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

Addressing V4 Exhaustion

RIR IPv4 Address Run-Down Model

© Geoff Huston, potaroo.net
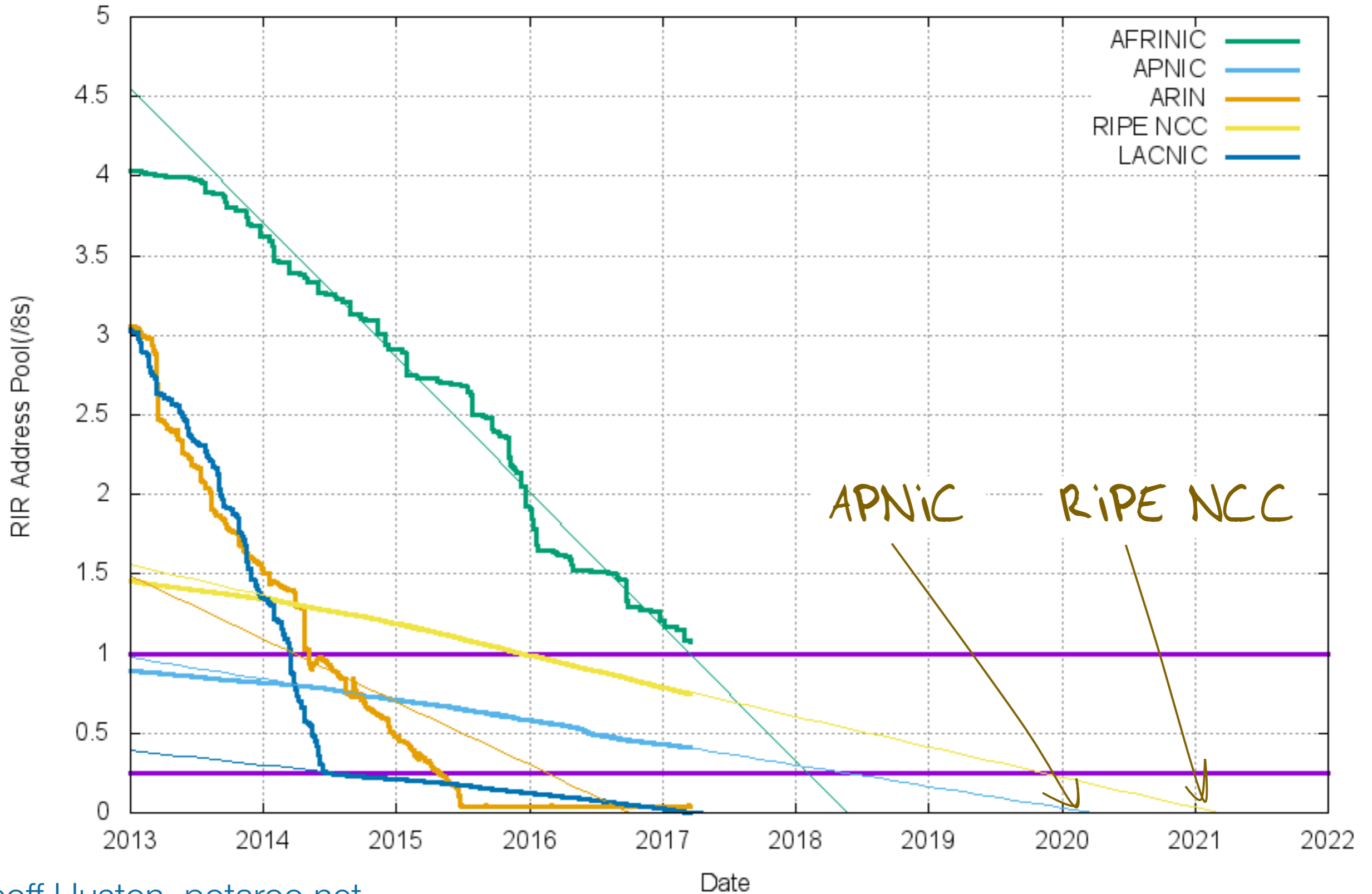
What's Left? (20 March 2017)

	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**	

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
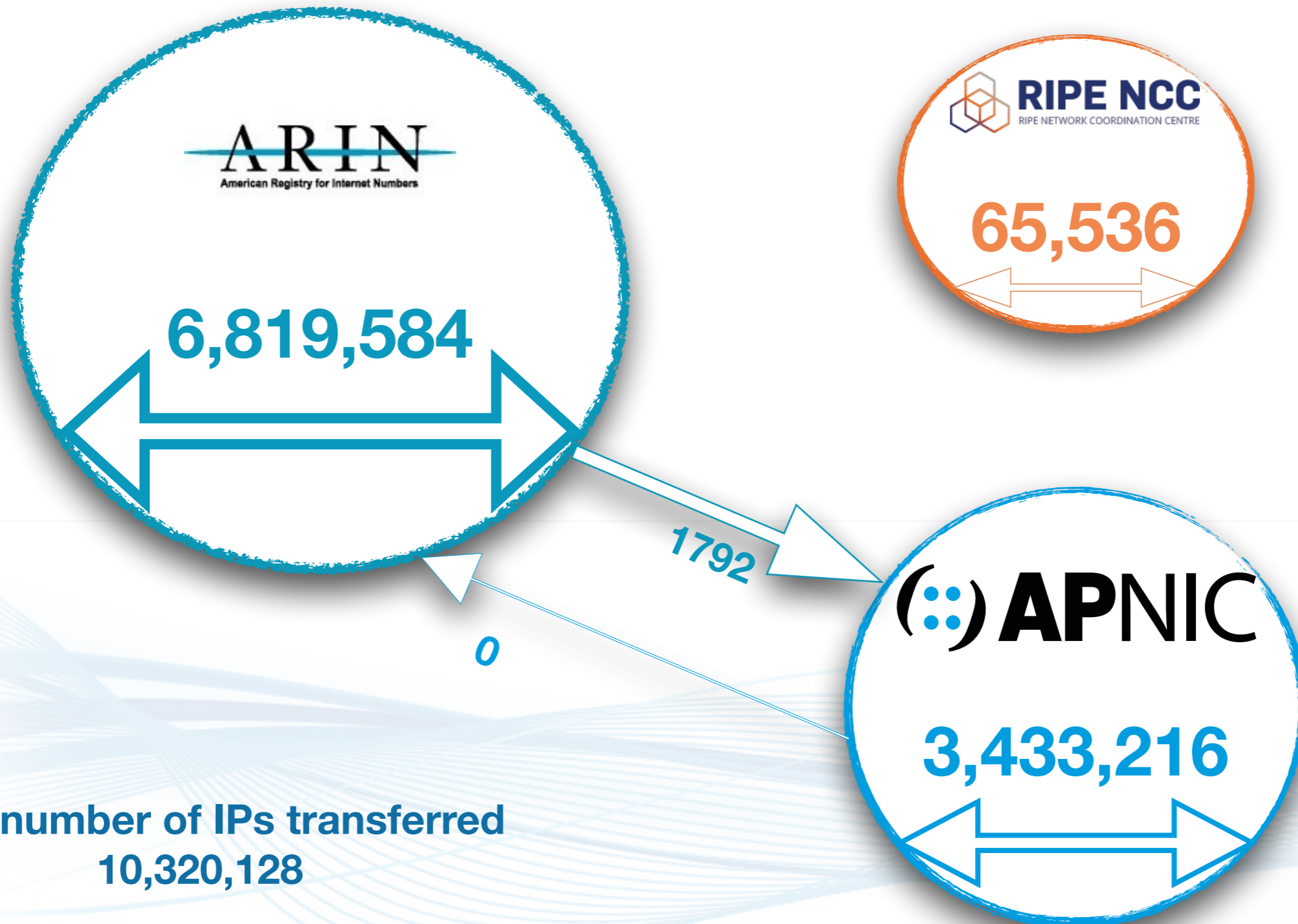
Total number of IPs transferred 10,320,128

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Transfer Statistics 2012 and before

	2009	2010	2011	2012
RIPE IPs - transfers	-	-	-	**65,536**
	-	-	-	**9**
ARIN IPs - transfers	**17,408**	**8,192**	**1,931,776**	**4,862,208**
	20	2	53	27
APNIC IPs - transfers	-	**2,304**	**1,611,008**	**1,821,696**
	-	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

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Transfer Statistics 2013

ARIN
American Registry for Internet Numbers

5,128,448

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

1,977,344

0

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

- ## 154 transfers within **RIPE NCC**

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

- ## 30 transfers within **ARIN**

Transfer Statistics 2014

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

9,647,616

ARIN
American Registry for Internet Numbers

4,745,472

1,101,824

0

APNIC

2,749,440

**Total number of IPs transferred
18,245,376**

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**
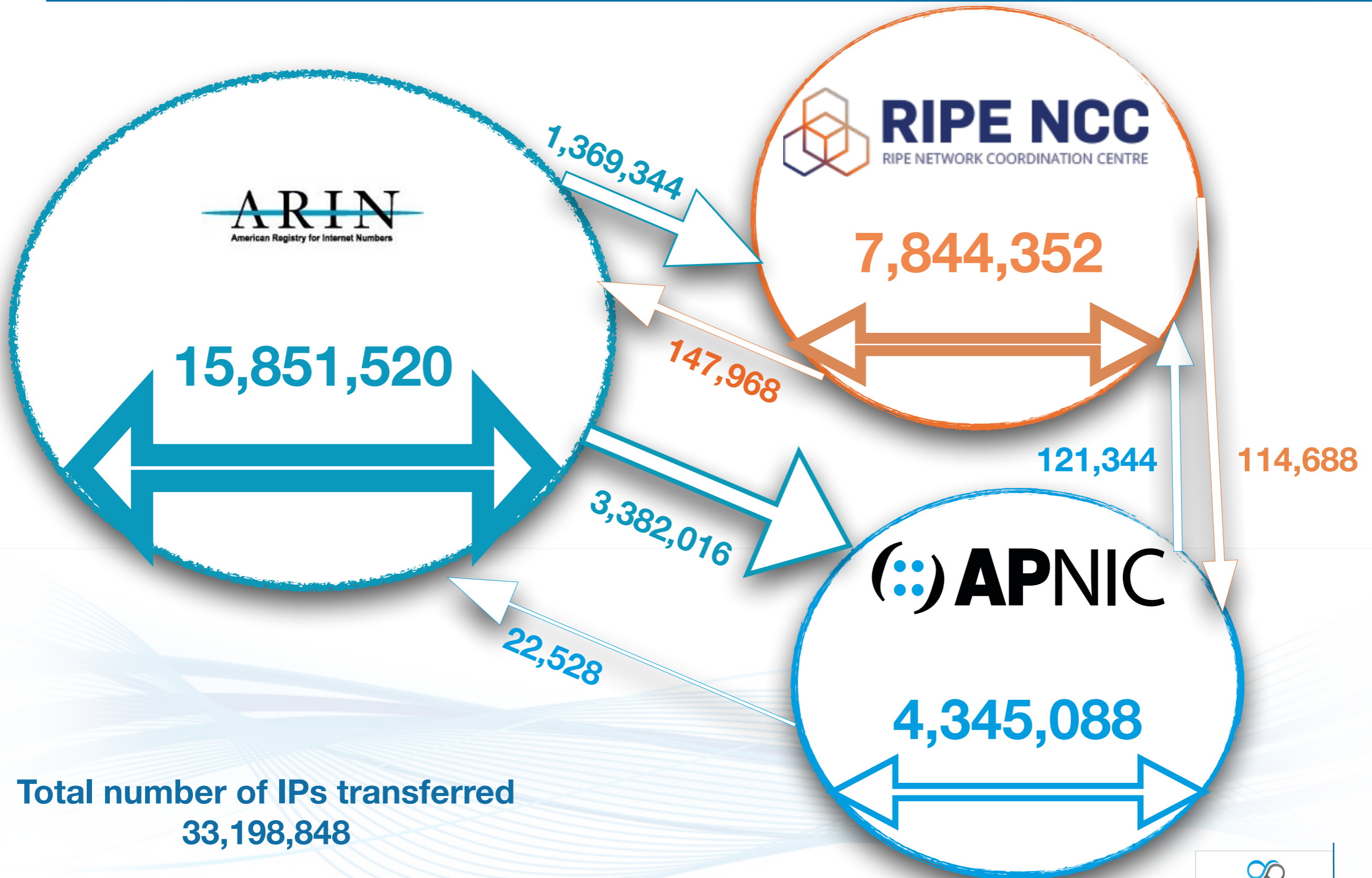
Transfer Statistics 2015
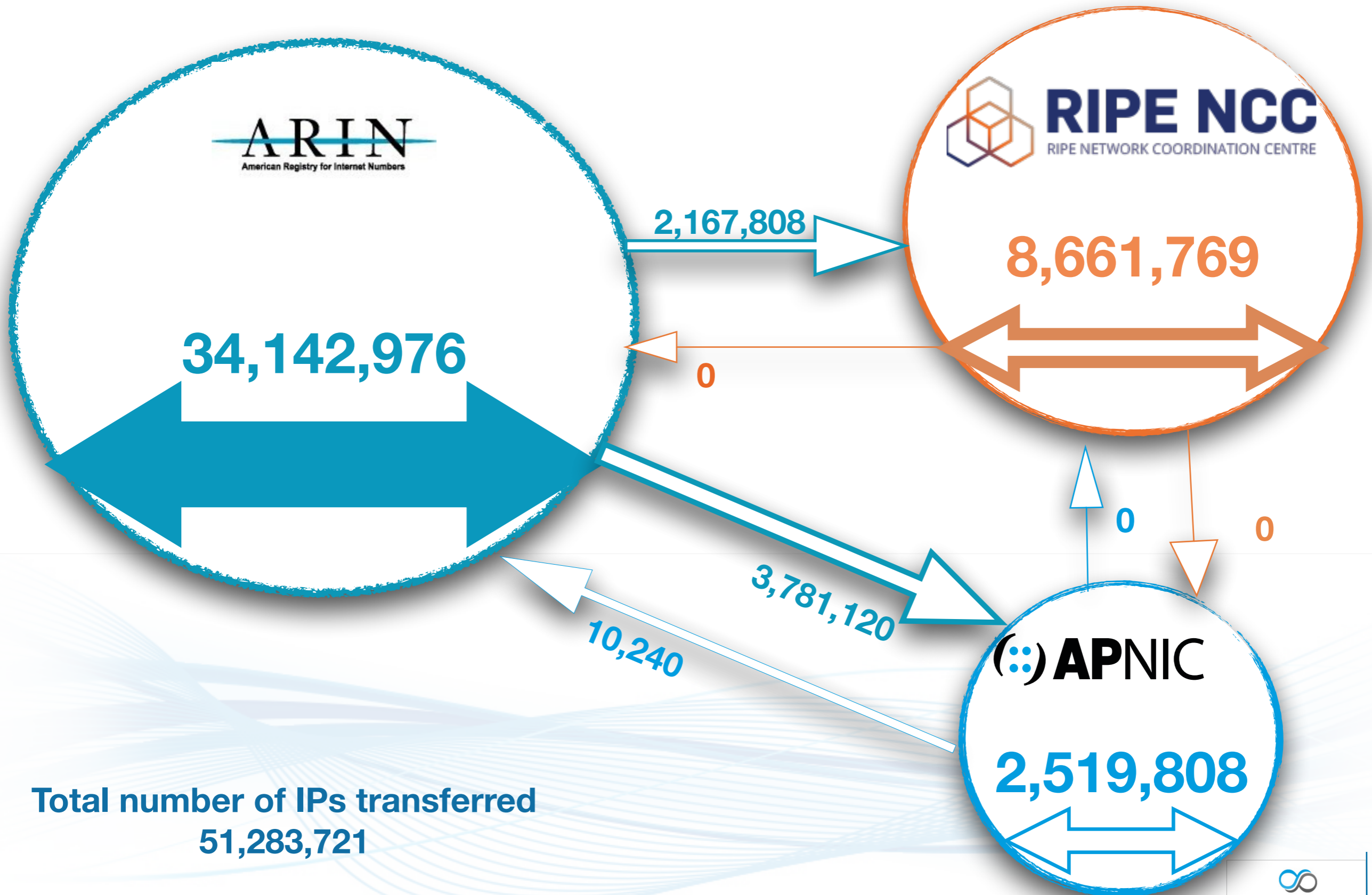
Total number of IPs transferred
51,283,721

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

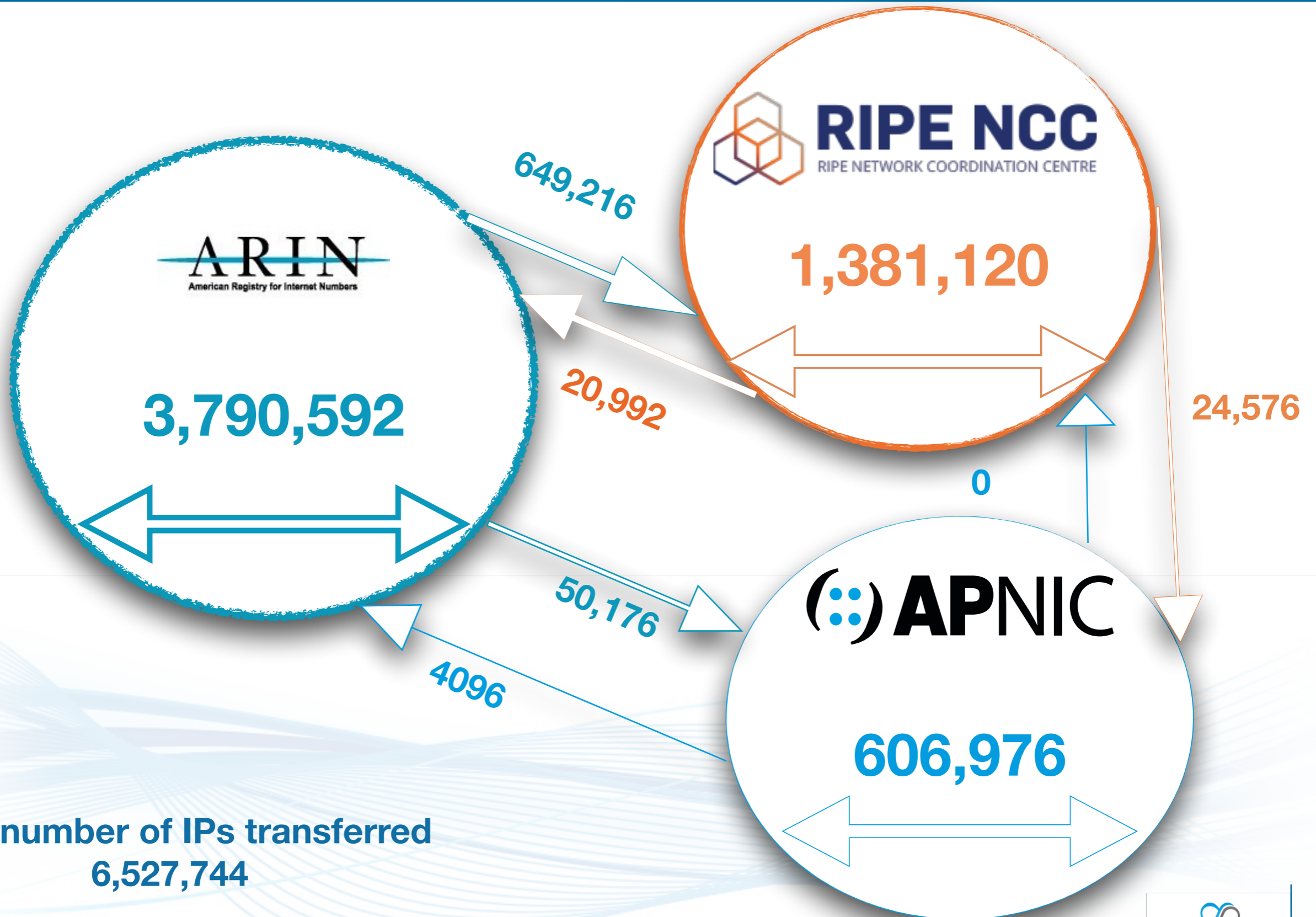- 260 transfers within **ARIN**

Transfer Statistics 2016

ARIN
American Registry for Internet Numbers

15,851,520

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

7,844,352

1,369,344

147,968

3,382,016

121,344

114,688

(:) **AP**NIC

4,345,088

22,528

Total number of IPs transferred
33,198,848

Elvis Daniel Velea, April 2017

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

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Transfer Statistics 2017 Q1

649,216

RIPE NCC
RIPE NETWORK COORDINATION CENTRE

1,381,120

ARIN
American Registry for Internet Numbers

3,790,592

20,992

24,576

0

50,176

(:) APNIC

4096

606,976

Total number of IPs transferred
6,527,744

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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.

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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

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

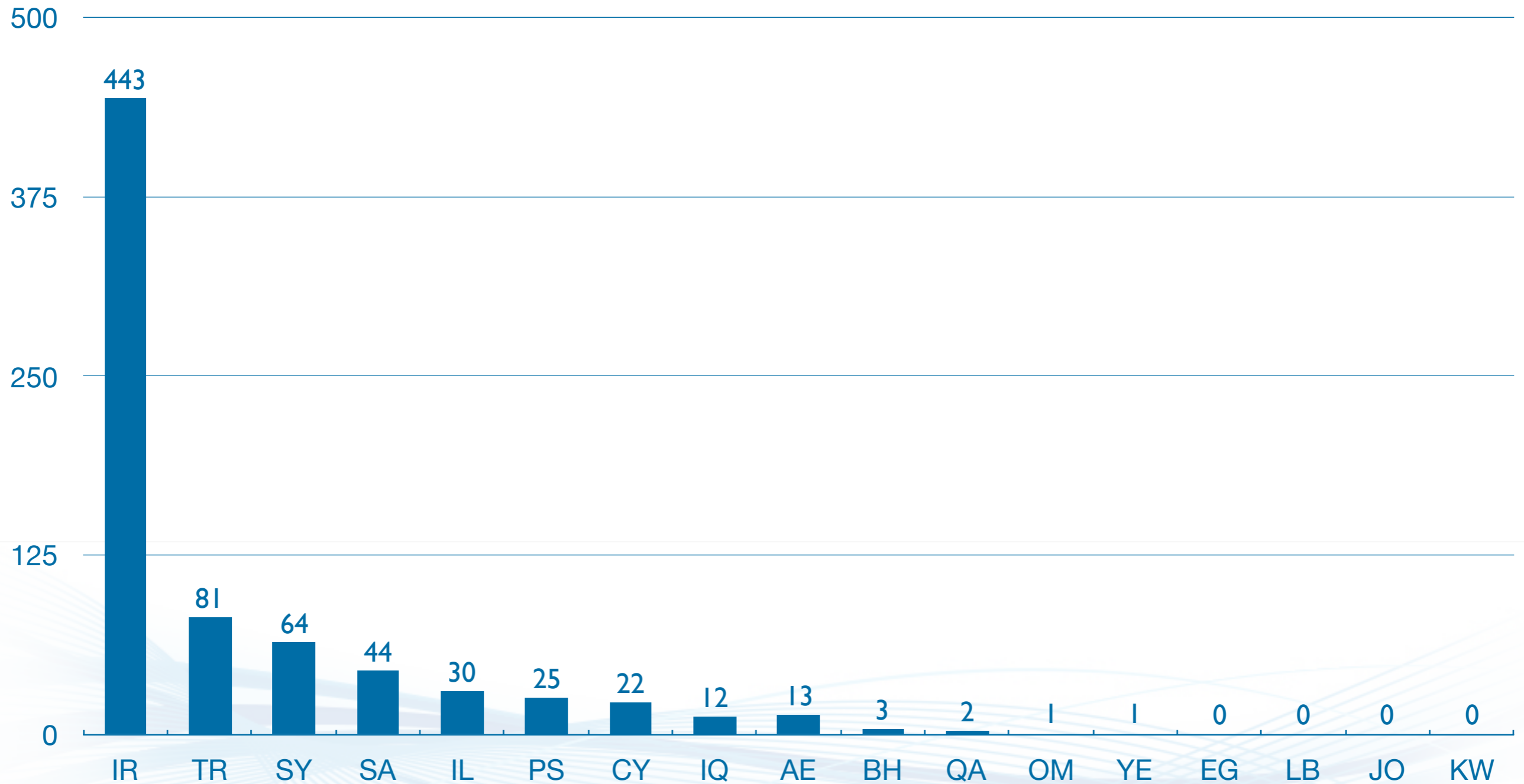   - 2017 will see an other slowdown in the IPv4 Marketplace

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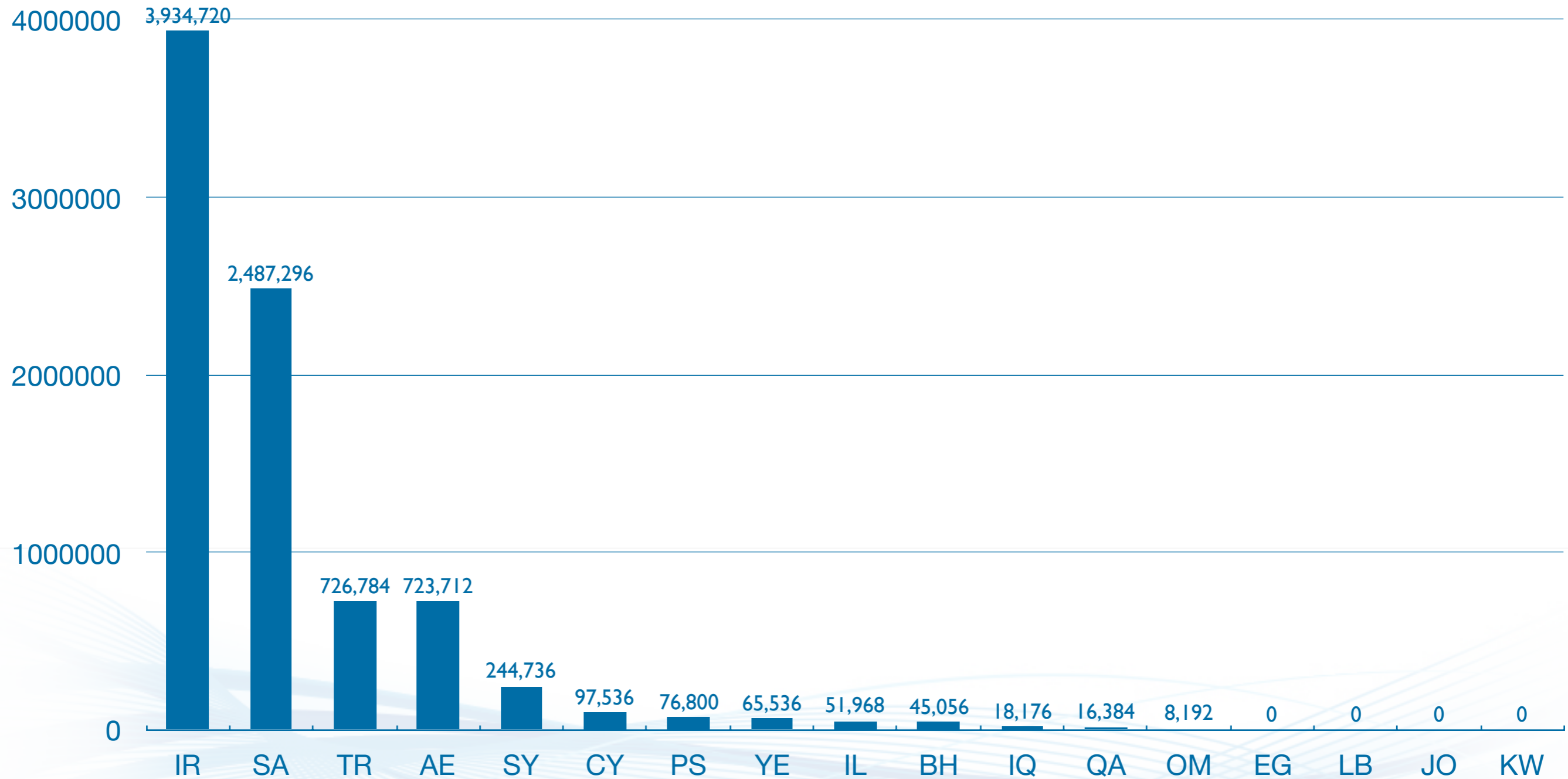# Number of IPs transferred

Number of IPs
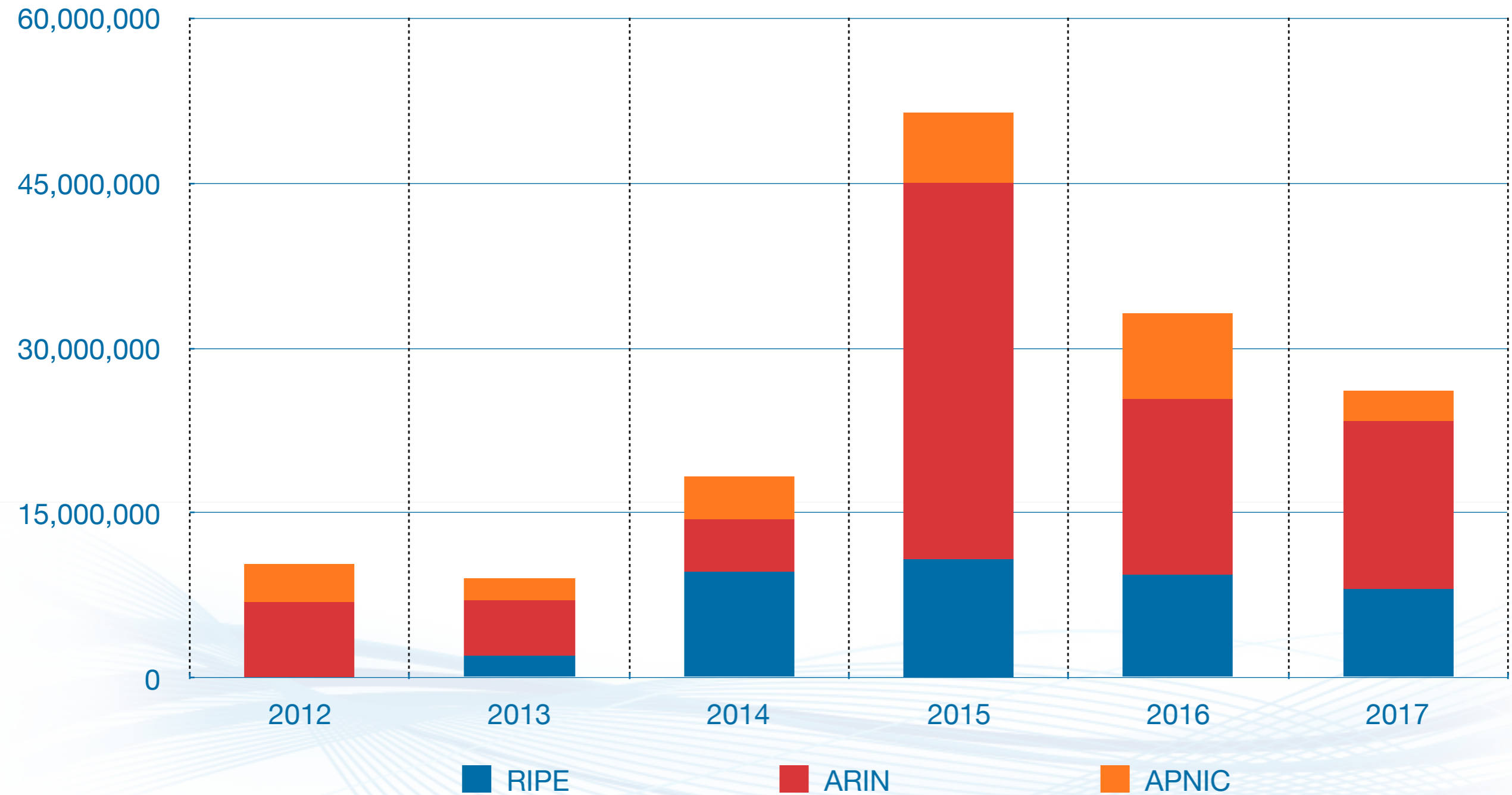
2017 calculated as 4xQ1

Regional statistics - Number of transfers

Regional statistics - Number of IPs transferred

Regional Statistics - Number of IPs

Country	IPs Transferred until Apr 2017	Total IPs as of Apr 2017	Gain
YE	65536	134144	96%
IR	3934720	12508672	46%
SA	2487296	8905728	39%
SY	244736	1126400	36%
AE	723712	3926656	23%
PS	76800	648448	14%
TR	726784	1646899	11%
CY	97536	1059136	10%
BH	45056	460800	11%
IL	51968	7645440	7%
IQ	18176	658688	3%
QA	16384	833792	2%
OM	8192	912384	1%
KW	0	1950208	0%
JO	0	672640	0%
LB	0	571904	0%
EG	0	59392	0%

Regional Statistics - Oman

- 96.9.128.0/19 transferred from APNIC to Awaser Oman

  – on the 29th of February 2016

- only 7 /22s from the last /8 received

  – 2 in 2017

- **11** LIRs in Oman, **7** have their last /22

- Largest IP blocks received from the RIPE NCC: 2x/15

  – both received in 2012, before runout, by OmanMobile
  Telecommunication company LLC

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**.

    - if we are to include the RIPE Legacy transfers which are not public, we can say that we have a great understanding of the IPv4 market and thus can make accurate predictions.

- We predict now, at Menog 17, that the total number of IPs that will be transferred in 2017 will decrease to less than 2x/8s.
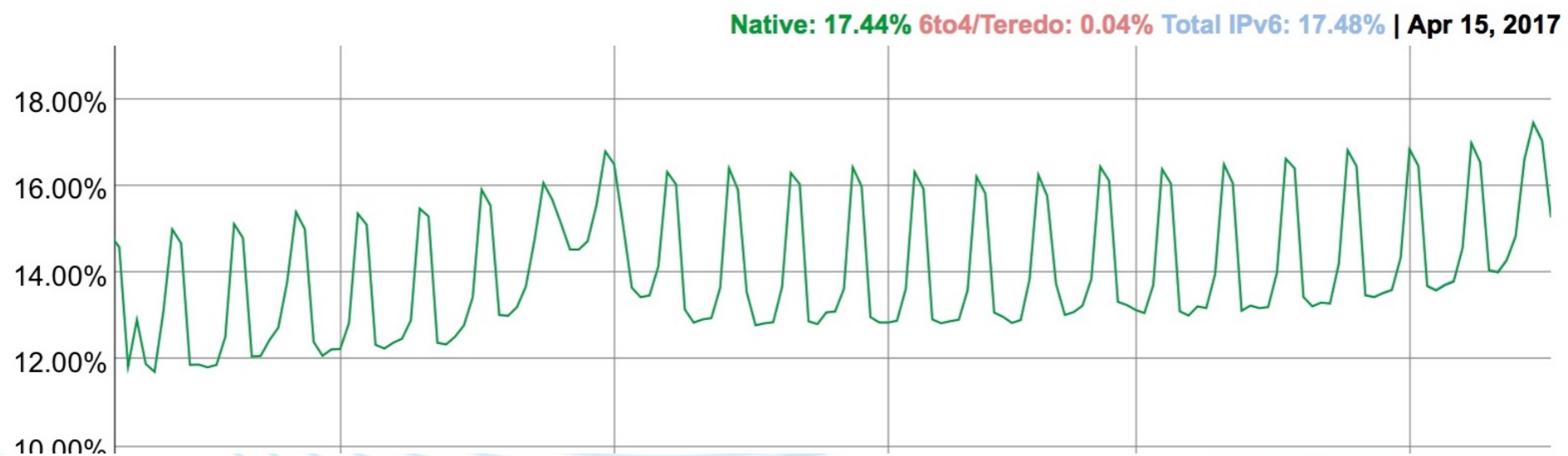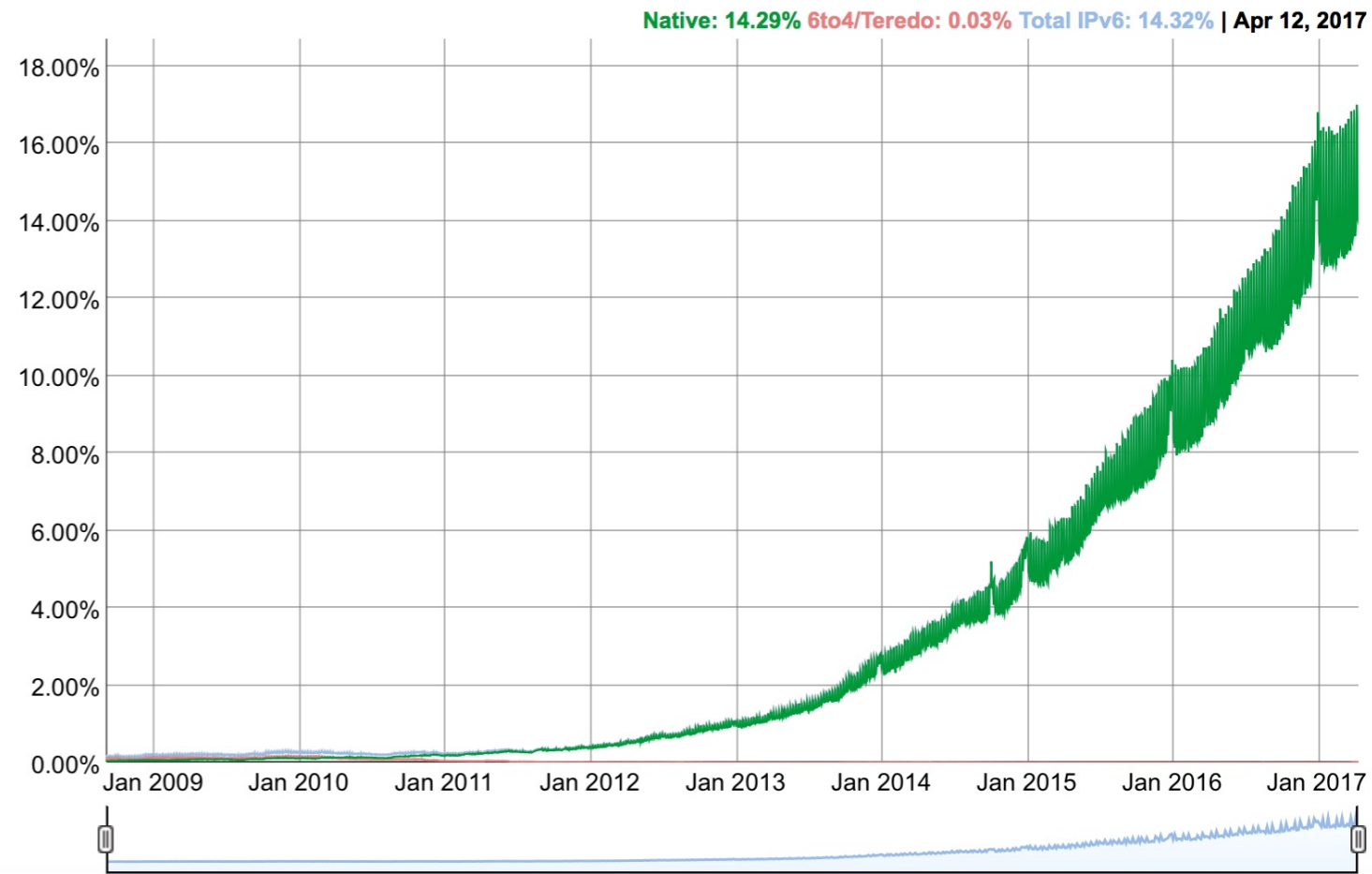
Lessons learned

- 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).

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 $15 and $20 per IP even for large blocks

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

- IPv4 Marketplace estimated to last at least until 2025
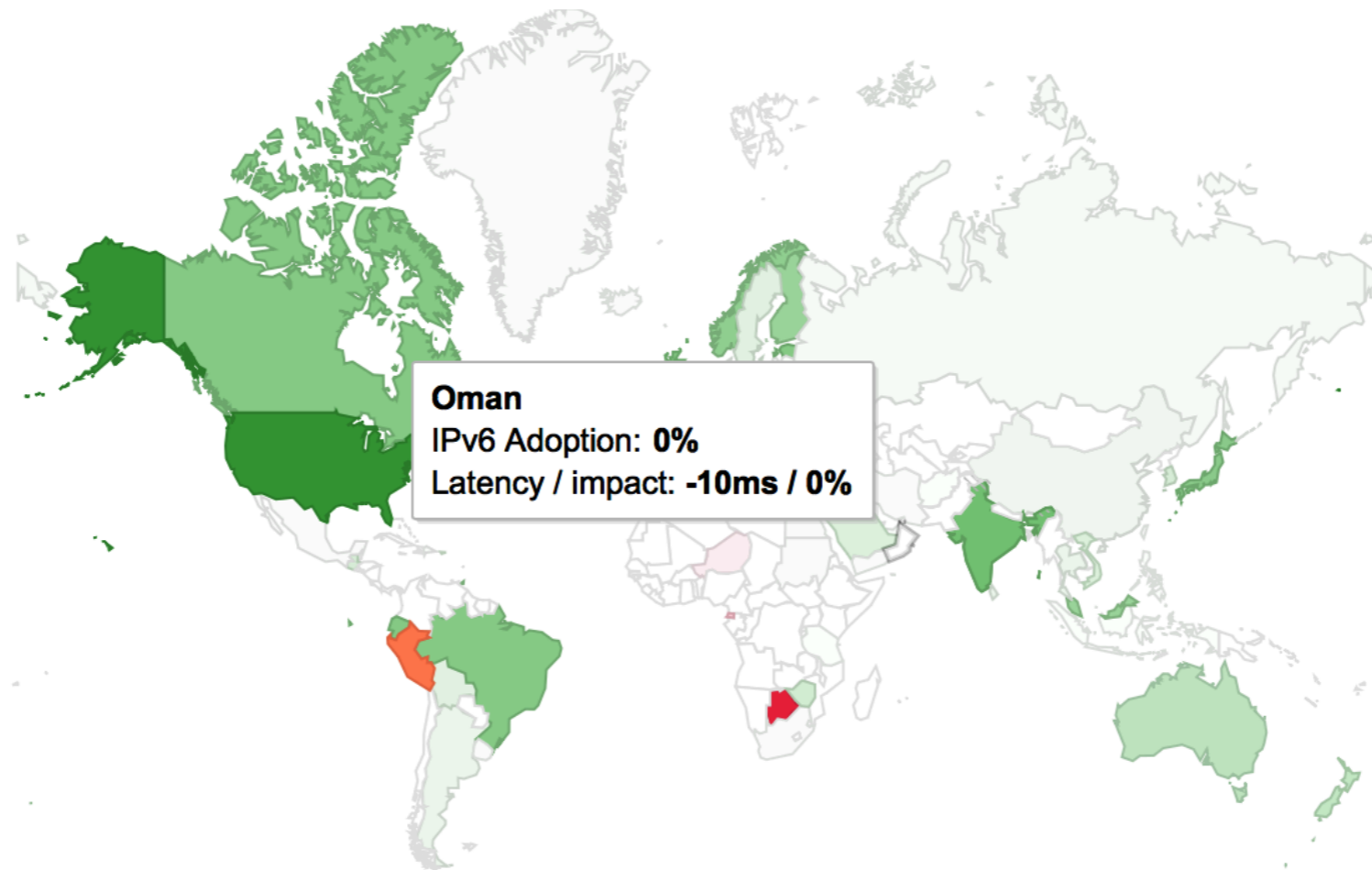
IPv6

- 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%

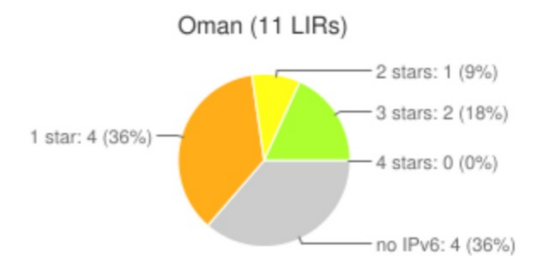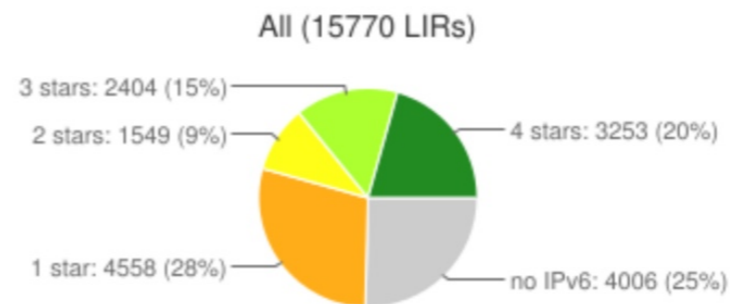   - now at 17% worldwide - slowdown of growth in 2016 and 2017

Native: 14.29% 6to4/Teredo: 0.03% Total IPv6: 14.32% | Apr 12, 2017

Native: 17.44% 6to4/Teredo: 0.04% Total IPv6: 17.48% | Apr 15, 2017

IPv6 in Oman

- IPv6 adoption in Oman

    - 0% according to Google

    - 0% with 4 * RIPEness

        - compared to 20% in RIPE

IPv6 RIPEness country pie charts (2017-04-13)

All

All (15770 LIRs)

3 stars: 2404 (15%)

2 stars: 1549 (9%)

4 stars: 3253 (20%)

1 star: 4558 (28%)

no IPv6: 4006 (25%)

Oman (11 LIRs)

2 stars: 1 (9%)

3 stars: 2 (18%)

1 star: 4 (36%)

4 stars: 0 (0%)

no IPv6: 4 (36%)

Per-Country IPv6 adoption

Oman
IPv6 Adoption: **0%**
Latency / impact: **-10ms / 0%**

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

Questions ?

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