RIPE 46: IPv6 WG

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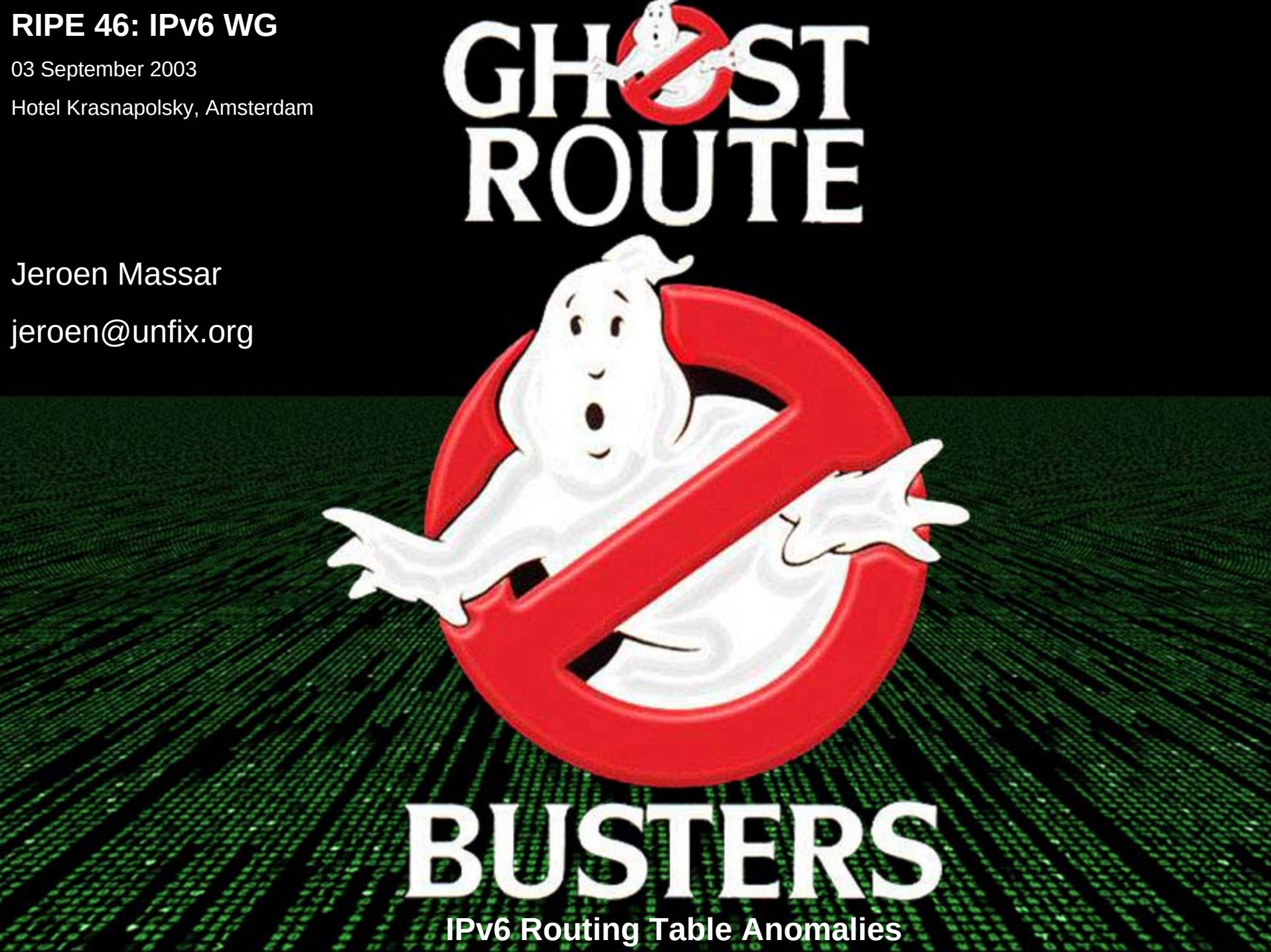


IPv6 Routing Table Anomalies

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 client hardware doesn't support IPv4. Each POP be public or closed based on prefixes, handles and a variety of other mechanisms.

More participating LIRs welcome

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

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.

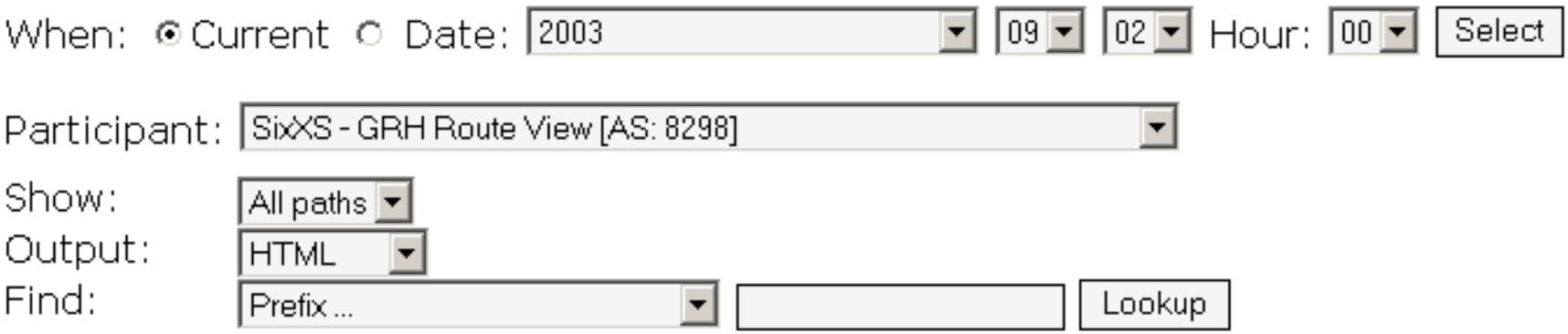
Participants

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

Improvements

- **Anomaly detection**
- **Anomaly Mailing List**
  - anomalies@grh.sixxs.net
- **BGP Peering**
  - peers can be modified through the web by the participants
- **Distributed Looking Glass**
  - builtin anomaly detection/filtering

Distributed Looking Glass



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

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

Long ASPath / Ghosts

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)

Peering Details

Description	**IPv6 Ghost Route Hunter Project**
ASN	**8298**
AS-Name:	**GRH**
Router	**grh.sixxs.net**
Router OS	**Linux / Quagga**
Location	**Breda, Netherlands**
Accept	**Any**
Announce	**None**

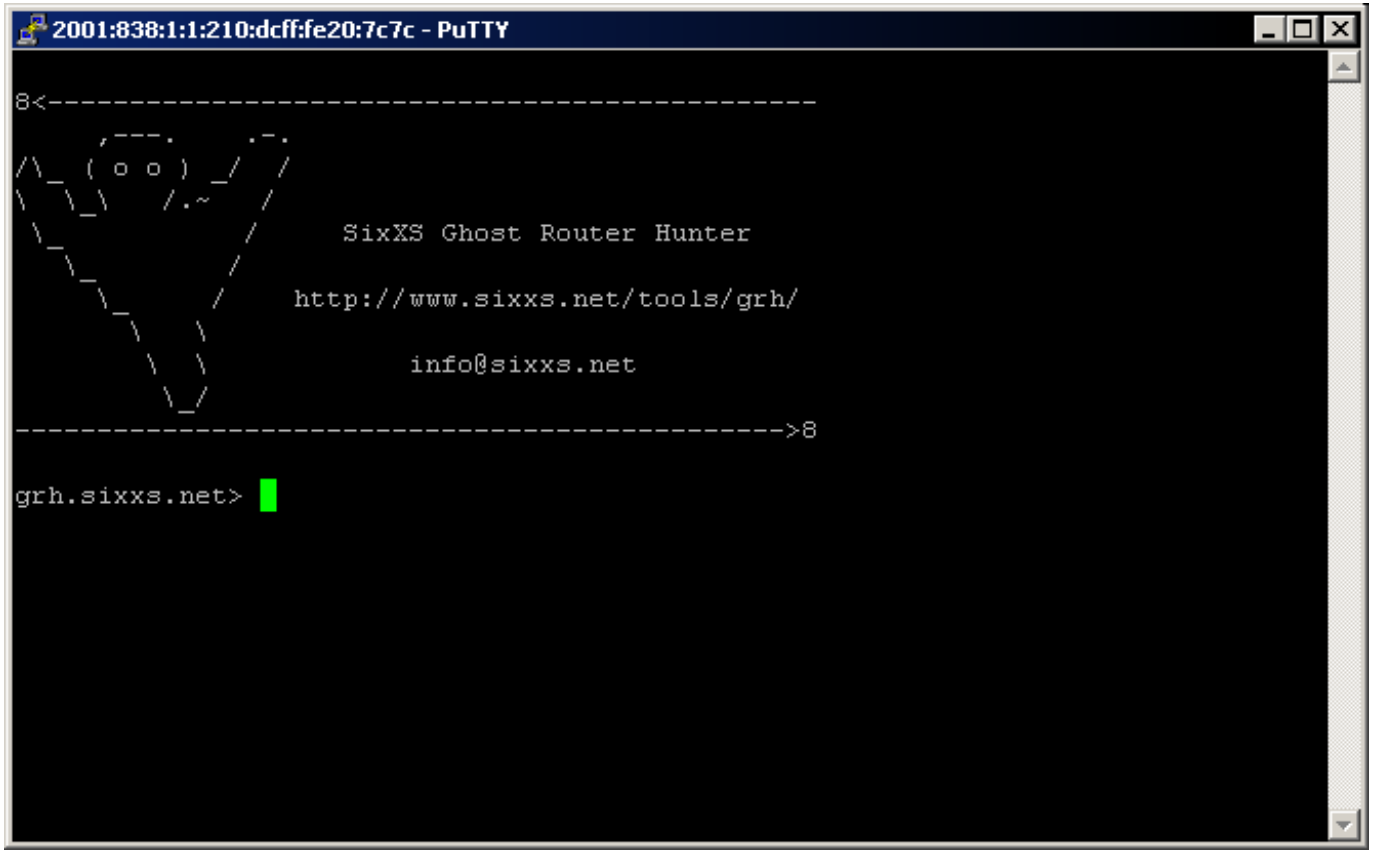
Thanks to Robert Kießling / Easynet for the ASN

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

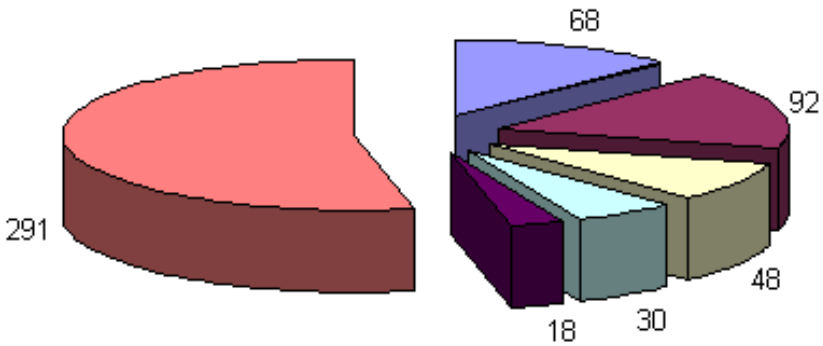
Route View



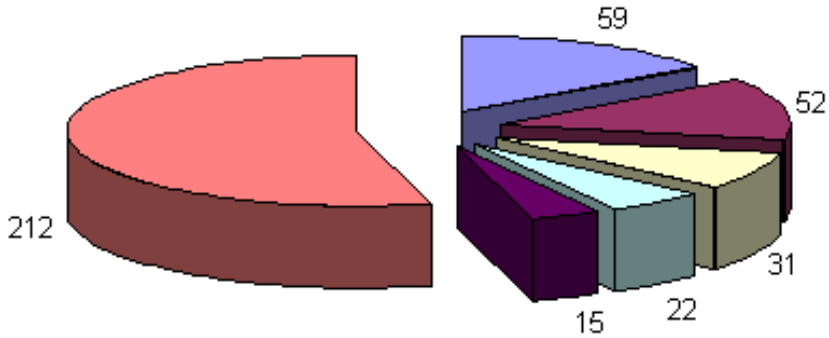
telnet://grh.sixxs.net

SixXS Worldwide TLA distribution

Allocated



Visible



Japan United States Germany Netherlands France others

SixXS 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.

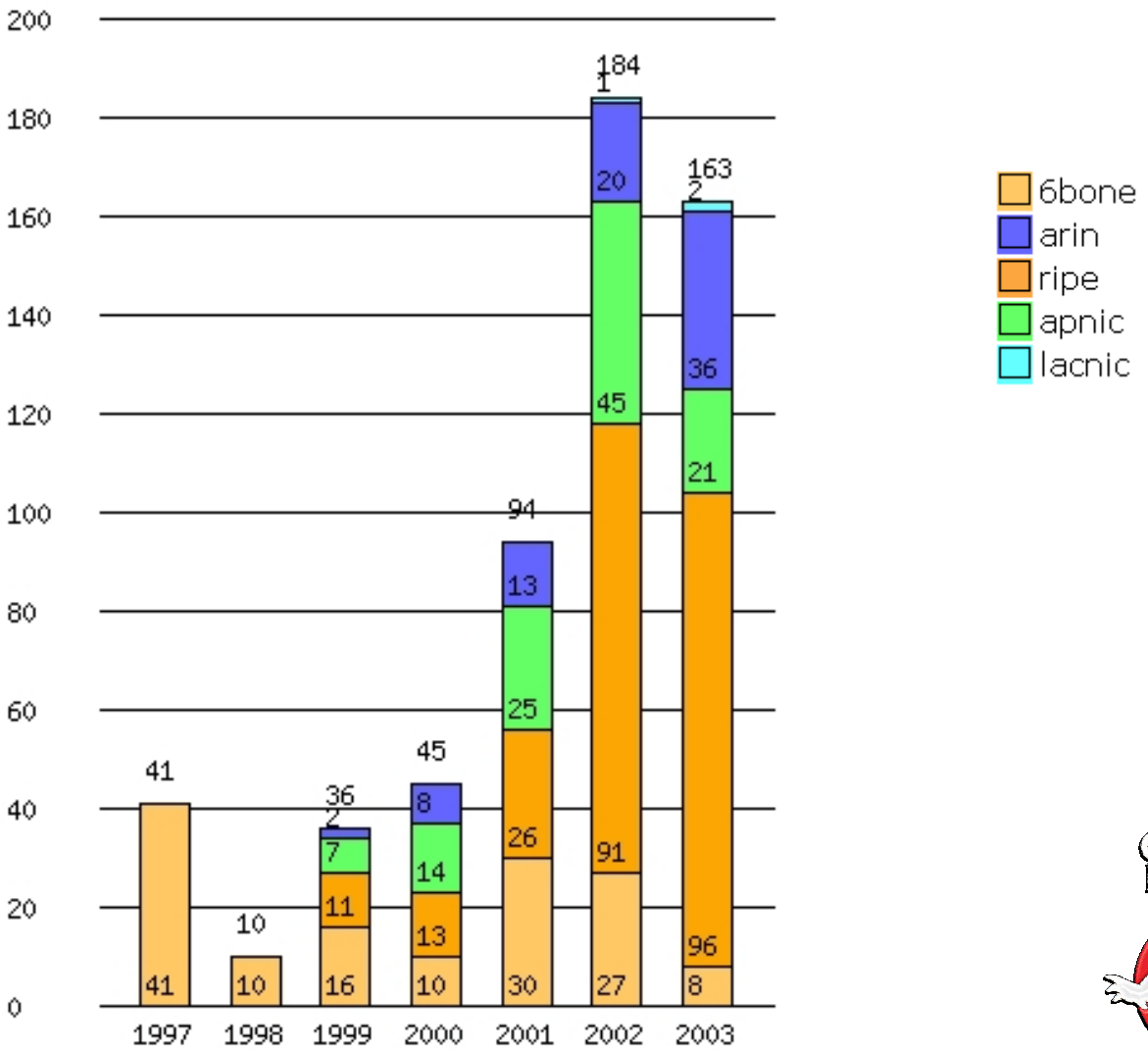
SixXS TLA report for RIPE region

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

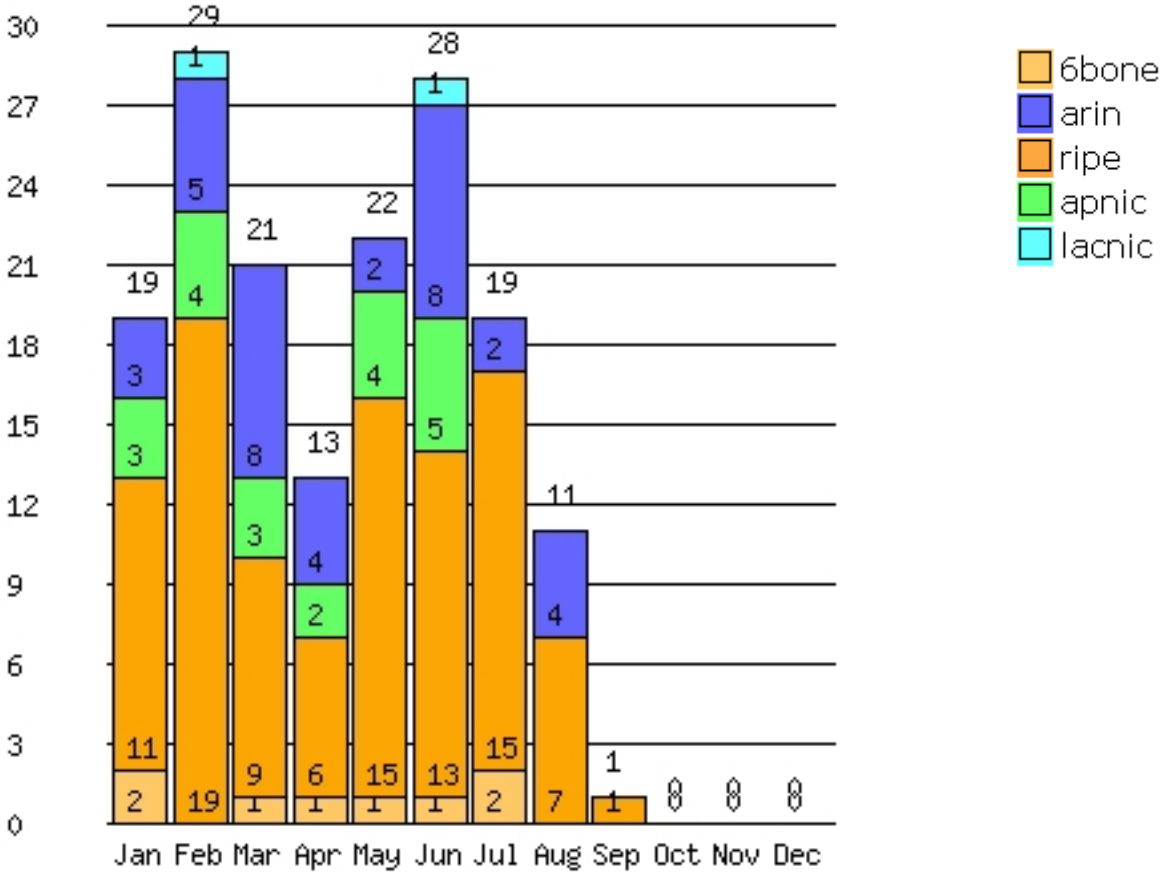
Of which:

- 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.

TLA allocations



TLA allocations 2003



References

Minimal IPv6 Peering by Robert Kießling
http://ip6.de.easynet.net/ipv6-minimum-peering.txt

Moving from 6bone to IPv6 Internet by Pekka Savola
http://www.ietf.org/internet-drafts/draft-savola-v6ops-6bone-mess-01.txt

An overview of the global IPv6 routing table by Gert Döring
http://www.space.net/~gert/RIPE/

Bogon Reference Page by Team Cymru
http://www.cymru.com/Bogons/

Hunting The Bogon by Geoff Huston
http://www.ripe.net/ripe/meetings/ripe-45/presentations/ripe45-eof-geoff.pdf

Questions?

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

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