



**RIPE
NCC**

IPv6 and IPv4 Update from the RIPE NCC

Sandra Brás, Ferenc Csorba

- **RIPE/RIPE NCC. Who are we?**
- **IPv4 exhaustion**
- **IPv4 transfers**
- **IPv6 address space**
- **Think subnets!**
- **IPv6 deployment statistics**
- **IPv6 in the RIPE Database**
- **RIPE NCC's IPv6 address tools**



RIPE / RIPE NCC

Who are we?

Section 1





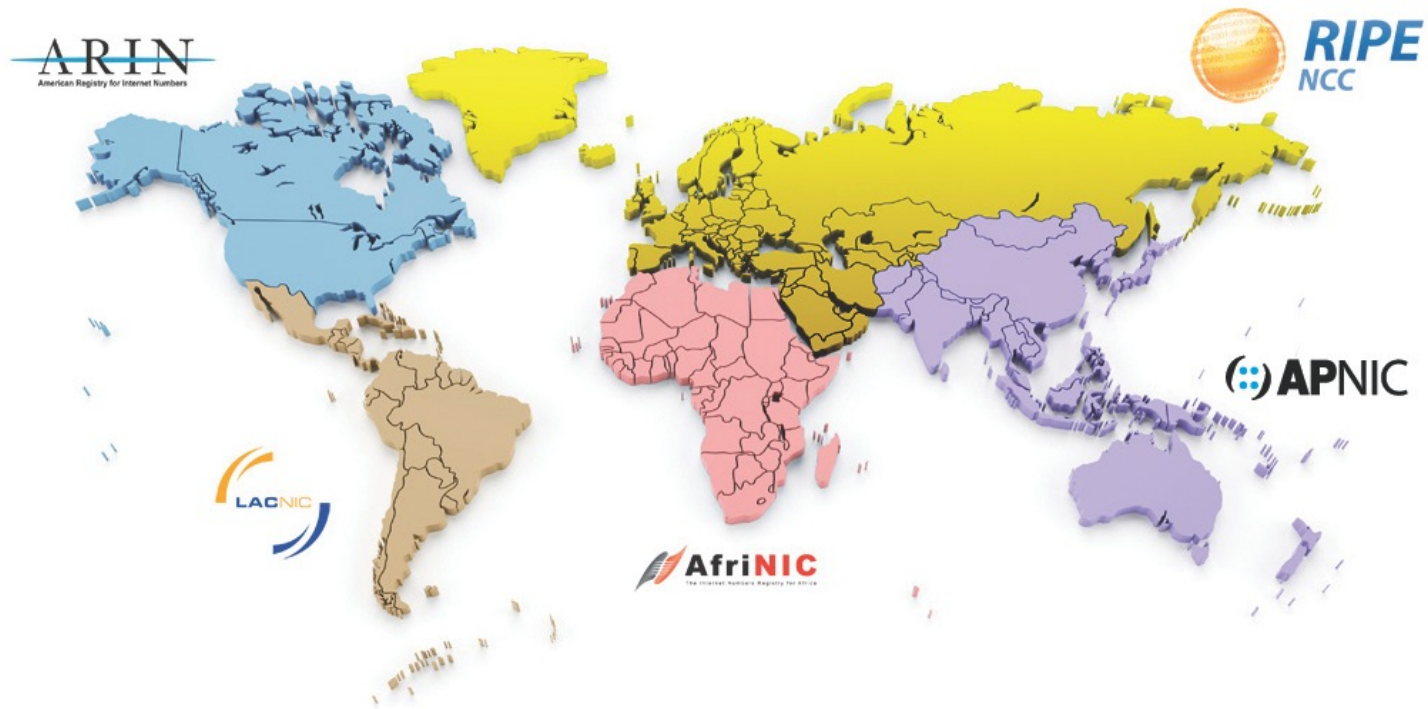
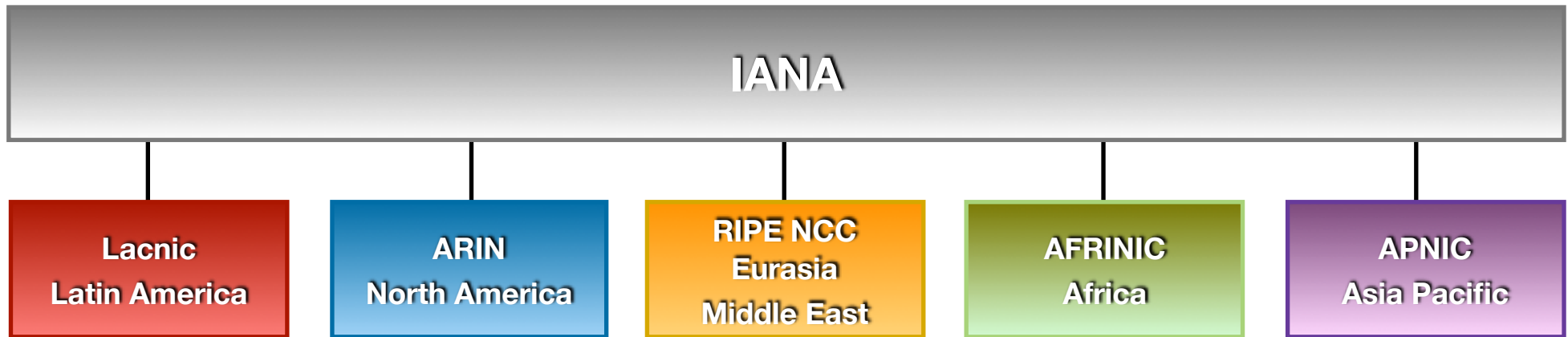
- **RIPE NCC**

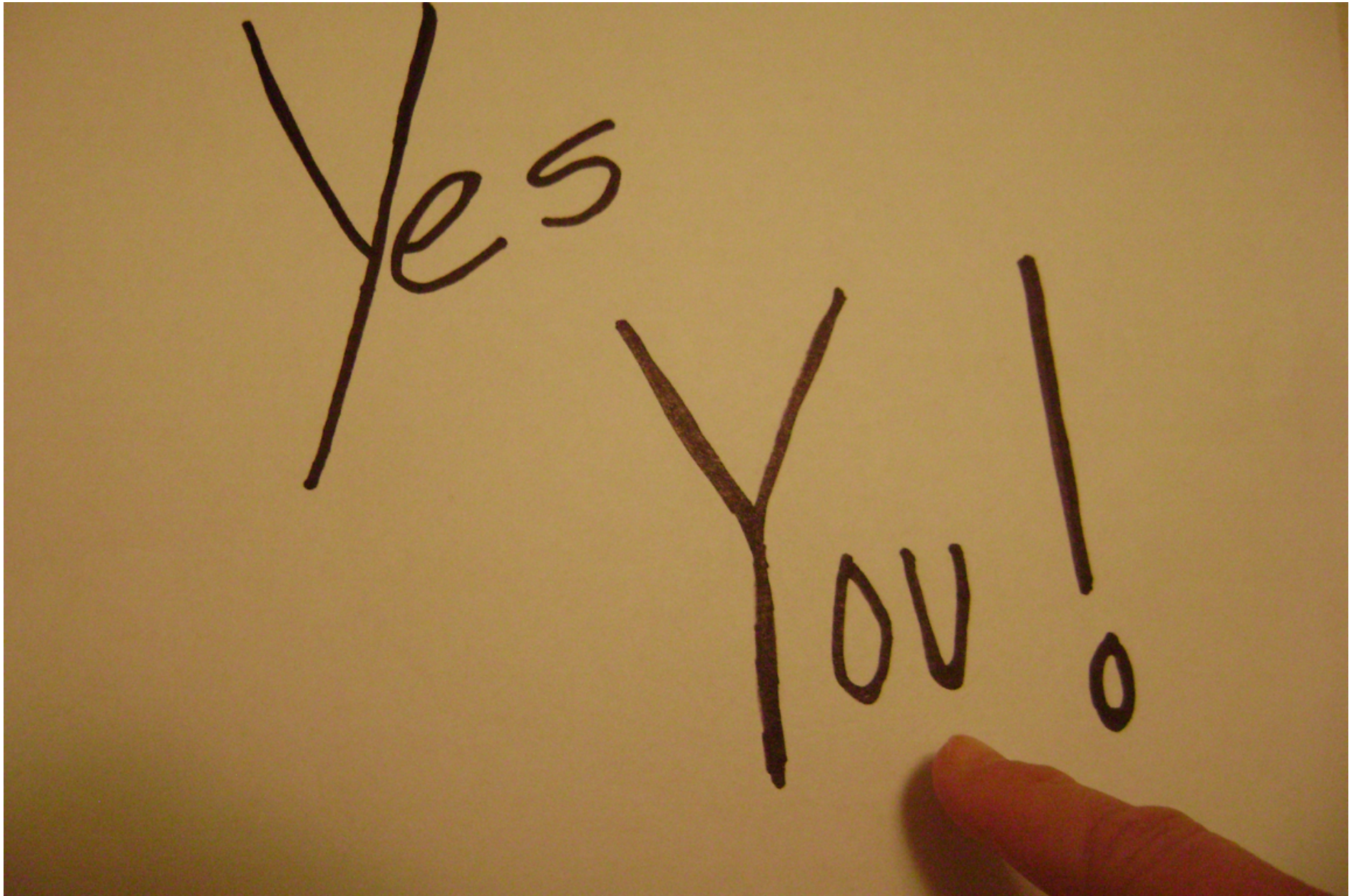
- Located in Amsterdam
- Not for profit membership organisation
- One of five RIRs

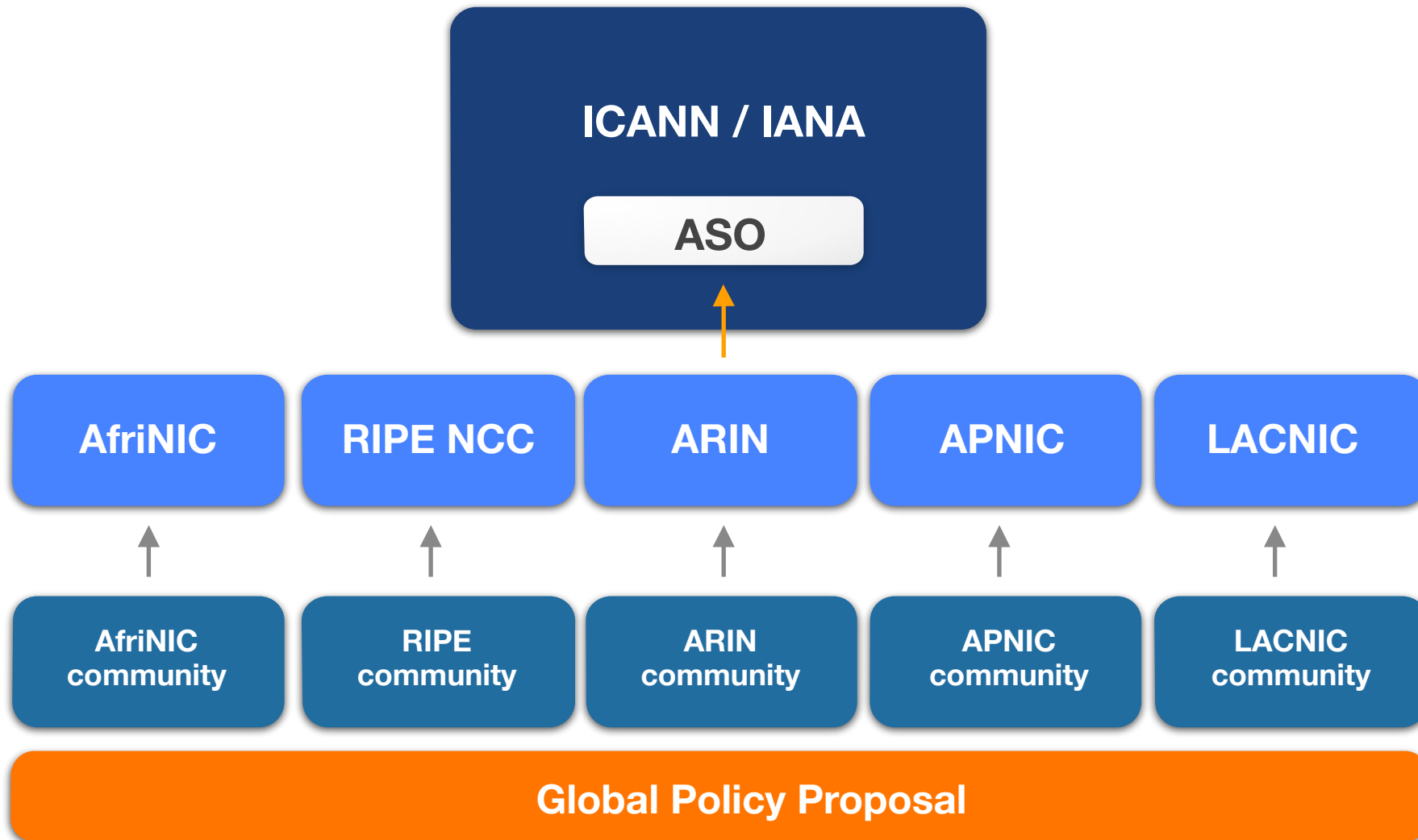
- **RIPE Community**

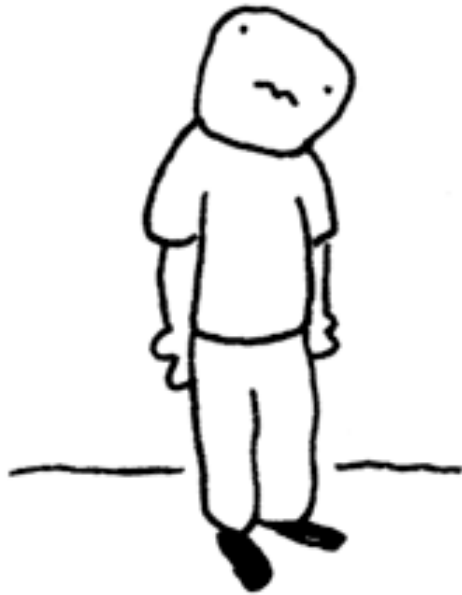
- Open community
- Develops policies
- Working group mailing lists

- **Distribute IPv4, IPv6, ASNs**
- **Support RIPE community**
- **Training**
- **RIPE Database**
- **RIPE Atlas**
- **RIPE Stat**
- **Resource Certification (RPKI)**
- **Research and Statistics**









When asked "would you rather work for change, or just complain?" 81% of the respondents replied, "Do i have to pick? This is hard."

- Join the Working group mailing lists
- Come to the RIPE Meetings

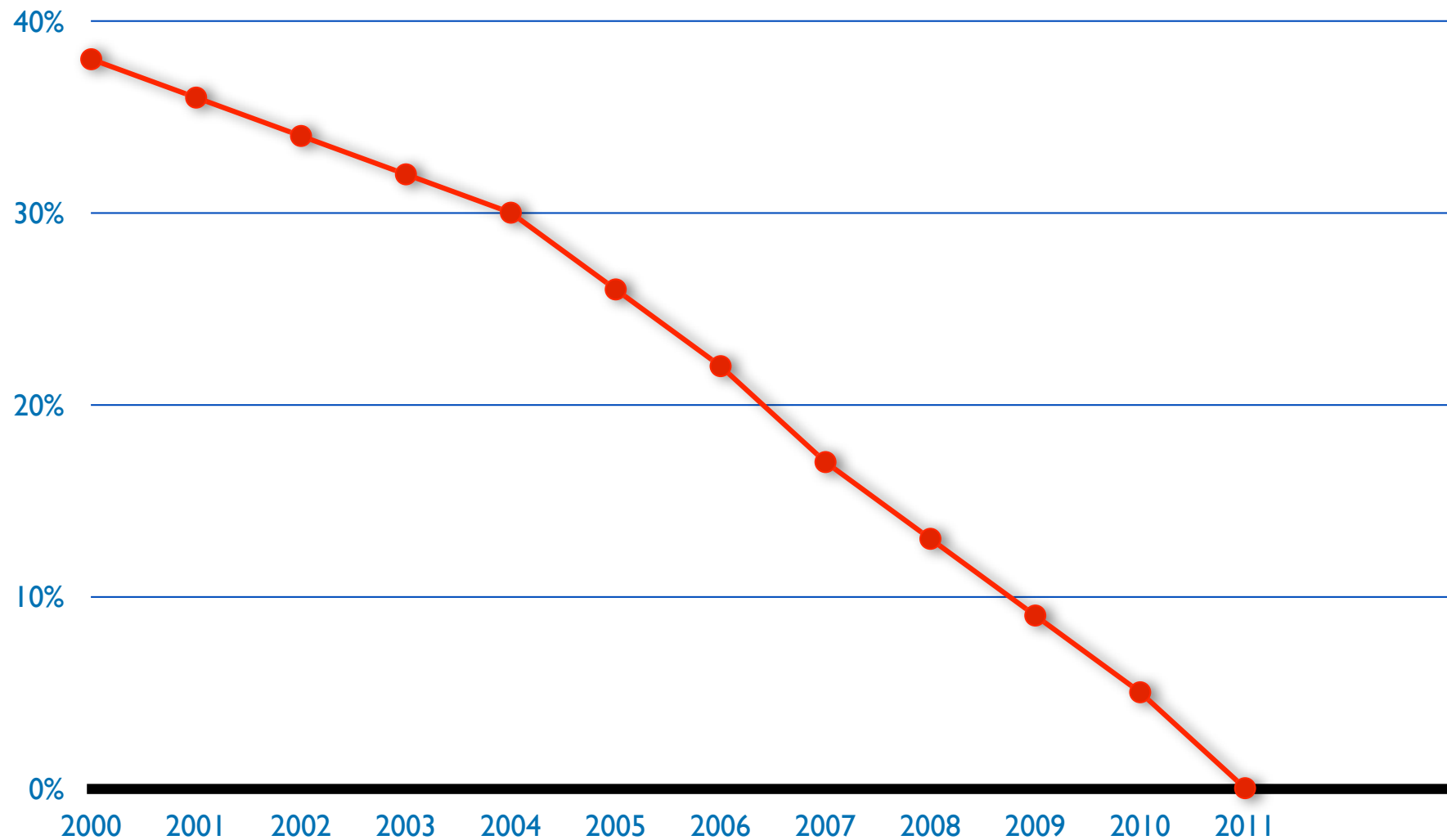


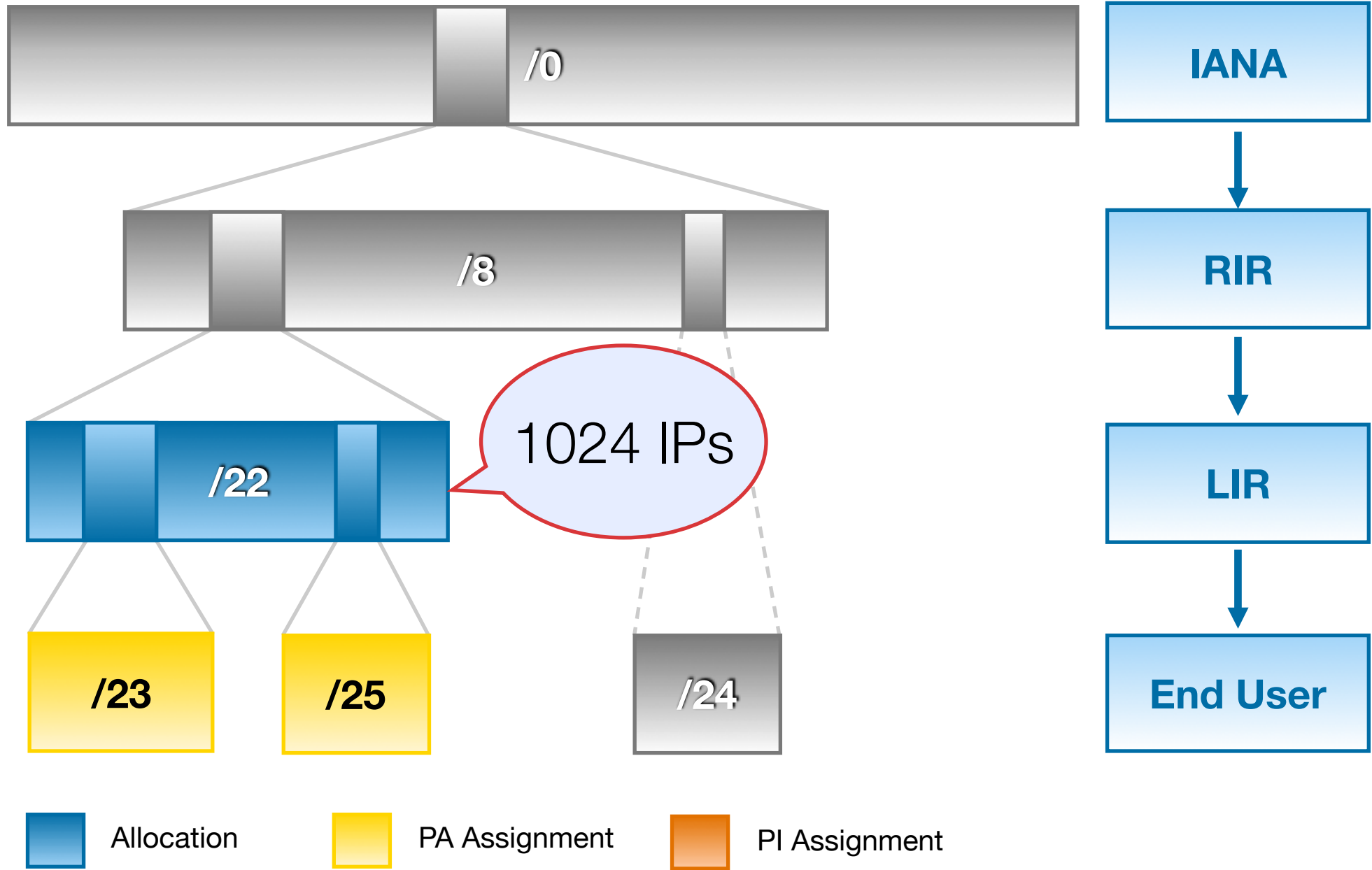


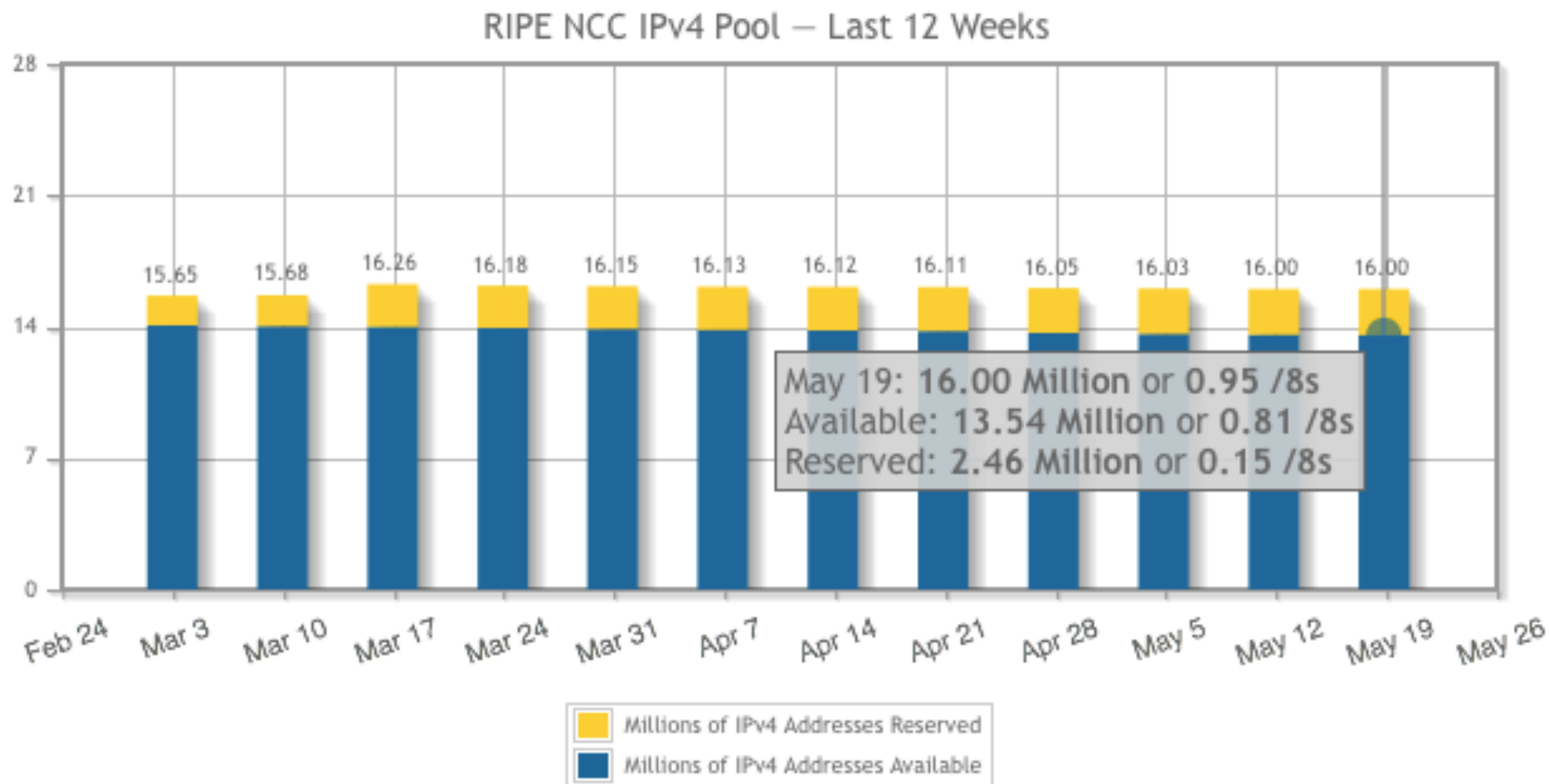
IPv4 Exhaustion

Section 2









- **We do things differently!**
 - Each LIR gets one /22 (=1024 IP addresses)
 - No PI

- Requirements to get your /22
 - Have an IPv6 allocation
 - Qualify for an IPv4 allocation



<p>2014-04</p> <p>Relaxing IPv6 Requirement for Receiving Space from the Final /8</p> <p>Address Policy Working Group</p>	<p>Open for Discussion</p> <p>Until 03 Jun 2014</p>
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IPv4 Transfers

Section 3





- **Transfer unused allocations to another LIR**
- **Minimum allocation size /22**
- **RIPE NCC evaluates it**
- **Updated in RIPE Database**

Total IPv4 Addresses Available for Transfer: 717,824

Available IPv4 Addresses Offered on the Listing Service by Prefix Size

/16
5 available

/17
2 available

/18
8 available

/19
13 available

/20
14 available

/21
11 available

/22
7 available

Total IPv4 Addresses Requested for Transfer: 21,465,088

Requested IPv4 Addresses by Prefix Size

/9
1 requested

/11
1 requested

/12
7 requested

/13
1 requested

/14
2 requested

/15
4 requested

/16
15 requested

/17
4 requested

/18
17 requested

/19
33 requested

/20
55 requested

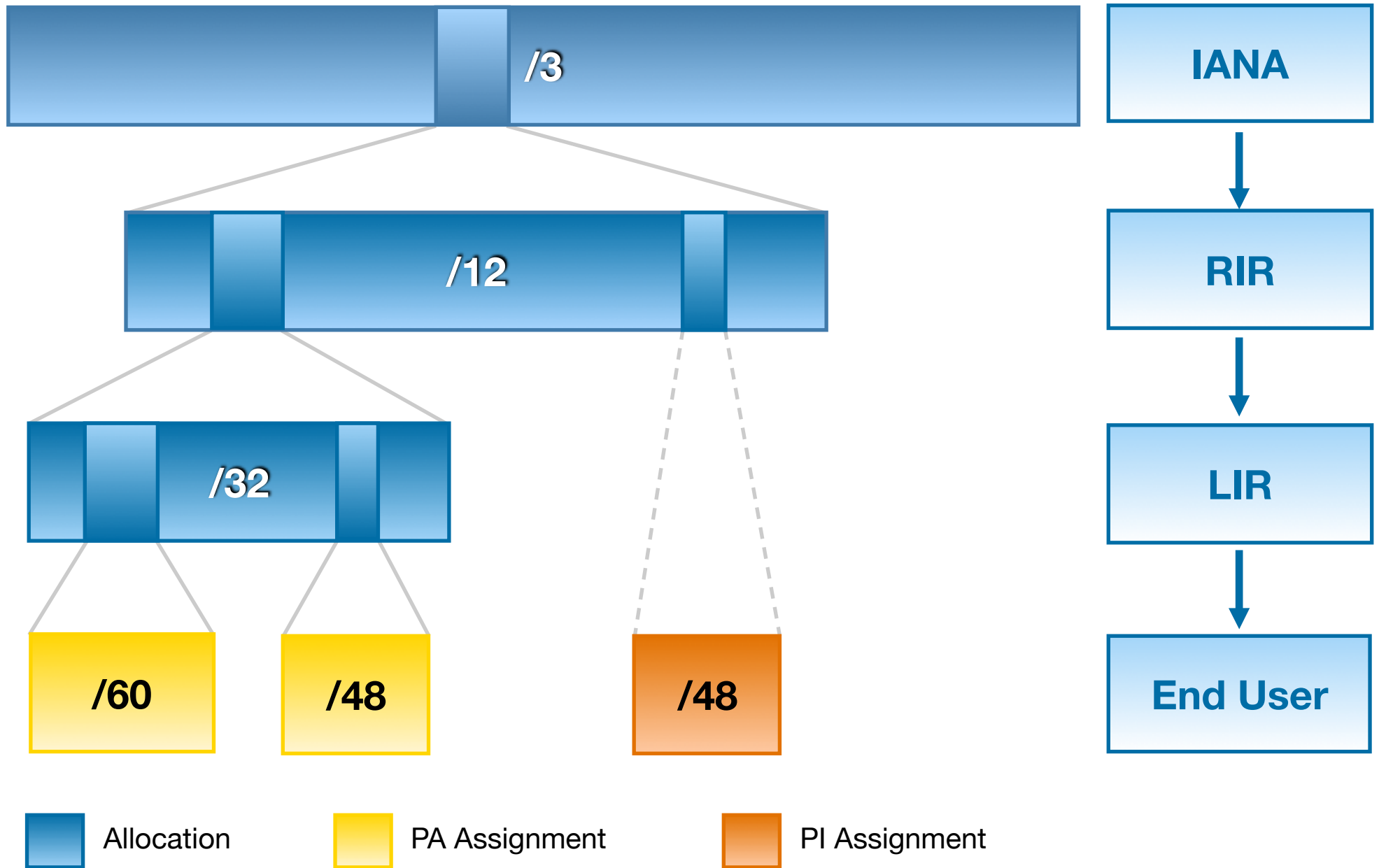
/21
57 requested

/22
60 requested

IPv6 Address Space

Section 4





- **Every subnet should be a /64**
- **Customer assignments (sites) between:**
 - /64 (1 subnet)
 - /48 (65536 subnets)
- **Minimum allocation size /32**
 - 65536 /48's
 - 16777216 /56's

IPv6 Subnetting

2001:0DB8:0000:0000:0000:0000:0000:0000

64 bits interface ID

/64


/60 = 16 /64

/56 = 256 /64

/52 = 4096 /64

/48 = 65536 /64

/32 = 65536 /48



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Contact Training Services: ts@ripe.net
Follow us on Twitter: www.twitter.com/TrainingRIPENCC

www.ripe.net

IPv6 Chart

Prefix	/48s	/56s	/64s	Bits
/24	16M	4G	1T	104
/25	8M	2G	512G	103
/26	4M	1G	256G	102
/27	2M	512M	128G	101
/28	1M	256M	64G	100
/29	512K	128M	32G	99
/30	256K	64M	16G	98
/31	128K	32M	8G	97
/32	64K	16M	4G	96
/33	32K	8M	2G	95
/34	16K	4M	1G	94
/35	8K	2M	512M	93
/36	4K	1M	256M	92
/37	2K	512K	128M	91
/38	1K	256K	64M	90
/39	512	128K	32M	89
/40	256	64K	16M	88
/41	128	32K	8M	87
/42	64	16K	4M	86
/43	32	8K	2M	85
/44	16	4K	1M	84
/45	8	2K	512K	83
/46	4	1K	256K	82
/47	2	512	128K	81
/48	1	256	64K	80
/49		128	32K	79
/50		64	16K	78
/51		32	8K	77
/52		16	4K	76
/53		8	2K	75
/54		4	1K	74
/55		2	512	73
/56		1	256	72
/57			128	71
/58			64	70
/59			32	69
/60			16	68
/61			8	67
/62			4	66
/63			2	65
/64			1	64

K = 1,024 • M = 1,048,576 • G = 1,073,741,824 • T = 1,099,511,627,776

RIPE NCC

IPv4 CIDR Chart

RIPE NCC

IP Addresses	Bits	Prefix	Subnet Mask
1	0	/32	255.255.255.255
2	1	/31	255.255.255.254
4	2	/30	255.255.255.252
8	3	/29	255.255.255.248
16	4	/28	255.255.255.240
32	5	/27	255.255.255.224
64	6	/26	255.255.255.192
128	7	/25	255.255.255.128
256	8	/24	255.255.255.0
512	9	/23	255.255.254.0
1 K	10	/22	255.255.252.0
2 K	11	/21	255.255.248.0
4 K	12	/20	255.255.240.0
8 K	13	/19	255.255.224.0
16 K	14	/18	255.255.192.0
32 K	15	/17	255.255.128.0
64 K	16	/16	255.255.0.0
128 K	17	/15	255.254.0.0
256 K	18	/14	255.252.0.0
512 K	19	/13	255.248.0.0
1 M	20	/12	255.240.0.0
2 M	21	/11	255.224.0.0
4 M	22	/10	255.192.0.0
8 M	23	/9	255.128.0.0
16 M	24	/8	255.0.0.0
32 M	25	/7	254.0.0.0
64 M	26	/6	252.0.0.0
128 M	27	/5	248.0.0.0
256 M	28	/4	240.0.0.0
512 M	29	/3	224.0.0.0
1024 M	30	/2	192.0.0.0
2048 M	31	/1	128.0.0.0
4096 M	32	/0	0.0.0.0

K = 1,024 • M = 1,048,576

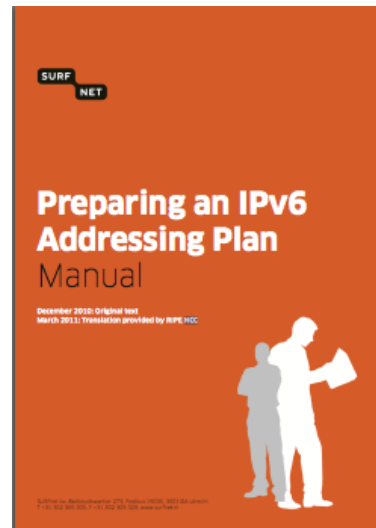
Contact Registration Services:
hostmaster@ripe.net • lir-help@ripe.net

www.ripe.net

- Be an LIR
- Have a plan for making assignments within two years
- Minimum allocation size /32
- Up to a /29
- Announcement as a single prefix recommended

- **Give your customers enough addresses**
 - Up to a /48
- **For more addresses, send in request form**
 - Alternatively, make a sub-allocation
- **Every assignment must be registered in the RIPE database**

- Customers have no idea how to handle 65536 subnets!
- Give them information



<http://bit.ly/116HCTg>



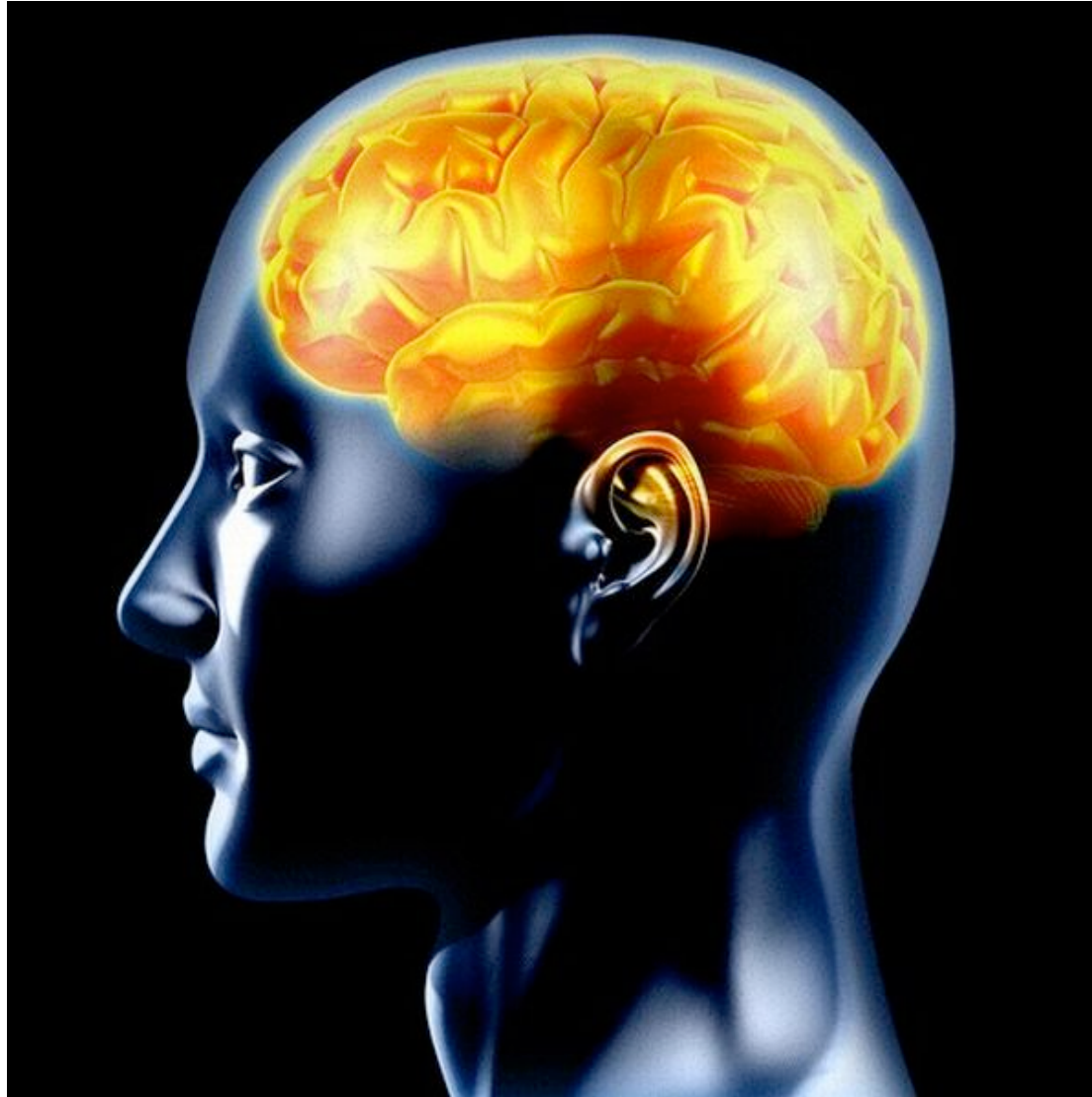
Think subnets!

Section 5



**RIPE
NCC**





~~How many IP addresses do I need?~~

How many subnets do I need?

Subnet always = /64

- **Why? Autoconfiguration (SLAAC)**
- **Feature of IPv6 Architecture**
- **Conservation?**
 - first 64 bits
 - not last 64 bits
- **Enough addresses**

Don't count IP addresses in a subnet!



... do I give to my customers?

- /64 (1 subnet)
- /60 (16 subnets)
- **/56 (256 subnets)**
- /52 (4096 subnets)
- **/48 (65536 subnets)**

- 4 billion /64's
- 268 million /60's
- **17 million /56's**
- 1 million /52's
- **65536 /48's**

- **Make an addressing plan**
- **/64 for all subnets**
- **Routers: /56 or /52**
 - give all routers the same size block
 - minimum /64 per interface
 - allow growth
- **Point-to-point: /64**

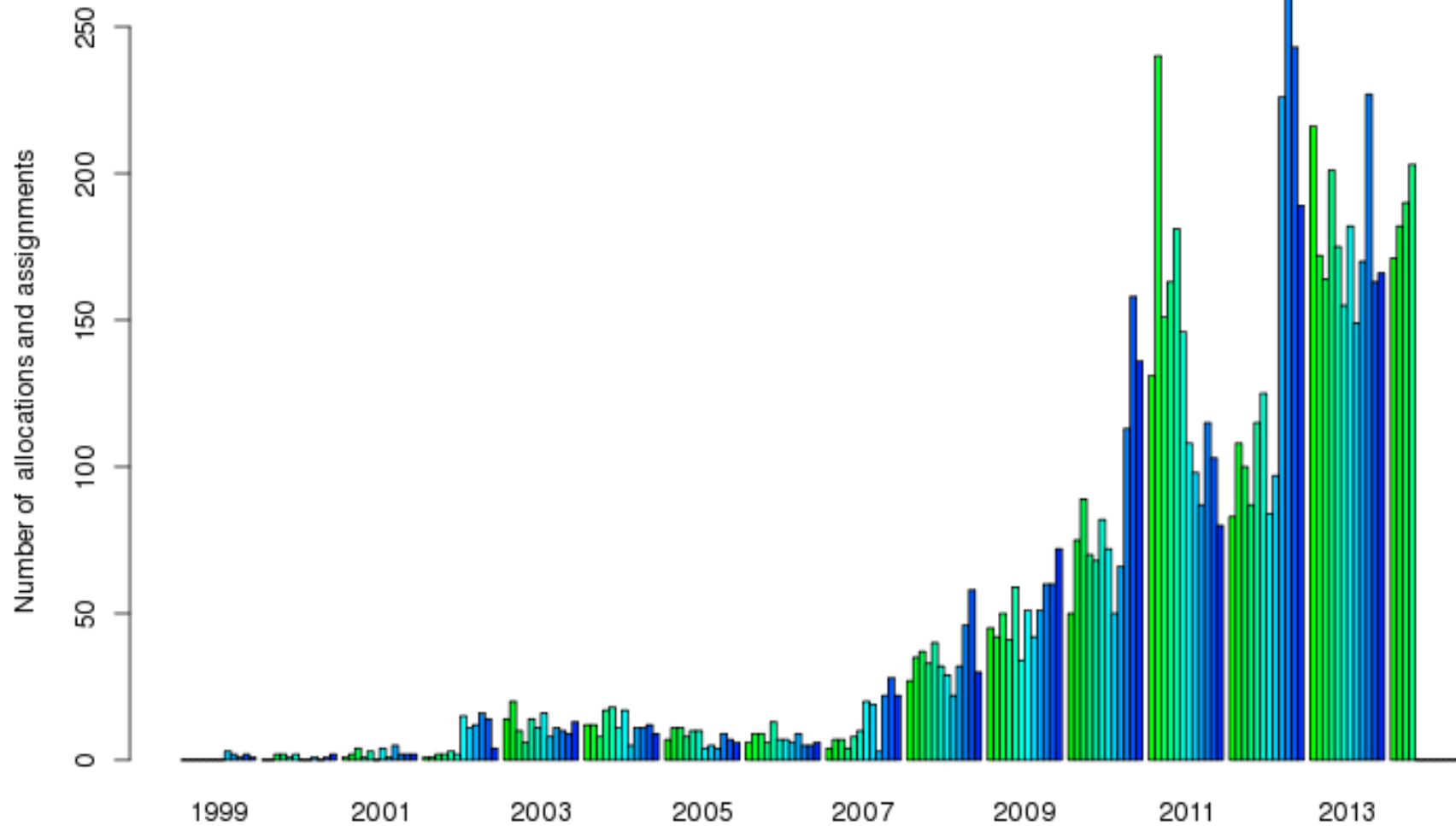


IPv6 Deployment Statistics

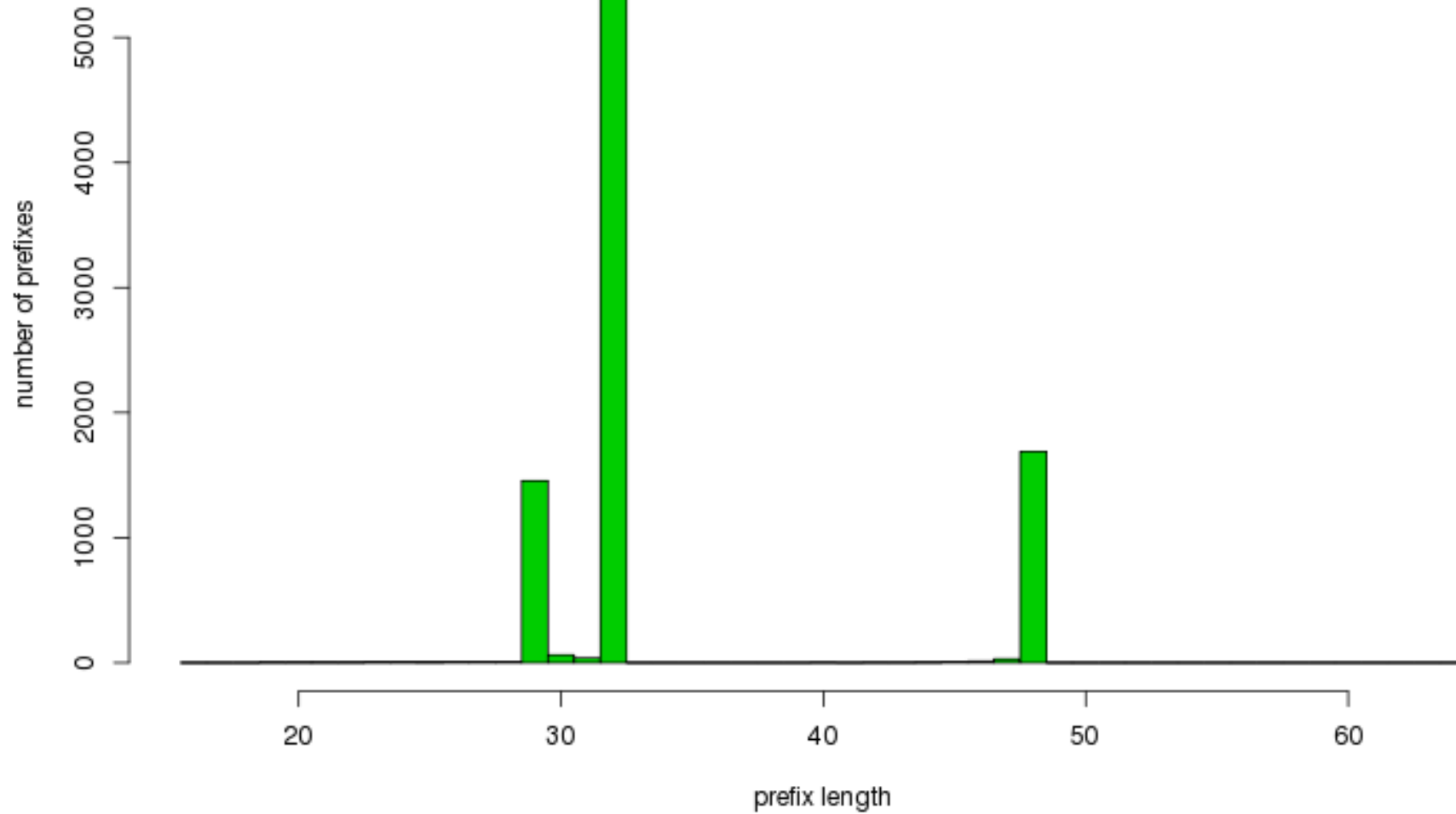
Section 6



Monthly IPv6 allocations and assignments - RIPE NCC

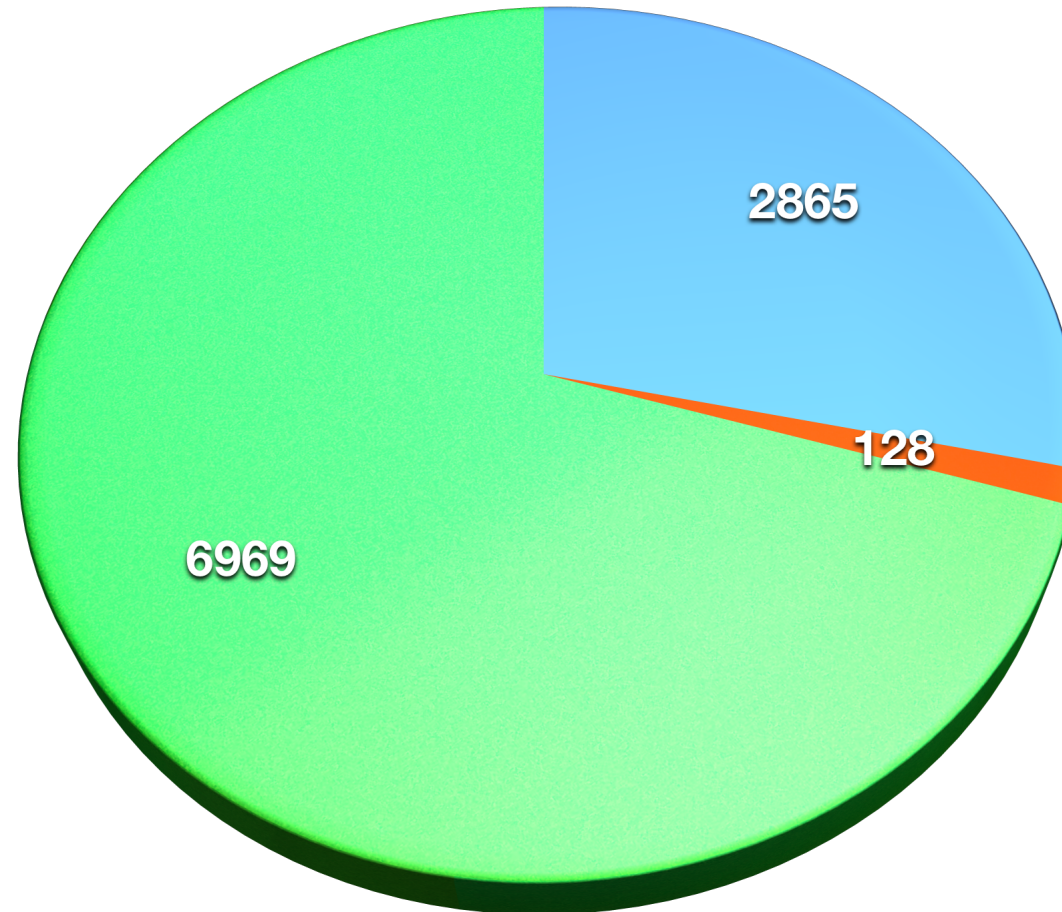


IPv6 prefix distribution - RIPE NCC



9962

members with
IP resources



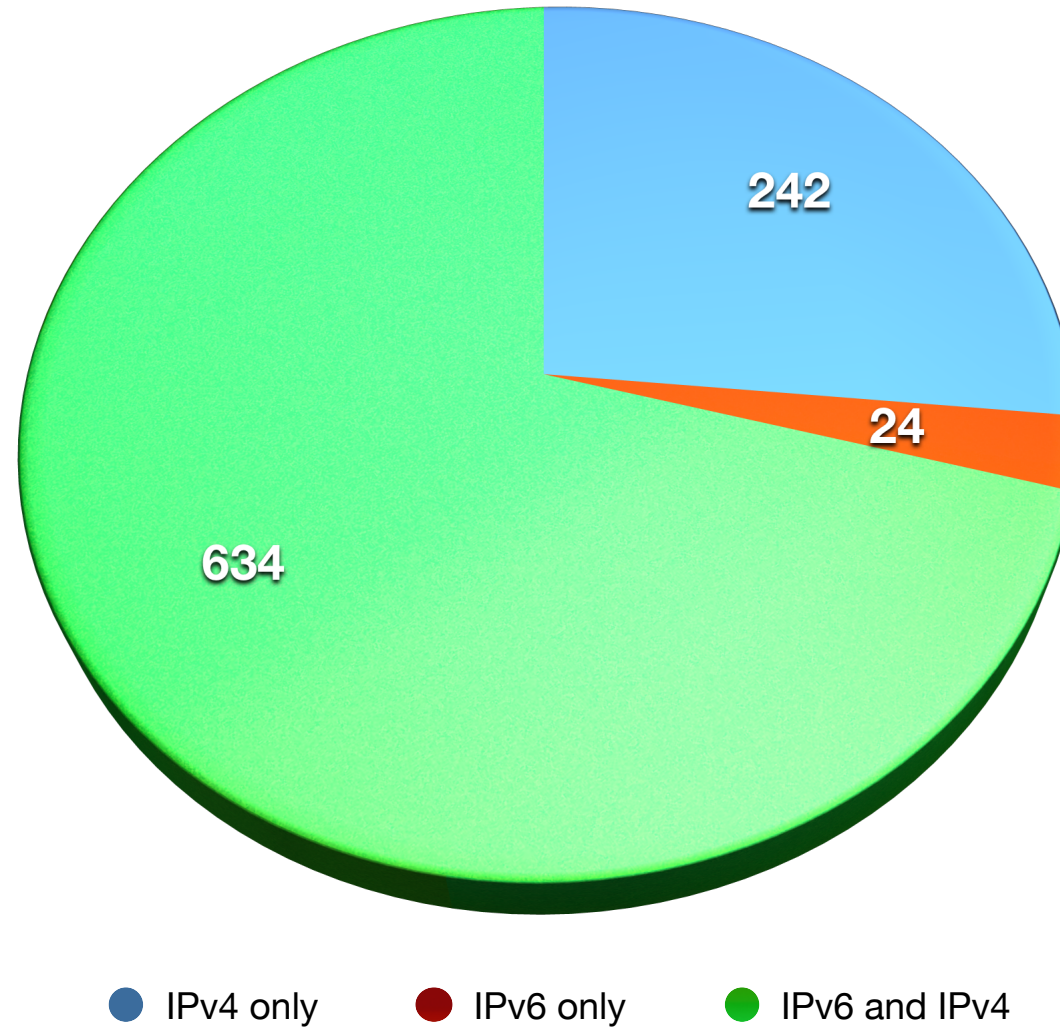
● IPv4 only

● IPv6 only

● IPv6 and IPv4

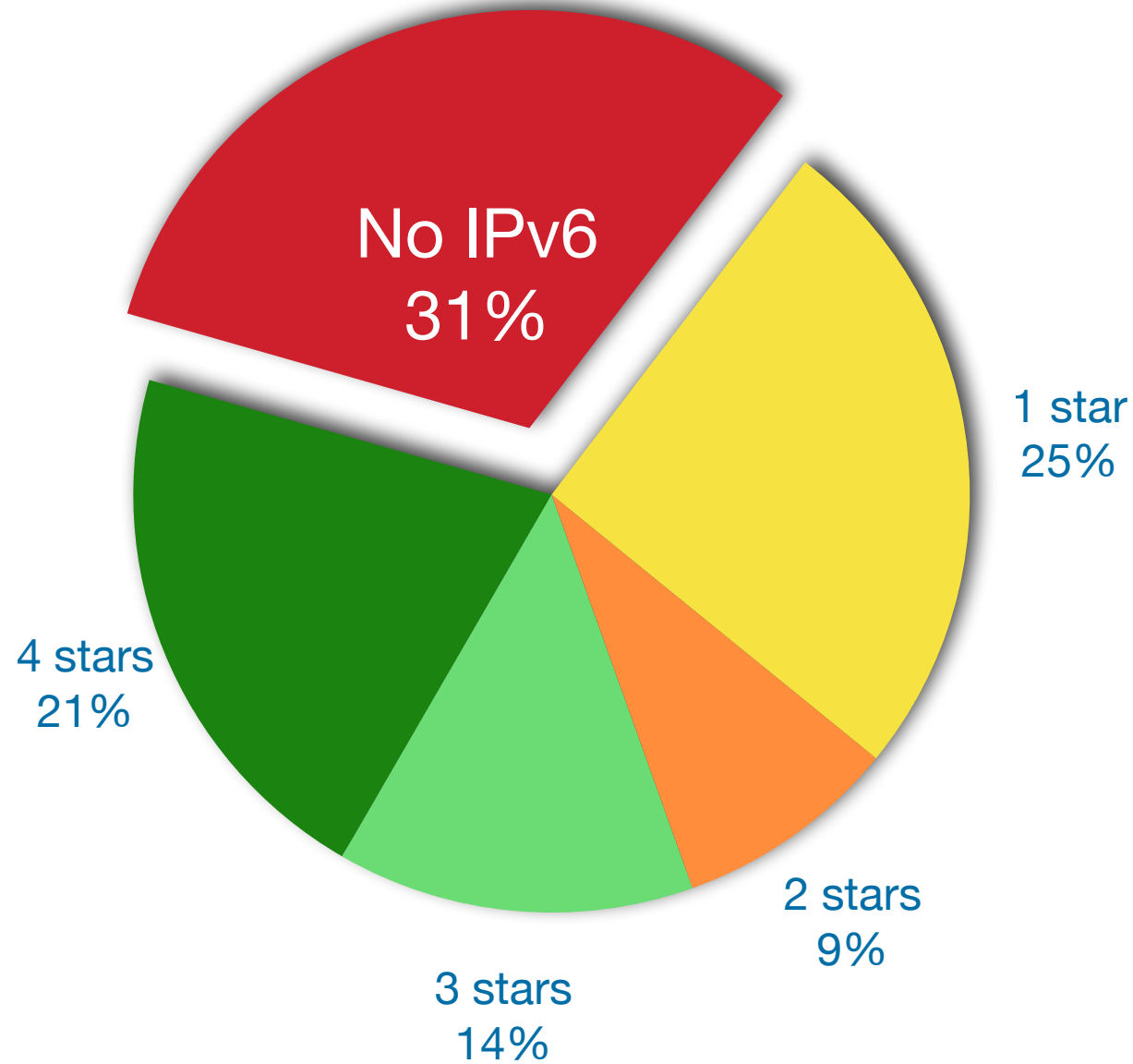
900

German members
with IP resources

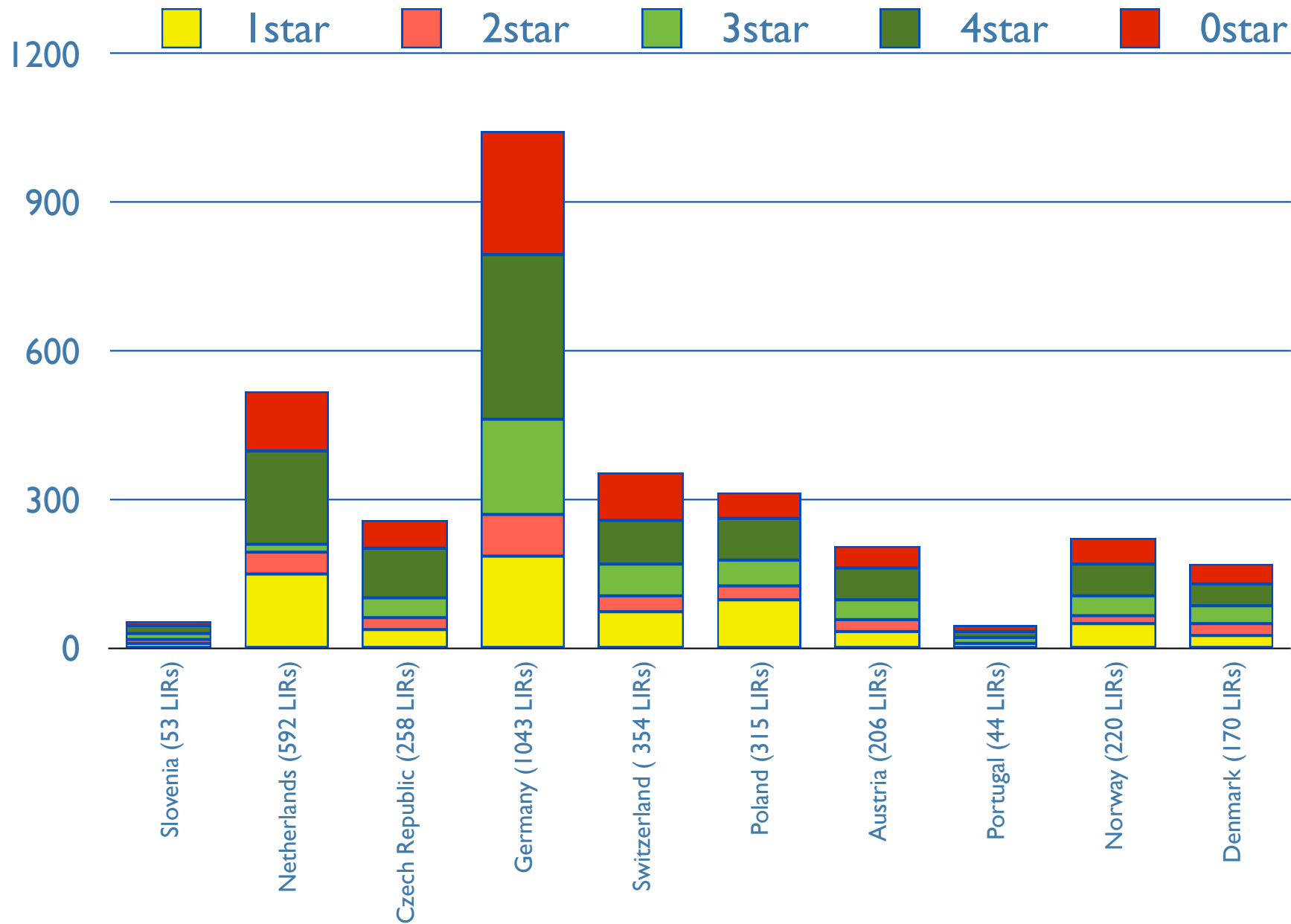


- **One star if the LIR has an IPv6 allocation**
- **Additional stars if:**
 - IPv6 Prefix is announced on router
 - A route6 object is in the RIPE Database
 - Reverse DNS is set up
- **A list of all 4 star LIRs: <http://ripeness.ripe.net/>**

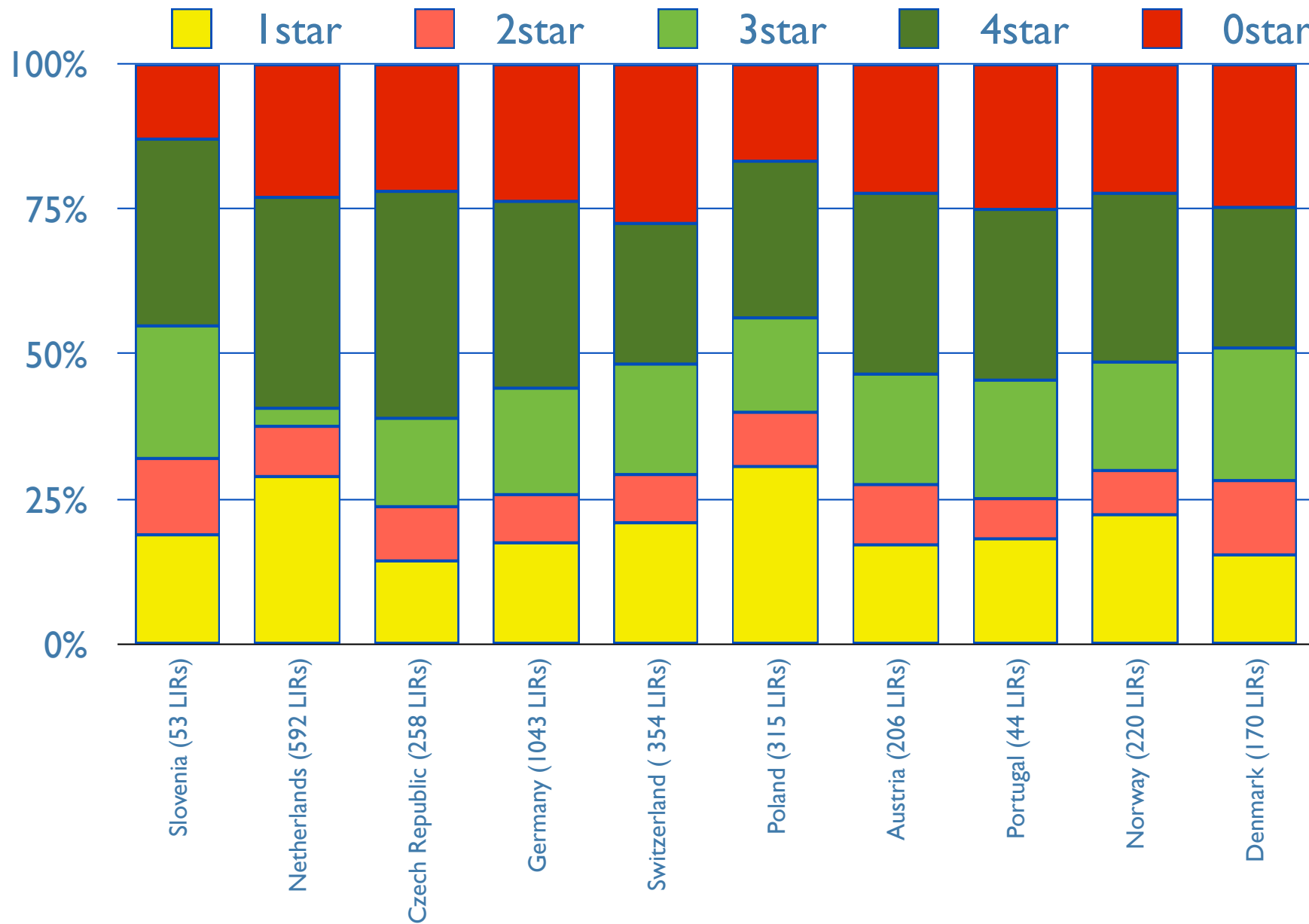
● 1 star ● 2 stars ● 3 stars ● 4 stars ● No IPv6

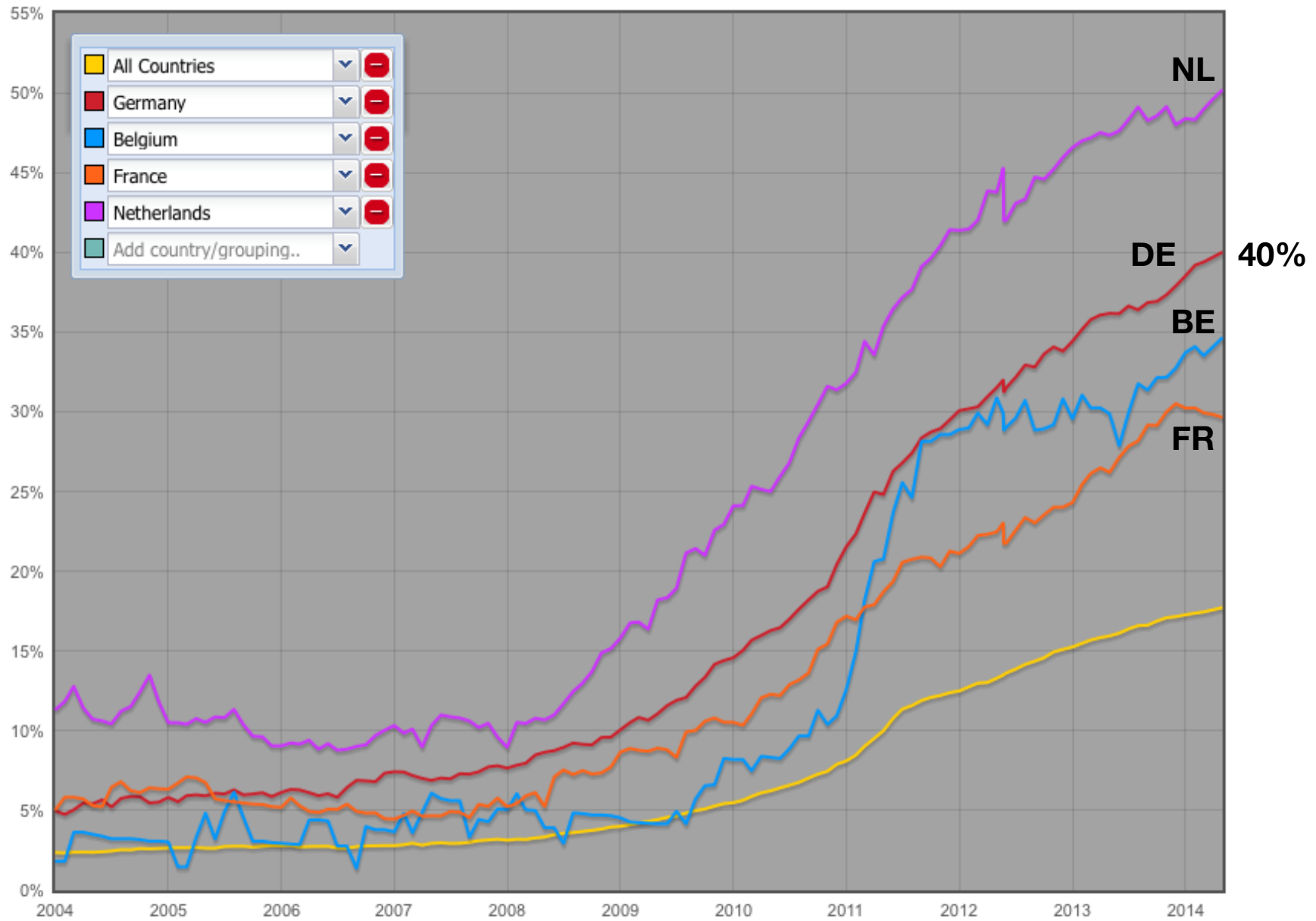


IPv6 RIPEness - countries



IPv6 RIPEness - countries, relative







IPv6 in the RIPE Database

Section 7



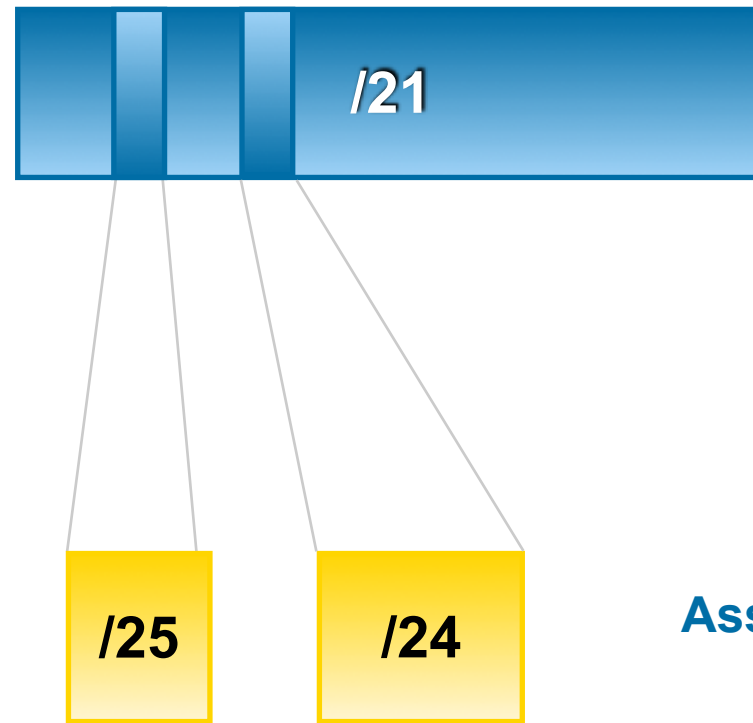
RIPE
NCC

- **Public Internet resource and routing registry database**

- **Resources**
 - inetnum, inet6num, aut-num, domain
- **Routing**
 - route, route6, aut-num
- **Security**
 - mntner
- **Contact**
 - organisation, person, role

```
inetnum:      85.11.184.0/21
netname:      NL-EXAMPLE
descr:        LIR's Name
status:       ALLOCATED PA
org:          ORG-BB2-RIPE
mnt-by:       RIPE-NCC-HM-MNT
mnt-lower:    LIR-MNT
mnt-domains:  LIR-MNT
admin-c:      LA789-RIPE
tech-c:       LA789-RIPE
```

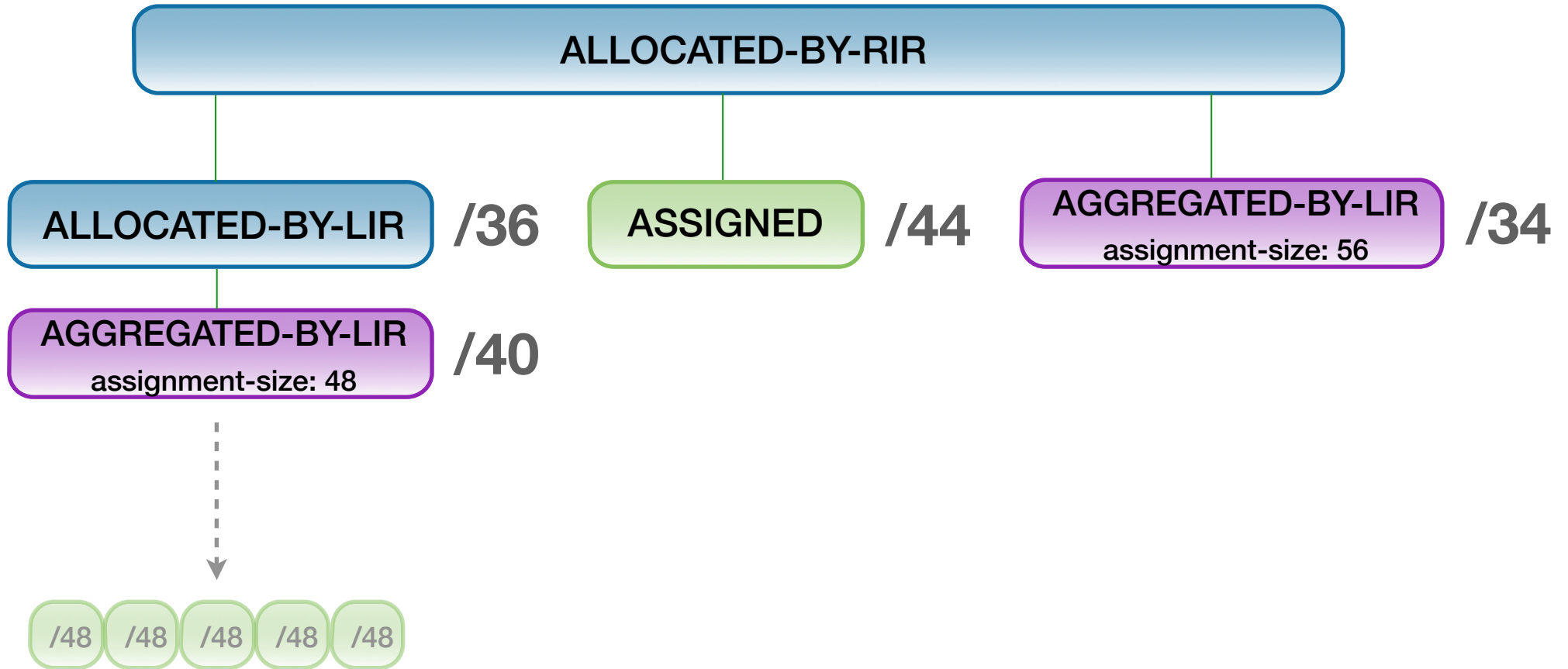
```
inetnum:      85.11.186.0/25
descr:        My Assignment
status:       ASSIGNED PA
mnt-by:       LIR-MNT
admin-c:      LA789-RIPE
tech-c:       LA789-RIPE
```



Allocation

Assignments

IPv4	IPv6
ALLOCATED PA	ALLOCATED-BY-RIR
ASSIGNED PA	ASSIGNED
ASSIGNED PA	AGGREGATED-BY-LIR
SUB-ALLOCATED PA	ALLOCATED-BY-LIR
ASSIGNED PI	ASSIGNED PI



inet6num: 2001:db8:1000::/36
netname: Brightlife
descr: Broadband services
country: NL
admin-c: BN649-RIPE
tech-c: BN649-RIPE
status: AGGREGATED-BY-LIR
assignment-size: 48
mnt-by: BRIGHTLIFE-MNT
notify: noc@example.net
changed: noc@example.net 20130218
source: RIPE



RIPE NCC's IPv6 Address Tools

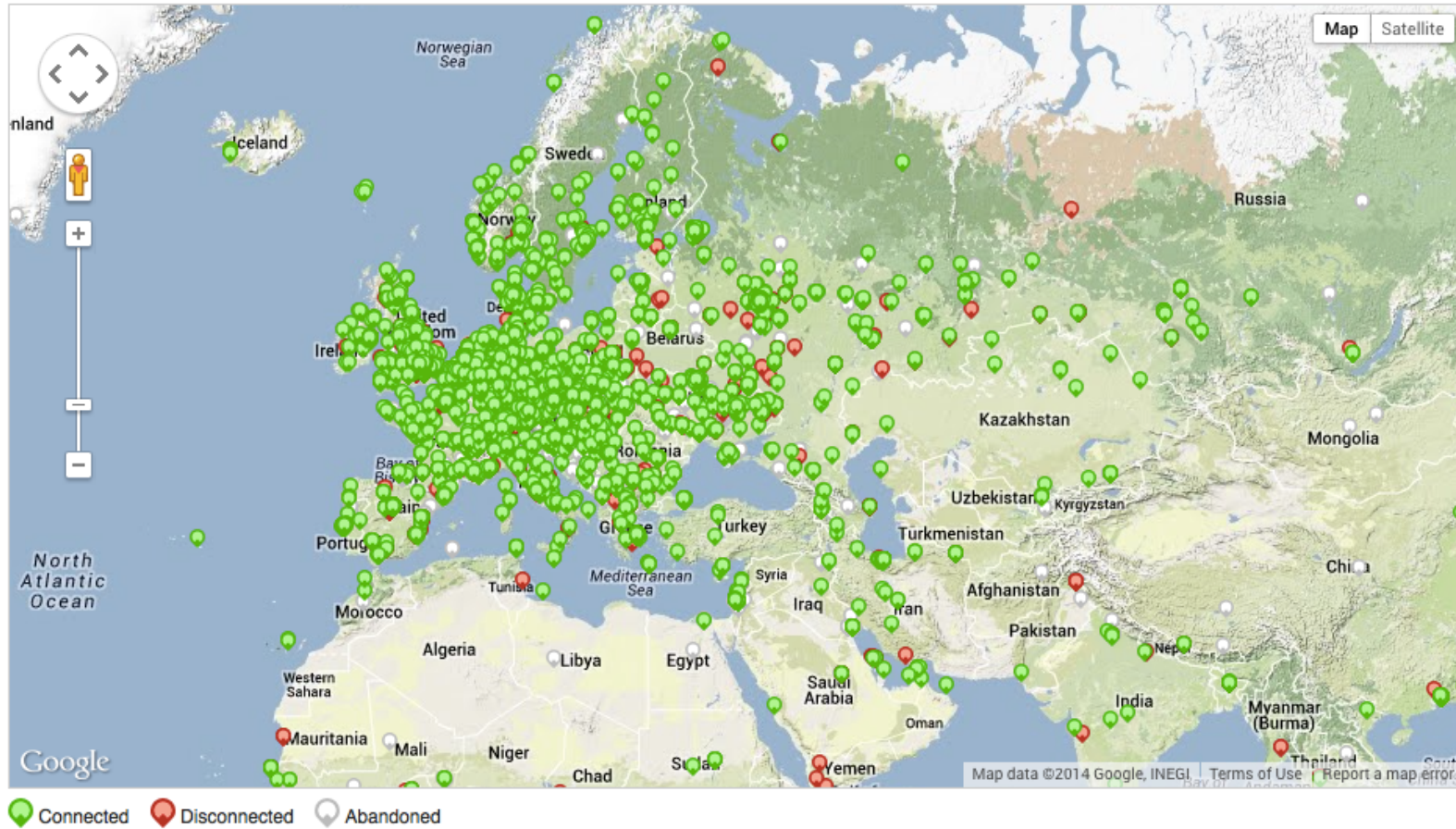
Section 8



- Internet measurement network
- Gives a big picture about Internet traffic
- Currently over 5000 active probes worldwide
- User Defined Measurements available for LIRs
 - ping, traceroute, DNS, SSL
- Set up IPv6 reachability test



<http://atlas.ripe.net>



Coverage Leaderboards

ASN (v4)	Probes	ASN (v6)	Probes	Prefix (v4)	Probes	Prefix (v6)	Probes	Country	Probes
7922	292	6939	164	87.128.0.0/10	42	2001:470::/32	166	United States	900
3320	222	7922	75	83.160.0.0/14	38	2601::/28	74	Germany	864
6830	208	12322	48	109.190.0.0/16	38	2002::/16	49	Russian Federation	729
12322	114	3320	47	193.0.10.0/23	37	2a01:e00::/26	49	United Kingdom	600
9143	90	3265	47	50.128.0.0/9	37	2003::/19	47		100

RIPEstat

Search

[permalink](#)

At a Glance (4)

Routing (8)

DNS (2)

Anti Abuse (1)

Database (9)

Geographic (2)

Activity (2)

Suggestions (1)

[+ MyView](#)

Prefix Overview (2001:67c:2e8::/48)
✖

Announced

This prefix is announced by

AS33333

RIPE-NCC-AS Reseaux IP Europeens Network Coordination Centre (RIPE NCC),NL

and is part of **2001:678::/29**, RIPE NCC PI Space, including anycast TLDs (ripe-510).

Advanced Settings


Exclude low visibility routes

Showing results for 2001:67c:2e8::/48 as of 2014-05-19 00:00:00 UTC

1 routes were filtered due to low visibility (min peers:3).

source data
embed code
permalink
info

Geoloc (2001:67c:2e8::/48)
✖



Showing results for 2001:67c:2e8::/48 as of 2014-05-18 00:00:00 UTC

source data
embed code
permalink
info

Routing Status (2001:67c:2e8::/48)
✖

At 2014-05-19 00:00:00 UTC, 2001:67c:2e8::/48 was 100% visible (by 95 of 95 RIS full peers).

First ever seen announced by AS33333, on 2010-09-28 16:00:00 UTC.

Originated by: AS33333 (valid route object in RIPE)

No less-specific covering prefixes.

Advanced Settings

Showing results for 2001:67c:2e8::/48 as of 2014-05-19 00:00:00 UTC

Results exclude routes with very low visibility (less than 3 RIS peers seeing).

source data
embed code
permalink
info

Registry Browser (2001:67c:2e8::/48)
✖

Last updated on 2012-03-12 at 08:53:46 UTC.

inet6num:

2001:67c:2e8::/48

netname RIPE-NCC-NET

descr Reseaux IP Europeens Network Coordination Centre (RIPE NCC)

org ORG-RIEN1-RIPE

country NL

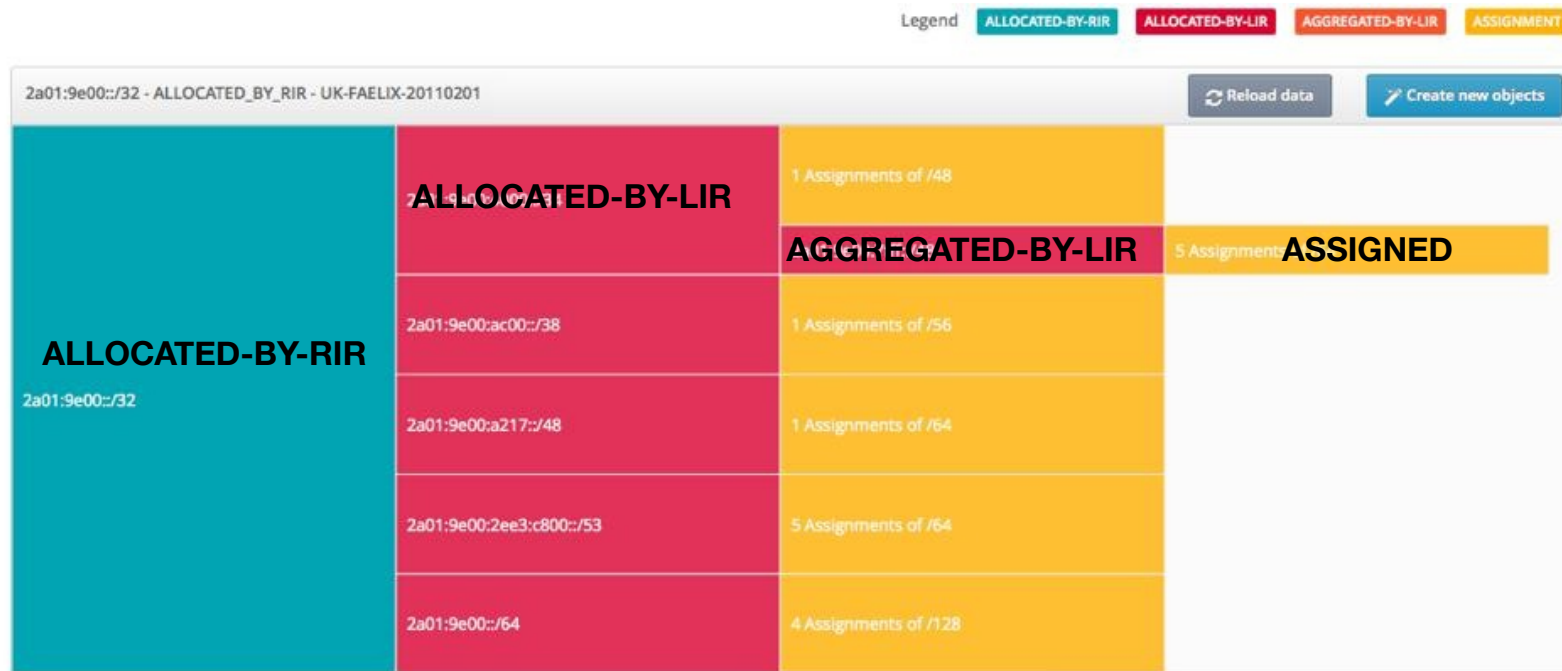
admin-c JDR-RIPE

admin-c BRD-RIPE

tech-c OPS4-RIPE

<http://stat.ripe.net>

Create new RIPE DB objects seamlessly



CREATE NEW OBJECTS

More specific inet6nums Filter on range...

inet6num	Status	Date	Size	AsgSize	Netname
2a01:9e00:4000::/34	ALLOCATED_BY_LIR	03-02-2011	/34		UK-FAELIX-CUSTOMER
2a01:9e00:ac00::/38	ALLOCATED_BY_LIR	04-02-2011	/38		UK-FAELIX-TUNNEL
2a01:9e00:a217::/48	ALLOCATED_BY_LIR	03-02-2011	/48		UK-FAELIX-FAELIX
2a01:9e00:7fff::/48	ALLOCATED_BY_LIR	23-06-2012	/48		UK-FAELIX-CROSSCONNECT
2a01:9e00:2ee3:c800::/53	ALLOCATED_BY_LIR	03-02-2011	/53		UK-FAELIX-V4MAPPING
2a01:9e00::/64	ALLOCATED_BY_LIR	17-02-2011	/64		UK-FAELIX-VANITY

wizard - for creating assignments and aggregations

1 Choose your option 2 Enter the details 3 Create objects in RIPE Database

Parent
inet6num
2001:1460::/32

Status
ALLOCATED-BY-RIR

Netname
NL-IO-20030616

What do you want to do? I want to...

Create a single assignment for my customer or my own infrastructure

Group assignments that are all the same size for a large number of customers

Sub-allocate a block so assignments can be created within it

Group assignments that are all the same size for a large number of customers into an aggregated block. Choose this option, for example, for DSL customers. A single object will be created with a fixed assignment size. The status will be AGGREGATED_BY_LIR.

[Next](#) [Return to the overview](#)

wizard - for creating assignments and aggregations

1 Choose your option 2 Enter the details 3 Create objects in RIPE Database

Parent
inet6num
2001:db8::/32

Status
ALLOCATED-BY-RIR

Netname
NL-EX-20030616

Creating assignments

What is the assignment size you want to give to each customer?

What is the size of the aggregated block you would like to create?

You can serve up to 256 customers

You can choose between a maximum of five prefix sizes for the assignment size. The maximum size of the aggregated block is limited by the amount of free space you have. If you would like to assign more than a /48 per customer, you will have to submit an IPv6 End Site Assignment Request form. Once you have approval, you will have to manually create an inet6num object in the RIPE Database.

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The End!

Край

Y Diwedd

النهاية

Соңы

ჟღერჟ

Fí

Finis

Ende

Finvezh

Liðugt

Кінець

Konec

Kraj

Ěnn

Fund

پایان

Lõpp

Beigas

Vége

Son

Край

An Críoch

הסוף

Fine

Endir

Sfârșit

Fin

Τέλος

Einde

Конец

Канец

Slut

Slutt

დასასრული

Pabaiga

Fim

Amaia

Loppu

Tmiem

Koniec