



RIPE NCC

RIPE NETWORK COORDINATION CENTRE

The IPv4 Transfer Market

...and What It Means For the Internet

Some #FAKENEWS (or not-so-fake)



NEWS

Running out of Internet addresses: What IPv4 exhaustion means for you

ARIN's announcement that it has run out of IPv4 addresses has hastened the long-awaited move to IPv6. Here's what you need to know about the changeover.

DYLAN TWENEY BUSINESS 02.03.11 09:58 AM

NO EASY FIXES AS INTERNET RUNS OUT OF ADDRESSES

6 years on, IPv4 still dominates IPv6

It's been six years since the official launch of IPv6 on "World IPv6" day in 2012, but the newest version of the Internet Protocol still doesn't account for the majority of online traffic, according to the Internet Society.

OK, this time it's for real: The last available IPv4 address block has gone

Now for the last time, will you all please shift to IPv6?!

By Kieren McCarthy in San Francisco 18 Apr 2018 at 22:10 211 SHARE ▼

Crashed RadioShack flogs off its IPv4 stash

Old-skool addresses worth about \$400,000 at

20:04 46 SHARE ▼

Microsoft pays Nortel \$7.5 million for IPv4 addresses

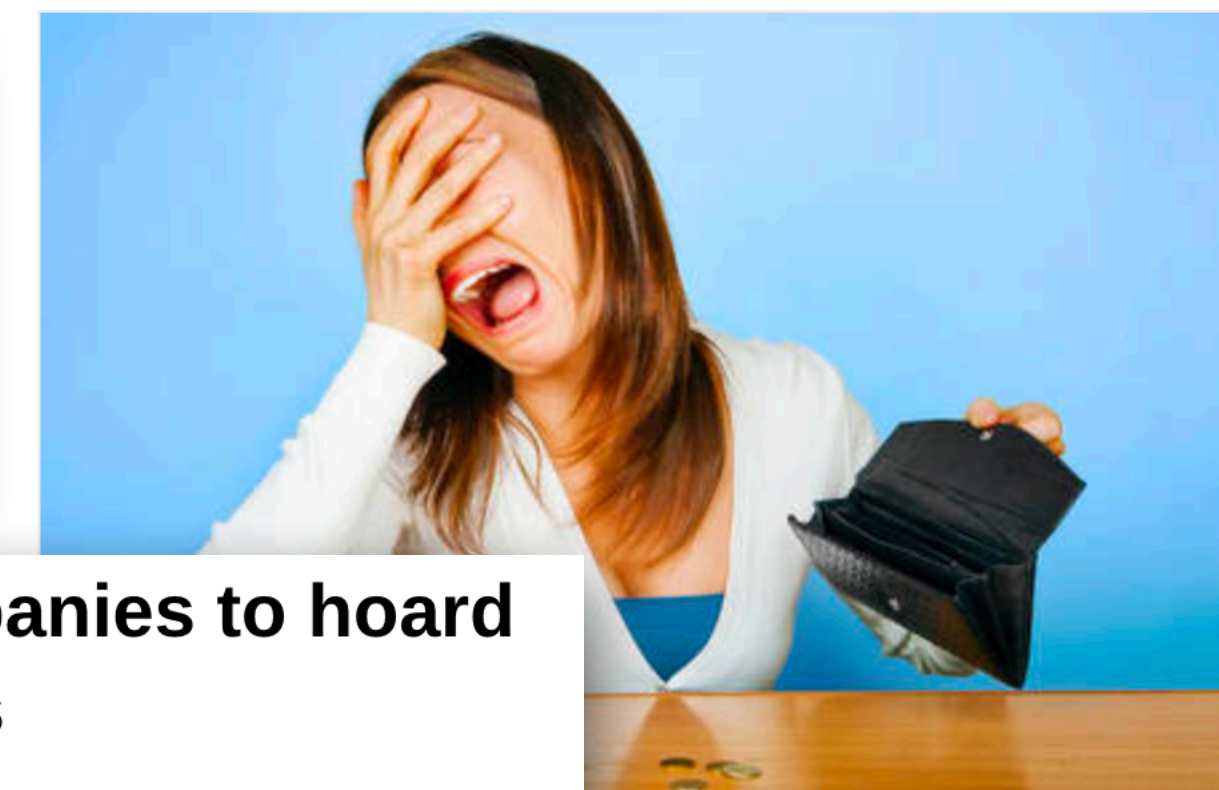
Bankrupt Nortel finds a buyer for 666K of its legacy IPv4 addresses, raising questions about the IPv4 black/grey market has arrived.

Crims set up fake companies to hoard and sell IPv4 addresses

Dot-com pirates play dirty while trading elderly digits

By Simon Sharwood 16 Jun 2016 at 10:59

57 SHARE ▼



What is an IP Address Transfer?

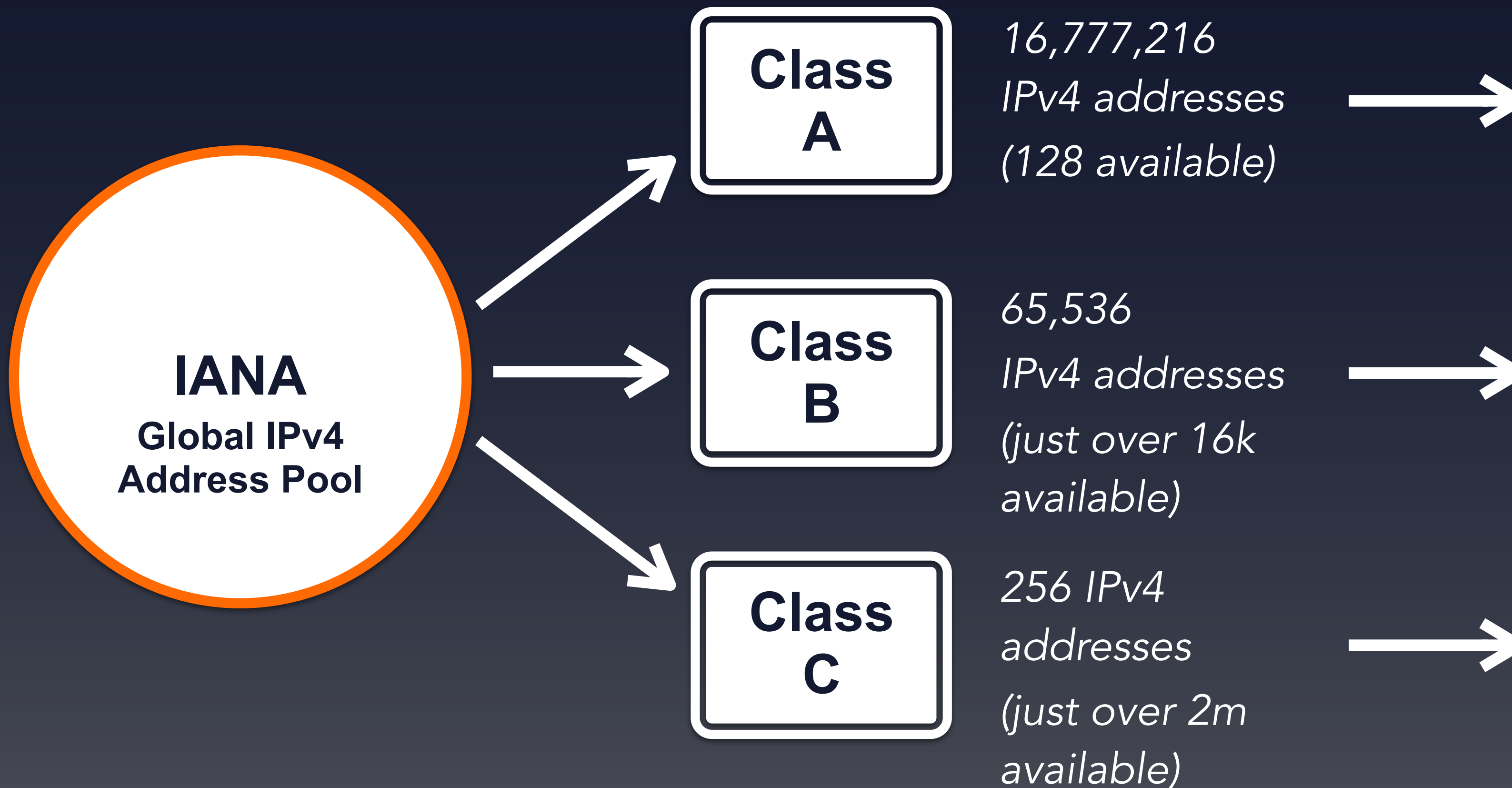


- The registration of a block of IP addresses in an RIR registry changes from one resource holder to another
 - Possibly in another RIR registry
- A financial transaction between the resource holders may accompany the change in registration
 - The RIRs have no role in the financial side of transfers



A Bit of Background

In the Beginning...



Blocks distributed to various government, academic and commercial entities, such as:

- US DoD
- MIT
- Stanford University
- British Post Office
- AT&T
- Apple
- Ford

The Regional Internet Registries



Internet address space is distributed according to the following three goals:

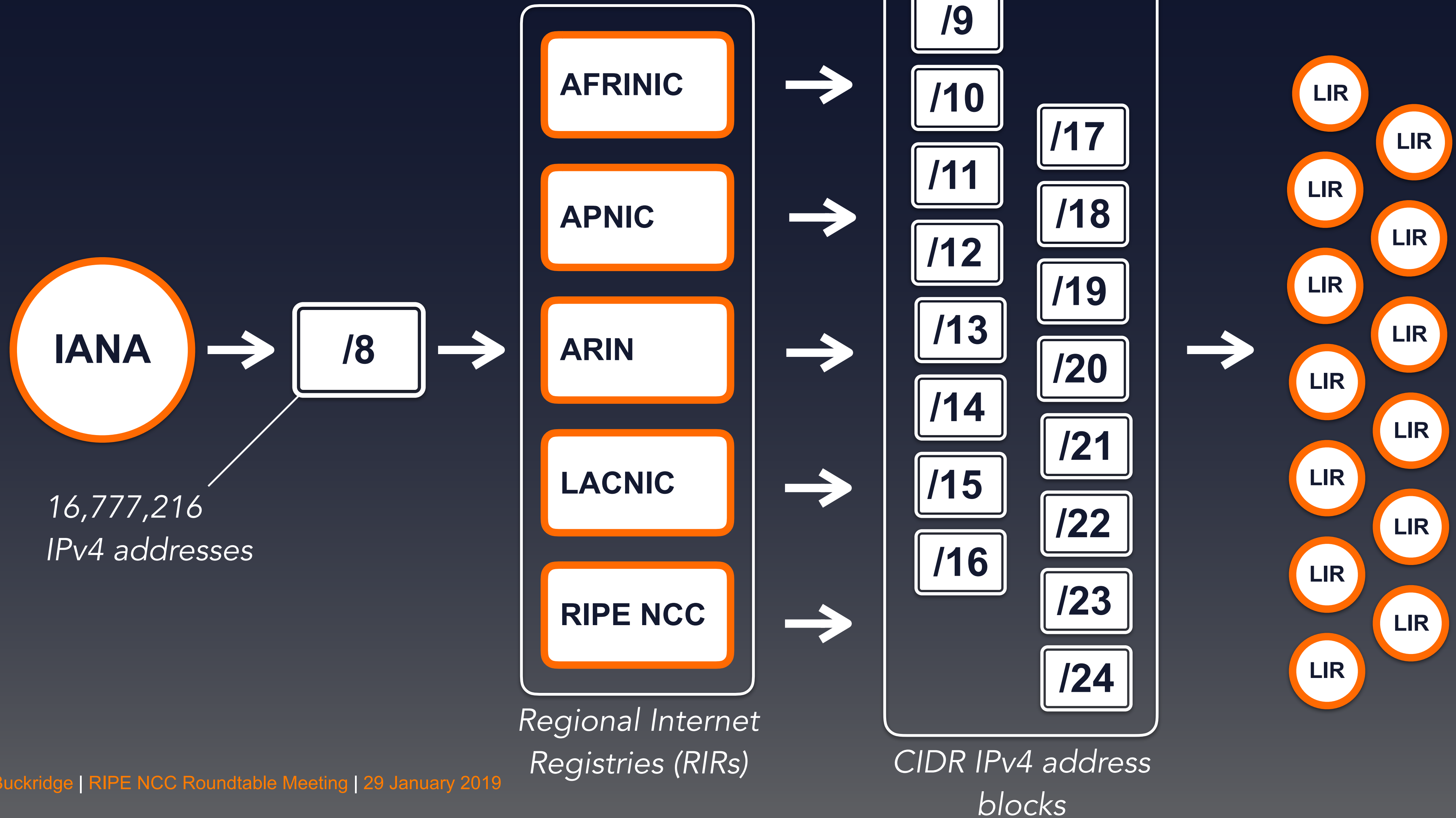
1) Conservation: Fair distribution of globally unique Internet address space according to the operational needs of the end-users and Internet Service Providers operating networks using this address space. Prevention of stockpiling in order to maximize the lifetime of the Internet address space.

2) Routability: Distribution of globally unique Internet addresses in a hierarchical manner, permitting the routing scalability of the addresses. This scalability is necessary to ensure proper operation of Internet routing, although it must be stressed that routability is in no way guaranteed with the allocation or assignment of IPv4 addresses.

3) Registration: Provision of a public registry documenting address space allocation and assignment. This is necessary to ensure uniqueness and to provide information for Internet trouble shooting at all levels.

- RFC 2050

CIDR and the RIRs



CIDR and the RIRs



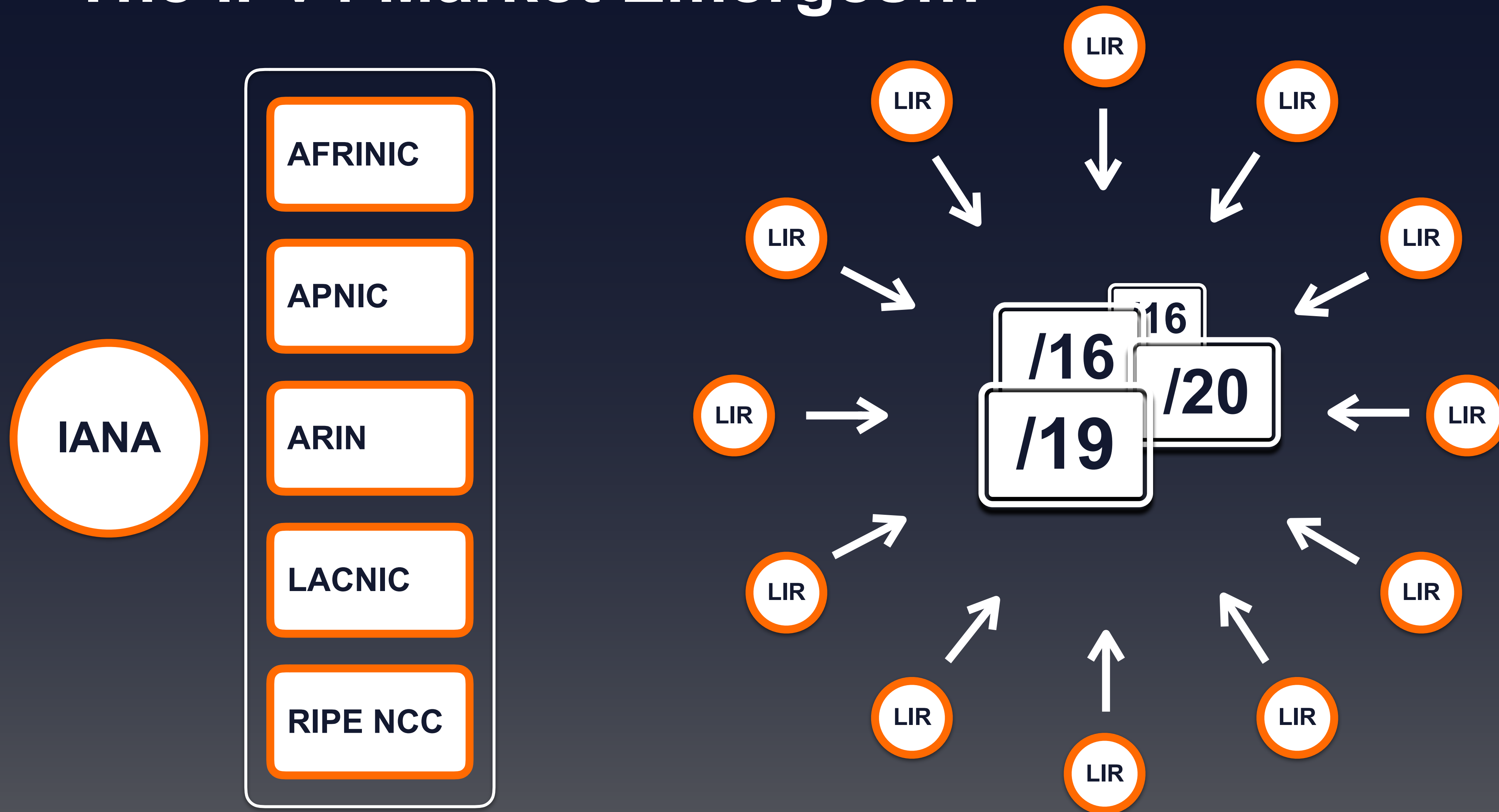
Regional Internet Registries (RIRs)



CIDR IPv4 address blocks



The IPv4 Market Emerges...



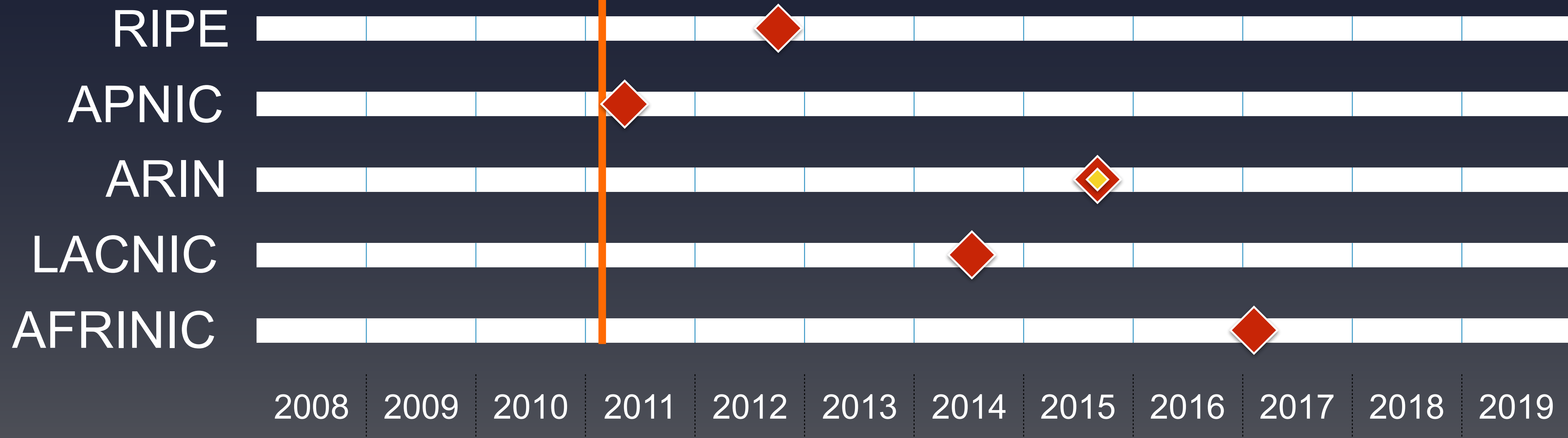
IPv4 Timeline



◆ IPv4 exhausted (soft-landing)

◆ No soft-landing!

3 Feb 2011
IANA distributes last /8
blocks of IPv4 to the
five RIRs

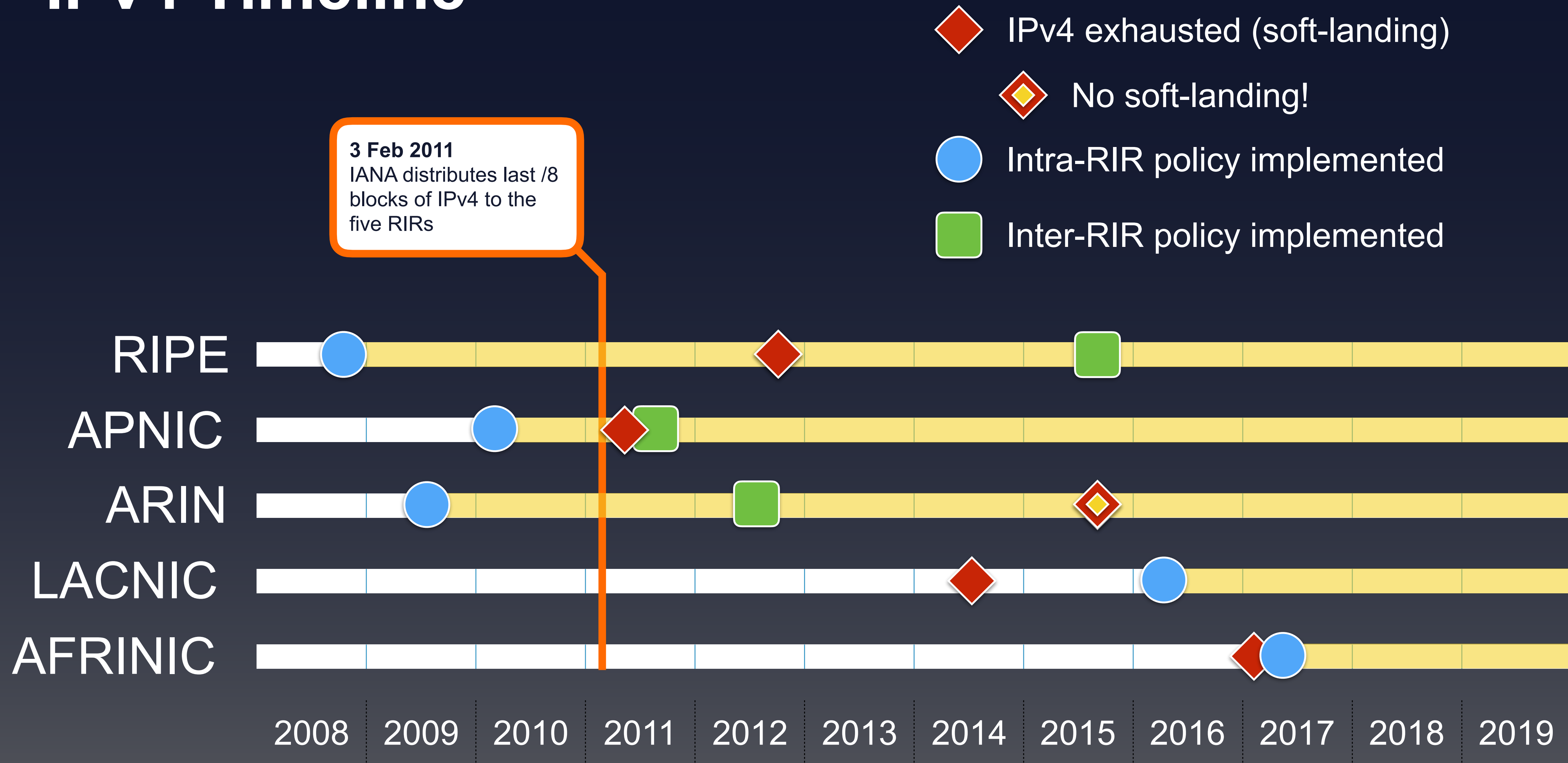


RIPE Community Policy Response



- Trading in IPv4 addresses seen as inevitable
- Priority for the community is an accurate registry of who holds what address space
- First RIPE transfer policy proposal (intra-RIR) introduced in 2007
 - Consolidated RIPE transfer policy implemented in 2017
- Transfers between RIR regions proved more contentious

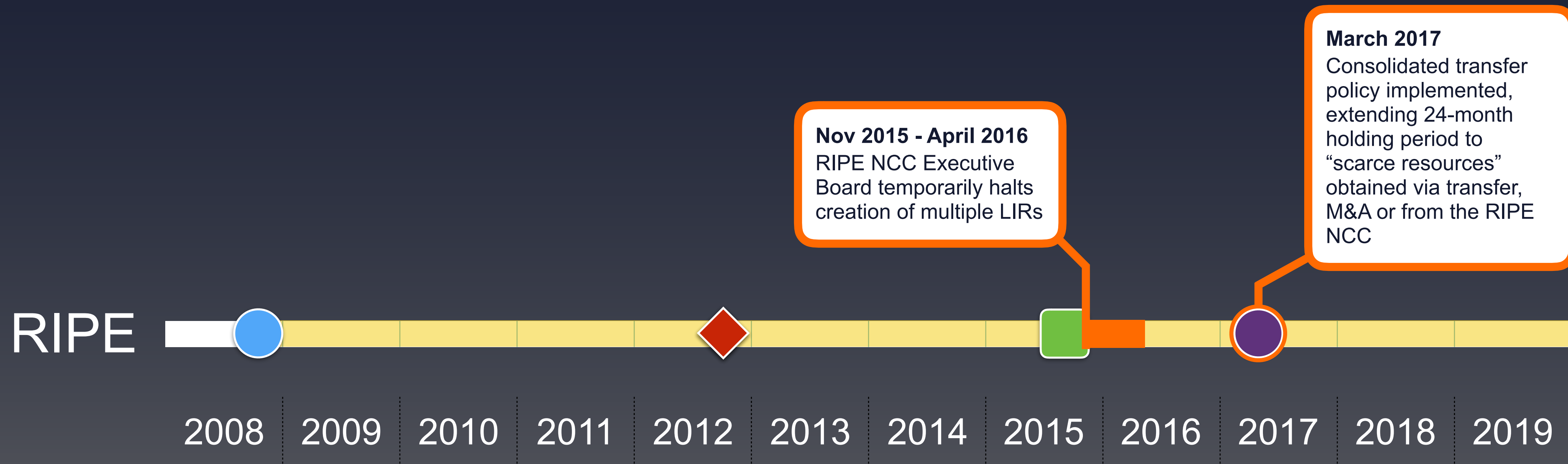
IPv4 Timeline



RIPE [NCC] IPv4 Timeline



- ◆ IPv4 exhausted (soft-landing)
- Intra-RIR policy implemented
- Inter-RIR policy implemented





IPv4 Transfers: Current Status

How Much For an IPv4 Address?



REMINDER: The RIPE NCC has no role in the financial side of transfers

...but we do listen to our community!

How Much For an IPv4 Address?



IPv4Auctions.com @IPv4Auctions · 6 Dec 2018
 IPv4 Auction Sales Report November 2018: A decrease in the volume of #IPv4addresses sold, however, price per address on sold blocks increased across the board. #ipv4pricing #IPv4 #ipaddresses

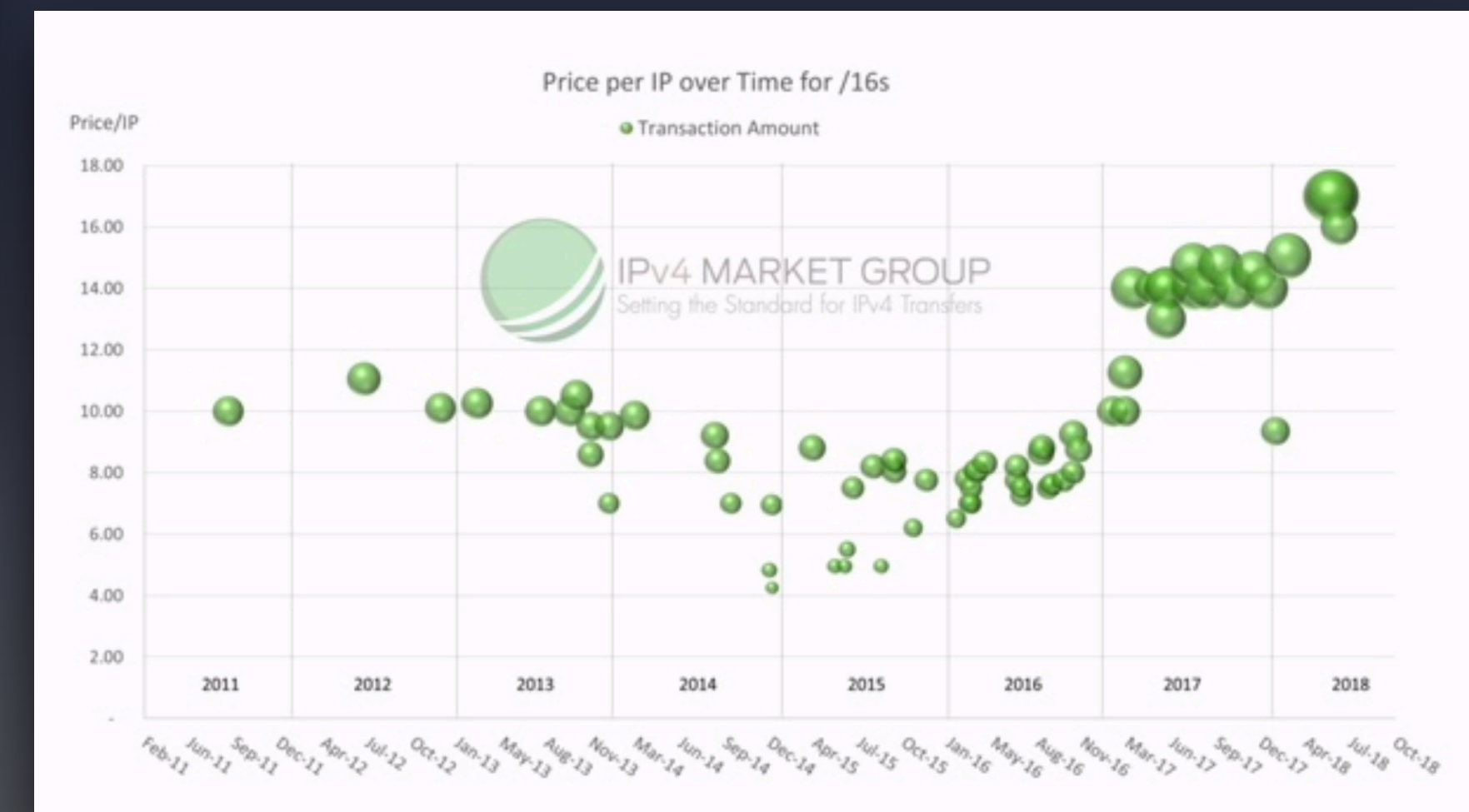
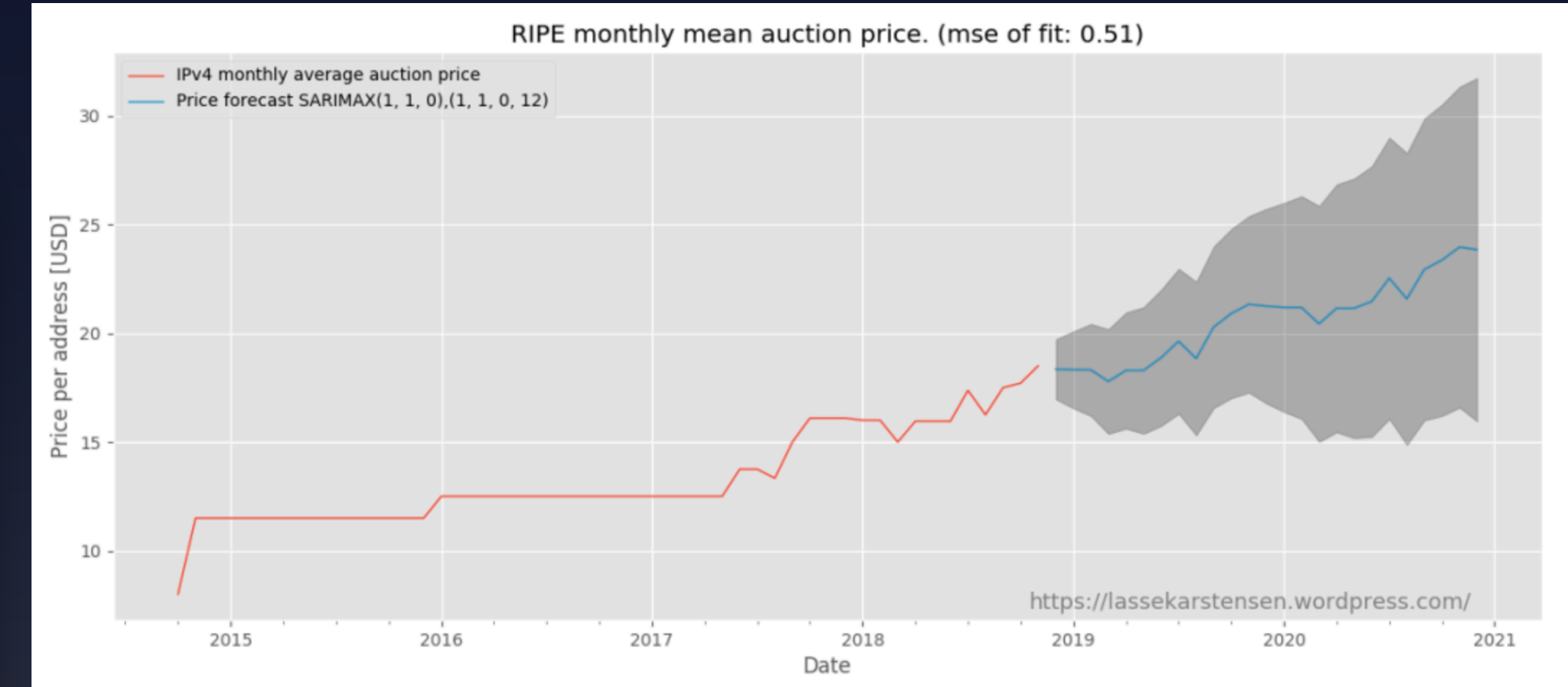
BLOCK SIZE	AVG \$/IP	LOW	HIGH	1 MONTH TREND	3 MONTH TREND
/18	\$18.50	\$18.50	\$18.50	2.78% ▲	0.91% ▲
/19	\$18.88	\$18.50	\$19.02	0.00%	1.71% ▲
/20	\$19.00	\$19.00	\$19.00	3.20% ▲	5.36% ▲
/21	\$18.44	\$17.62	\$20.00	0.00%	2.84% ▲
/22	\$18.50	\$18.00	\$18.00	2.04% ▲	4.88% ▲
/23	\$19.17	\$18.50	\$20.20	1.97% ▲	4.30% ▲
/24	\$20.62	\$19.00	\$22.00	8.99% ▲	12.04% ▲

November 2018 IPv4 Auction Sales Report - IPv4.Global
 ipv4.global

RECENTLY CLOSED AUCTIONS

Select Year: 2018

BLOCK	REGION	SOLD DATE	PRICE	PRICE PER ADDRESS
/24	ARIN	2018-12-26	\$5,120.00	\$20.00
/19	ARIN	2018-12-20	\$155,648.00	\$19.00
/23	ARIN	2018-12-19	\$10,240.00	\$20.00
/21	ARIN	2018-12-18	\$40,960.00	\$20.00
/22	ARIN	2018-12-18	\$18,944.00	\$18.50
/23	ARIN	2018-12-17	\$10,240.00	\$20.00
/20	ARIN	2018-12-17	\$81,920.00	\$20.00
/24	ARIN	2018-12-14	\$5,376.00	\$21.00
/18	ARIN	2018-12-13	\$365,500.00	\$22.31
/22	ARIN	2018-12-13	\$20,306.00	\$19.83
/24	ARIN	2018-12-13	\$5,632.00	\$22.00
/23	ARIN	2018-12-12	\$10,240.00	\$20.00
/20	ARIN	2018-12-11	\$83,074.00	\$20.28
/21	ARIN	2018-12-11	\$40,960.00	\$20.00
/22	APNIC	2018-12-11	\$18,944.00	\$18.50
/23	ARIN	2018-12-10	\$10,028.00	\$19.59
/23	ARIN	2018-12-07	\$10,752.00	\$21.00
/24	ARIN	2018-12-07	\$5,120.00	\$20.00
/21	ARIN	2018-12-06	\$40,960.00	\$20.00
/22	ARIN	2018-12-04	\$20,480.00	\$20.00
/20	ARIN	2018-12-04	\$86,016.00	\$21.00
/24	ARIN	2018-12-03	\$5,376.00	\$21.00

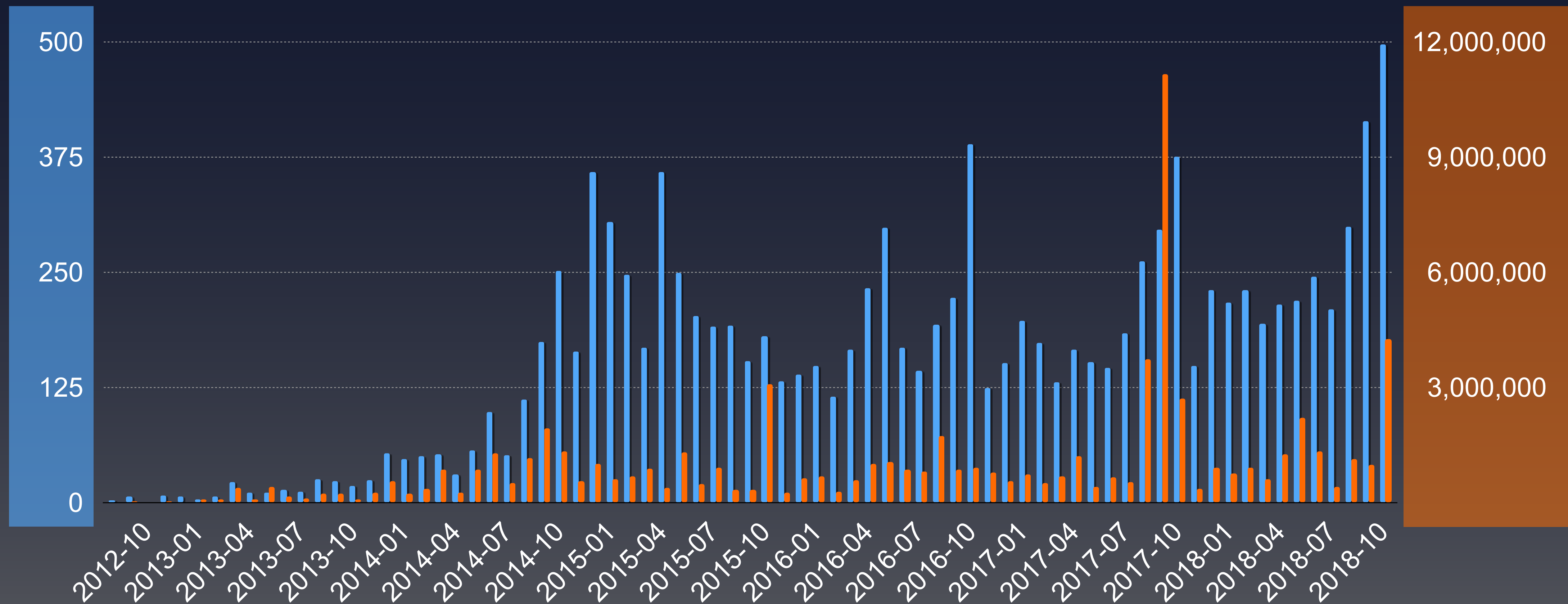


“...we’ve seen and done deals for /16s of \$14-\$20 per IP – that’s 1-1.3 million.”

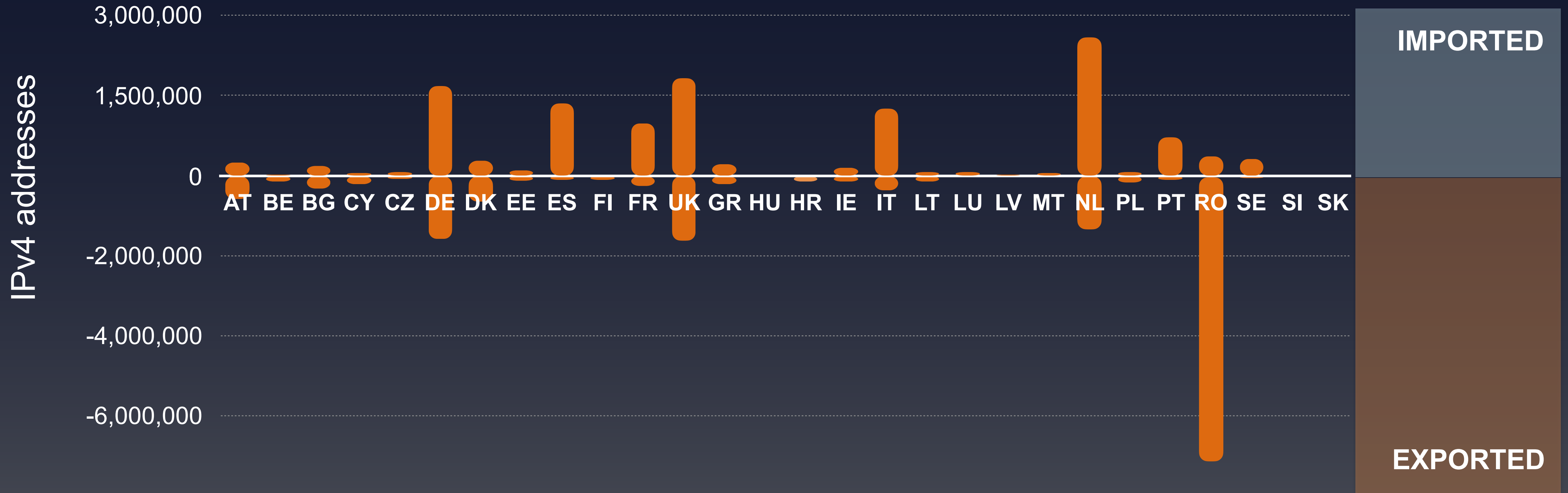
Transfer Activity in the RIPE NCC Service Region



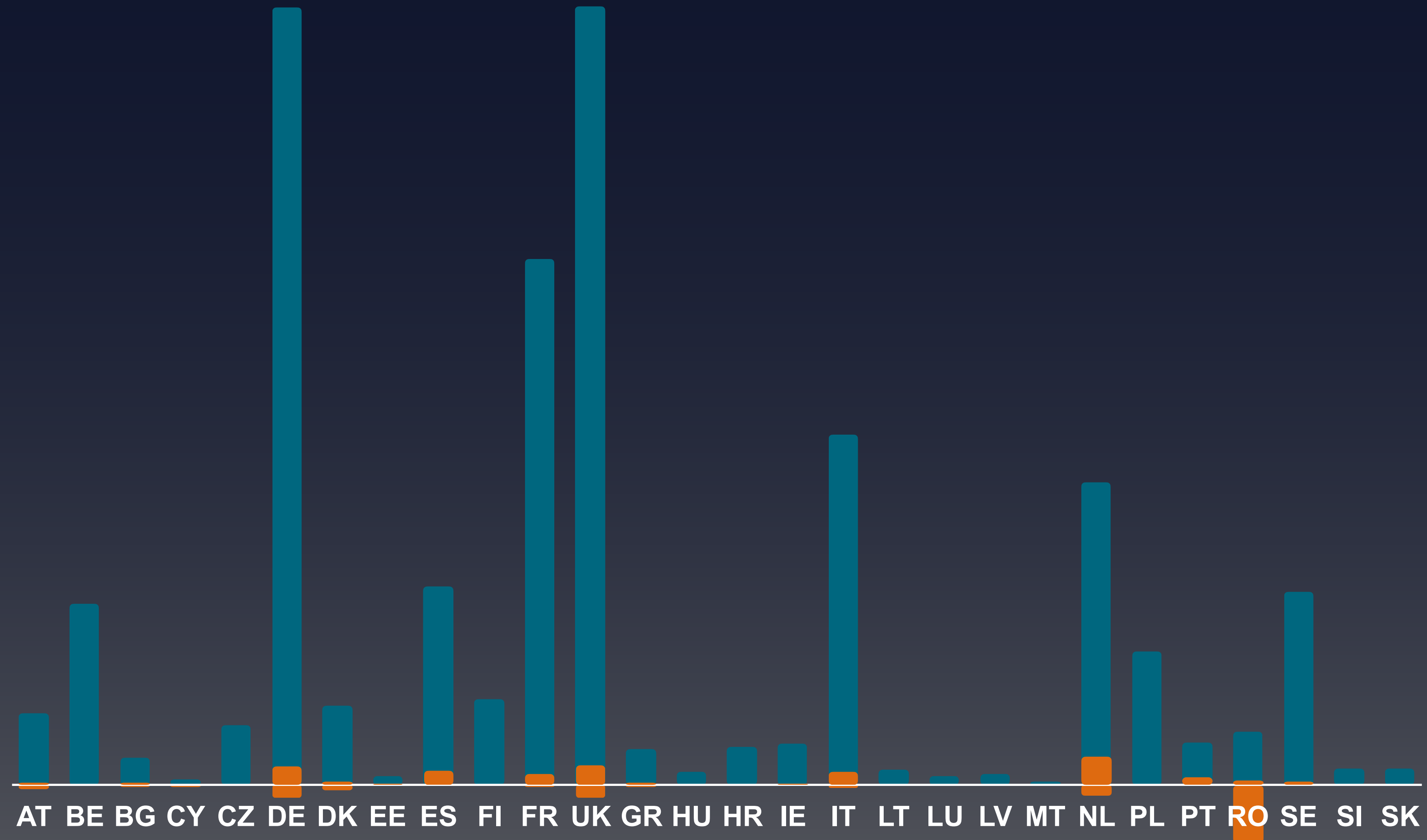
Number of IPv4 addresses Number of transfers



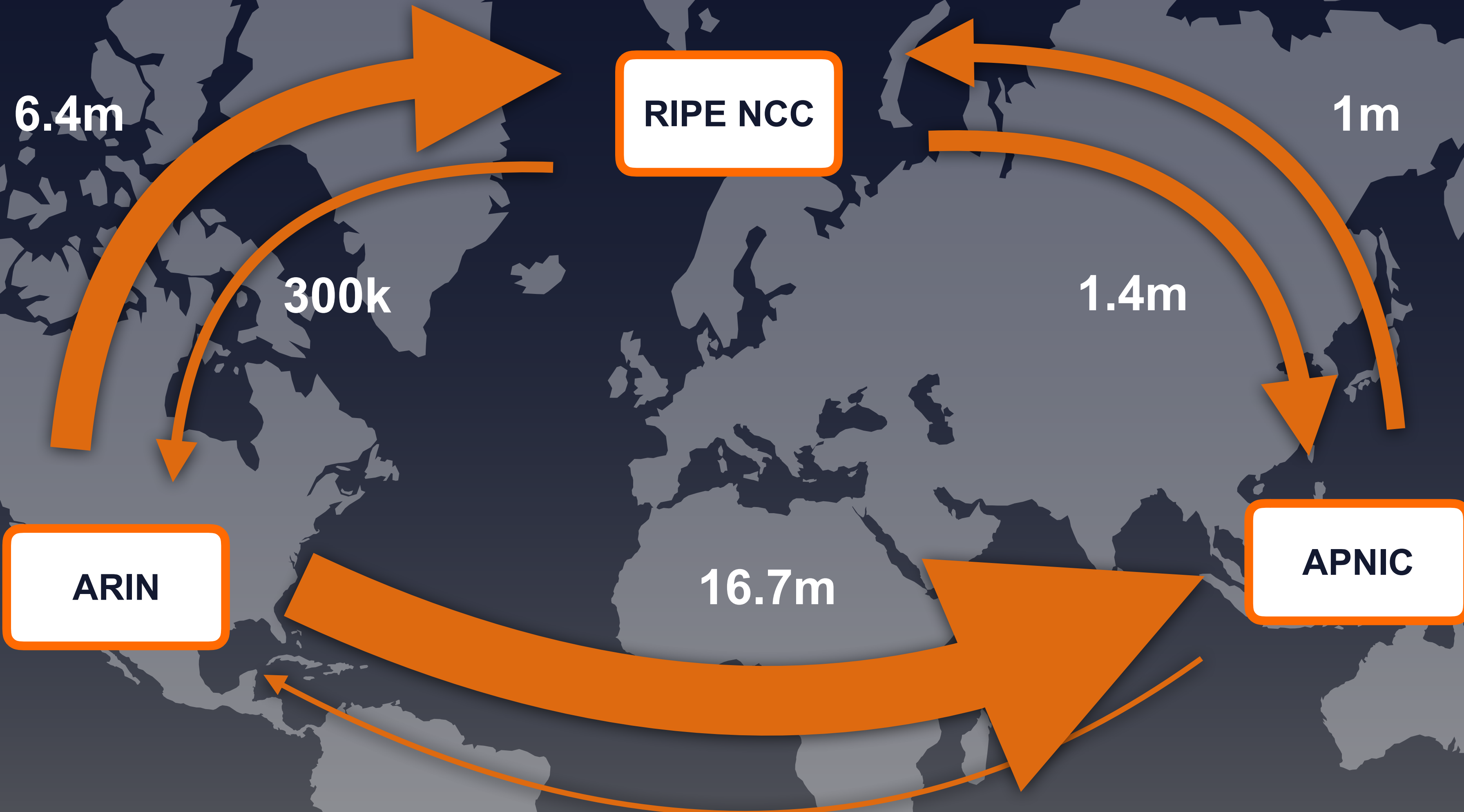
Imports/Exports in the EU



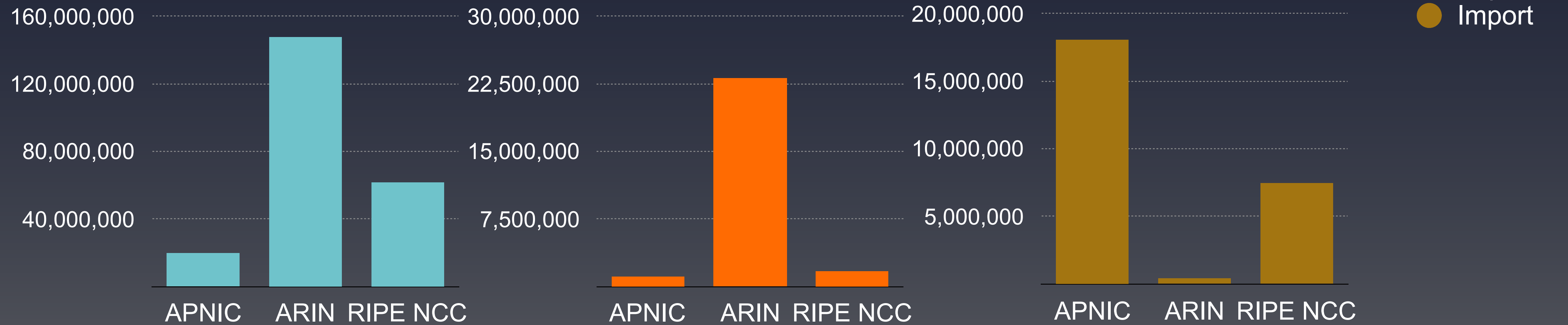
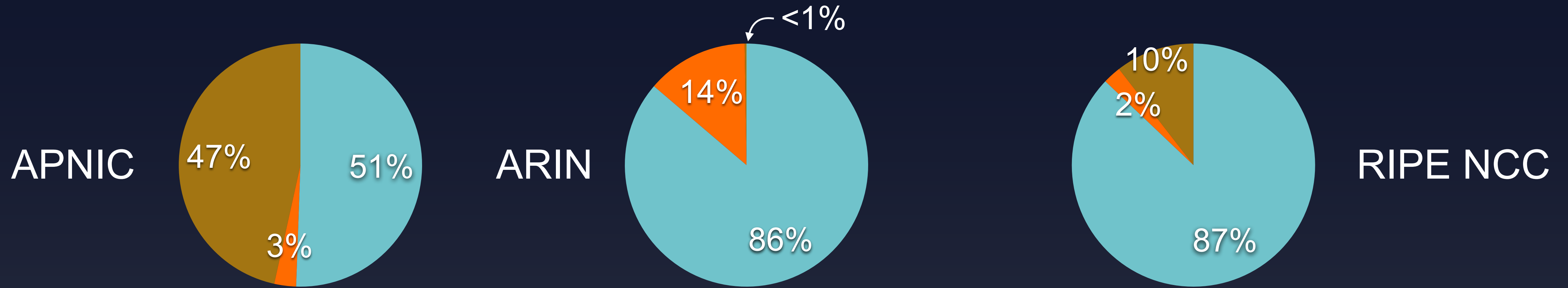
EU Imports/Exports vs Total IPv4 Holdings



Inter-RIR Transfer Flows



Transfers Across Different RIRs





What Does It All Mean?

A New Paradigm for IP Addresses



**Plentiful, available
as needed**



A scarce resource

**No inherent
monetary value**



**Seen as a commodity
to be bought or sold**

**Hierarchical
distribution**



**More complex
movement between
all parties**

What Does It Mean For the Internet?



- Extending the lifespan of IPv4 as a technology
- Possibly slowing or delaying IPv6 adoption
- Possibly causing complexity of the routing table
 - [though at the RIPE NCC we haven't seen evidence of this to date]
- Encouraging hoarding or speculative behaviour in relation to IP addresses

What Does It Mean For The RIPE NCC?



- Transfer market reinforces importance of the registry
- Changes the dynamic between the RIPE NCC and its members
- Requires the RIPE NCC to provide new services, processes
- New drivers and incentives: speculators, hoarders
- Greater incentive to abuse the system
 - Requiring greater efforts on the RIPE NCC's part to prevent fraud and abuse

RIPE NCC Transfer-Related Services



- RIPE NCC IPv4 Transfer Listing Service
 - Facilitates communication between those wanting to obtain resources and those looking to sell, increasing transparency
 - Only accessible to RIPE NCC members (via the LIR Portal)
- List of “recognised” brokers on our website
 - Brokers who have signed an agreement to follow RIPE Policies and RIPE NCC procedures
 - <https://www.ripe.net/brokers>

Protecting IP Registrations



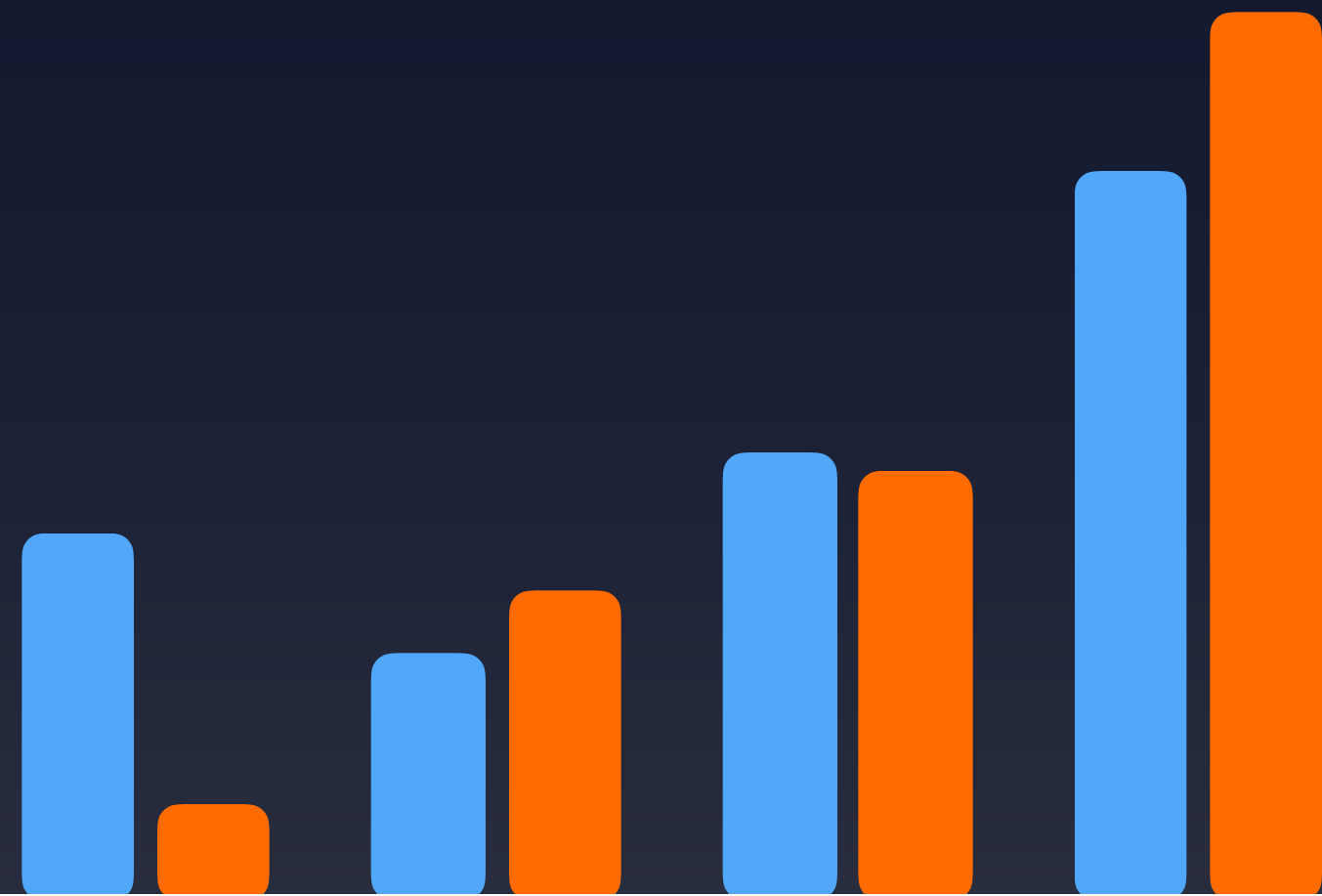
- Criminals use very sophisticated methods to obtain control over (seemingly) unused address blocks
 - Faking registration and identity papers
 - Faking entire websites and domains
- Hijackers often target resources with long-standing contact details!

Increase in Disputes Over IP Addresses

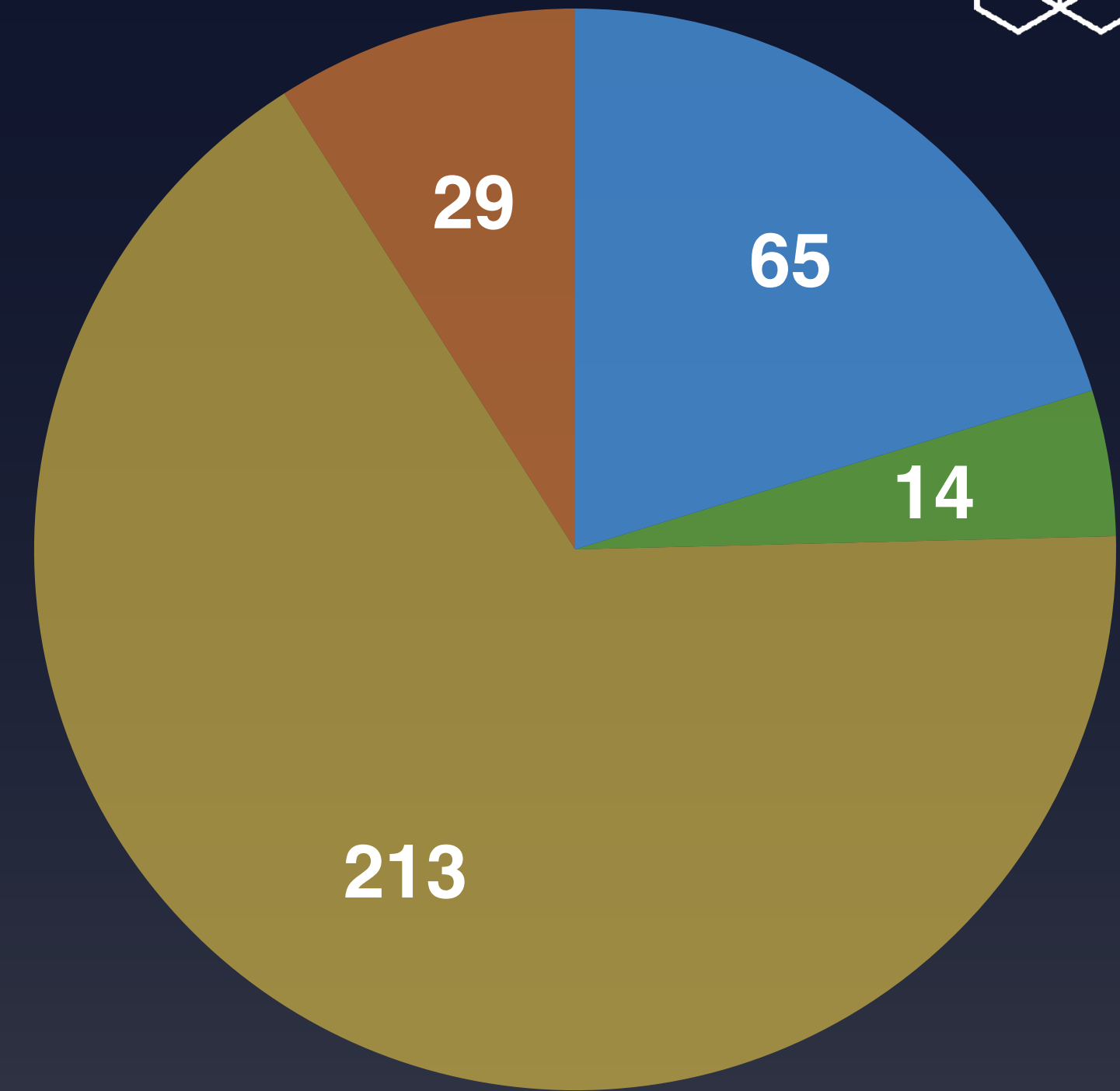


- Disputed transfers
 - Outdated contact information
 - “LIR contact was no longer working at the company”
- Hijacked, disputed LIR accounts
 - LIR contacts removing other contacts from the LIR Portal
 - LIR accounts opened on behalf of unaware organisations
- We see an increase in efforts to “hijack” legacy space!

Actions Taken By The RIPE NCC



Year	2015	2016	2017	2018
Concluded	95	64	116	188
New	25	80	111	229



Since 2014

- Due-diligence reminder*
- Final warnings**
- LIR closures (SSA termination) (203 in 2018)
- Disputed transfers

* Due diligence reminder for more minor infringements

** Final warnings for major policy and contractual violations

What Does It Mean For The RIPE Community?



- New policy concerns, new policy strategies
 - Renewed focus on accuracy of the registry
- New kinds of actors in the RIPE Policy Development Process, and in the RIPE community generally
 - Brokers, those with an interest in buying or selling

What Does It Mean For Regulators?



- Is this a case for regulation? Likely not.
 - ...and we don't hear demand from market participants
- Be aware of developments, as this is evolving quickly
- Be ready to participate in the RIR policy development processes
- And, of course... focus on IPv6 adoption!



Questions



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