SwiNOG 11

20 October 2005

Altes Tramdepot, Bern, Switzerland

Taking a look at deploying IPv6

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SixXS

SixXS accommodates an extendible whitelabel tunnelbroker to assist LIRs in having a rapid IPv6 deployment in their organisation by providing a native and tunneled IPv6 broker, giving IPv6 access to their clients even though intermediate hardware doesn't support IPv4. Each PoP serves users based on the policies defined by the owner of the PoP.

More participating LIRs always welcome.

See http://www.sixxs.net for more information

European PoPs

Current PoPs

Belgium

Brussels	■	bebru01	Easynet
Brussels	■	bebru02	BELNET, The Belgian Research and Education Network

Estonia

Tallinn	■	eetll01	Data Telecom

Finland

Helsinki	■	fihel01	Finnet Verkot Oy

Germany

Hamburg	■	deham01	Easynet
Muenchen	■	demuc02	M"net Telekommunikations GmbH

Ireland

Dublin	■	iedub01	HEAnet

Italy

Torino	■	ittrn01	ITgate

Netherlands, The

Amsterdam	■	nlams04	Scarlet Internet B.V.
Amsterdam	■	nlams05	SURFnet
Breda	■	nlams01	Concepts ICT BV
Ede	■	nlede01	BIT BV

Poland

Poznan	■	plpoz01	Poznan Supercomputing and Networking Center

Portugal

Lisboa	■	ptlis01	NFSi - Soluções Internet, Lda.

Slovenia

Maribor	■	simbx01	Medinet / Amis

Sweden

Stockholm	■	sesto01	Port80 AB

United Kingdom (Great Britain)

London	■	gblon01	Kewlio.net Limited
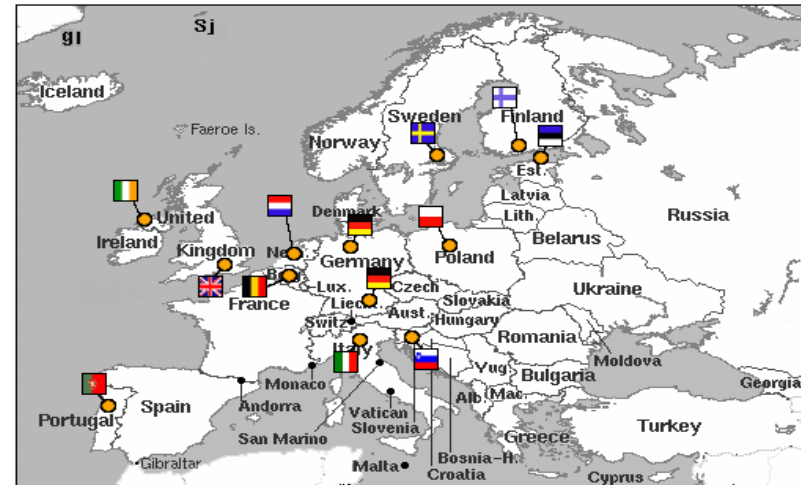
17 PoPs in Europe

PoPs are named according to UN/LOCODE in the format of a two letter country code followed by a three letter city code and a two digit sequence number.

United States PoPs

Since 14th of October, two PoPs in the USA (Chicago + Atlanta). Another 5 spread out over the USA will be deployed during the coming months.

OCCAID (http://www.occaid.org), who are running a public network for experimentation such as free (as in beer) IPv6 transit and a lot more is providing these.

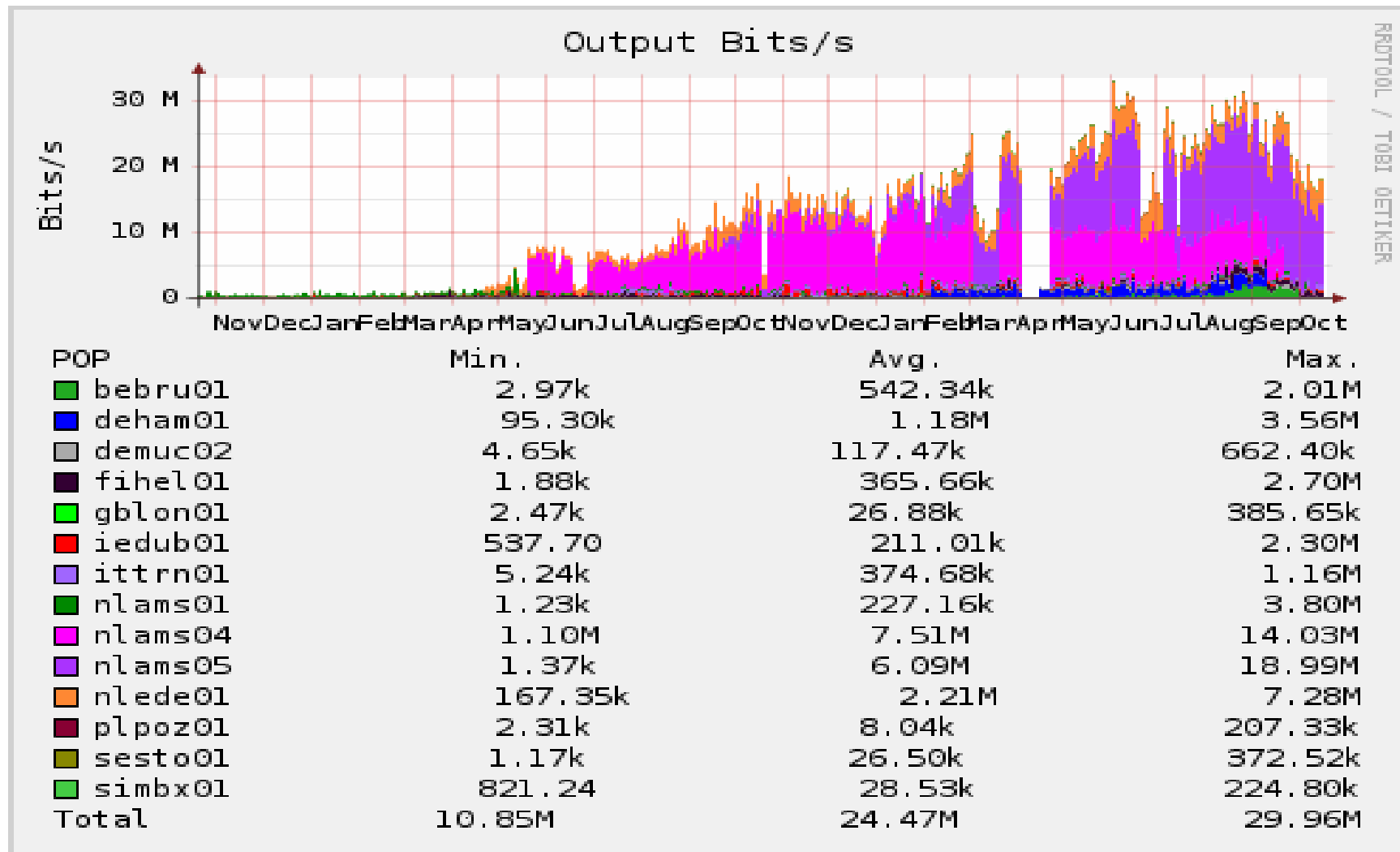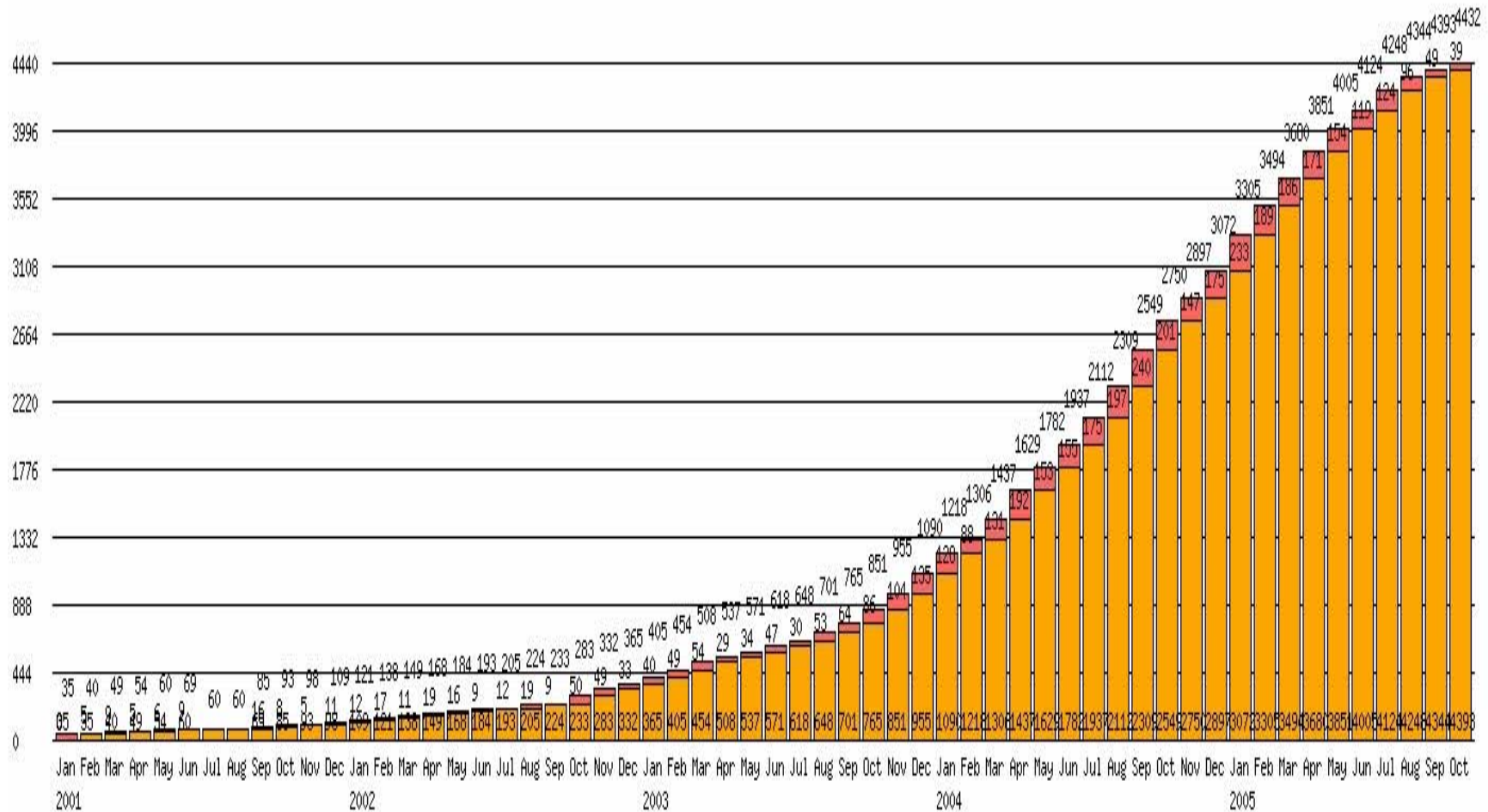# Users and Origins

Users
The 4424 users span 55 countries.

Users	Percentage		Country	Users	Percentage		Country
1881	42.52%		Netherlands, The	8	0.18%		Luxembourg
783	17.70%		Germany	5	0.11%		Iceland
250	5.65%		Italy	5	0.11%		New Zealand
211	4.77%		Belgium	4	0.09%		Iran
210	4.75%		Finland	4	0.09%		Japan
198	4.48%		Poland	4	0.09%		Latvia
118	2.67%		Slovenia	3	0.07%		Lithuania
113	2.55%		Sweden	3	0.07%		Malaysia
105	2.37%		United Kingdom (Great Britain)	2	0.05%		Hong Kong
103	2.33%		France	2	0.05%		Malta
83	1.88%		United States	2	0.05%		South Africa
81	1.83%		Norway	2	0.05%		Taiwan
64	1.45%		Hungary	1	0.02%		Bulgaria
55	1.24%		Ireland	1	0.02%		Croatia
51	1.15%		Austria	1	0.02%		Cyprus
42	0.95%		Switzerland	1	0.02%		Greece
38	0.86%		Estonia	1	0.02%		Greenland
29	0.66%		Denmark	1	0.02%		Lebanon
25	0.57%		Portugal	1	0.02%		Malawi
14	0.32%		Canada	1	0.02%		Pakistan
13	0.29%		Spain	1	0.02%		Senegal
11	0.25%		Brazil	1	0.02%		Serbia and Montenegro
11	0.25%		Israel	1	0.02%		Slovakia
10	0.23%		Romania	1	0.02%		Thailand
10	0.23%		Russia	1	0.02%		Turkey
9	0.20%		Australia	1	0.02%		Venezuela
9	0.20%		Czech Republic	1	0.02%		Yugoslavia
9	0.20%		Indonesia				

Traffic Statistics

Output Bits/s

POP	Min.	Avg.	Max.
bebru01	2.97k	542.34k	2.01M
deham01	95.30k	1.18M	3.56M
demuc02	4.65k	117.47k	662.40k
fihel01	1.88k	365.66k	2.70M
gblon01	2.47k	26.88k	385.65k
iedub01	537.70	211.01k	2.30M
ittrn01	5.24k	374.68k	1.16M
nlams01	1.23k	227.16k	3.80M
nlams04	1.10M	7.51M	14.03M
nlams05	1.37k	6.09M	18.99M
nlede01	167.35k	2.21M	7.28M
plpoz01	2.31k	8.04k	207.33k
sesto01	1.17k	26.50k	372.52k
simbx01	821.24	28.53k	224.80k
Total	10.85M	24.47M	29.96M

Growth

http://www.sixxs.net/misc/growth/

Top Uptimes

🇨🇭 Top 10 highest uptime for Switzerland

Rank	Name	Uptime
🏆	Jeroen Massar	695 days / 99 weeks
2	Banchieri Julien	416 days / 59 weeks
3	Marc Kramis	370 days / 53 weeks
4	Iwan Eberhart	358 days / 51 weeks
5	Christoph Ernst	345 days / 49 weeks
6	Rolf Ochsenbein	303 days / 43 weeks
7	Marcel Waldvogel	285 days / 41 weeks
8	Stefan Marti	271 days / 39 weeks
	Felix Bommeli	271 days / 39 weeks
9	Luc de Louw	256 days / 37 weeks
10	Marcel Waldvogel	246 days / 35 weeks

Credit System

These are the last 25 rows of your personal log.

Date	Log Entry	*
2003-11-14 01:15:33	Tunnel endpoint 3ffe:8114:1000::27 pinged for 56 weeks	5
2003-11-14 01:15:33	Heartbeat Tunnel T1448 exists for one week	5
2003-11-14 01:15:33	Heartbeat Tunnel T1564 exists for one week	5
2003-11-14 01:15:33	Heartbeat Tunnel T1567 exists for one week	5
2003-11-13 01:15:29	Heartbeat Tunnel T1448 exists for one week	5
2003-11-13 01:15:29	Heartbeat Tunnel T1564 exists for one week	5
2003-11-13 01:15:29	Heartbeat Tunnel T1567 exists for one week	5
2003-11-12 01:15:42	Tunnel endpoint 2001:770:100:7::2 didn't ping for 2 days	-5
2003-11-10 13:53:14	Subnet 2001:838:36a::/48 was user enabled	
2003-11-10 13:53:05	SixXS approved the subnet 2001:838:36a::/48 to 2001:838:300:b8::2	-4
2003-11-10 13:53:01	Requested a subnet to tunnel 2001:838:300:b8::2	-10
2003-11-10 02:03:13	Tunnel to tinc was user enabled	
2003-11-10 02:03:05	Tunnel to tinc set protocol to tinc	
2003-11-10 02:02:56	SixXS approved the tunnel to tinc	-5
2003-11-10 02:02:51	Requested a tunnel from tinc to POP iedub01	-10
2003-11-09 23:25:11	Tunnel to tinc set protocol to tinc	
2003-11-09 23:24:56	Tunnel to tinc was user enabled	
2003-11-09 23:24:47	SixXS approved the tunnel to tinc	-5
2003-11-09 23:24:43	Requested a tunnel from tinc to POP nlams04	-10
2003-11-09 13:17:01	Tunnel to heartbeat set protocol to tinc	
2003-11-07 01:15:36	Tunnel endpoint 3ffe:8114:1000::27 pinged for 55 weeks	5
2003-11-03 01:15:36	Heartbeat Tunnel T1448 exists for one week	5
2003-10-31 01:15:36	Tunnel endpoint 3ffe:8114:1000::27 pinged for 54 weeks	5
2003-10-28 21:59:37	Tunnel to heartbeat was admin enabled	
2003-10-28 19:27:32	Tunnel to heartbeat was admin requested	

Latency & Traffic Stats
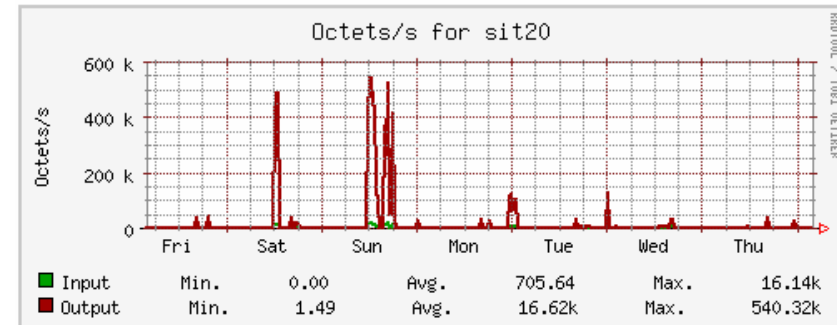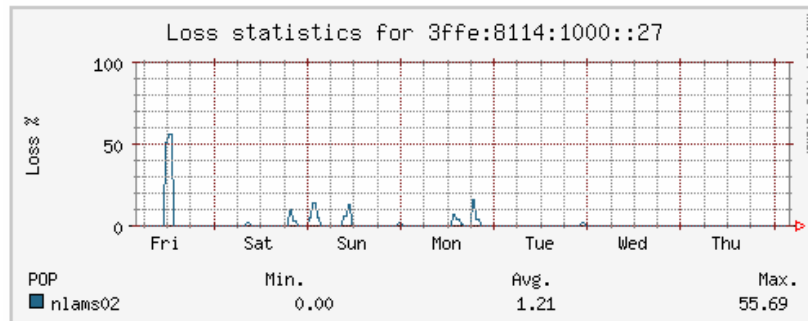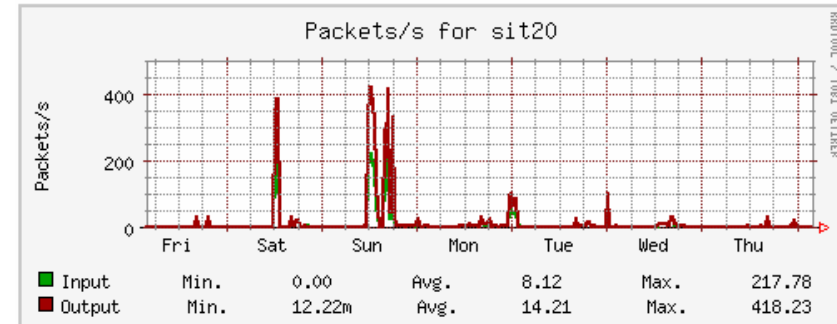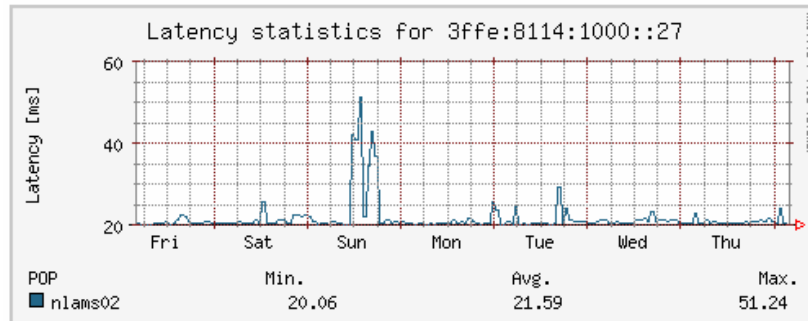
Latency & Traffic information per
tunnel using RRDTool (Swiss
produce :)
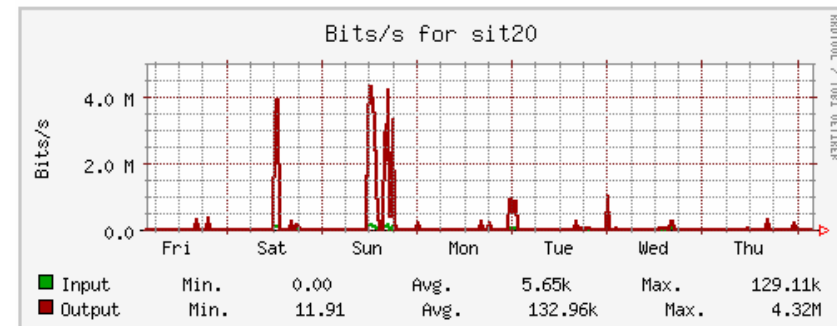
Automatic IPv6 Connectivity Configuration Utility

Configuration information:

- TIC (Tunnel Information Control protocol)
- TSP (Tunnel Setup Protocol)*

Tunnels:

- proto-41 with or without heartbeat
- AYIYA

SixXS :: AICCU : Automatic IPv6 Connectivity Client Utility

AiCCU SixXS
Automatic IPv6 Connectivity Configuration Utility

Welcome to AICCU, the Automatic IPv6 Connectivity Configuration Utility.

Please login using your username and password, which where provided to you by SixXS. If you have lost your password then proceed to the password recovery form to request a new password.

When you do not have an account yet, you can signup for free!

Username: JRM1-RIPE

Password: •••••••••••••••

OK

SixXS :: AICCU : Tunnel Information

Property	Value
Tunnel Id	T1646
Tunnel Type	6in4-heartbeat
POP Name	deham01
ISP Name	Easynet
POP City	Hamburg
POP Country	Germany (de)
IPv6 POP	2001:6f8:900::1
IPv6 Local	2001:6f8:900::2
IPv6 Prefixlength	64
IPv4 POP	212.224.0.188
IPv4 Local	heartbeat
Password	******
Heartbeat Interval	60 seconds

Easynet
POP Information
Tunnel Information
Contact SixXS

Enable   Disable   Test

☐ Behind NAT
☐ Auto Enable

SixXS :: AICCU : Tunnel Selection

Please select the tunnel you want to use for this host from the below list.

Tunnel ID	IPv6 Local	IPv4 Local	POP Name
T1448	2001:838:300:b8::2	62.78.96.38	nlams01
T1564	2001:960:2:ad::2	tinc	nlams04
T1567	2001:770:100:7::2	213.197.27.252	iedub01
T1646	2001:6f8:900::2	heartbeat	deham01
T1733	2001:6f8:900:58::2	heartbeat	deham01
T1869	3ffe:4005:1000::2	ayiya	gblon01
T2285	2001:838:300:159::2	213.254.12.34	nlams01
T2993	2001:7b8:2ff::2	195.64.92.136	nlede01

ⓘ Need an additional tunnel? Request it!   OK

(* = in upcoming version :)

Heartbeat

Notifies PoP of the current users endpoint in a secure manner

(md5'd string including timestamp & password)

Draft Currently in RFC Queue

http://www.sixxs.net/tools/heartbeat/

AYIYA

Anything In Anything

- IPv6 over IPv4 UDP/TCP
    - IPv4 over IPv4 UDP

- Built-in heartbeat mechanism
- Per packet signing and/or encryption

draft-massar-v6ops-ayiya-02 (soon -03)

http://www.sixxs.net/tools/ayiya/

Manual Configuration?

http://www.sixxs.net/faq/

Frequently Asked Questions (FAQ): Connectivity (Tunnels and Subnets)
Other FAQ sections

How do I configure my machine to setup the IPv6 in IPv4 tunnel to the SixXS POP? ▼ | View

How do I configure my machine to setup the IPv6 in IPv4 tunnel to the SixXS POP?
Select your Operating System
- 6Wind (SixOS)
- Cisco (IOS)
- FreeBSD
- Juniper (JunOS)
- Linux - Debian
- Linux - New - using iproute2
- Linux - Old
- NetBSD
- OpenBSD
- Solaris
- Tru64
- Windows 98 / NT4 / 2000 / XP / .Net

If you know how to configure other Operating Systems, don't hesitate and mail it to info@sixxs.net.
Information about setting up tunnels behind NAT can be found in the Euro6ix IPv6 Tunnels over NAT document

Home Networks

unfix.org (UNFIX-NET)

- Cabling is 100mbit Ethernet CAT5 unless stated
- IPv6 and IPv4 is native everywhere (yes including the DSL line)
- ISP is BIT BV (http://www.bit.nl)

Jeroen Massar / jeroen@unfix.org / JRM1-RIPE

Internet

unfix.org

213.136.24.43/24
2001:7b8:5:10:f71::/80

8mbit/1mbit ADSL

—10mbit Ethernet—

SpeedTouch

purgatory
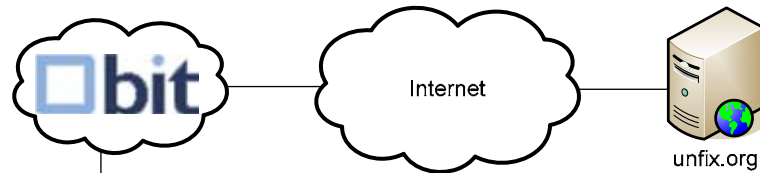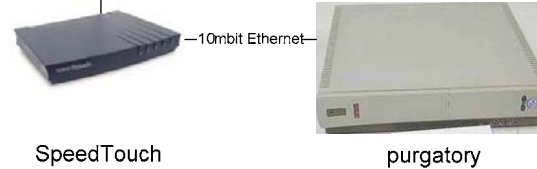
213.154.246.80/28
2001:7b8:20d::/64

addiction

heaven

thunderstick

LaCie 250Gb

USB2

USB2

eden

paradise

USB2

LaCie 250Gb

USB2

ToUCam
Pro

hell

cable to upstairs

Wireless 802.11b/g
11/54mbit
(SSID: gouda.nl.unfix.org)

magrathea

Edimax 8 port
Switch

sheol

dis, gehenna, malebolge

limbo

IPv6Gate
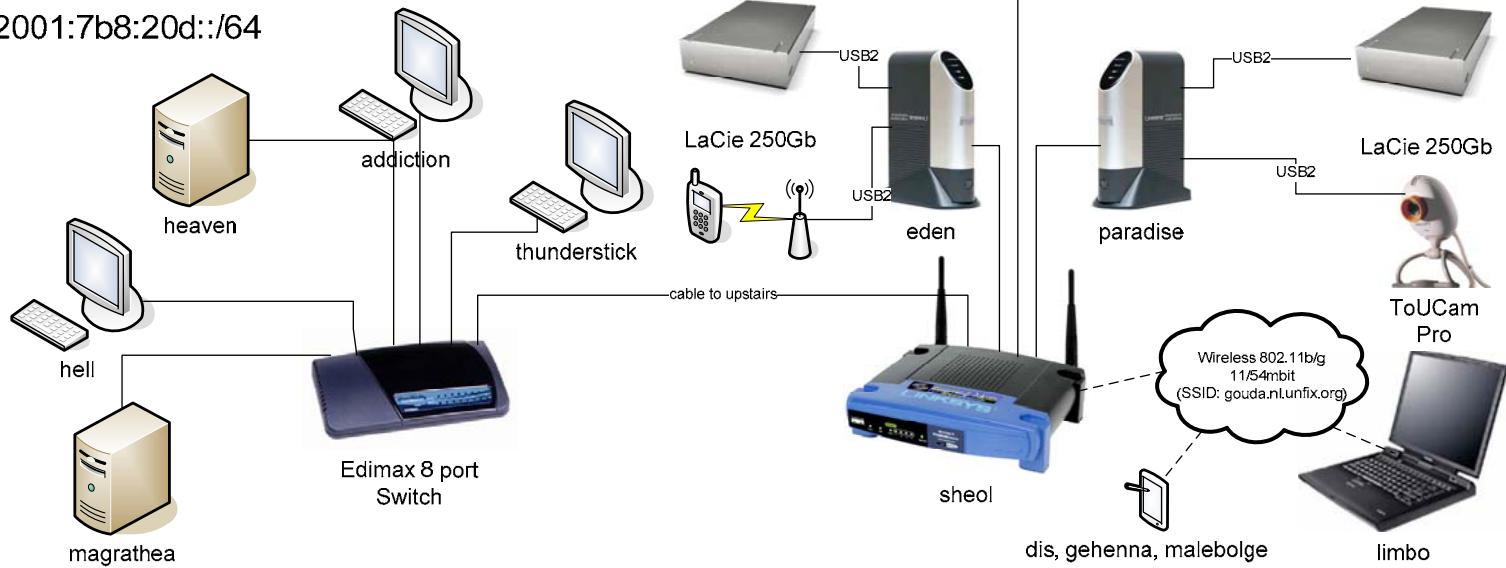
http://ipv6gate.sixxs.net

http://<host>.sixxs.org

Makes your IPv4 website

available over IPv6

http://<host>.ipv4.sixxs.org

Makes your IPv6 only website

available over IPv4

Distributed Traceroute

IPv6 traceroute

IPv6 traceroute from uschi01.sixxs.net @ OCCAID, AS30071 to plpoz01.sixxs.net / Poznan Supercomputing and Networking Center, AS9112 :

Hop	Node	Loss%	Sent	Last	Avg	Best	Worst	StDev		ASN	Organisation
1.	2001:4830:e5:5::1 505.ge0-0.cr1.ord1.us.occaid.net.	0.0%	5	0.9	0.8	0.6	0.9	0.1	🇺🇸	30071	TowardEX Technologies Network
2.	2001:4830:ff:1753::1 57.fe0-0.cr1.mci1.us.occaid.net.	0.0%	5	13.0	13.2	13.0	13.3	0.1	🇺🇸	30071	TowardEX Technologies Network
3.	2001:4830:ff:1750::2 6.fe0-0.cr1.sfo2.us.occaid.net.	0.0%	5	48.4	48.5	48.2	48.7	0.2	🇺🇸	30071	TowardEX Technologies Network
4.	2001:4f8:4:b:290:6900:b30:54	0.0%	5	49.0	48.7	48.4	49.0	0.2	🇺🇸	3557	Internet Software Consortium, Inc.
5.	2001:4f8:0:1::6:2 r2.r3.sfo2.isc.org.	0.0%	5	48.9	48.7	48.5	49.0	0.2	🇺🇸	3557	Internet Software Consortium, Inc.
6.	2001:4f8:0:1::5:1 r3-sfo2.r5.paol.isc.org.	0.0%	5	50.0	49.5	49.2	50.0	0.3	🇺🇸	3557	Internet Software Consortium, Inc.
7.	2001:4f8:0:1::3:1 r5-2.r7.paol.isc.org.	0.0%	5	49.6	49.5	49.2	50.1	0.4	🇺🇸	3557	Internet Software Consortium, Inc.
8.	3ffe:80a::bd	0.0%	5	50.8	50.8	50.6	50.9	0.1	🇺🇸	4555	LAP-EXCHANGE
	[Note: 6bone Phaseout Address space must be returned per 6/6/2006]										
9.	2001:468:ff:1017::1 dnvrng-snvang.abilene.ucaid.edu.	0.0%	5	95.8	90.4	75.8	127.2	22.2	🇺🇸		UCAID
10.	2001:468:ff:1013::2 kscyng-dnvrng.abilene.ucaid.edu.	0.0%	5	86.0	93.8	85.6	125.7	17.8	🇺🇸		UCAID
11.	2001:468:ff:1213::1 iplsng-kscyng.abilene.ucaid.edu.	20.0%	5	322.7	325.1	319.6	332.3	5.4	🇺🇸		UCAID
12.	2001:468:ff:f12::1 chinng-iplsng.abilene.ucaid.edu.	0.0%	5	116.9	106.0	99.0	116.9	7.4	🇺🇸		UCAID
13.	2001:468:ff:f15::2 nycmng-chinng.abilene.ucaid.edu.	0.0%	5	126.9	125.7	118.8	130.1	4.9	🇺🇸		UCAID
14.	2001:468:ff:15c5::2	0.0%	5	119.1	119.1	118.9	119.2	0.1	🇺🇸		UCAID
15.	2001:798:20cc:1c01:2801::2 ny.uk1.uk.geant.net.	0.0%	5	187.8	187.9	187.8	188.0	0.1	🇪🇺	20965	Dante
16.	2001:798:20cc:2501:2801::1 uk.se1.se.geant.net.	0.0%	5	222.6	222.9	222.6	223.4	0.3	🇪🇺	20965	Dante
17.	2001:798:2013:10aa::a	20.0%	5	246.9	246.8	246.5	247.4	0.5	🇪🇺	20965	Dante
18.	2001:b10:c000:2::2 z-poznan-gw1.poznan.10gb.pol34.pl.	20.0%	5	246.8	246.8	246.7	247.0	0.1	🇵🇱		Lodman
19.	2001:808:0:5::2 csa7-ATM4-0-0-103.ipv6.man.poznan.pl.	20.0%	5	247.4	247.4	247.2	247.5	0.1	🇵🇱		Poznan Supercomputing And Networking Center
20.	2001:808::66 plpoz01.sixxs.net.	20.0%	5	247.1	247.3	247.1	247.6	0.2	🇵🇱		Poznan Supercomputing And Networking Center

SixXS Ghost Route Hunter (GRH)

Swiss GRH Participants
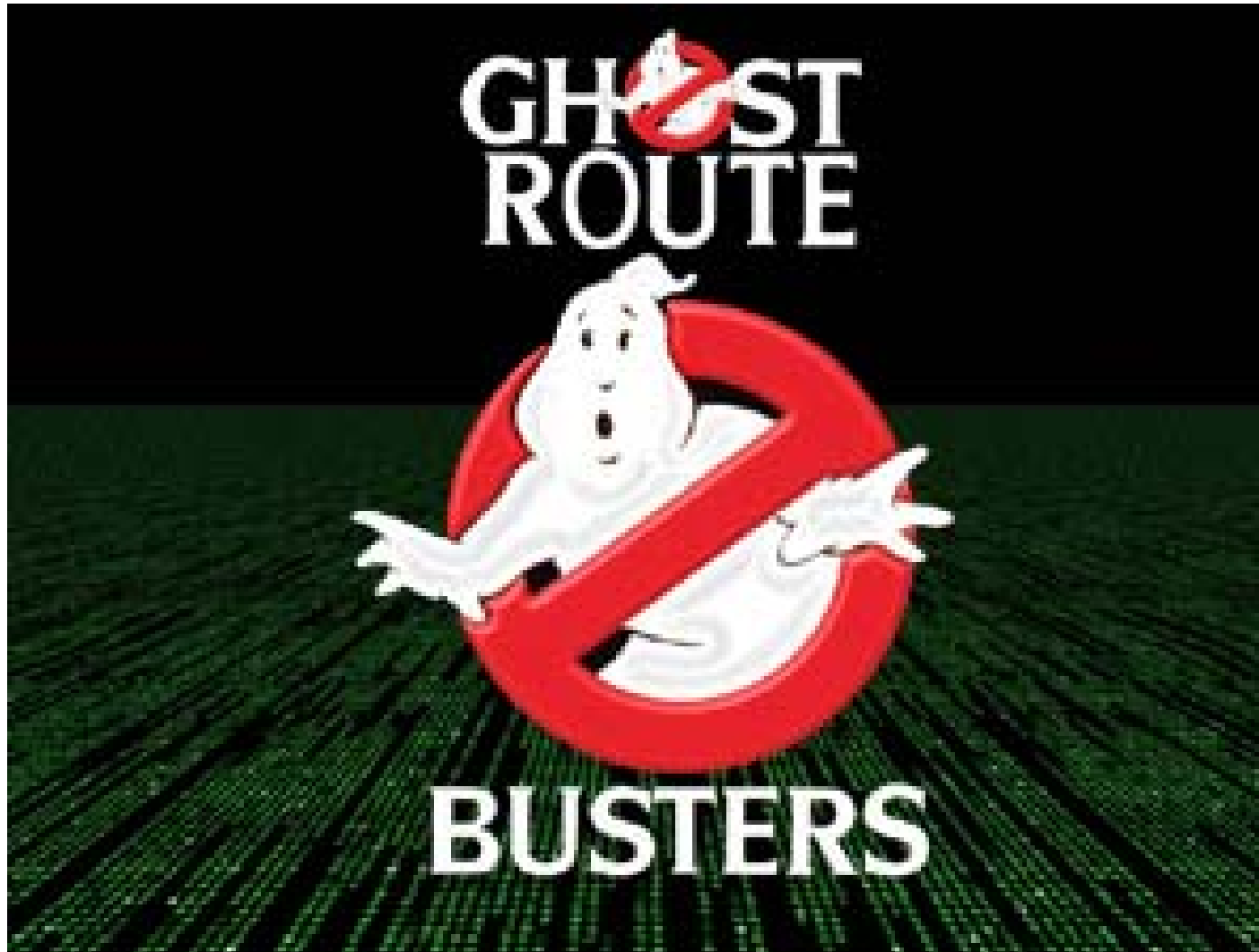
Cyberlink Internet Services AG
Country: 🇨🇭 Switzerland
ASN: AS15623
Website: http://www.cyberlink.ch
Router: 🇨🇭 Zurich, Switzerland

Dolphins Network Systems AG
Country: 🇨🇭 Switzerland
ASN: AS8758
Website: http://www.dolphins.ch
Router: 🇨🇭 Zurich, Switzerland

Init Seven AG
Country: 🇨🇭 Switzerland
ASN: AS13030
Website: http://www.init7.net

SolNet
Country: 🇨🇭 Switzerland
ASN: AS9044
Website: http://www.solnet.ch
Router: 🇨🇭 Solothurn, Switzerland (user disabled)

SWITCH - Swiss Education and Research Network
Country: 🇨🇭 Switzerland
ASN: AS559
Website: http://www.switch.ch
Router: 🇨🇭 Zurich, Switzerland

Ghost Route Hunter

GRH: Ghost Route Hunter

URL: http://www.sixxs.net/tools/grh/

Contact: info@sixxs.net

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

More peers always wanted for a better view into
   the routing tables!

Distributed Looking Glass

When: ⦿ Current ○ Date: | 2003 ▼ | 09 ▼ | 02 ▼ | Hour: | 00 ▼ | [Select]

Participant: | SixXS - GRH Route View [AS: 8298] ▼ |

Show: | All paths ▼ |
Output: | HTML ▼ |
Find: | Prefix ... ▼ | | | [Lookup]

Types of Anomalies
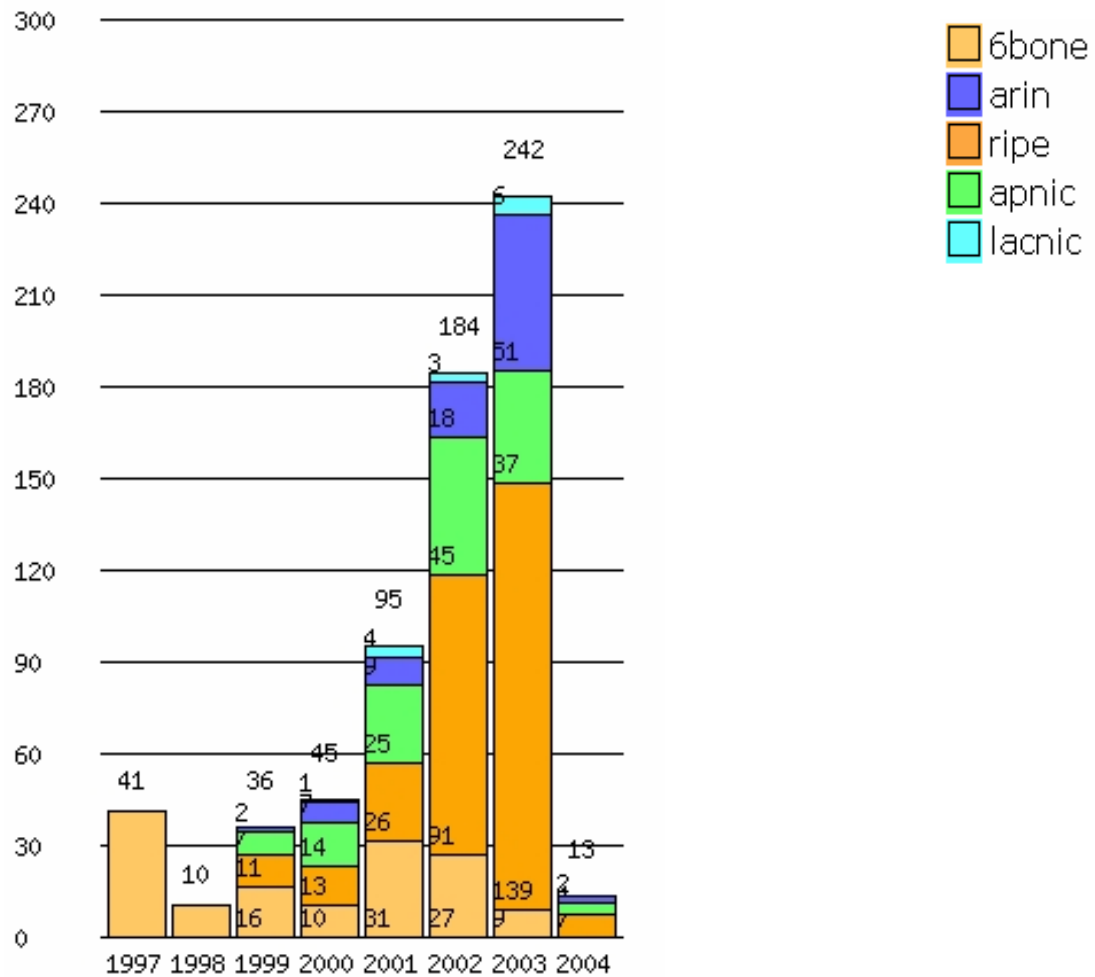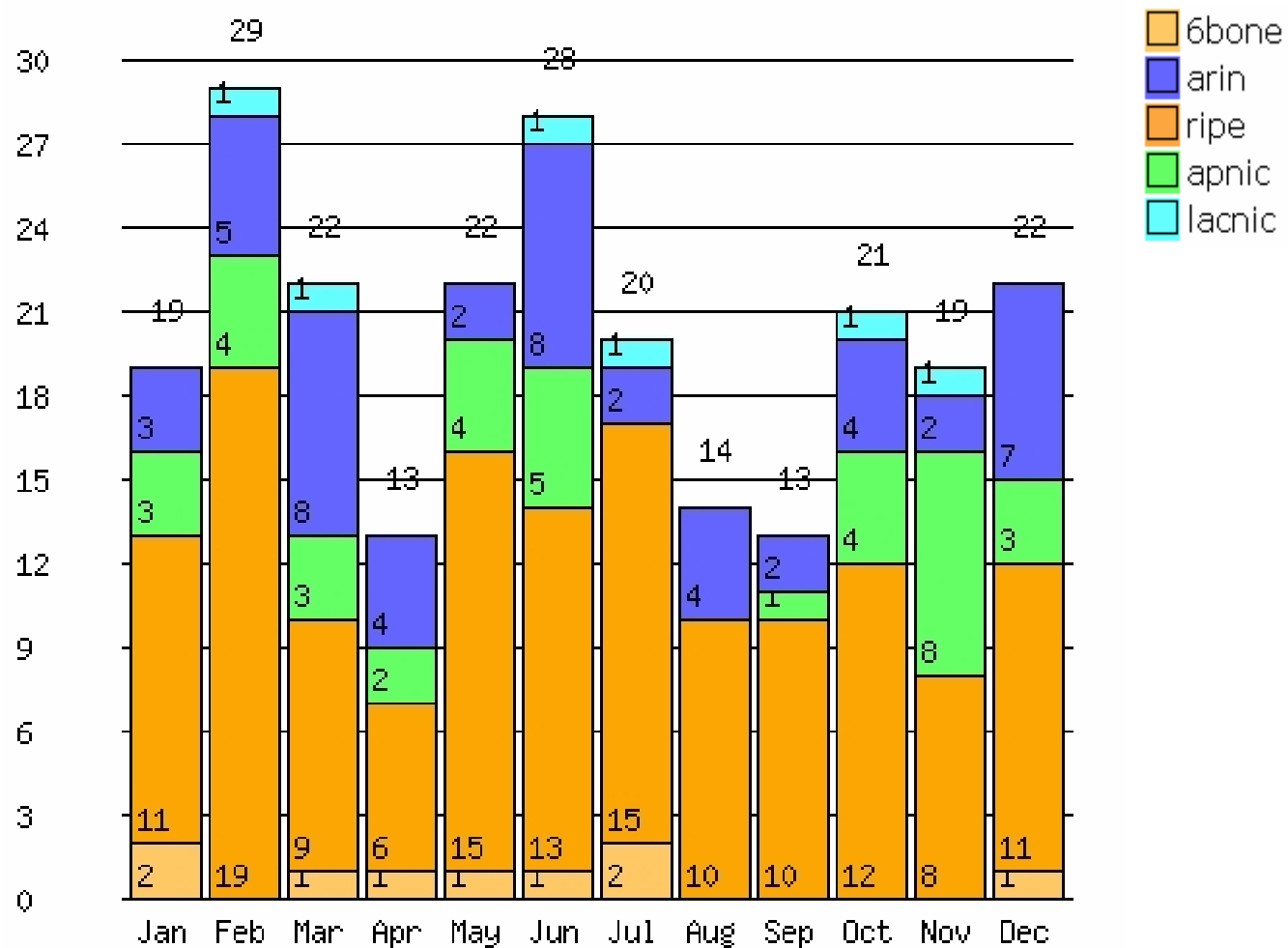
- **Default Route**

  Quite obvious announcing a default route into the GRT is not a thing that should happen.

- **Martian Prefix**

  Martian prefixes are prefixes which should only reside inside a network. The following prefixes should never be found in BGP as based on the

  IANA Address Space Assignments like:

    - ff00::/8
    - fe80::/10
    - fec0::/10
    - ::/96
    - ::1/128

IX Prefixes

The following are a list of IX prefixes, these prefixes are handed out per /48 to Internet Exchanges. As these prefixes are only /48's they should not be visible in the GRT.

2001:7f8::/32

2001:504::/32

2001:7fa::/32

2001:7f8:1::/48	12337	5539	3257	1200
2001:7f8:1::/48	12779	3549	1200	
2001:7f8:5::/48	1888	1103	11537	6939	3257
	25396	21238	15703	21238

Unassigned Prefixes

2001:468::/31	3ffe:4013:4:2::1	25358 1752 4725 2500 11537
2001:468::/31	2001:1418:1:400::1	12779 3549 6939 4716 2500 11537
2001:468::/31	2001:9c0:1:1::2:2	12902 12859 3265 3549 6939 4716 2500 11537
2001:468::/31	> 2001:470:1fff:3::3	6939 4716 2500 11537
2001:468::/31	2001:960::290:6900:1bb:5000	12634 3265 3549 6939 4716 2500 11537
2001:468::/31	2001:838:0:10::1	12871 3265 3549 6939 4716 2500 11537
2001:468::/31	2001:14d0:a001::1	15516 1752 4725 2500 11537
2001:468::/31	2001:610:25:5062::62	1103 6680 786 1752 4725 2500 11537
2001:468::/31	2001:610:ff:c::2	1888 1103 6680 786 1752 4725 2500 11537
2001:468::/31	2001:780:0:2::6	12337 12337 12337 6939 4716 2500 11537
2001:468::/31	2001:7b8::290:6900:1cc6:d800	12859 3265 3549 6939 4716 2500 11537

SixXS   Subnets of big allocation

More specifics of an assigned prefix should never
 be announced in the GRT.
See Gert's IPv6 Filter Recommendations.
(http://www.space.net/~gert/RIPE/ipv6-filters.html)

2001:478::/45	2001:478::/32
2001:478:65::/48	2001:478::/32
2001:4b0::/35	2001:4b0::/32
2001:4b8::/35	2001:4b8::/32
2001:4f0::/35	2001:4f0::/32
2001:500::/48	2001:500::/32
2001:500:1::/48	2001:500::/32
2001:530:dead::/64	2001:530::/32
2001:530:dead:bead::/64	2001:530::/32
2001:570::/48	2001:570::/32
2001:5e8::/33	2001:5e8::/32

Mismatching origin ASN

The origin ASN of the announced prefix didn't match up with the well known ASN.

3ffe:1300::/24   should be 762   (now: 10318)

3ffe:2f00::/24   should be 2547   (now: 1955)

3ffe:8070::/28   should be 278   (now: 237)

Multiple origin ASN's

A prefix should have only one origin ASN, multiples usually mean a routing glitch. Note that this doesn't include so called MOAS which are aggregated in the ASPath.

SixXS More specific 6to4 prefixes

6to4 is one of the several IPv4 to IPv6 transition methods. Section 5.2.3 of RFC3056 explictely restricts the propagation of more specifics than 2002::/16 to prevent polution of the IPv6 routing table by elements of the IPv4 routing table.

2002:8c6d:106::/48	140.109.1.6/32
2002:c0e7:d405::/48	192.231.212.5/32
2002:c2b1:d06e::/48	194.177.208.110/32
2002:c8a2::/33	200.162.0.0/17
2002:c8c6:4000::/34	200.198.64.0/18
2002:c8ca:7000::/36	200.202.112.0/20

Prefixes having a steady ASPath length of over 12 ASN's will quite probably mean that it concerns a so called Ghost Route.

(see the RIPE44 presentation and Gert Döring's work)

Prefixes

🇩🇰 Arrownet A/S			
🇩🇰 Glostrup	2001:14d0:a001::1		399
🇳🇱 BIT			
🇳🇱 Ede	2001:7b8::290:6900:1cc6:d800		407
🇳🇱 Concepts			
🇳🇱 Amsterdam	2001:838:0:10::1		400
🇳🇱 Centrum voor Wiskunde en Informatica			
🇳🇱 Amsterdam	2001:610:ff:c::2		460
Easynet			
🇩🇪 München	2001:6f8:800::24		403
🇺🇸 Hurricane Electric			
🇺🇸 Fremont	2001:470:1fff:3::3		470
🇳🇱 Intouch / IPng.nl			
🇳🇱 Amsterdam	2001:6e0::2		402
🇮🇹 ITGate Network			
🇮🇹 Turin	2001:1418:1:400::1		464
🇳🇱 Luna.nl BV			
🇳🇱 Amsterdam	2001:9c0:1:1::2:2		422
🇫🇷 NDSoftware			
🇫🇷 Paris	3ffe:4013:4:2::1		390
🇩🇪 noris network AG			
🇩🇪 Nürnberg	2001:780:0:2::6		427
🇳🇱 Scarlet Internet			
🇳🇱 Amsterdam	2001:960::290:6900:1bb:5000		414
🇳🇱 Surfnet			
🇳🇱 Amsterdam	2001:610:25:5062::62		447
Tiscali			
🇩🇪 Frankfurt	2001:668:0:1:34:49:6900:40		434

5033 BGP AS-PATH entries
133 BGP community entries
Average of 359 prefixes
14 peers

SixXS

telnet://grh.sixxs.net

SixXS Worldwide TLA distribution

Allocated
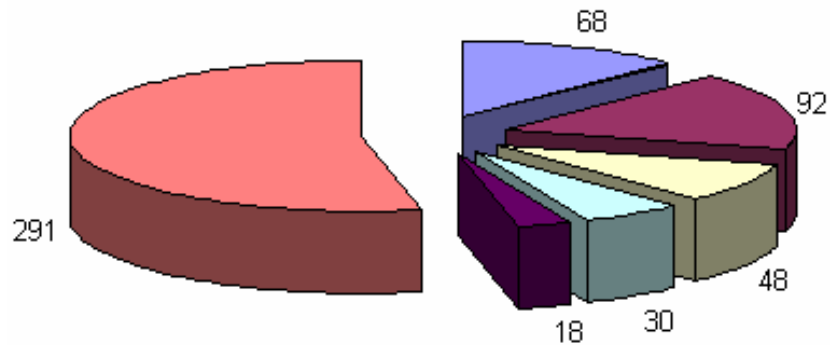
Visible
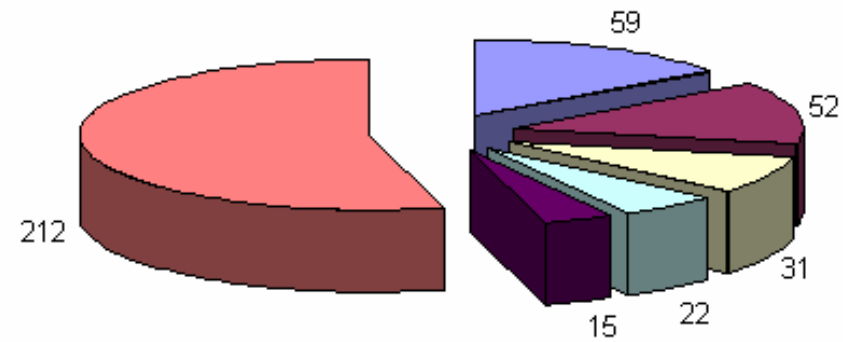
Japan United States Germany Netherlands France others

Worldwide TLA distribution

Pos	Flag	Country	V	A	VP
1		Japan	59	68	10.61%
2		United States	52	92	9.35%
3		Germany	31	48	5.58%
4		Netherlands, The	22	30	3.96%
5		France	15	18	2.70%
6		United Kingdom	15	27	2.70%
7		Italy	13	20	2.34%
8		Taiwan	13	14	2.34%
9		Korea	11	19	1.98%
10		Poland	11	13	1.98%
11		Switzerland	11	12	1.98%
12		Austria	9	13	1.62%
13		Finland	9	12	1.62%
14		Portugal	8	9	1.44%
15		Spain	8	12	1.44%
16		Sweden	8	15	1.44%
17		Canada	7	8	1.26%
18		China	6	8	1.08%
19		Europe	6	8	1.08%
20		Mexico	6	9	1.08%

Pos	Flag	Country	V	A	VP
21		Thailand	6	7	1.08%
22		Czech Republic	5	9	0.90%
23		Denmark	5	5	0.90%
24		Norway	5	6	0.90%
25		Australia	4	5	0.72%
26		Belgium	3	4	0.54%
27		Estonia	3	4	0.54%
28		Ireland	3	3	0.54%
29		Luxembourg	3	4	0.54%
30		Malaysia	3	4	0.54%
31		Singapore	3	5	0.54%
32		Argentina	2	3	0.36%
33		Brazil	2	2	0.36%
34		Greece	2	2	0.36%
35		Hong Kong	2	2	0.36%
36		Hungary	2	2	0.36%
37		Lithuania	2	2	0.36%
38		Romania	2	2	0.36%
39		Slovakia	2	2	0.36%
40		Turkey	2	3	0.36%

Pos	Flag	Country	V	A	VP
41		Yugoslavia	2	2	0.36%
42		Chile	1	1	0.18%
43		India	1	2	0.18%
44		Indonesia	1	2	0.18%
45		Israel	1	1	0.18%
46		Russia	1	4	0.18%
47		Slovenia	1	1	0.18%
48		South Africa	1	2	0.18%
49		Tunisia	1	1	0.18%

V: Visible: Number of Visible Prefixes for this country.

A: Allocated: Number of Allocated Prefixes for this country (excludes returned prefixes).

VP: Visible Percentage: Percentage of visible prefixes against global number of allocated prefixes.

RIPE TLA distribution

Pos	Flag	Country	V	A	VP
1		Germany	28	45	11.81%
2		Netherlands, The	18	25	7.59%
3		France	10	13	4.22%
4		United Kingdom	9	20	3.80%
5		Austria	8	12	3.38%
6		Finland	8	11	3.38%
7		Italy	8	13	3.38%
8		Portugal	6	6	2.53%
9		Sweden	6	13	2.53%
10		Switzerland	6	7	2.53%
11		Czech Republic	5	9	2.11%
12		Poland	5	7	2.11%

Pos	Flag	Country	V	A	VP
13		Spain	5	9	2.11%
14		Denmark	4	4	1.69%
15		Europe	4	6	1.69%
16		Norway	4	5	1.69%
17		Estonia	3	4	1.27%
18		Ireland	3	3	1.27%
19		Lithuania	2	2	0.84%
20		Luxembourg	2	3	0.84%
21		Romania	2	2	0.84%
22		Belgium	1	2	0.42%
23		Greece	1	1	0.42%
24		Hungary	1	1	0.42%

Pos	Flag	Country	V	A	VP
25		Israel	1	1	0.42%
26		Slovenia	1	1	0.42%
27		Tunisia	1	1	0.42%
28		Turkey	1	2	0.42%
29		Yugoslavia	1	1	0.42%

V: Visible: Number of Visible Prefixes for this country.

A: Allocated: Number of Allocated Prefixes for this country (excludes returned prefixes).

VP: Visible Percentage: Percentage of visible prefixes against global number of allocated prefixes.

SixXS TLA report for RIPE region

The database currently holds 235 (151) TLA's.

Of which:

- 83 (45) IPv6 TLA's didn't have a routing entry.
- 153 (106) networks are currently announced.
- 0 (4) only announced a /35 while they have been assigned a /32.
- 4 (5) announce both their /32 and their /35.

SixXS TLA report for RIPE region

The database currently holds 287 IPv6 TLA's.

105 (36.59%) IPv6 TLA's didn't have a routing entry.
182 (63.41%) networks are currently announced.
0 only announced a /35 while they have been assigned a /32.
5 (1.74%) announce both their /32 and their /35.

SixXS Documentation Prefix

2001:db8::/32

```
inet6num:      2001:0DB8::/32
netname:       IPV6-DOC-AP
descr:         IPv6 prefix for documentation purpose
country:       AP
admin-c:       HM20-AP
tech-c:        HM20-AP
status:        ALLOCATED PORTABLE
remarks:       This address range is to be used for documentaiton
remarks:       purpose only. For more informaiton please see
remarks:       http://www.apnic.net/info/faq/ipv6-documentation-prefix-faq.html
mnt-by:        APNIC-HM
changed:       hm-changed@apnic.net 20040115
source:        APNIC
```

IPv6 Addresses

- **2000::/3 – current global unicast**

- **2001::/16 – RIR space (RIPE/ARIN/LACNIC/APNIC)**
  - **3ffe::/16 – 6bone (going away 6/6/6)**

  - **fe80::/10 – Link Local**
  - **fec0::/10 – Site Local (deprecated)**
  - **ff00::/8 – Multicast IPv6**

SixXS

**IPv6 Address Space Policy for Internet
Exchange Points**

http://www.ripe.net/ripe/docs/ipv6-policy-ixp.html

**"4.0 Warning: Networks assigned under this policy
may not be globally routable."**

2001:7f8::/32 (39) - 8 routes
2001:504::/30 (10) – No routes
2001:7fa::/32 (10) – No routes
59 in total

APNIC is going to lift routing restriction per 2004-03-19
http://www.apnic.net/docs/policy/proposals/prop-011-v001.html

Currently seen IX's

2001:7f8:1::/48 AMSIX
2001:7f8:2::/48 UK6IX
2001:7f8:4::/48 LINX
2001:7f8:5::/48 LIPEX
2001:7f8:8::/48 ECIX
2001:7f8:b::/48 MIX
2001:7f8:18::/48 INEX
2001:7f8:22::/48 F-IX

8 out of 39 allocated blocks

EP.net Exchanges

http://www.ep.net/policy.html

2001:478::/32 announced by AS6175 (Sprint)

Should only announce /48's.

Currently seen :

2001:478:65::/48

2001:478:9200::/48

both announced by AS4555 (EP)

Also seen: 2001:478::/45 from AS4555 (EP)

ARIN

http://www.arin.net/registration/ipv6/micro_alloc.html

2001:0504::/30

Exchange Points

10 at the moment

2001:0500::/30

Critical Infrastructure

4 at the moment

DNS servers

SixXS

(http://www.root-servers.org)

2001:7fd::/32 – K

2001:7fe::/32 – I

2001:dc3::/32 – M

2001:500::/32 – ISC F + H

Others:

2001:dc4::/32 .jp

Filtering

- Filtering on maximum of /48
  - Many filter on /32's
- Announcing a more specific usually leads to long AS paths or ones over Korea/Japan

IPv6 Filter Recommendations by Gert Döring

http://www.space.net/~gert/RIPE/ipv6-filters.html

Minimal IPv6 Peering by Robert Kießling

http://ip6.de.easynet.net/ipv6-minimum-peering.txt

- **Very hot topic(tm)**

  "Solution": shim6

- **End-site/host based**
- **Will require all end-hosts to be updated to work**
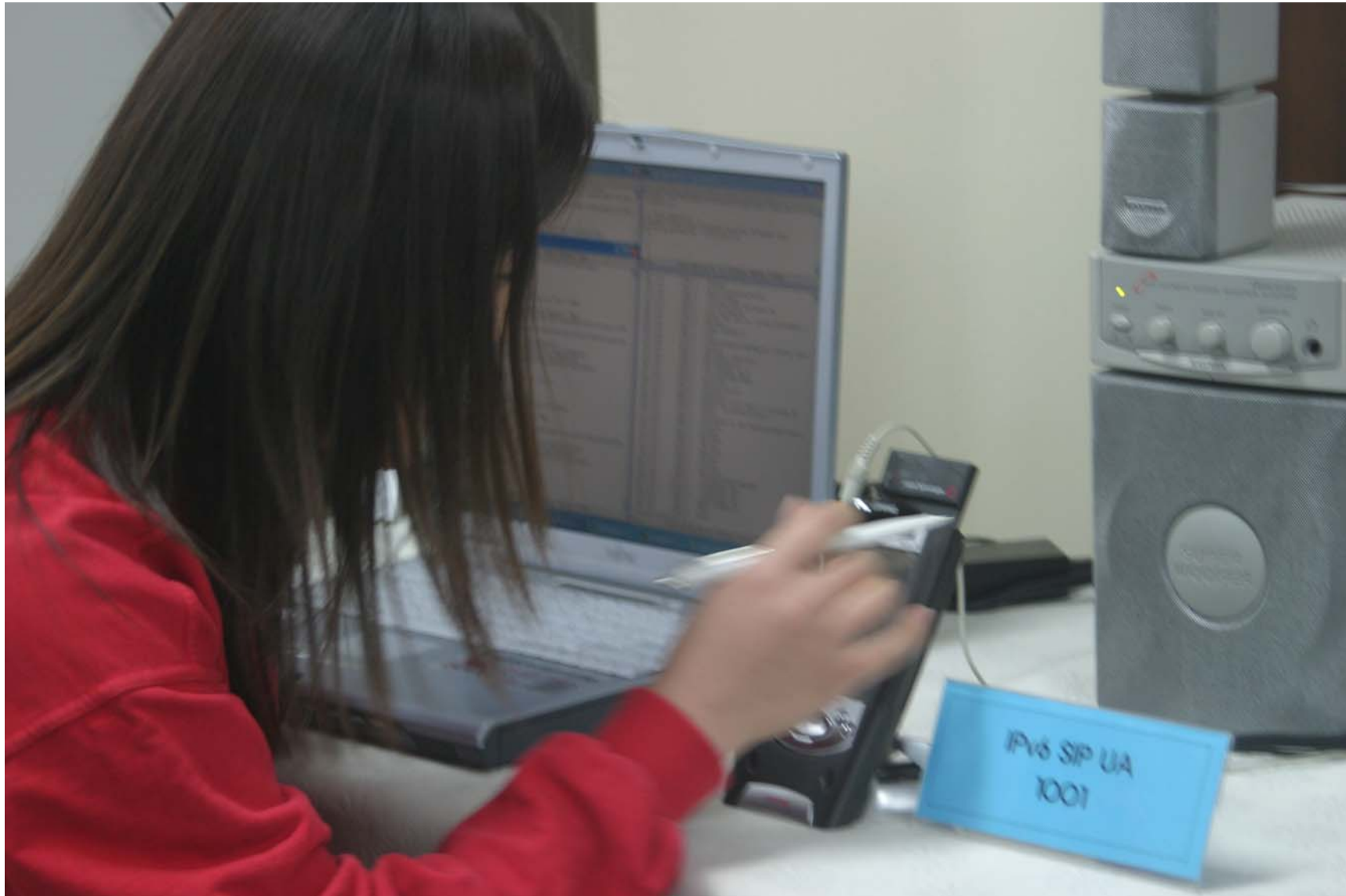- **Not really useful for Traffic Engineering**

Questions?

SixXS

http://www.sixxs.net/

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

Jeroen Massar

JRM1-RIPE

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- More diverse devices connected, thus possibly also more vulnerabilities.
- Firewalls should be enabled per default for all incoming connections.
- Scanning of address space is not feasible
  - /64 per link
  - /48 per 'endsite'
- BSD has a stateful firewall, Linux since 2.6.[5|6]-USAGI.
  Cisco PIX also finally (7.x branch)

DOCTOR FUN

4 June 2003

W3
OwN
uR
fR1dg3!

3133T
SNAX0rZ

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http://ibiblio.org/Dave/drfun.html

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The brave new world of IPv6