure the IPv4+IPv6 routing works to their PoPs, thanks to them for providing this service**

IPng.nl

Overview:

- **Started in 1999 by Pim van Pelt**
- **1 PoP: p200, 64mb memory @ AMS-IX**
- **Static 6bone /127 Tunnels & /60 subnets**
- **Mostly shell scripts (read: bash)**
- **MySQL database**
- **Monitoring using customized fping & rrdtool**
- **About 200 users**

IPng

Sitemap
Introduction
Contact IPng
DNS Pollution
BGP Information
DNS Setup
OS Setup
IPV6 Apps
IPng Users

Connectivity
Our numberplan
Our network topology
Static tunnel
Getting a 6BONE Handle
Getting a /64

Statistics
Ping Statistics
Our BGP information

Introduction

IPng stands for *IP Next Generation*, and it is a different name for the global IPv6 network that is currently being deployed.

Ever since 1997, students of the University of Technology in Eindhoven (TU/e) have been active on the 6bone. One of these students, Pim van Pelt, started collaborating with Intouch in late 1999. At Intouch, he has been building a production network with usage of the IPv6 protocol.

In early 2000, Intouch joined the Group of Six, six large network operators at the Amsterdam Internet Exchange (AMS-IX) in a unique project, which involves native IPv6 transit over an IX.

Basically, the AMS-IX board have granted us a dedicated vlan on the shared medium which we use to interconnect our routers without the usage of intermediate tunnels. We are:

- Intouch, Organising through Communcating
- SurfNet, The educational backbone in The Netherlands
- AMS-IX, The Amsterdam Internet Exchange
- UUNet, UUNet Europe, The Netherlands
- Cistron, Cistron Internet Services
- RIPE NCC, The RIPE hq in The Netherlands
- AT&T, An American Telco

Basically, Intouch provides IPv6 connectivity and services to those of you interested in connecting to and working with the 6bone.

IPng.nl

Problems:

- **Scalability problems (management, stats)**
- **Only static tunnels, thus not useful for dialup/cable**
- **Too difficult for non-technical users**
- **Messy code (according to Pim ;)**
- **Again: too much work to maintain in general**

Protocol 41

- **Protocol 41 = IPv6**
- **It specifies how to put an IPv6 packet directly inside an IPv4 packet.**
- **Protocol 41 is static only.**
- **Protocol 41 doesn't cross NATs.**
- **Protocol 41 is 'hacker' according to some:**
  - **Firewalls see this, user gets an alert of 'weird' traffic, user yells abuse.**
  - **This can happen when a 'static' endpoint is not so static, eg cable links, dialup, etc.**

RFC3053 – IPv6 Tunnel Broker

Tunnel Broker

config

PoP

IPv6 router

server

IPv4 router

you
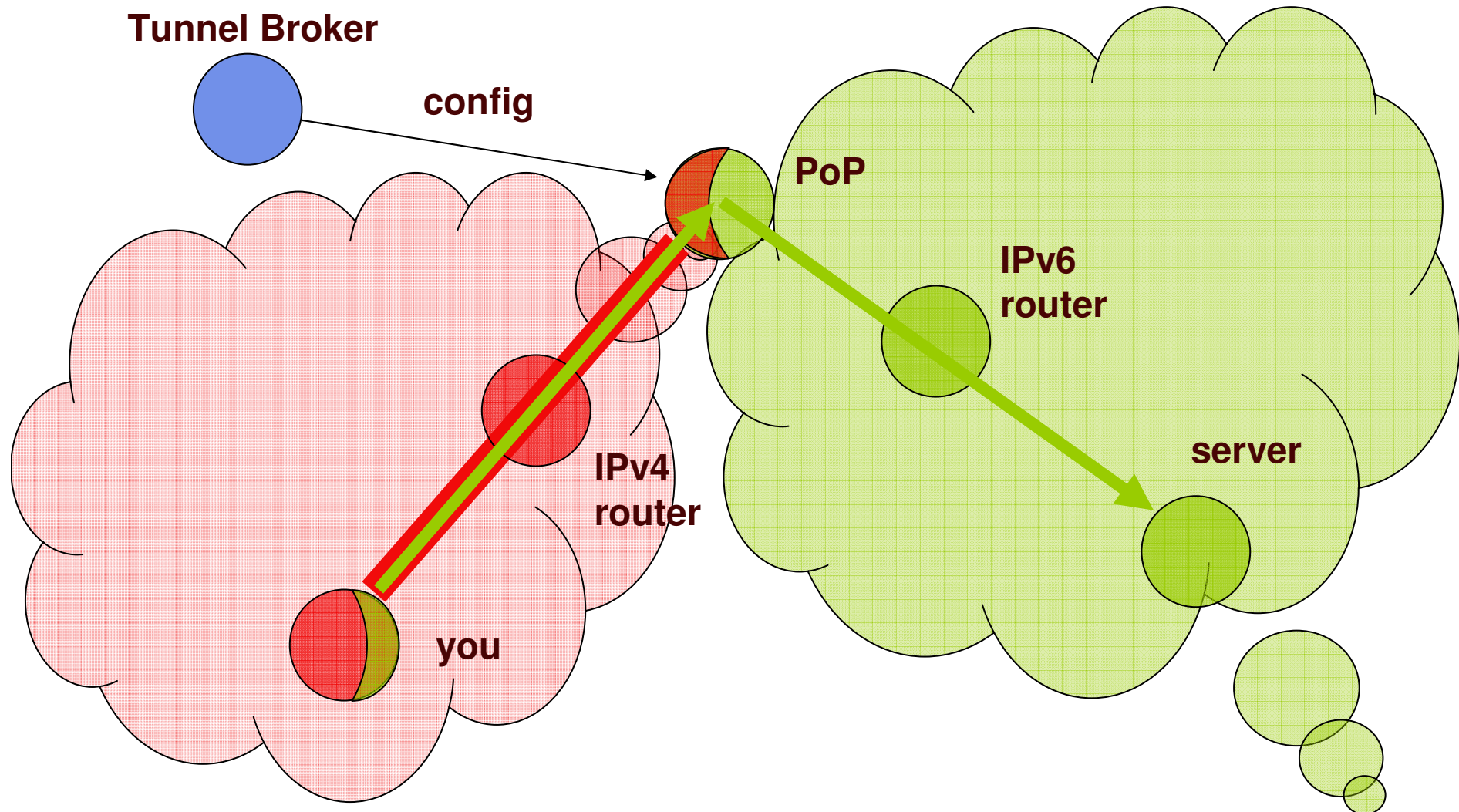
SixXS v1

- **New idea: a distributed Tunnel Broker**
  - **1 IPv6 prefix (eg a 6bone /32)**
  - **1 IPv4 address per PoP**
  - **Allow users to connect to multiple PoPs**
  - **Do routing**
  - **We called it: Six Access -> SixXS (thanks to XS4all.nl for the 'XS' part)**

SixXS v1

- **Several problems with that though:**
  - **ISP's reluctant to carry traffic for others**
  - **Requires cross-tunnelling between PoPs**
  - **Different OS's on different PoPs, synchronisation of statistics and management in general becomes quite hard**
  - **Introduces new places where things can break**
  - **More difficult for the user in the end and most likely doesn't give them any advantage (except when a PoP goes down)**

- **Additionally time issues caused this idea to be aborted… thus…**

SixXS v2

- **Pim and Jeroen as core team.**
- **Second go at it, thus v2.**
- **Design a TB from the ground up.**
- **White label, so we could 'brand' it.**
- **Central control site & Multiple PoPs**
- **Shell & Web interface for the backend**
- **PHP as the common language**
- **Credit system to limit abuse**
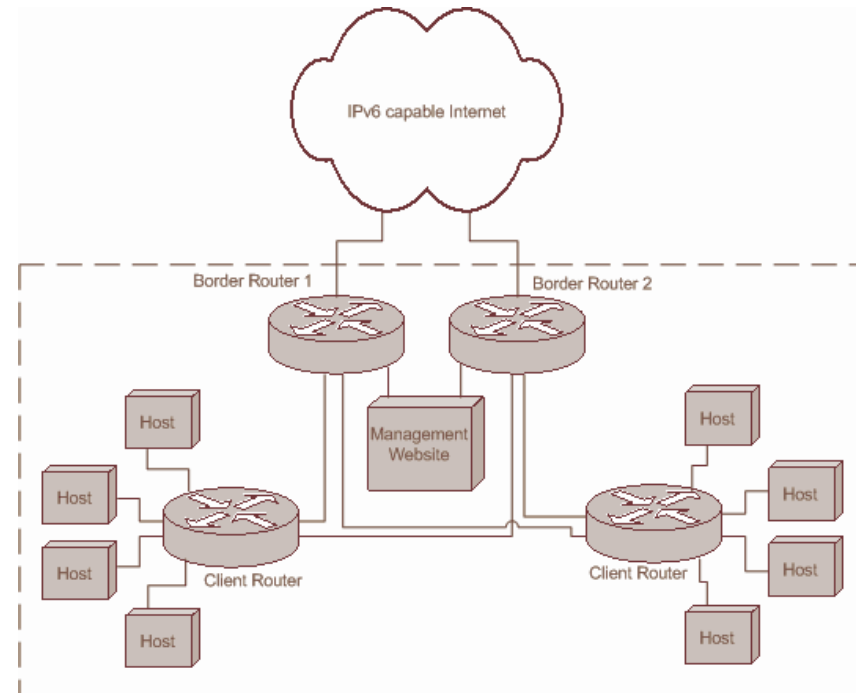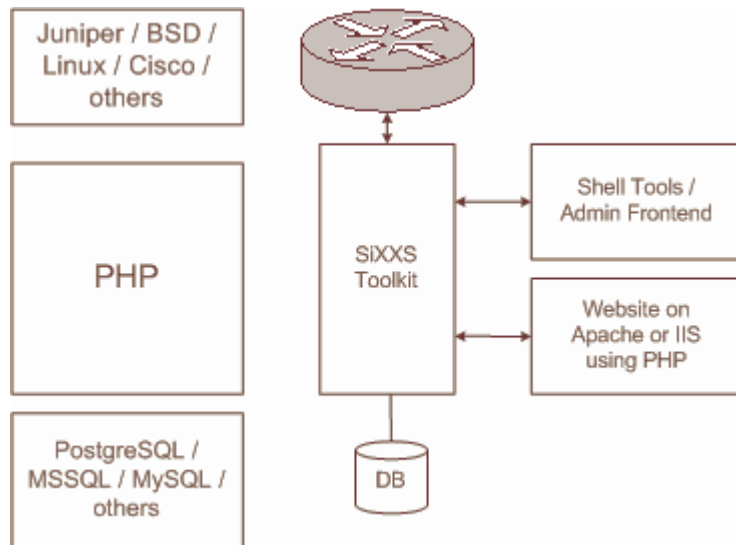- **Launched at AMS-IX Awareness Day (AIAD)**

← Jeroen
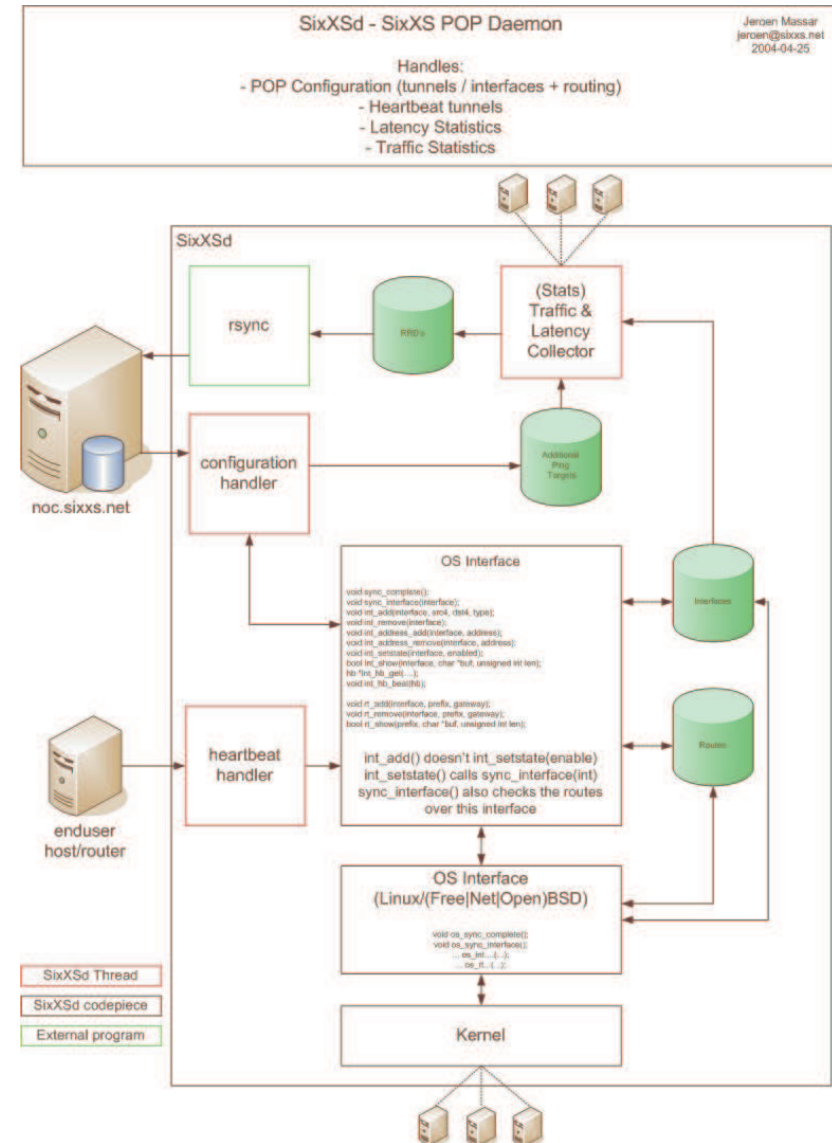
← For people wondering who this "Pim van Pelt" actually is…

SixXS v2 Toolkit

SixXS v3

v2 was still not 'automatic' enough:
- **No direct updates**
- **Sometimes synchronizations where missed, manual changes or other routing daemons on the PoP would cause changes which the scripts didn't handle.**

SixXS v3

- **Thus v3: C-based daemons on the PoPs**
- **Kept using our sync/configuration architecture which was designed with such a change in mind**
- **Act as a routing daemon and "counteract" changes where needed**
- **TIC support, AICCU to use it**
- **AYIYA support**
- **Better logging, notification and tracking**

SixXS Tunnel Broker

Tunnel Broker

config

stats

PoP

IPv6 router

TIC

IPv4 router or NAT

server

you
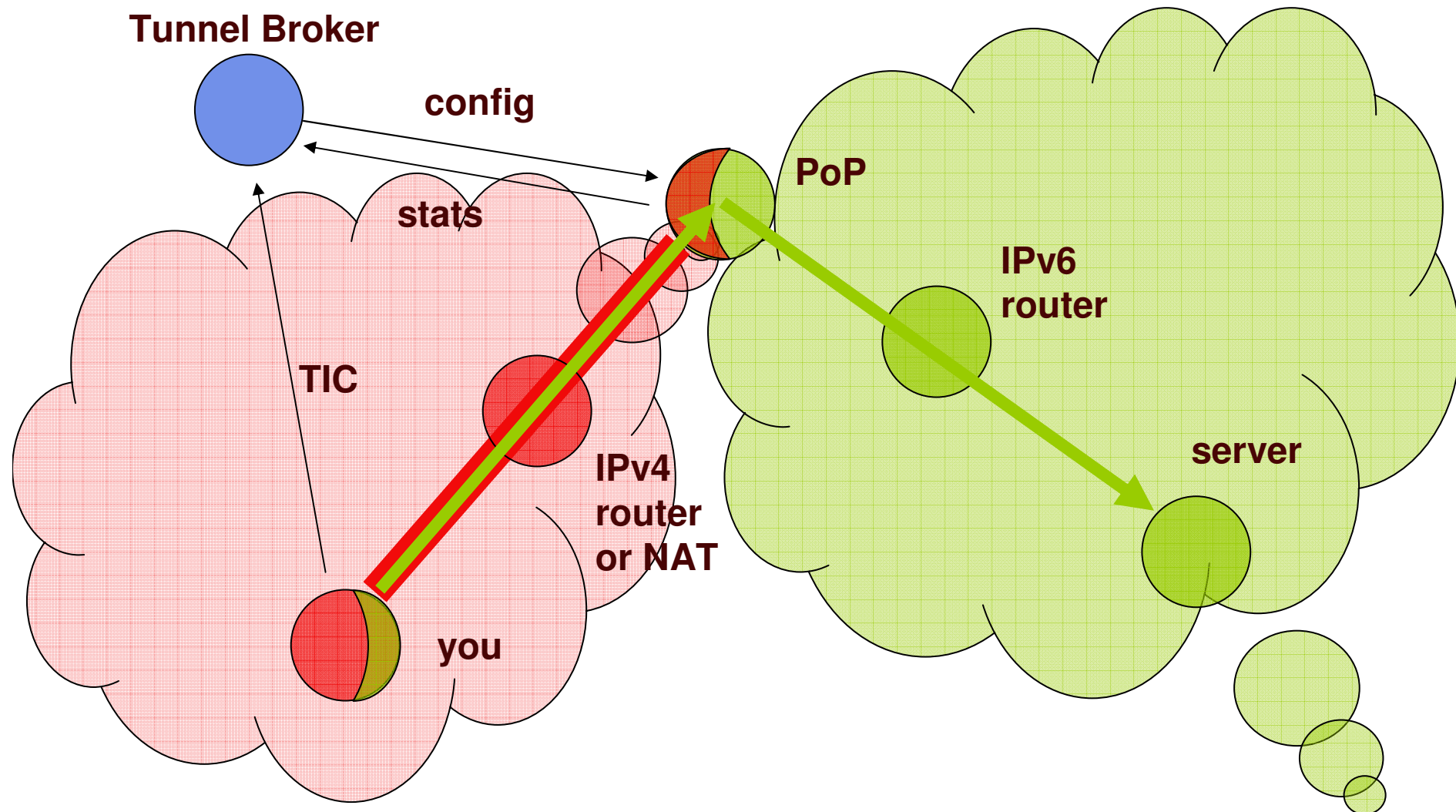
Heartbeat

- **Dynamic/non-24/7 IPv4 endpoints.**
- **Proto-41 is static. The moment the user unplugs, another user can get that IPv4 address. That user then gets proto-41 packets and the firewall tool beeps with warnings, which sometimes results in abuse reports because we are attacking them.**
- **Allows one to move around proto-41 tunnels automatically or enable/disable them on the fly.**

AYIYA – Anything in Anything

- **Proto-41 tunnels can't cross NATs.**
- **Proto-41 tunnels are not authenticated.**

  (read: one can spoof them easily)
- **Heartbeat runs next-to the proto-41 tunnel. Heartbeat might work, proto-41 might not.**

AYIYA solves these issues by tunneling IPv6

**inside IPv4/UDP and signing these packets.**

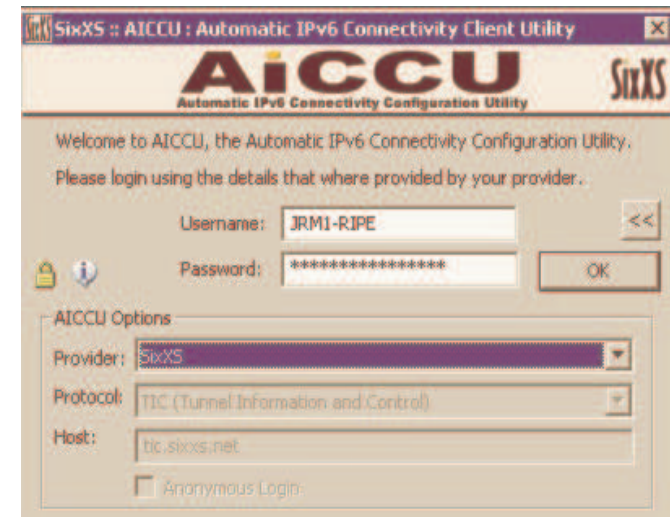# Tunnel Information & Control

- **Short: TIC**
- **Simple SMTP-alike command/answer protocol**
- **Authentication**
- **Tunnel Configuration Information**
- **Tunnel Modification**
- **Route/Subnet Information**

AICCU

"Automatic IPv6 Connectivity Client Utility"

• Proto-41, heartbeat and AYIYA tunnels.

• Windows GUI, Debian Debconf, CLI.

•More-or-less click-and-have-IPv6
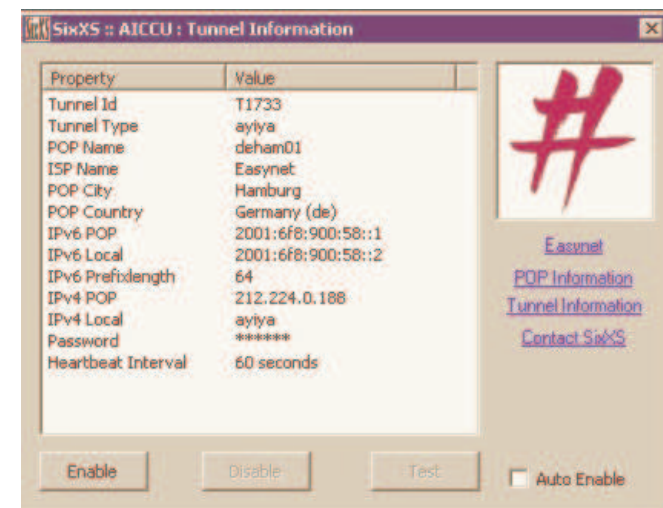
Fritz!Box IPv6

- **http://www.avm.de/en/news/artikel/IPv6_Lab.html**

  " **New: FRITZ! IPv6 Lab**

  For FRITZ!Box Fon WLAN 7270 or 7570 VDSL

  Features at a glance

  ….

  IPv6 – SixXS Tunnel Broker support"

  Does TIC + heartbeat + subnet delegation

  Configureable from the webinterface,

  Just enter the user login/password

Abuse handling

- **Lots of people seem to just want to abuse IPv6: ability to 'hide' on IRC and then annoy people, inviting an DoS which ends up at the PoP.**

- **We thus require proper details at signup, and verify these. Non-free email addresses solves already a large portion of this as getting a new ISP address is difficult, and very hard when your ISP knows about ones misbehavior.**

- **Good contacts with various IRC network where the abuse generally comes from**

Common Issues

- **AICCU takes quite a few setup problems away, but it is far from perfect as it can't solve broken systems.**

- **DNS issues (AAAA being dropped)**

- **Firewalling tools just dropping and thus breaking IPv6.**

- **Misconfigured Firewalls**

- **Mis-understanding**

Management

```
noc.sixxs.net - PuTTY
jeroen@noc:~$ sadmin
Usage: sadmin {user|tunnel|route|pop|mail|dns|review} {help|args}
jeroen@noc:~$ sadmin user
Usage: user {create|update|delete|verify|approve} NICHDL
       user checkwhois NICHDL {report}
       user show|view NICHDL [full]
       user {showlog|viewlog|viewdata}[ip] [[@]NICHDL|%DATE] [LINES|all]
       user list [{name|email|state|address|country|maintainer|ip} QUERY [exact]]
       user {allowmodify|allowrequest|usecredit|allowforum} NICHDL {yes|no}
       user setstate NICHDL {enabled|disabled|deleted}
       user setadmin NICHDL {yes|no}
       user setcountry NICHDL COUNTRYID
       user setpass NICHDL <password>
       user credit NICHDL <integer> [reason]
       user log NICHDL MESSAGE
       user popright NICHDL POPNAME {A[llow]|D[eny]|R[emove]}
       user getemail NICHDL
       user rename OLDHDL NEWHDL
       user forum posts NICHDL
jeroen@noc:~$ sadmin tunnel
Usage: tunnel request NICHDL POPNAME IPV4THEM CITY COUNTRYID
       tunnel {delete|show} TUNID
       tunnel list [{pop|user|ipv4|ipv6|...} [exact]]
       tunnel move TUNID {NEWIPv4THEM|heartbeat|ayiya}
       tunnel setstate TUNID admin {enabled|disabled|requested}
       tunnel setstate TUNID user {enabled|disabled|deleted}
       tunnel approve TUNID [POPNAME [POPPREFIXNAME]]
       tunnel {showlatency} TUNID
       tunnel set TUNID {country|city|heartbeatpassword|private|mtu} VALUE
       tunnel chown TUNID <NICHDL>
jeroen@noc:~$ sadmin route
Usage: route request TUNID DESCRIPTION
       route {delete|show|free} ROUTEID
       route list [{pop|user|prefix|tunnel} QUERY exact]
       route setstate ROUTEID {admin|user} {enabled|disabled|deleted|requested}
       route settype TUNID {static|bgp}
       route approve ROUTEID [POPPREFIXNAME] [PREFIX]
       route {delegate|undelegate} ROUTEID NAMESERVER
jeroen@noc:~$
```

Reviewing

As most faulty requests have similar things wrong we have a standard list of rejections, thus don't be offended when you get rejected, it is not only you…

```
noc.sixxs.net - PuTTY
Approve this user [n/y/d/r/o/c/f/a/i/s/?] ? ?
n : Skip
y : Approve
d : Mark as deleted in silence
r : Reject: custom reason
o : Disable: Only one account/signup per user
c : Disable: IPv6 is not only for IRC
f : Reject: Freemail / Non-ISP mail / Not enough MX's
a : Reject: Address incomplete
i : Reject: Illegal/fake user
s : Disable: We don't provide IPv6 connectivity to shell providers
Approve this user [?] ? r
Custom reason: Bought us a six pack of heineken while he promised us two bottles of Jameson
```
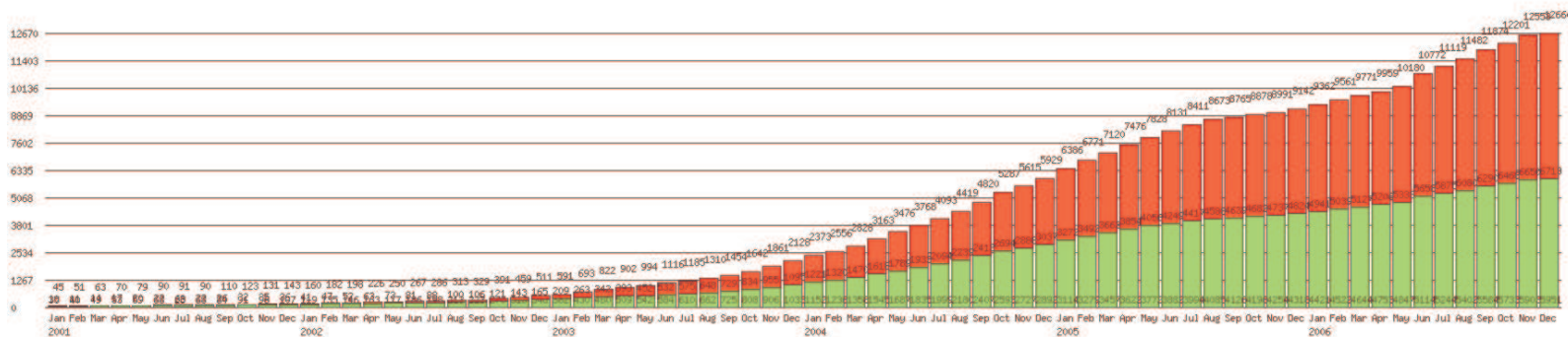
IPv6Gate

Allows access to any IPv4 website over IPv6 from IPv6-only hosts.

http://www.google.com.sixxs.org

(or get in their approved DNS list ;)

Also allows the reverse: IPv6-only site from IPv4-only host:

http://ipv6.google.com.ipv4.sixxs.org

GRH – Ghost Route Hunter

- **Peers actively with over 150 ISPs around the world.**

- **A tool for detecting and hunting down Ghost Routes in the IPv6 routing tables and displaying DFP availability.**

- **Distributed Looking Glass**

- **Missing Prefixes**

- **Prefix Comparison**

- **http://www.sixxs.net/tools/grh/**

  (See also possible lightning talk about this)

RFC4193 - ULA

IPv6 ULA (Unique Local Address)
RFC4193 Registration

- **fd00::/8 ULA Locally Assigned.**
  It is Unique, but maybe not Unique enough as it has a chance that it is not.
- **fc00::/8 ULA "Registered" – not specified**
  and thus can't be used.
- **Nearly 200 registrations**
- **Of course not guaranteed, when people don't check this list it can't be.**

Future / Wish list

- **New signup mechanics**
- **Multicast**
  – **Most PoPs already in the SixXS Multicast cloud, but need more testing/experiments**
- **AYIYA/DNS and AYIYA/HTTP(S)**
- **New AICCU client**
- **BGP Support / Multi-PoP Tunnels**
- **Community Edition**
- **More and more and more PoPs!**

http://www.sixxs.net/about/technology/

SixXS for ISPs

First the ISP contacts popmaster@sixxs.net and discuss the possible PoP with us.

The ISP provides:
- **A policy describing who can use their PoP**
- **A (virtual) host**
- **1 IPv4 + 2 IPv6 addresses (management .**
- **Routes IPv6 /40 or more to it**
- **Installs our root SSH key**
- **Delegate the reverse for the prefix to us.**
- **Register the prefix in RIPE**

ISP gets

- **A PoP for their users (eg their paying customers, or users in country/region X etc) providing all these folks with IPv6**

- **We handle signups, tunnel and subnet requests. Optionally this can be automated with a backend to the ISP, eg POP/IMAP-based authentication, ACL or other methods.**

- **Experience in IPv6 in the core**

- **For free, as SixXS is a project for the community, getting IPv6 to the world is the ultimate goal (along with having to shutdown the IPv6 tunnel broker because everybody has IPv6).**

Questions?

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