V4Escrow

We recycle IPv4 and promote IPv6!

Recognized IPv4 Broker in:
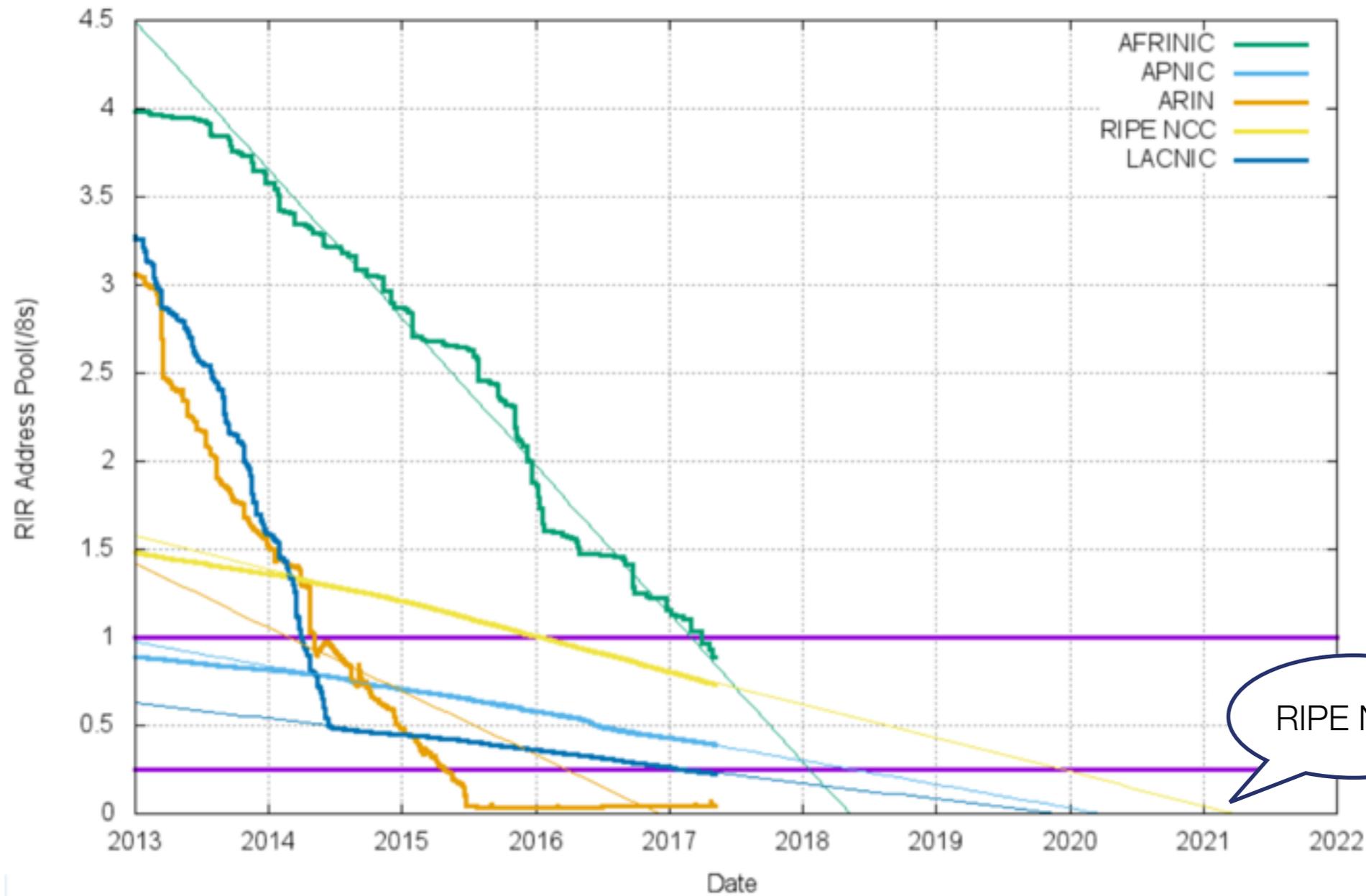
RIPE NCC
RIPE NETWORK COORDINATION CENTRE

APNIC

ARIN
American Registry for Internet Numbers
FACILITATOR

IPv4 Transfers
5 years after runout

Elvis Daniel Velea
Chief Executive Officer

MENOG17 - April 2017

Elvis Daniel Velea, April 2017

Projection of consumption of Remaining RIR Address Pools

© Geoff Huston, potaroo.net

What's Left? (20 March 2017)

	Available /32s	Reserved /32s	Current Run Out
APNIC	6,840,832	4,071,680	Last /8: early 2020
RIPE NCC	12,497,304	1,050,176	Last /8: early 2021
ARIN	0	6,163,968	
LACNIC	16,128	4,930,560	
AFRINIC	18,076,672	1,840,384	Pool: May2018
	37,412,936	**18,056,768**	

Number of IPs transferred

Number of IPs
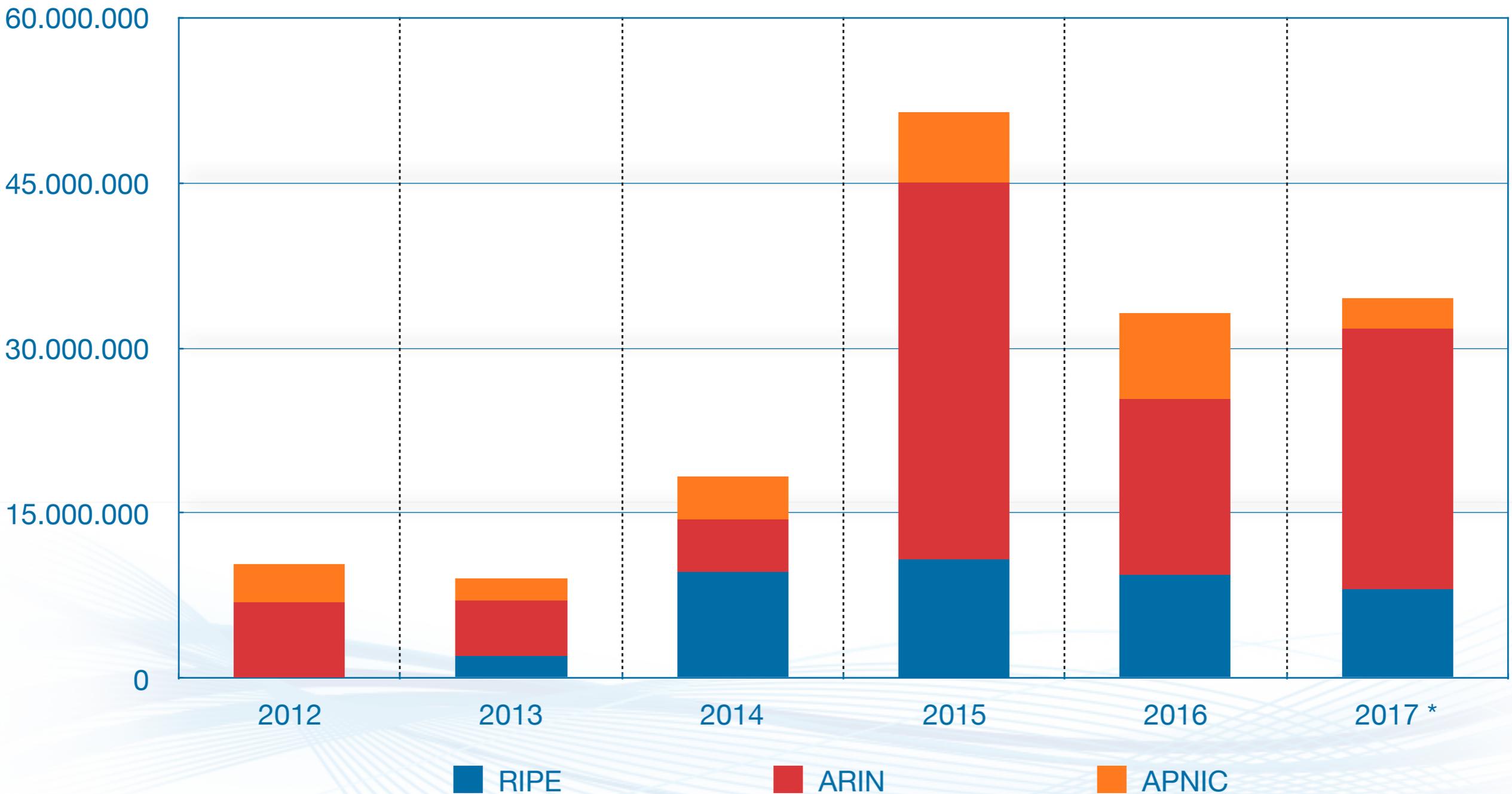
* 2017 calculated as 4xQ1 + /9 sold by MIT

Elvis Daniel Velea, April 2017
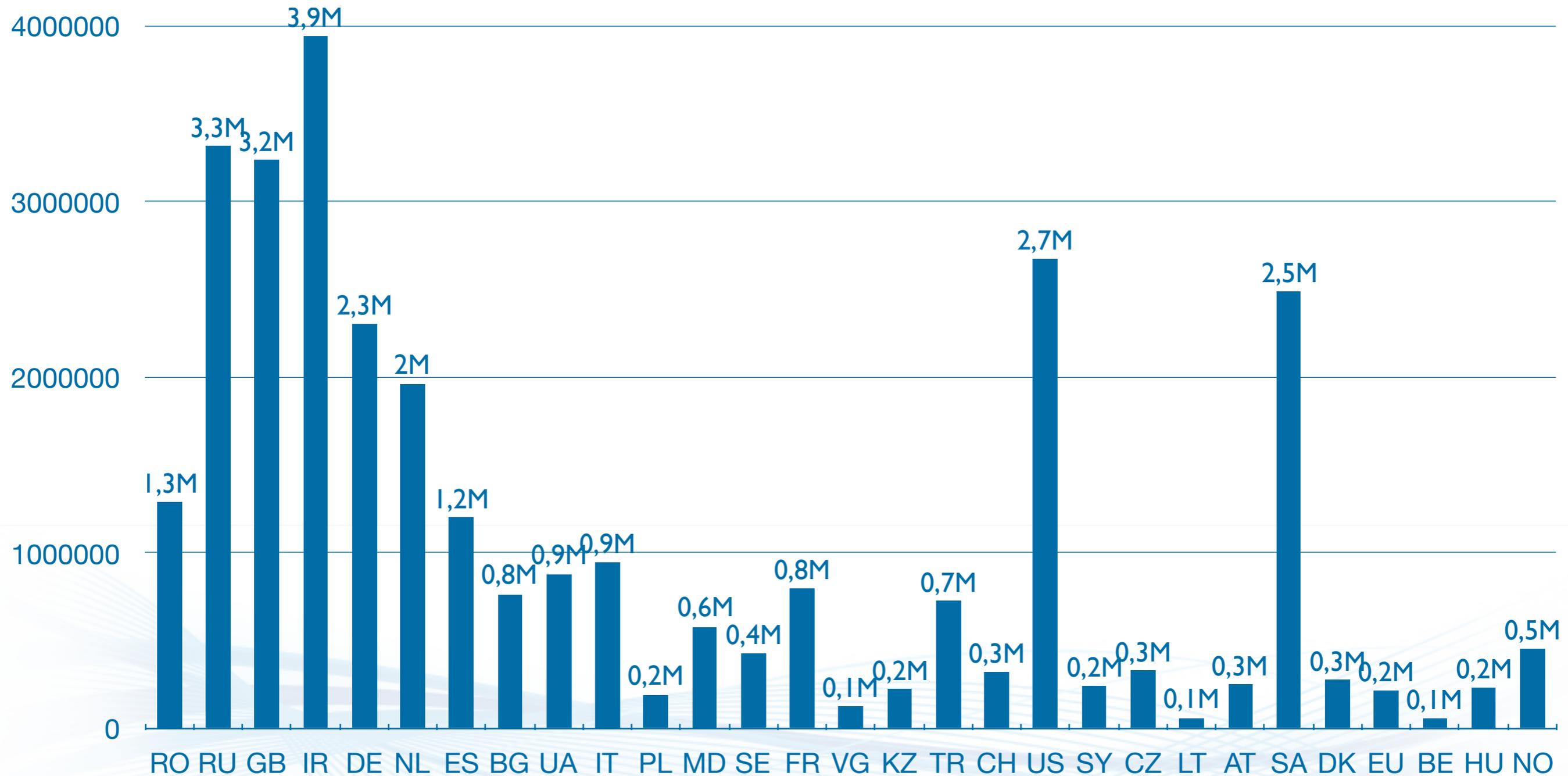
v4Escrow | 4
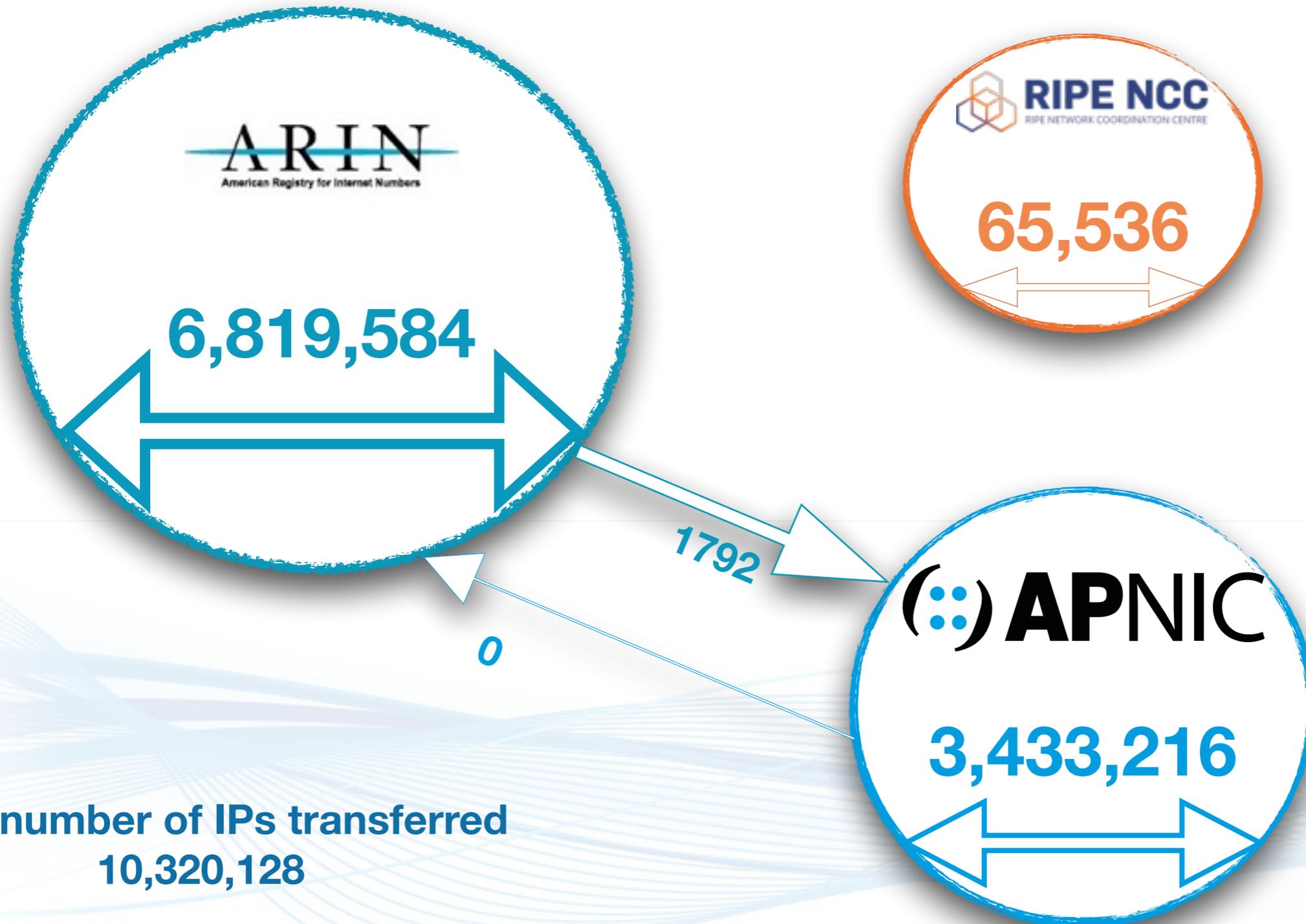
RIPE - Number of transfers per country (IN)
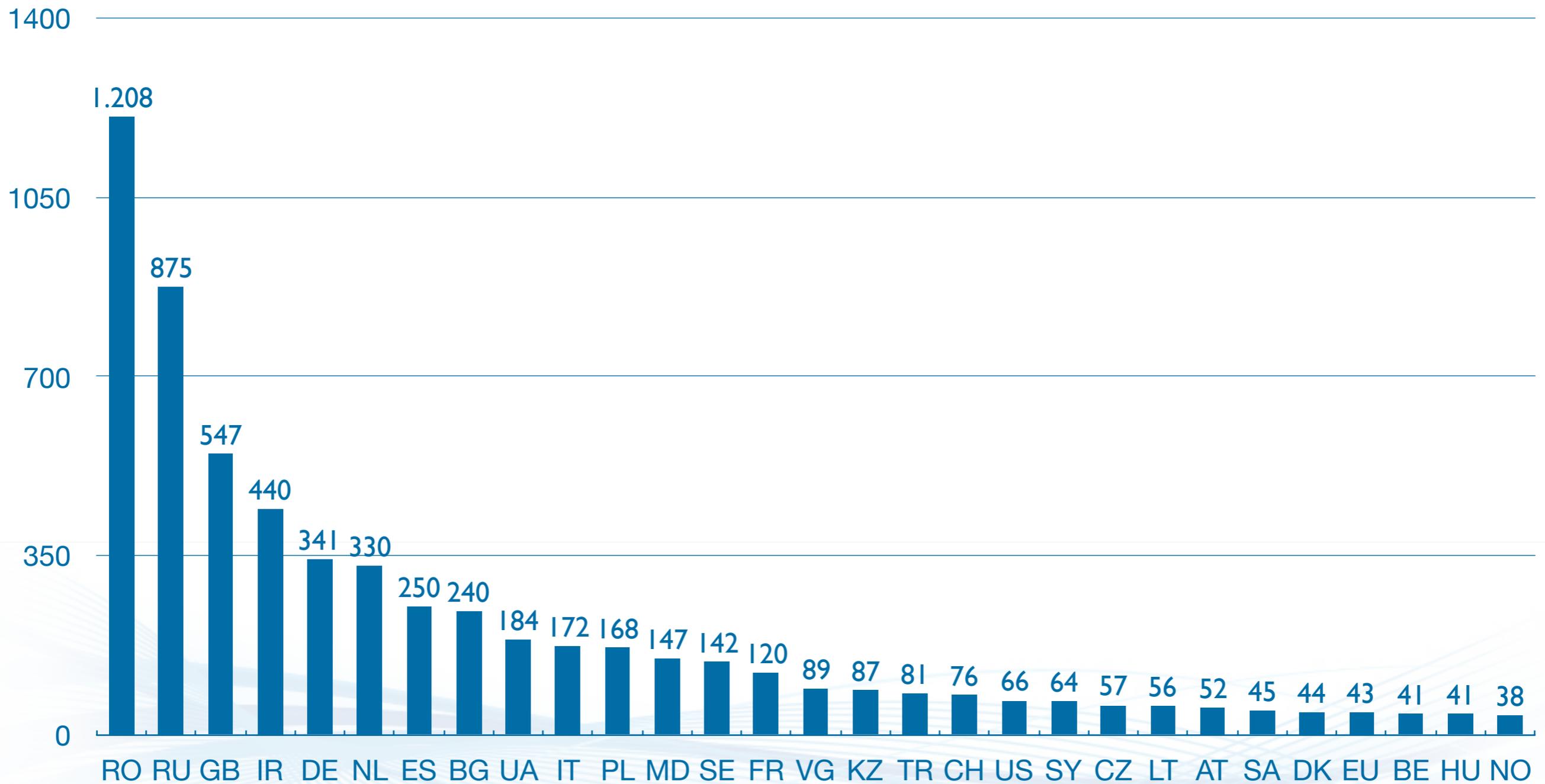
Number of IPs transferred (IN)

Transfer Statistics 2012 and before

ARIN
American Registry for Internet Numbers

6,819,584

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

65,536

1792

0

APNIC

3,433,216

**Total number of IPs transferred
10,320,128**

Transfer Statistics 2012 and before

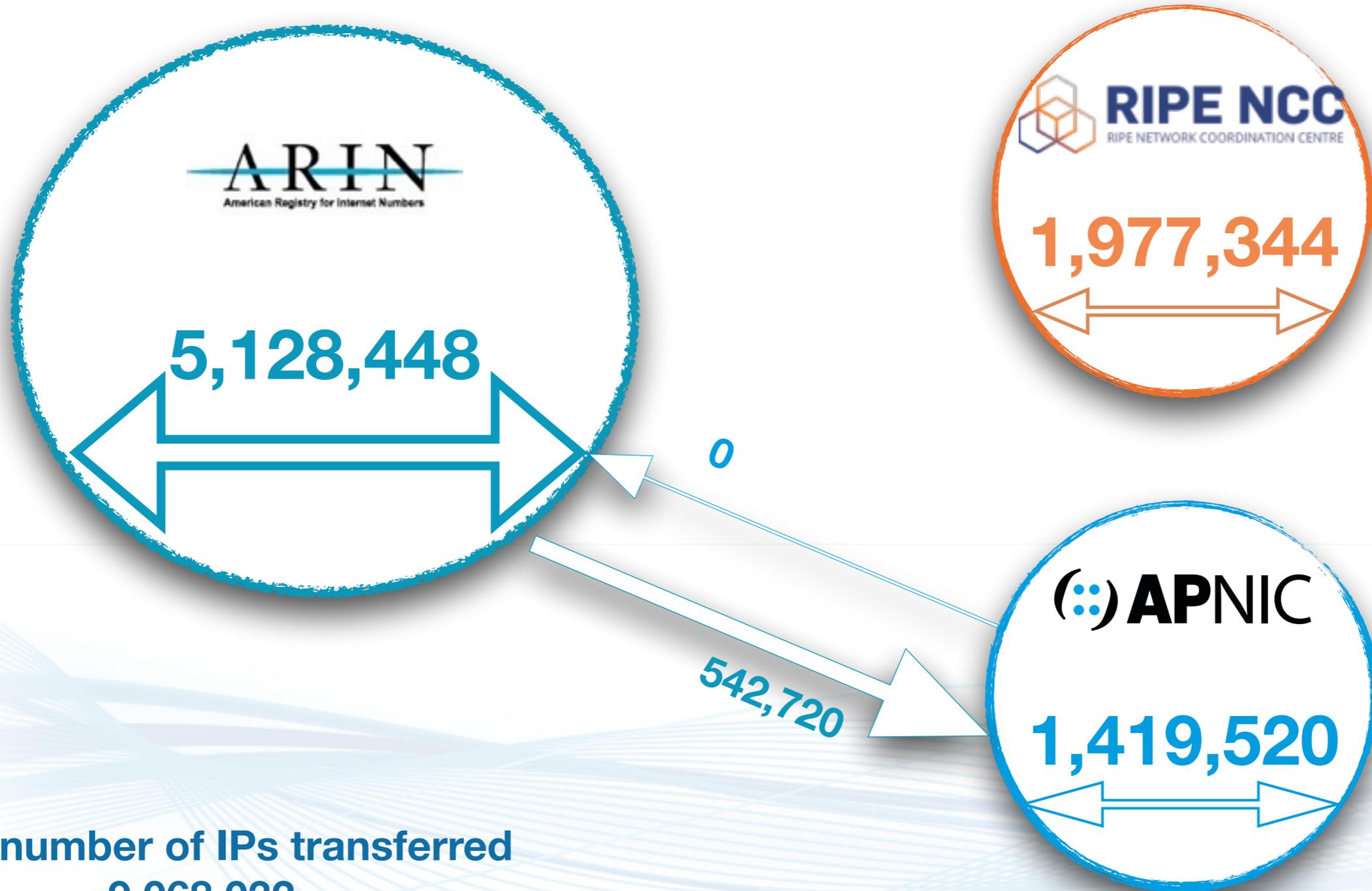|	2009	2010	2011	2012
RIPE **IPs**	-	-	-	**65.536**
- transfers	-	-	-	**9**
ARIN **IPs**	**17.408**	**8.192**	**1.931.776**	**4.862.208**
- transfers	**20**	**2**	**53**	**27**
APNIC **IPs**	-	**2.304**	**1.611.008**	**1.821.696**
- transfers	**-**	**2**	**83**	**165 ***

* 6 Inter-RIR transfers from ARIN to APNIC

Transfer Statistics 2012 and before

- First transfer recorded in **RIPE NCC** in October 2012
  - Intra-RIR Transfer policy since December 2010
  - Run-out on 14 September 2012

- First transfer recorded in **APNIC** in November 2010
  - Intra-RIR Transfer policy since February 2010
  - Inter-RIR transfer policy since August 2011
  - Run-out on 15 April 2011

- First transfer recorded in **ARIN** in October 2009
  - Intra-RIR policy since June 2009

- 10,3 Million IPs transferred in total before or during 2012

- Less than 2,000 IPs transferred from ARIN to APNIC

Transfer Statistics 2013

ARIN
American Registry for Internet Numbers

5,128,448

0

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

1,977,344

542,720

APNIC

1,419,520

**Total number of IPs transferred
9,068,032**

Transfer Statistics 2013

- Number of IPs transferred in RIPE NCC almost equal to number of IPs transferred within or into APNIC

- More than half a million IPs transferred from ARIN to APNIC, 0 transferred from APNIC to ARIN

  - APNIC's 'free' pool depleted while ARIN still had IPs to allocate from the 'free' pool

1,977,344

5,128,448

- 154 transfers within **RIPE NCC**

0

- 172 transfers within **APNIC** + 17 Inter-RIR from ARIN

- 30 transfers within **ARIN**

542,720

1,419,520

Total number of IPs transferred
9,068,032

Transfer Statistics 2014

Total number of IPs transferred
18,245,376

ARIN: 4,745,472

RIPE NCC: 9,647,616

APNIC: 2,749,440

ARIN → APNIC: 1,101,824

APNIC → ARIN: 0

Transfer Statistics 2014

- Number of IPs transferred in RIPE NCC increased almost 5 times compared to 2013

  - IPv4 policy clean-up in February 2014 removing needs based policy

  - IPv4 PI can be transferred since Nov 2014

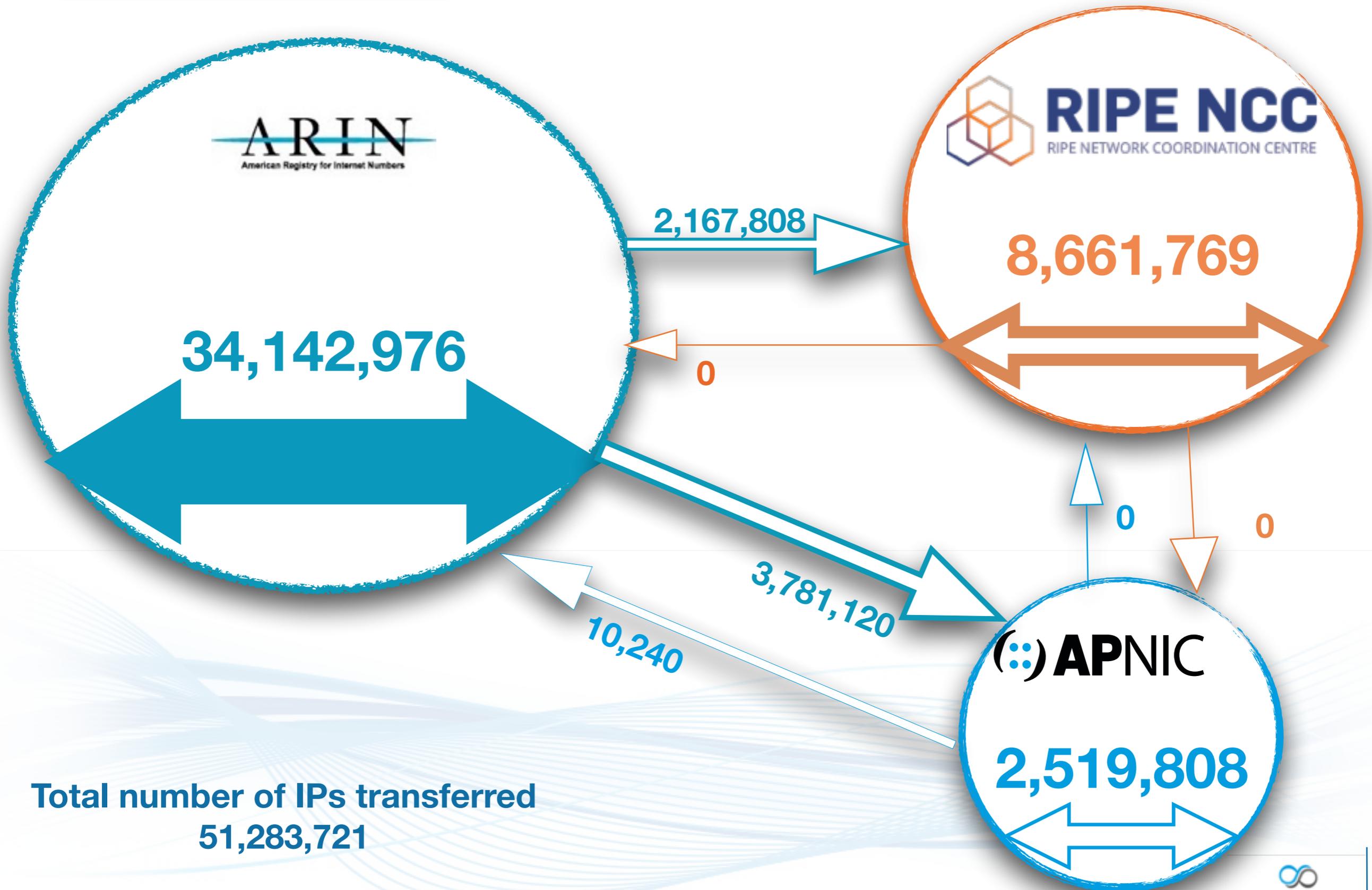- More than a million IPs transferred from ARIN to APNIC, 0 transferred from APNIC to ARIN

- 920 transfers (20 PI) within **RIPE NCC**

- 249 transfers within **APNIC** + 94 Inter-RIR from ARIN

- 59 transfers within **ARIN**

9,647,616

4,745,472

,101,824

0

2,749,440

Total number of IPs transferred
18,245,376

Transfer Statistics 2015

ARIN
American Registry for Internet Numbers

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

2,167,808

8,661,769

34,142,976

0

3,781,120

10,240

0
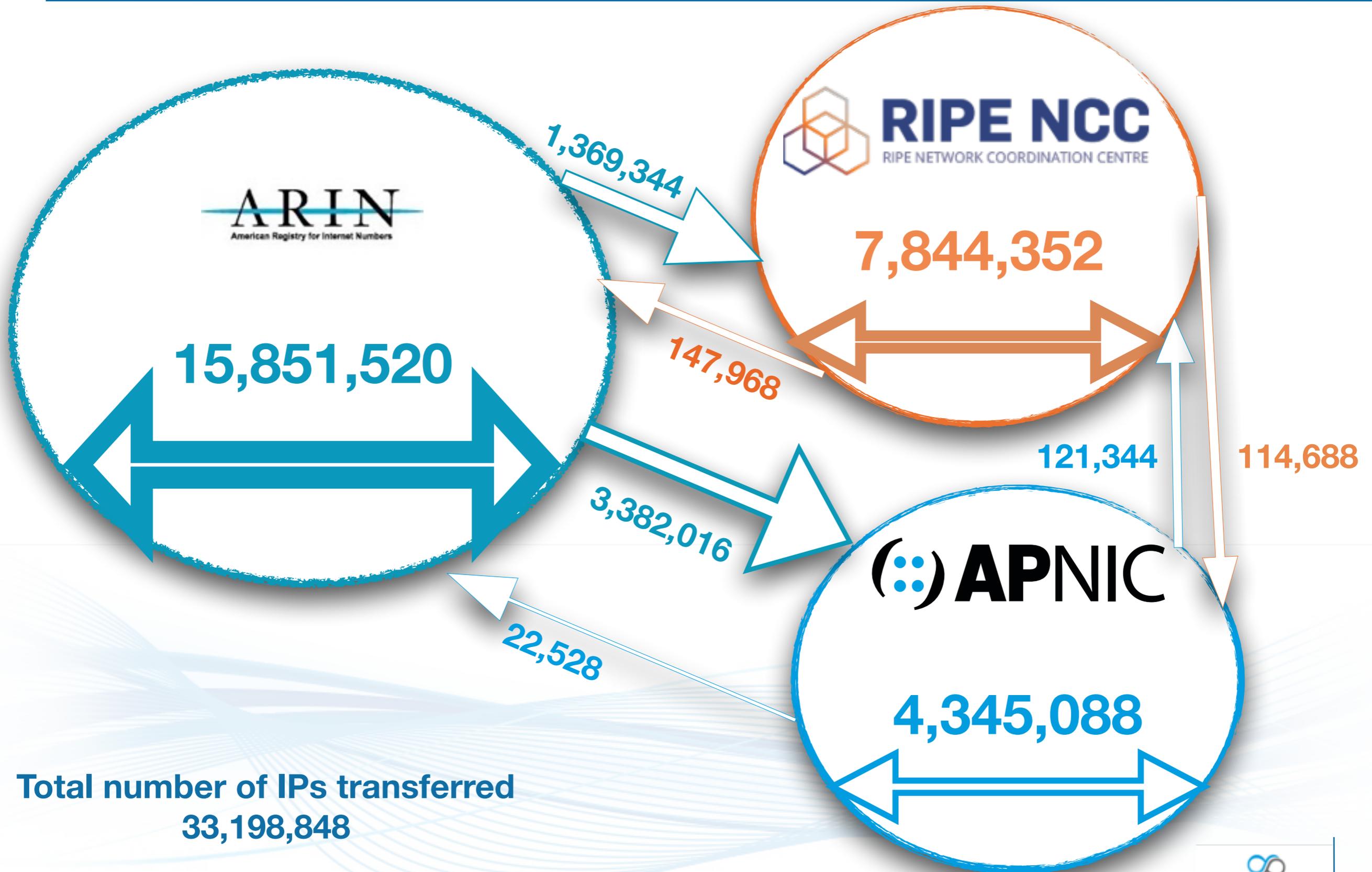
0

APNIC

2,519,808

Total number of IPs transferred
51,283,721

Transfer Statistics 2015

- RIPE NCC Inter-RIR transfer policy compatible with ARIN and APNIC since October 2015
  - ~ 2,2M IPs transferred from ARIN to RIPE NCC (in less than 2 months)
  - ~3,8M IPs transferred from ARIN to APNIC in 2015
- **ARIN Run-out on 24th September 2015**
  - ~**34M** IPs transferred within ARIN
    - most to date, more than the number of IPs allocated by ARIN in previous 4 years
- APNIC transfers more IPs from ARIN (~3,8M) than within the registry (~2,5M)

- **2699** transfers within **RIPE NCC** + 11 Inter-RIR from ARIN

- 367 transfers within **APNIC** + 75 Inter-RIR from ARIN

  - 3 transfers from APNIC to ARIN

- 260 transfers within **ARIN**

Transfer Statistics 2016

1,369,344

147,968

ARIN
American Registry for Internet Numbers

15,851,520

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

7,844,352

3,382,016

121,344

114,688
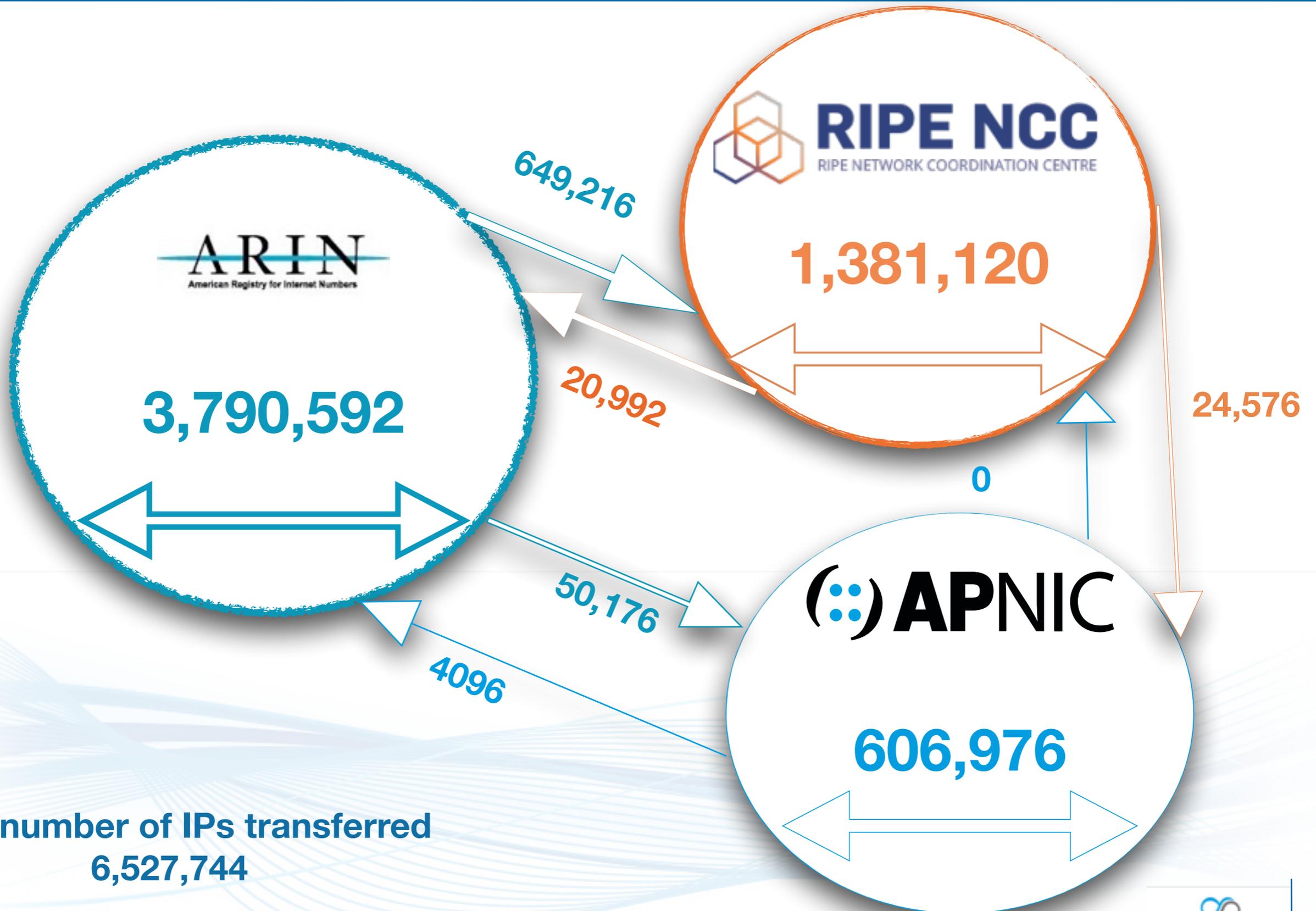
22,528

⊙APNIC

4,345,088

**Total number of IPs transferred
33,198,848**

Transfer Statistics 2016

- ARIN has had ~500 more transfers in 2016 than in 2015. RIPE NCC has had ~500 less.

- Number of total IPs transferred - 35% less in 2016

  - less large IP blocks available

- 2181 transfers within **RIPE NCC**

  - 14 Inter-RIR from APNIC,

  - 100 Inter-RIR from ARIN

- 523 transfers within **APNIC**

  - 3 Inter-RIR transfers from RIPE NCC

  - 55 Inter-RIR transfers from ARIN

- 798 transfers within **ARIN**

  - 12 Inter-RIR transfers from APNIC

  - 8 Inter-RIR transfers from RIPE NCC

Transfer Statistics 2017 Q1

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

1,381,120

ARIN
American Registry for Internet Numbers

3,790,592

649,216

20,992

24,576

0

(:) APNIC

606,976

50,176

4096

Total number of IPs transferred
6,527,744

Transfer Statistics 2017

- 429 transfers within **RIPE NCC**

  - 14 Inter-RIR from APNIC

- 80 transfers within **APNIC**

  - 3 Inter-RIR transfers from RIPE NCC

  - 7 Inter-RIR transfers from ARIN

- 261 transfers within **ARIN**

  - 4 Inter-RIR transfers from APNIC

  - 4 Inter-RIR transfers from RIPE NCC

- Expecting another decrease in total number of IPs transferred, the number of transfers is expected to increase in ARIN.

- Further de-aggregation of some of the large blocks. Some sellers prefer to split their IP block in smaller pieces and sell them to multiple Buyers at a higher price.

Transfer Statistics - RIPE NCC

- Number of transfers increased since IPv4 policy clean-up in February 2014

  - needs based criteria removed from policy

  - thus, registry accuracy increased

- Number of LIRs doubled since runout

- 5391 transfers of PA Allocations (Including 2017 Q1)

- 1000 PI transfers since November 2014 totaling 1,067,776 IPs (Including 2017 Q1)

- Import:

  - 128 Inter-RIR Transfers from ARIN totaling 4,186,368 IPs

  - 14 Inter-RIR Transfers from APNIC totaling 121,344 IPs

- Export:

  - 13 Inter-RIR Transfers to ARIN totaling 168,960 IPs

  - 6 Inter-RIR Transfers to APNIC totaling 139,264 IPs

- 2016 - the first year to see a slowdown in number of transfers in RIPE

  - 2017 will see an other slowdown in the IPv4 Marketplace

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Lessons learned

- Contact Geo-IP providers once you receive an IP block through a transfer
  - your customers will be seen in the country of the transferor for the first 1-2 months.
  - if you are not in a hurry to add the IP block to production, use it in a test environment first.
- Ask for a blacklist report on the IP block or check major blacklisting providers.
- If you are they Buyer - request the seller to forward you the abuse reports for the IP addresses transferred to you
  - the Seller will continue to receive abuse reports for at least 6-12 months for the IP addresses transferred because abuse reporters do not update their databases and continue to send the reports to the 'old' abuse contact
- Start routing immediately, hijacks do happen very often
- Make sure the person you talk to has corporate authorization to transfer to you.
  - Ask for PoA (Power of Attorney).

Fun facts about stats

- ARIN stats used to show an IP block transferred to APNIC while it was actually transferred to RIPE NCC
  - 150.112.0.0/16

- ARIN stats used to show one IP block being transferred to both RIPE **and** APNIC
  - 104.244.8.0/22

- ARIN stats were missing some IP blocks transferred
  - 192.28.124.0/22, 192.28.128.0/22, 66.248.204.0/22, 96.30.64.0/18

- RIPE shows a PI transferred on 01/01/2014 while the policy was implemented on the 25th of November 2014
  - 91.197.160.0/22

- All of the above issues resolved by the RIRs after discussions at the ARIN39 meeting

- APNIC and RIPE are publishing IP transfer statistics at least daily.
  - It takes ARIN at least two weeks to **manually** publish IP transfer statistics from the previous month

Regional Statistics - Hungary

- 41 Intra-RIR transfers

- 231,424 IP addresses transferred to HU LIRs (only PA)

- no PI transfers yet

- no Inter-RIR transfers yet

- 497 IPv4 allocations + assignments

- 5,887,744 IPv4 addresses

- 253 ASNs

- 98 IPv6 allocations + 7 PIv6 assignments

- 145 LIRs (~25% are 0-2 years old)

Pricing - observed vs estimated

- Runout in ARIN in 2015 affected pricing - prices started to go up in ARIN

- RIPE Inter-RIR transfer policy caused prices to harmonize between ARIN and RIPE

- Prices keep going up while supply is decreasing
  - minimum price observed was around 2013 - $5/IP (ARIN) and $7/IP (RIPE)
    - a lot of IPv4 available on the market
  - prices have harmonized at $10-$12/IP in 2015-2016 within all the regions
    - only a few large blocks (/16 or larger) available on the market
    - many transactions (/17 and smaller) observed at $12-$14/IP
    - several small transactions at even $15-$20/IP
    - **very little supply still available**

- Probable price per IP at the end of 2017 will be between $10 and $20 per IP

- Maximum price still to be observed but we estimate it to grow up to $25/IP in 2018

- IPv4 Marketplace estimated to last at least until 2025

Pricing

Price per IP over time (min/max/trendline)
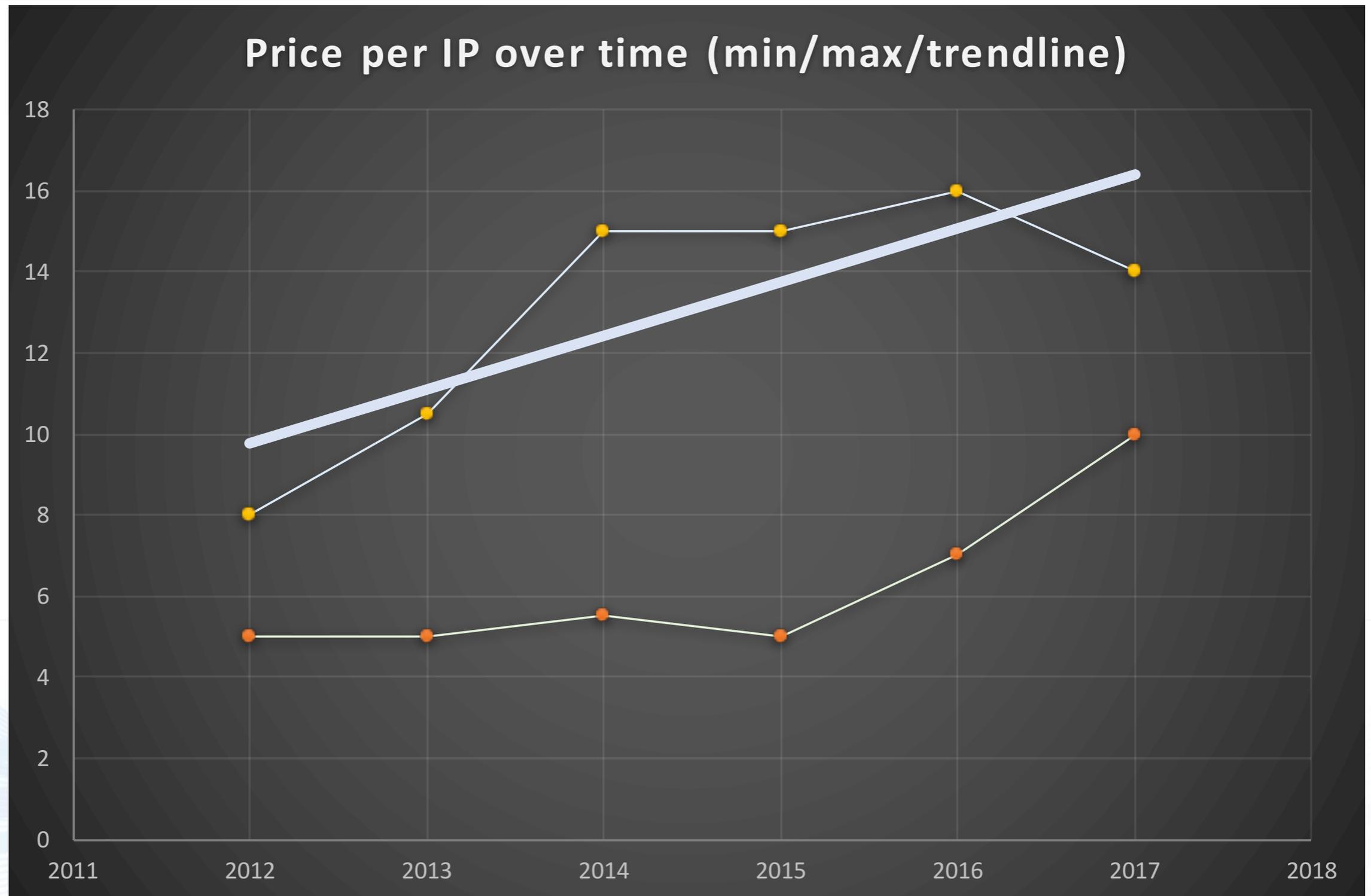
Predictions

- V4Escrow was asked during Menog14 in **2014** to make a prediction on the number of IPs transferred in 2014. We estimated that **1x/8** will have been transferred and were **98%** right.

- During Menog15 in **2015** we also predicted that **4x/8s** will be transferred globally in 2015. The 4 /8s prediction was also over **90%** accurate.

- During Menog16 we predicted that the total number of IPs transferred in 2016 will decrease to **2.5x/8s**.

  - 1st observed slowdown of the IPv4 market

  - total number of IPs transferred (not including legacy space transfers) was just shy of **2x/8s**.

- We predicted at Menog17, that the total number of IPs that will be transferred in 2017 will decrease to less than 2x/8s.

  - considering that MIT has just announced they will sell a /9 and IF an other large legacy holder will decide to join the market, 2017 may no longer see a decrease in the number of IPs transferred but a slight increase compared to 2016.
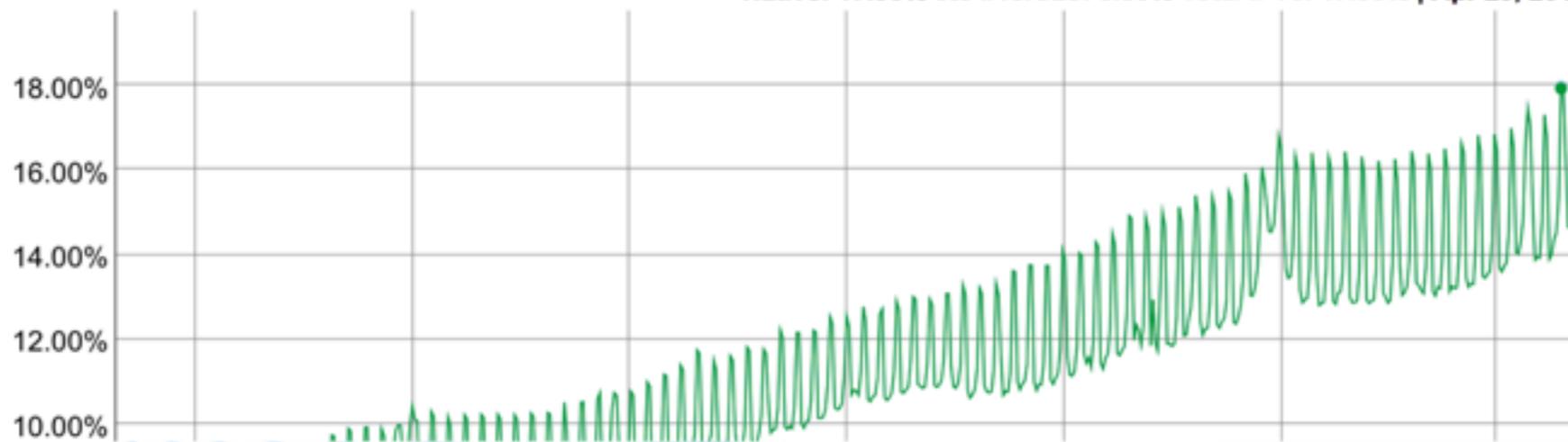
IPv6

- as per Google site

  - measured since 2008

  - 0,5% before 2012

  - 100% growth in 2012 up to 1.1%

  - 150% growth in 2013 up to 2.8%

  - 100% growth in 2014 up to 5.6%

  - 95% growth in 2015 up to 10.4%

  - 50% growth in 2016 up to 16%

  - now at 18% worldwide - slowdown of growth in 2016 and 2017

IPv6 Adoption

We are continuously measuring the availability of IPv6 connectivity among Google users. The graph shows the percentage of users that access Google over IPv6.

Native: 13.48% 6to4/Teredo: 0.02% Total IPv6: 13.50% | Mar 27, 2017
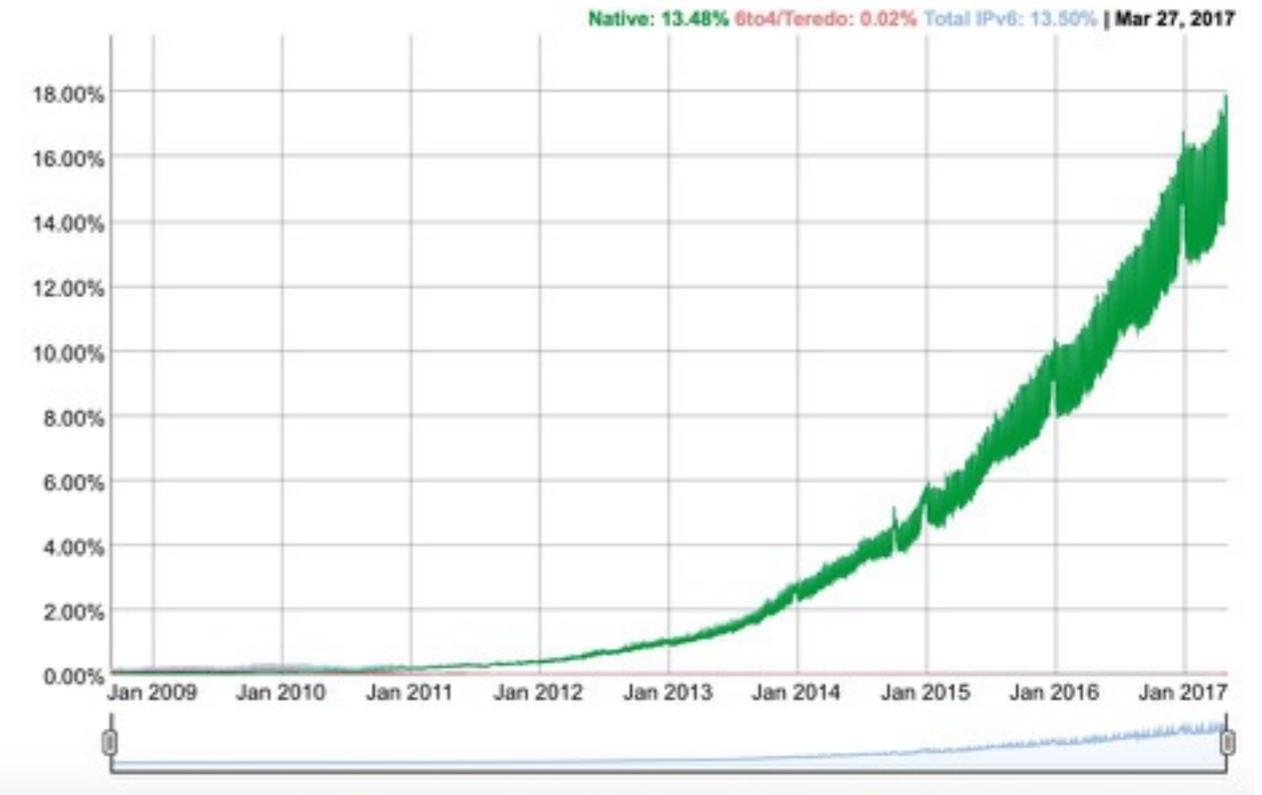
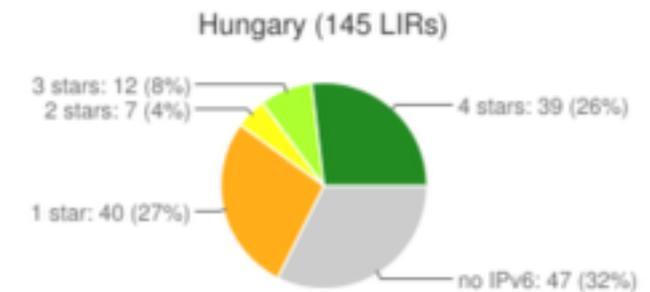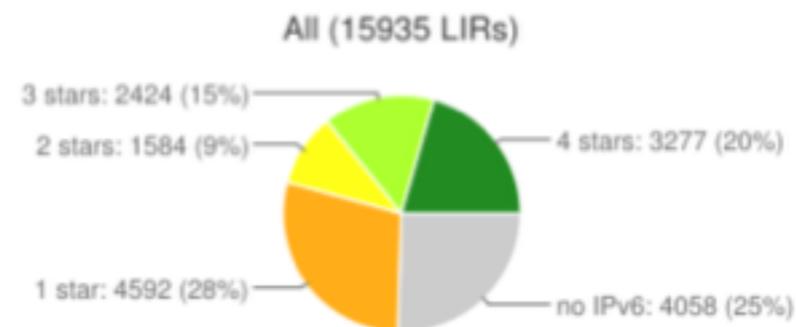Native: 17.93% 6to4/Teredo: 0.05% Total IPv6: 17.98% | Apr 29, 2017

IPv6 in Hungary
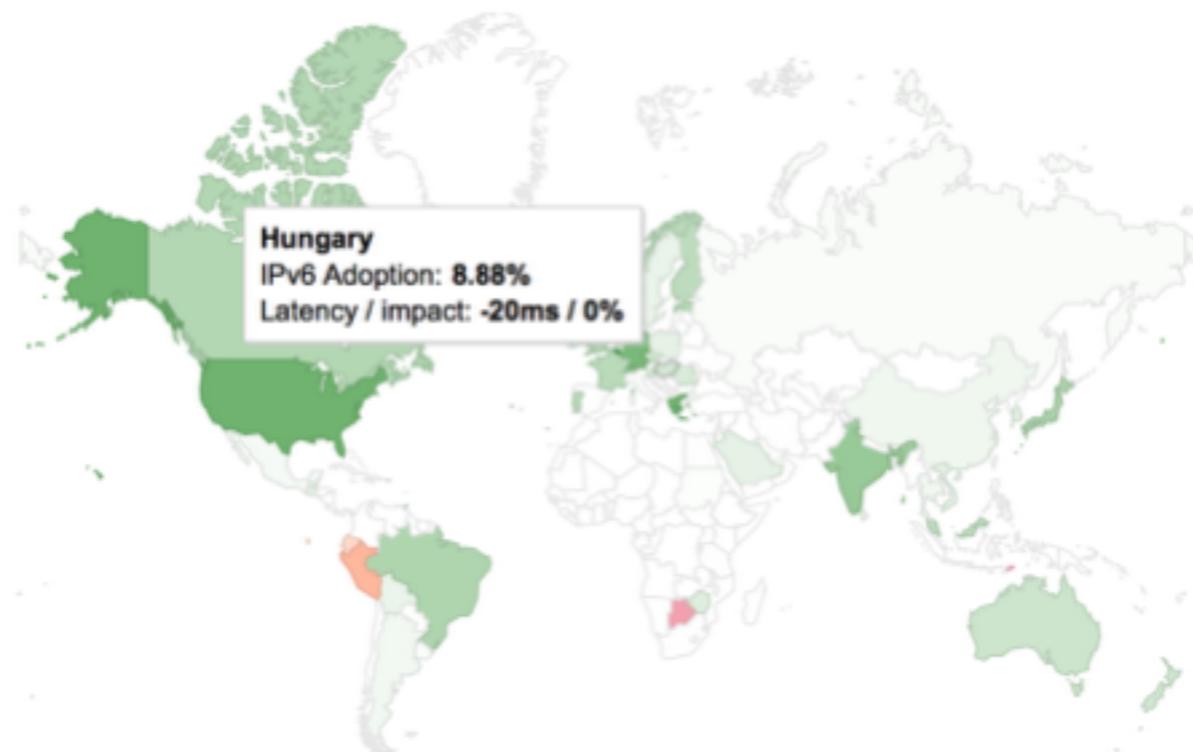
- IPv6 adoption in Hungary
  - % according to Google
  - 26% with 4 * RIPEness
    - compared to 20% in RIPE

IPv6 RIPEness country pie charts (2017-05-08)

All

All (15935 LIRs)

3 stars: 2424 (15%)
2 stars: 1584 (9%)
4 stars: 3277 (20%)
1 star: 4592 (28%)
no IPv6: 4058 (25%)

Hungary (145 LIRs)

3 stars: 12 (8%)
2 stars: 7 (4%)
4 stars: 39 (26%)
1 star: 40 (27%)
no IPv6: 47 (32%)

Per-Country IPv6 adoption

Hungary
IPv6 Adoption: **8.88%**
Latency / impact: **-20ms / 0%**

  - low IPv6 adoption = higher IPv4 prices in the next years

Questions ?

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