

Addressing 2020

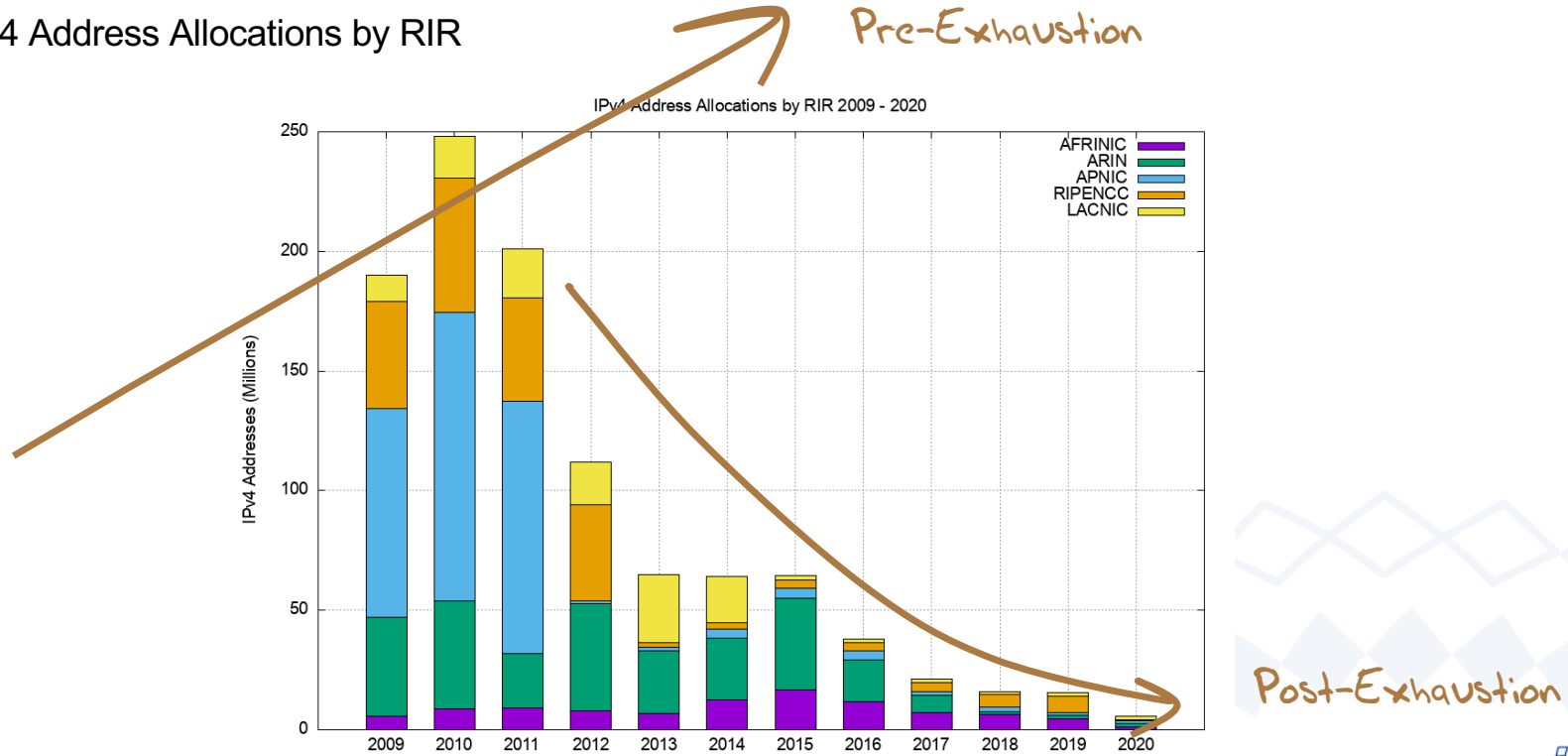


Geoff Huston
APNIC Labs

IPv4

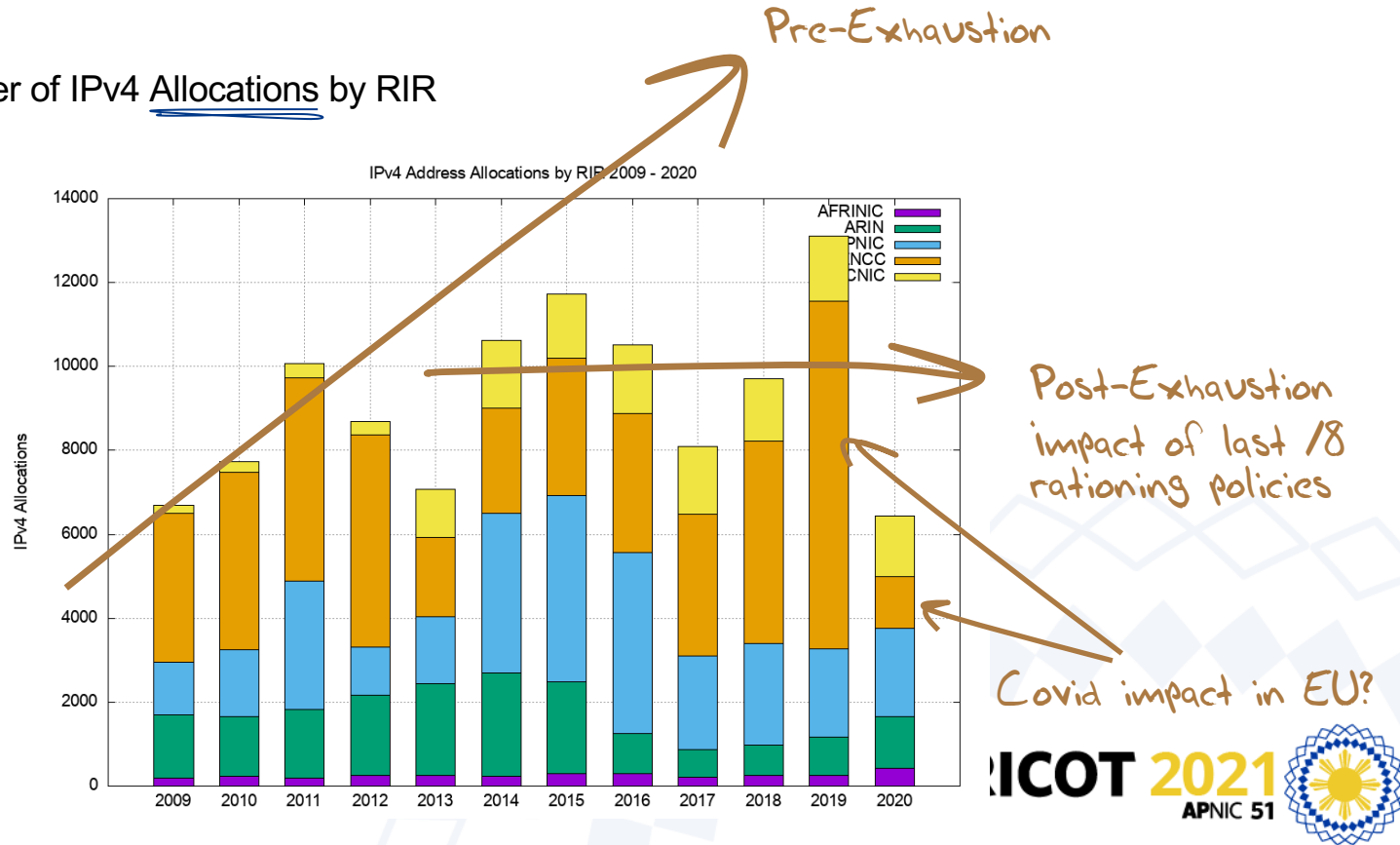
IPv4 - Over the Exhaustion Cliff

IPv4 Address Allocations by RIR



IPv4 - Over the Exhaustion Cliff

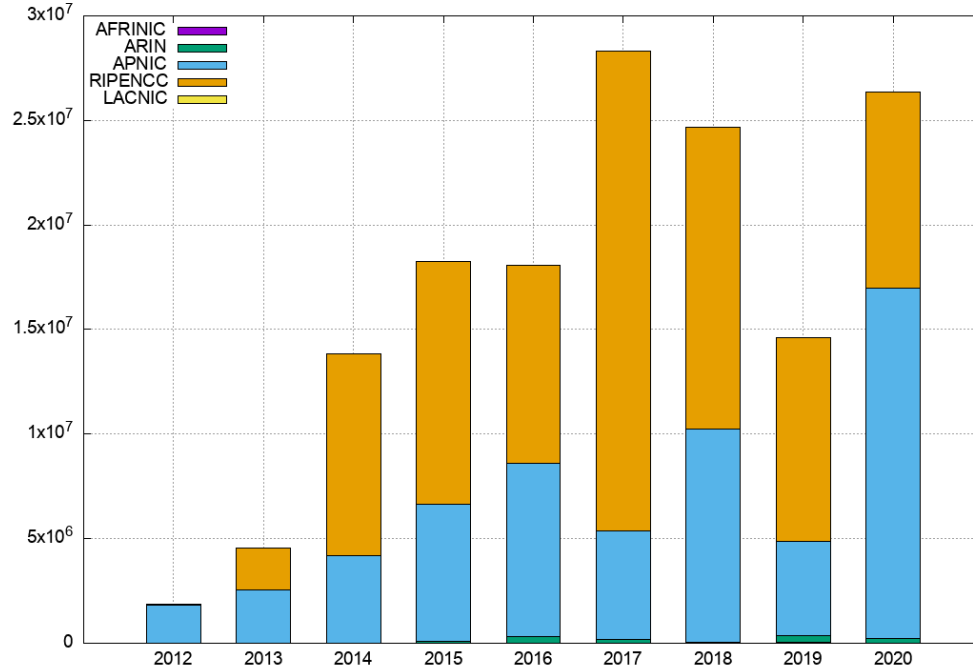
Number of IPv4 Allocations by RIR



IPv4 Transfers

Volume of Recorded Transfers

IPv4 Transfers, 2012 - 2020



Number of Recorded Transfers

RIR	2012	2013	2014	2015	2016	2017	2018	2019	2020
APNIC	167	194	350	464	867	889	500	565	815
RIPE NCC	10	171	1,054	2,836	2,412	2,368	3,190	3,456	4,183
ARIN				4	22	28	27	76	99
LACNIC							2		3
AFRINIC							7	7	3
Total	177	365	1,404	3,304	3,301	3,285	3,726	4,104	5,103



Imports and Exports - 2015 - 2020

Exports

Rank	From	Addr (M)
1	USA	19.0
2	Australia	13.5
3	Canada	3.6
4	Romania	3.2
5	UK	2.9
6	Singapore	2.7
7	Russia	2.2
8	Netherlands	2.1
9	China	1.7
10	Ukraine	1.3
11	Hong Kong	1.2
12	India	1.1
13	Germany	1.1
14	European Union	1.1
15	Denmark	0.7
16	France	0.6
17	Italy	0.5
18	Austria	0.5
19	Iran	0.5
20	Bulgaria	0.5



Imports

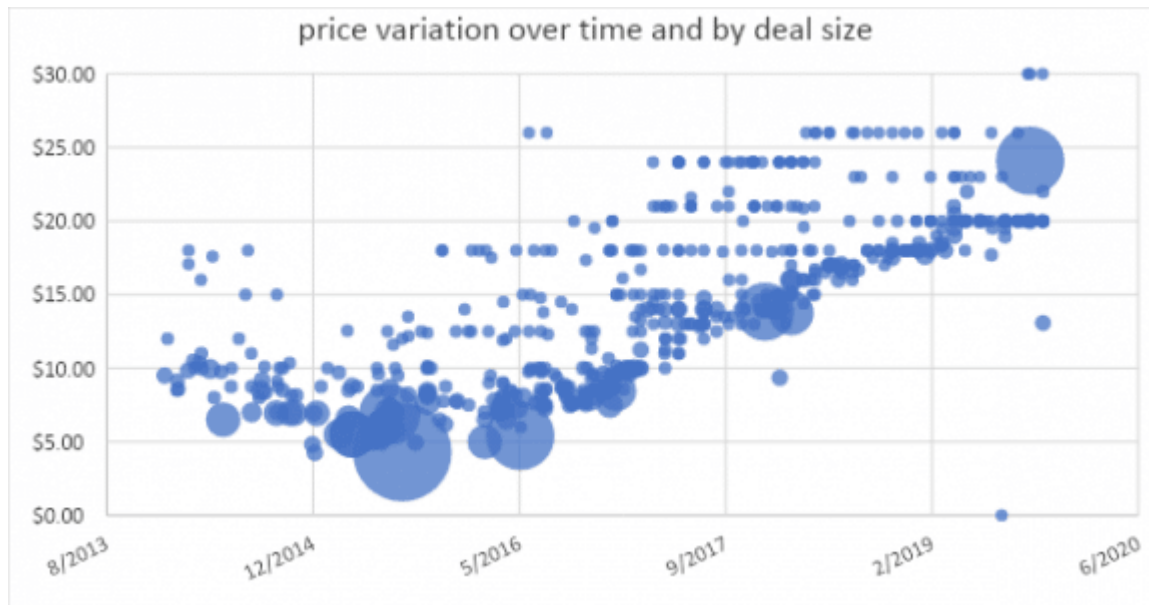
Rank	To	Addr (M)
1	Singapore	14.8
2	China	6.1
3	Hong Kong	6.1
4	India	5.6
5	UK	3.1
6	Japan	3.0
7	Saudi Arabia	2.9
8	Germany	2.8
9	USA	2.1
10	Spain	1.9
11	Iran	1.9
12	Netherlands	1.5
13	France	1.4
14	Italy	1.2
15	Australia	0.6
16	Russia	0.5
17	Kazakhstan	0.5
18	Ireland	0.4
19	Switzerland	0.4
20	Poland	0.4

Bilateral Trade

Rank	From	To	Addresses (M)
1	Australia	Singapore	8.6
2	USA	Singapore	5.6
3	Australia	Hong Kong	4.3
4	Canada	China	2.5
5	USA	India	2.5
6	Singapore	India	2.4
7	USA	Japan	1.7
8	USA	China	1.4
9	USA	UK	1.4
10	China	Hong Kong	1.2
11	USA	Saudi Arabia	1.1
12	Hong Kong	China	0.9
13	USA	Germany	0.8
14	European Union	UK	0.8
15	Netherlands	China	0.6
16	Romania	Saudi Arabia	0.6
17	India	Italy	0.5
18	USA	France	0.5
19	Canada	India	0.5
20	UK	Saudi Arabia	0.5



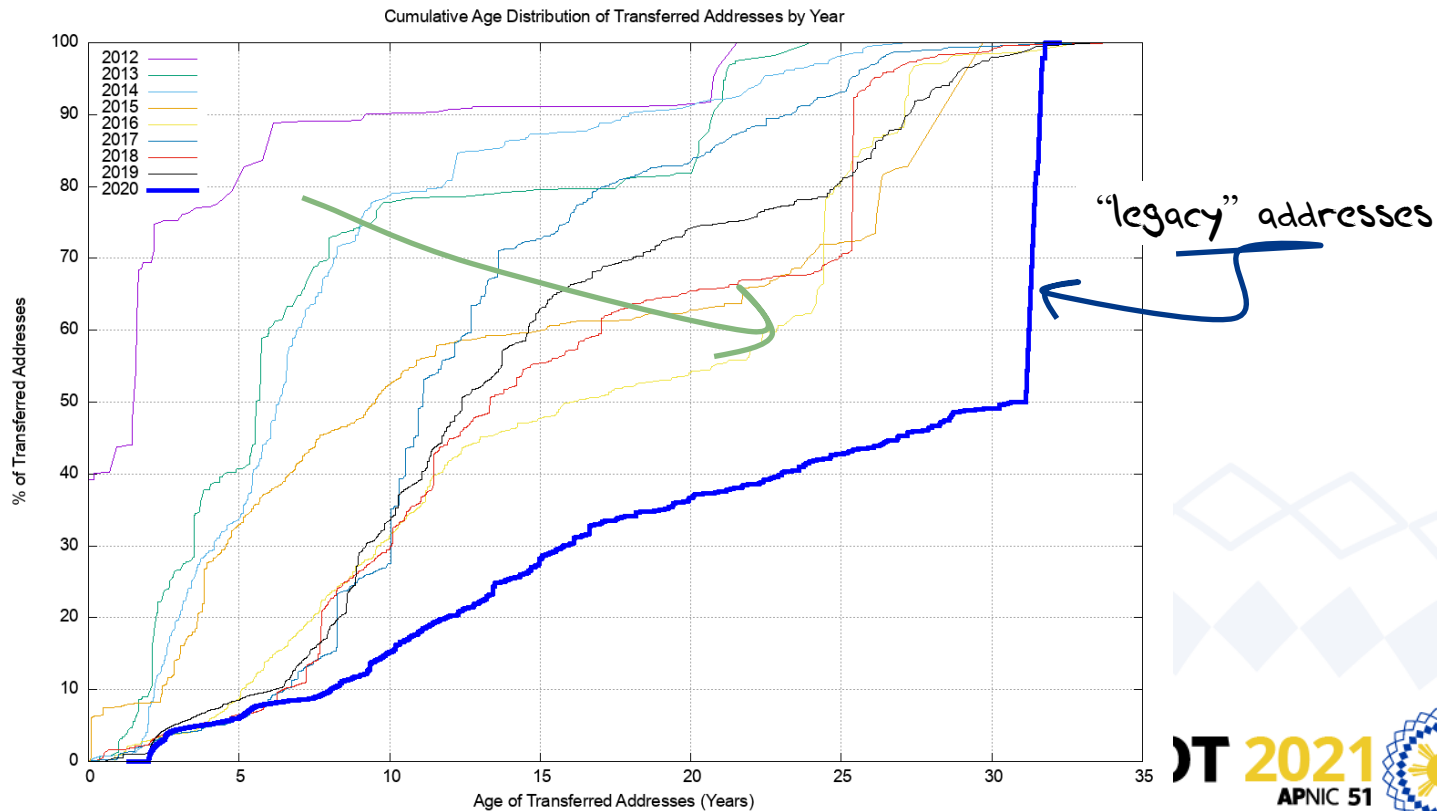
Market Data



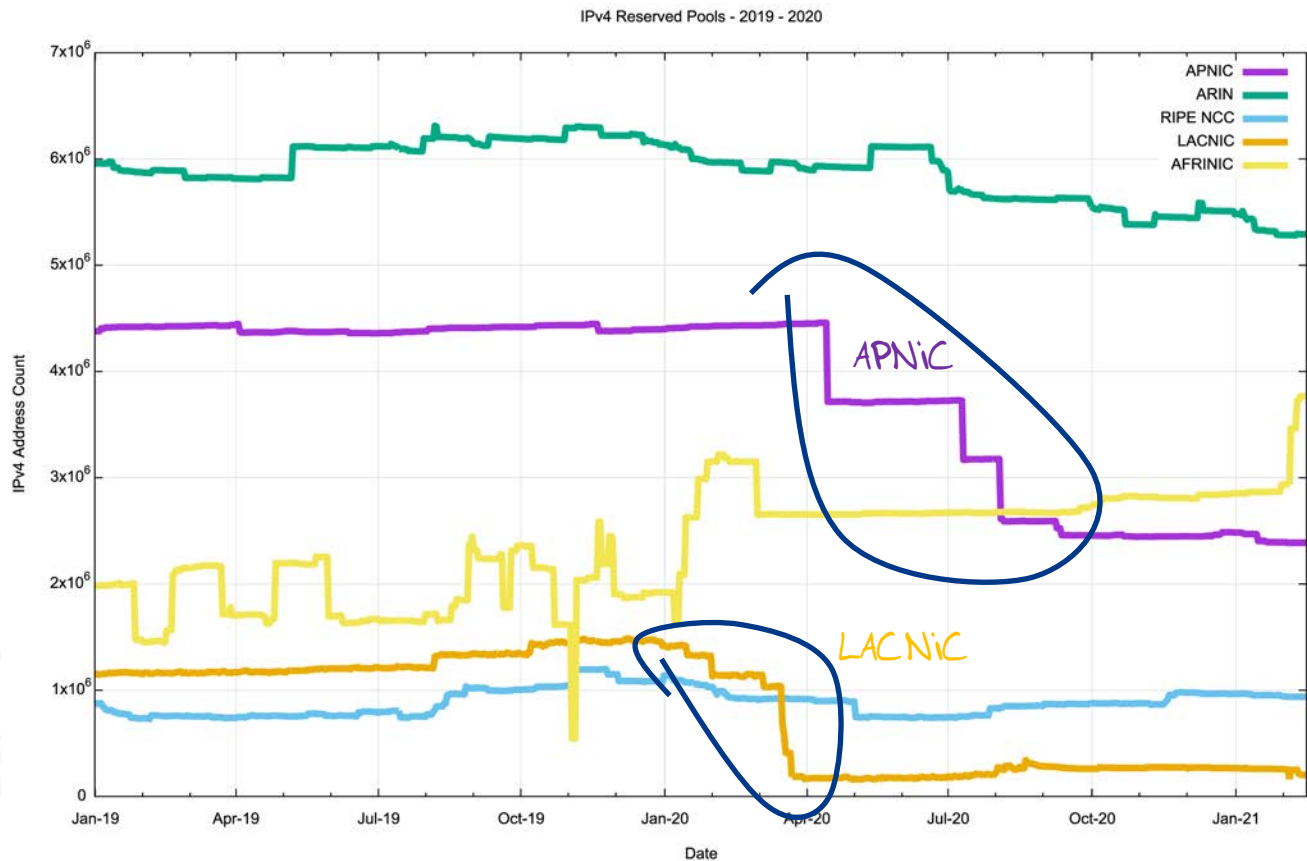
IPv4 Market Group
<https://ipv4marketgroup.com/ipv4-pricing/>



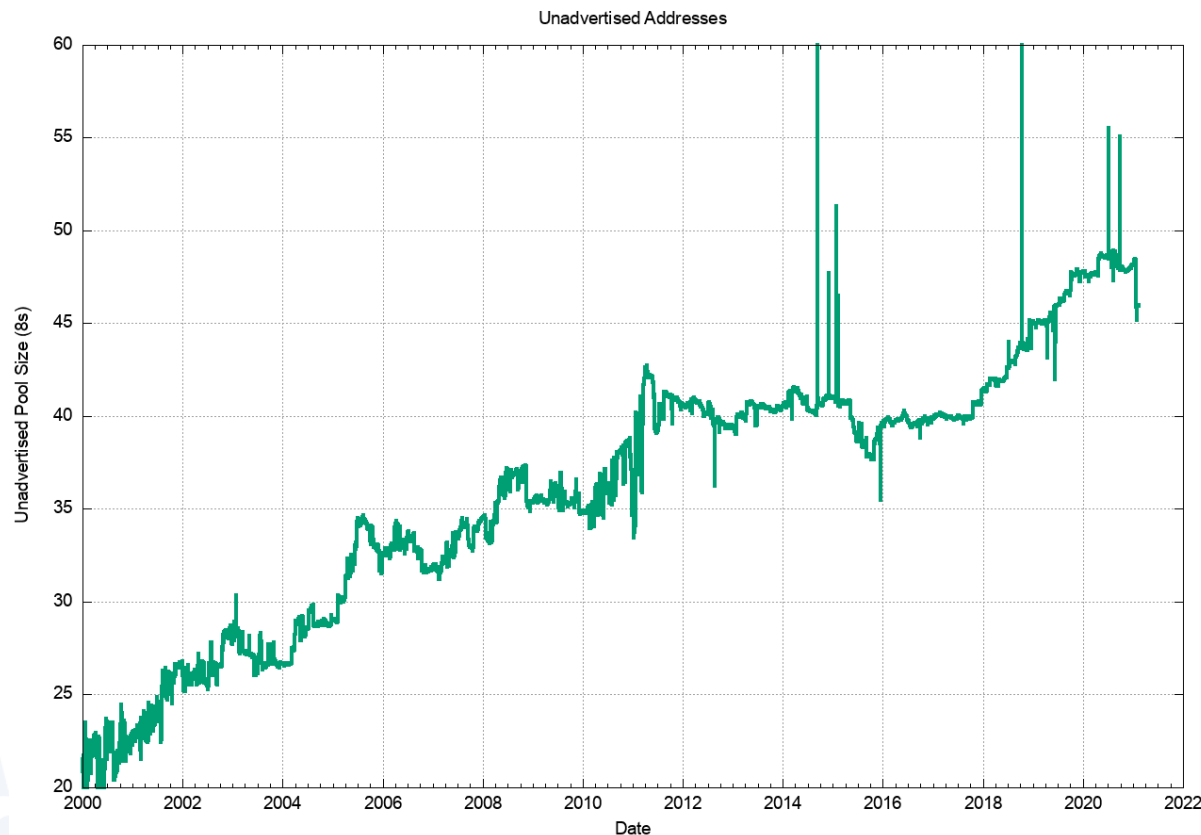
Age of Transferred Addresses



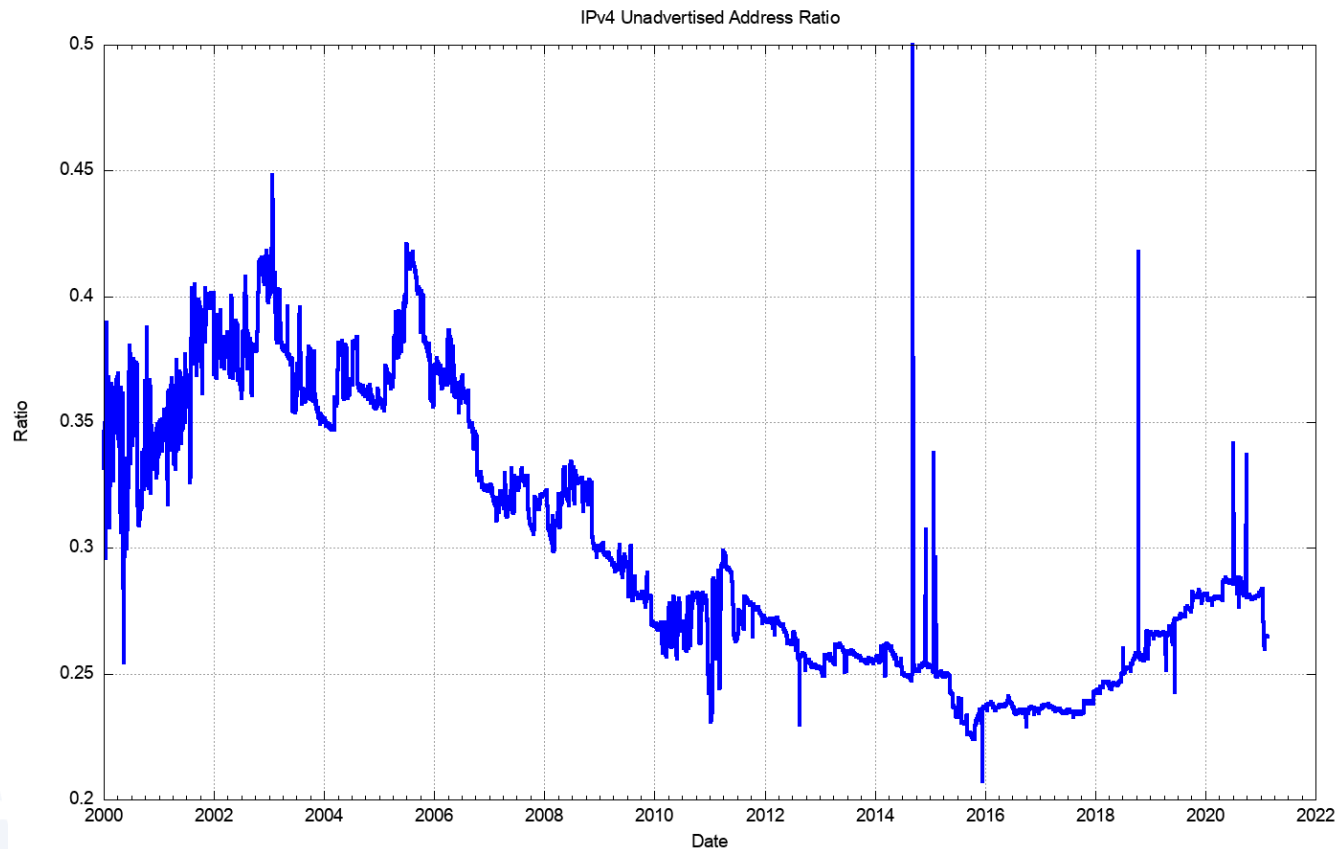
Recycling from the Reserved Pools



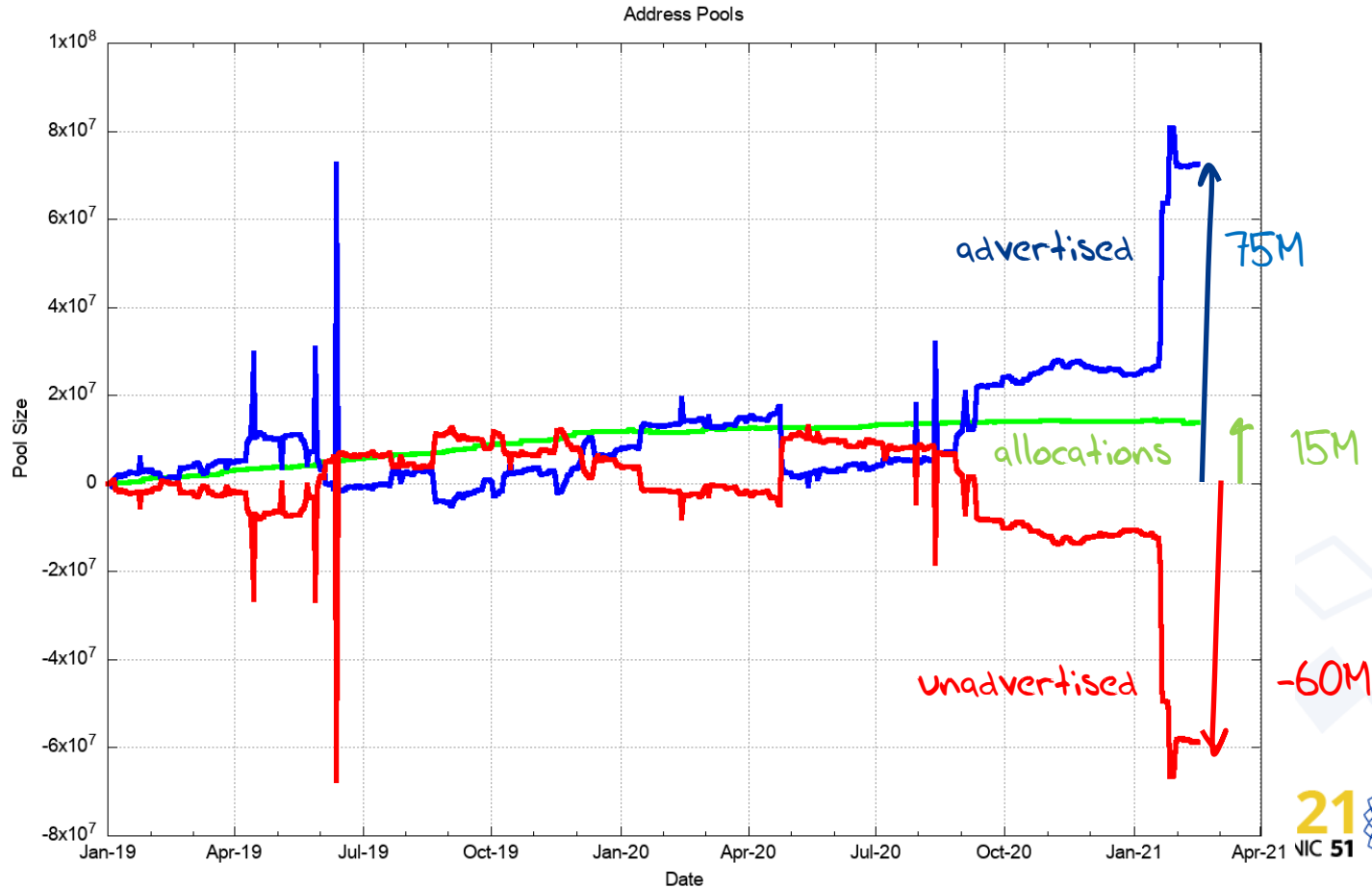
Unadvertised IPv4 Addresses



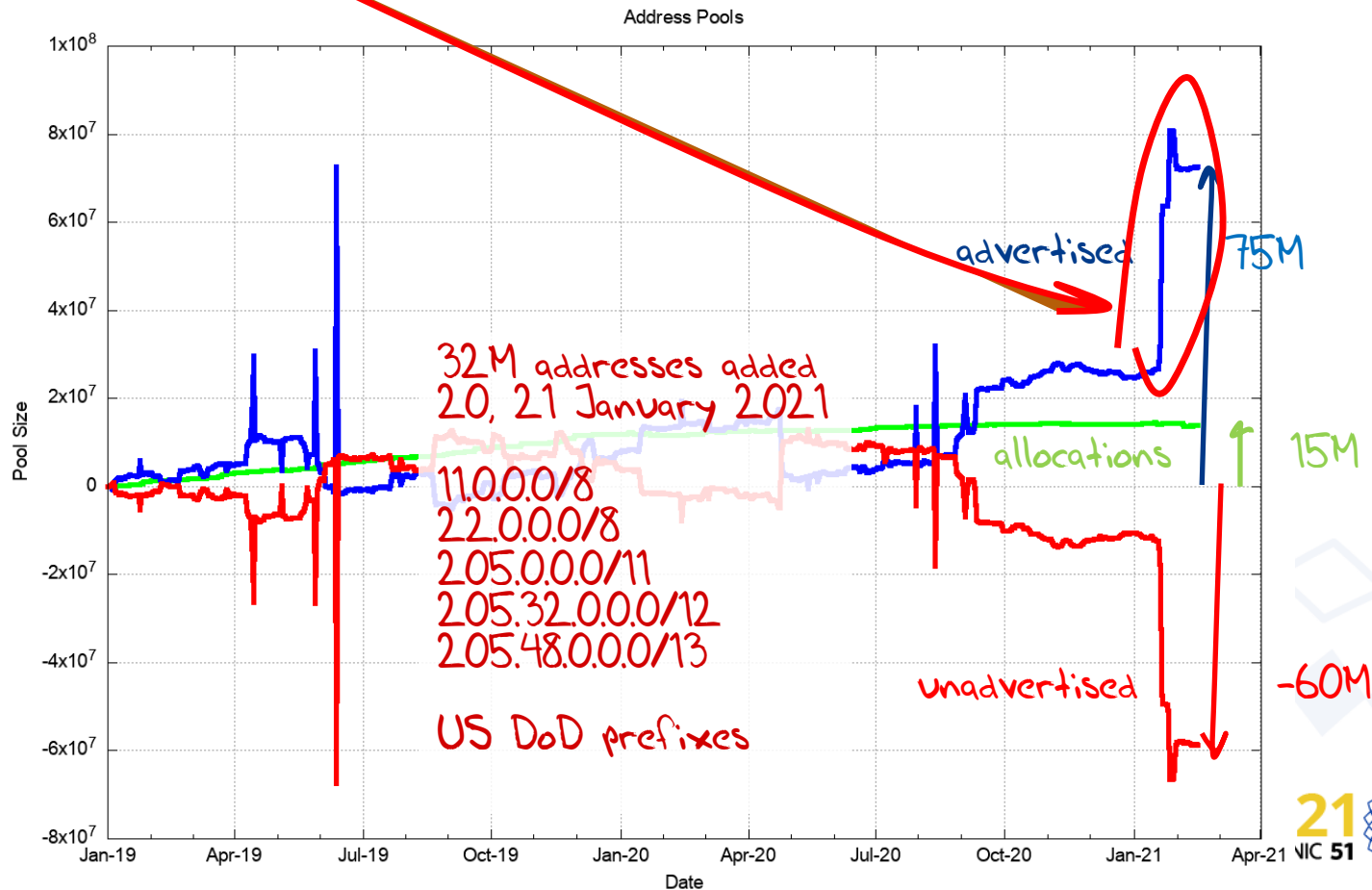
Unadvertised vs Advertised Ratio



IPv4 Address Pools - 2019 to now



Aside: huh?



Where have IPv4 Addresses ended up?

Allocated Address Pools

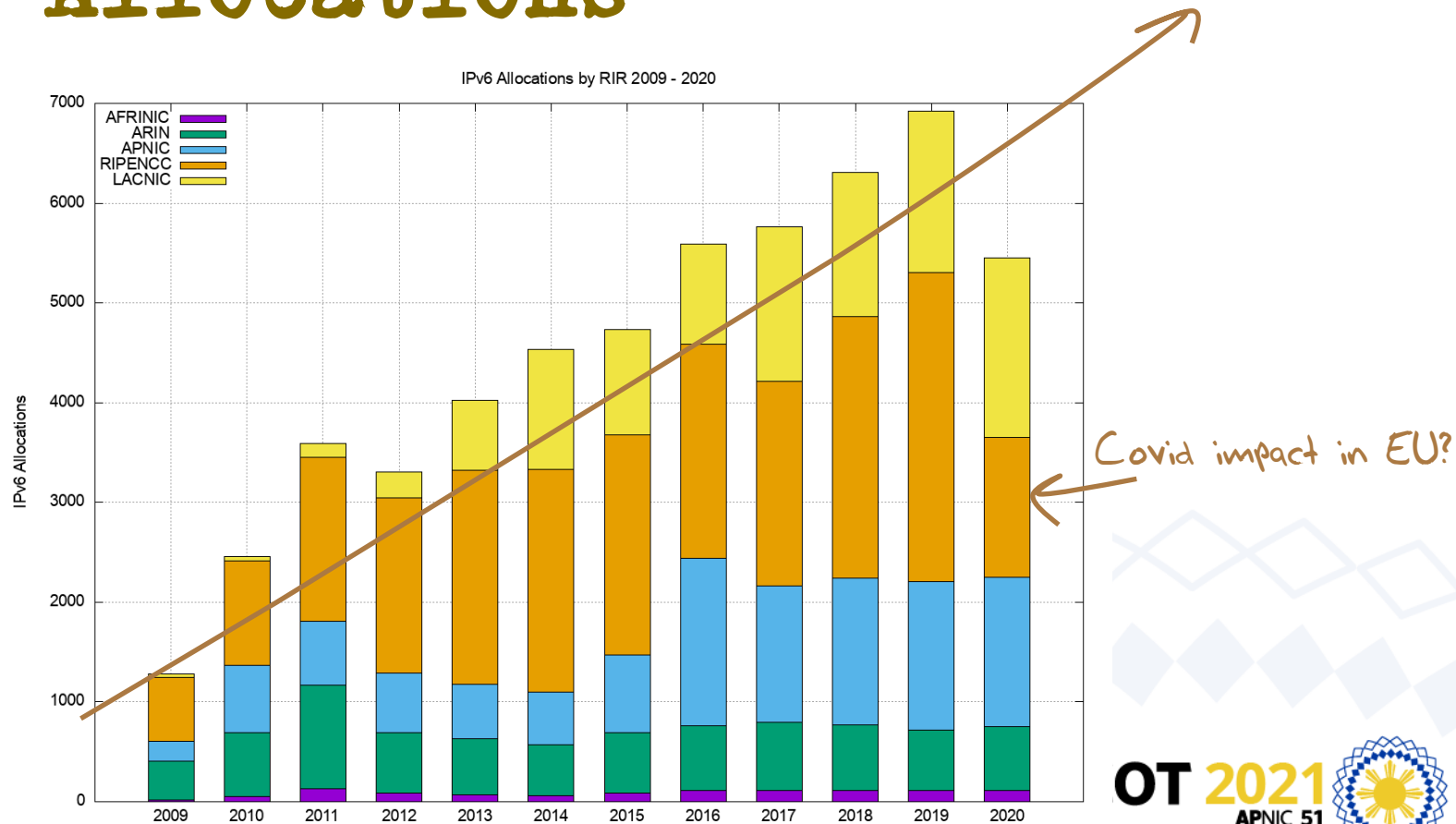
Rank	Addrs (M)	% Alloc	Name
1	1,615.4	43.9%	USA
2	344.4	9.4%	China
3	190.0	5.2%	Japan
4	123.8	3.4%	Germany
5	113.4	3.1%	UK
6	112.5	3.1%	Korea
7	87.2	2.4%	Brazil
8	82.4	2.2%	France
9	69.8	1.9%	Canada
10	55.0	1.5%	Italy
11	51.0	1.4%	Australia
12	50.4	1.4%	Netherlands
13	45.5	1.2%	Russia
14	41.3	1.1%	India
15	35.7	1.0%	Taiwan

Allocated Addresses Per Capita

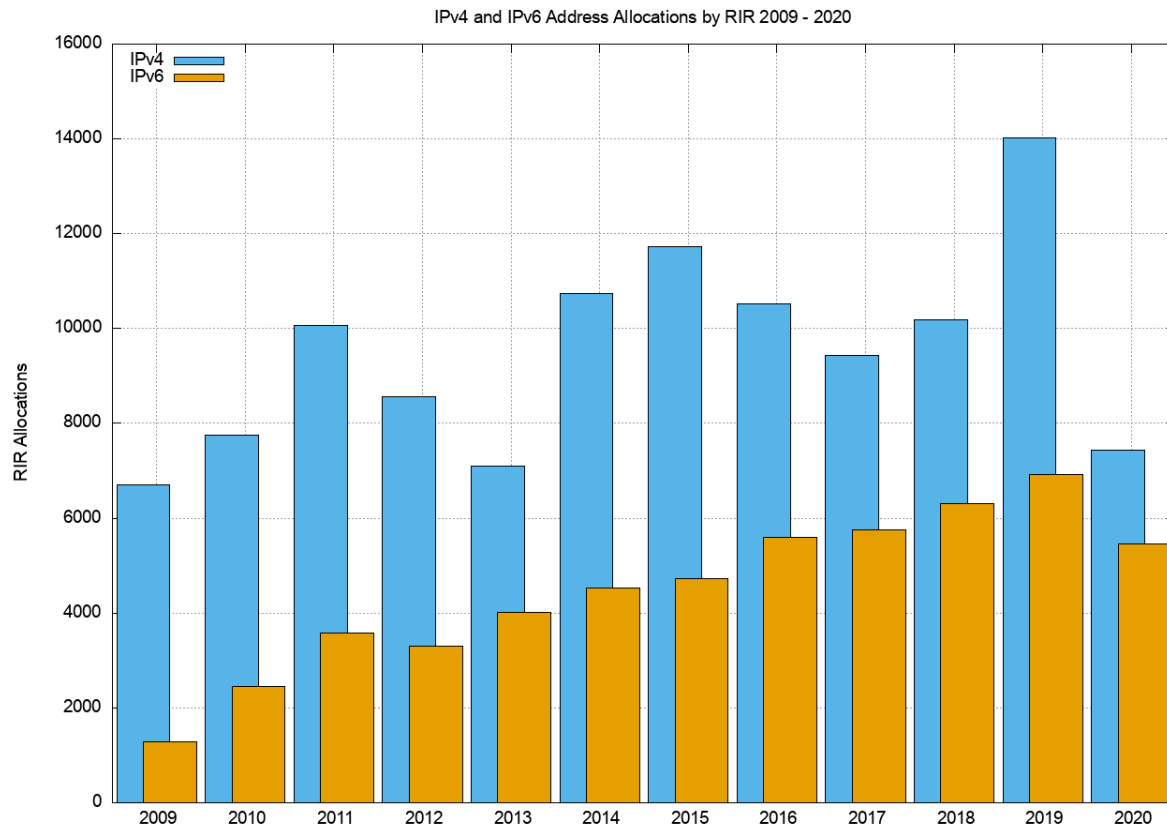
Rank	Addrs (M)	Per Capita	Name
1	8.1	82.5	Seychelles
1	0.0	13.4	Holy See
1	0.3	7.9	Gibraltar
1	1,615.4	4.9	USA
1	23.4	4.0	Singapore
1	0.1	3.3	British Virgin Islands
1	30.0	3.0	Sweden
1	50.4	2.9	Netherlands
1	0.1	2.9	Liechtenstein
1	15.7	2.9	Norway
1	3.6	2.9	Mauritius
1	1.7	2.7	Luxembourg
1	0.9	2.6	Iceland
1	13.6	2.5	Finland
1	20.6	2.4	Switzerland

IPv6

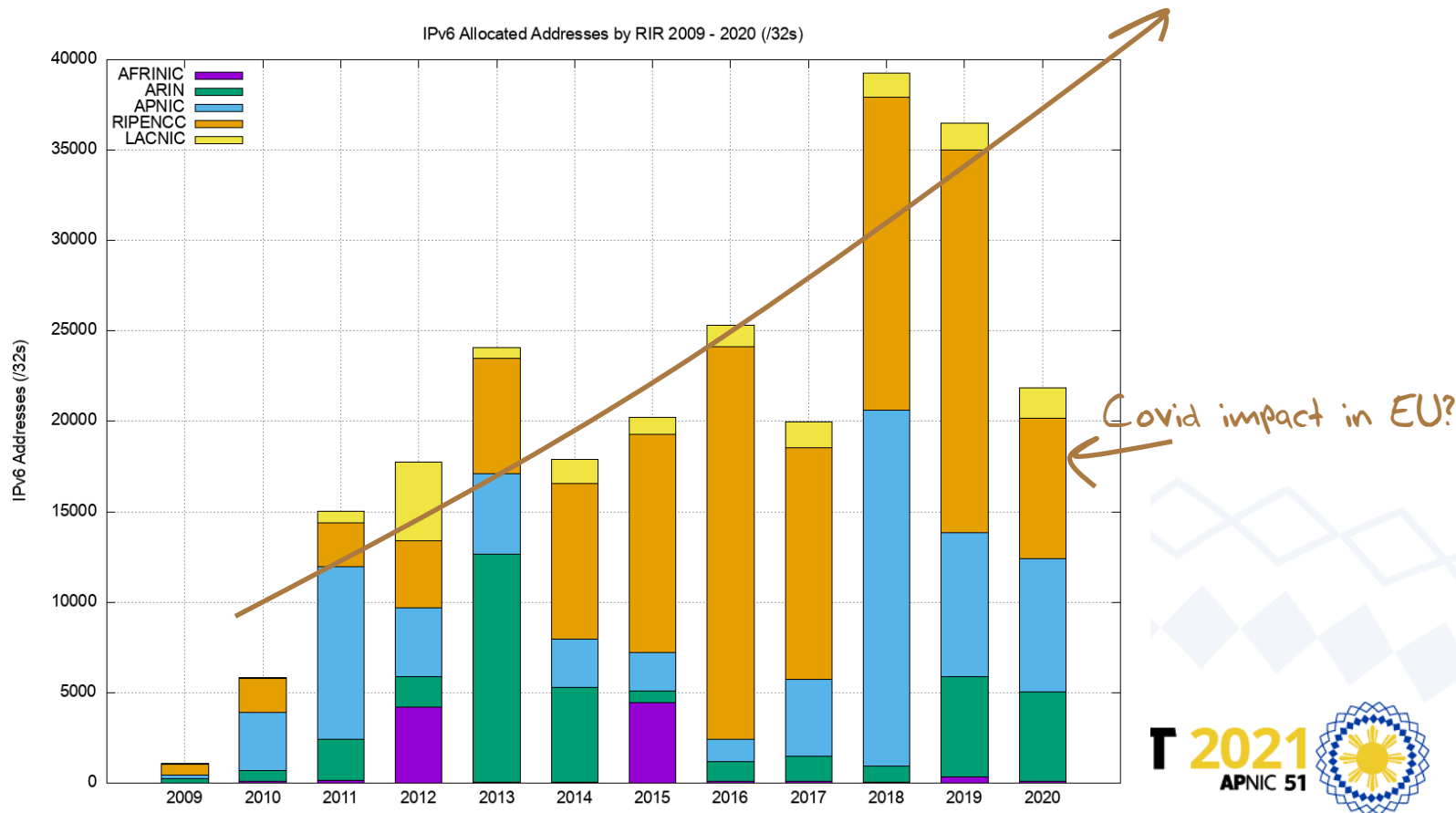
IPv6 Allocations



IPv4 / IPv6 RIR Allocations



IPv6 Addresses Allocated



Where did those addresses go each year?

IPv6 Allocations (/32s)

Rank	2016		2017		2018		2019		2020	
1	UK	9,571	China	2,245	China	17,647	China	6,787	China	6,765
2	Germany	1,525	USA	1,497	Russia	4,675	USA	5,510	USA	5,051
3	Netherlands	1,312	Germany	1,364	Germany	1,932	Russia	3,716	Brazil	1,358
4	USA	1,142	Russia	1,358	UK	1,209	Germany	2,522	Netherlands	1,331
5	Russia	1,005	Netherlands	1,296	Singapore	1,055	Netherlands	2,516	Germany	716
6	France	926	Spain	1,170	Netherlands	1,025	UK	1,355	Russia	715
7	Brazil	727	India	1,087	Brazil	1,007	France	1,182	UK	552
8	Spain	702	UK	1,072	USA	874	Italy	1,052	Italy	391
9	Italy	679	Brazil	1,049	Spain	851	Brazil	1,049	France	390
10	China	597	France	714	France	722	Spain	854	Turkey	290

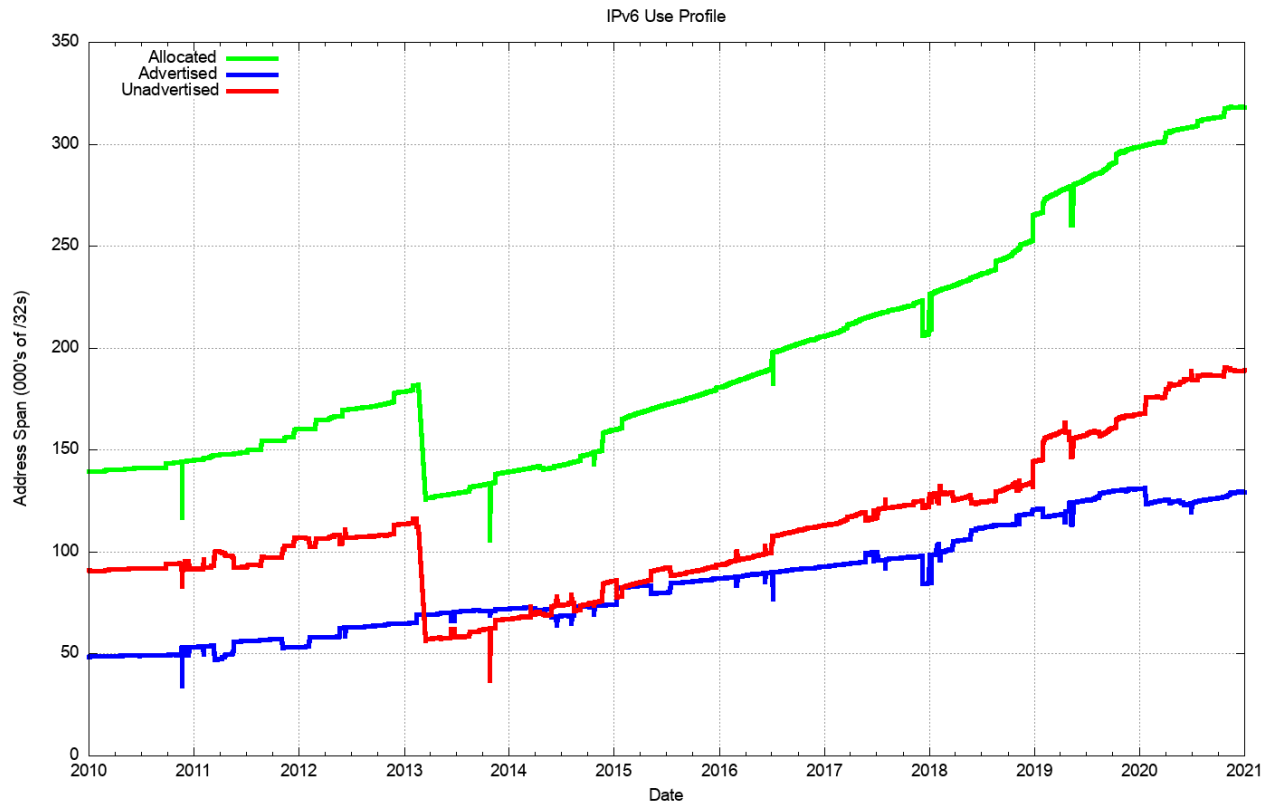


What's the total picture so far?

Rank	CC	Allocated (/48s)	% Total	/48s p.c.	Advertised /48s	% Util	Name
1	US	3,781,720,299	18.1%	11.4	995,561,503	26.3%	USA
2	CN	3,583,049,820	17.2%	2.5	1,385,479,853	38.7%	China
3	DE	1,444,151,922	6.9%	17.2	1,007,210,021	69.7%	Germany
4	GB	1,341,718,755	6.4%	19.8	386,508,083	28.8%	UK
5	FR	918,880,387	4.4%	14.1	142,697,493	15.5%	France
6	RU	809,632,046	3.9%	5.5	213,602,534	26.4%	Russia
7	JP	660,938,940	3.2%	5.2	506,102,053	76.6%	Japan
8	IT	623,054,872	3.0%	10.3	394,403,964	63.3%	Italy
9	AU	615,253,158	2.9%	24.1	305,355,551	49.6%	Australia
10	NL	579,141,930	2.8%	33.8	249,749,134	43.1%	Netherlands
11	BR	513,171,855	2.5%	2.4	297,615,084	58.0%	Brazil
12	SE	426,377,541	2.0%	42.2	352,600,454	82.7%	Sweden
13	ES	361,168,925	1.7%	7.7	89,469,533	24.8%	Spain
14	PL	353,173,719	1.7%	9.3	196,706,987	55.7%	Poland
15	AR	347,670,884	1.7%	7.7	280,830,395	80.8%	Argentina
16	KR	344,719,370	1.7%	6.7	6,226,204	1.8%	Korea
17	ZA	315,429,286	1.5%	5.3	286,032,529	90.7%	South Africa
18	EG	269,090,818	1.3%	2.6	268,894,209	99.9%	Egypt
19	CH	225,181,865	1.1%	26.0	105,767,838	47.0%	Switzerland
20	TR	196,608,023	0.9%	2.3	37,666,566	19.2%	Turkey
21	CZ	193,527,917	0.9%	18.1	105,042,577	54.3%	Czech Republic
22	TW	167,444,494	0.8%	7.0	154,670,384	92.4%	Taiwan
23	IR	164,495,367	0.8%	2.0	24,268,880	14.8%	Iran
24	UA	150,208,673	0.7%	3.4	48,230,838	32.1%	Ukraine
25	IN	147,063,401	0.7%	0.1	84,026,162	57.1%	India

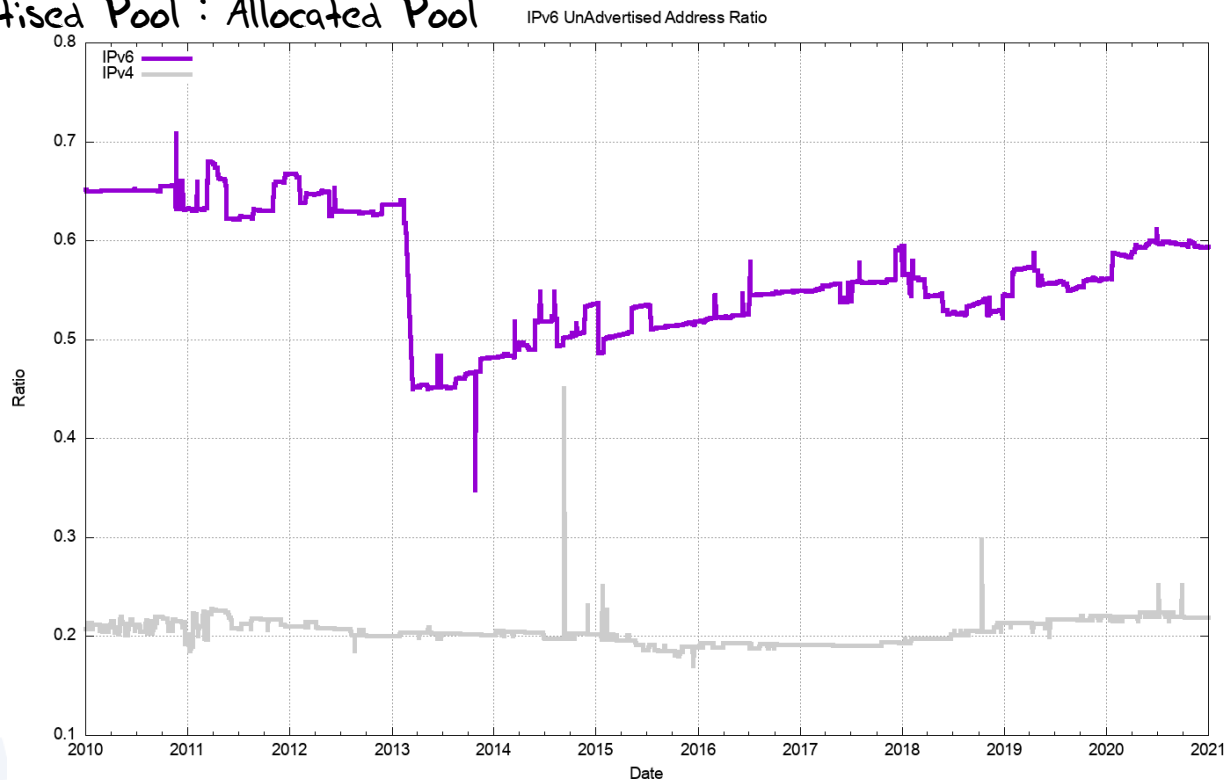
Advertised / Allocated

Advertised vs Unadvertised

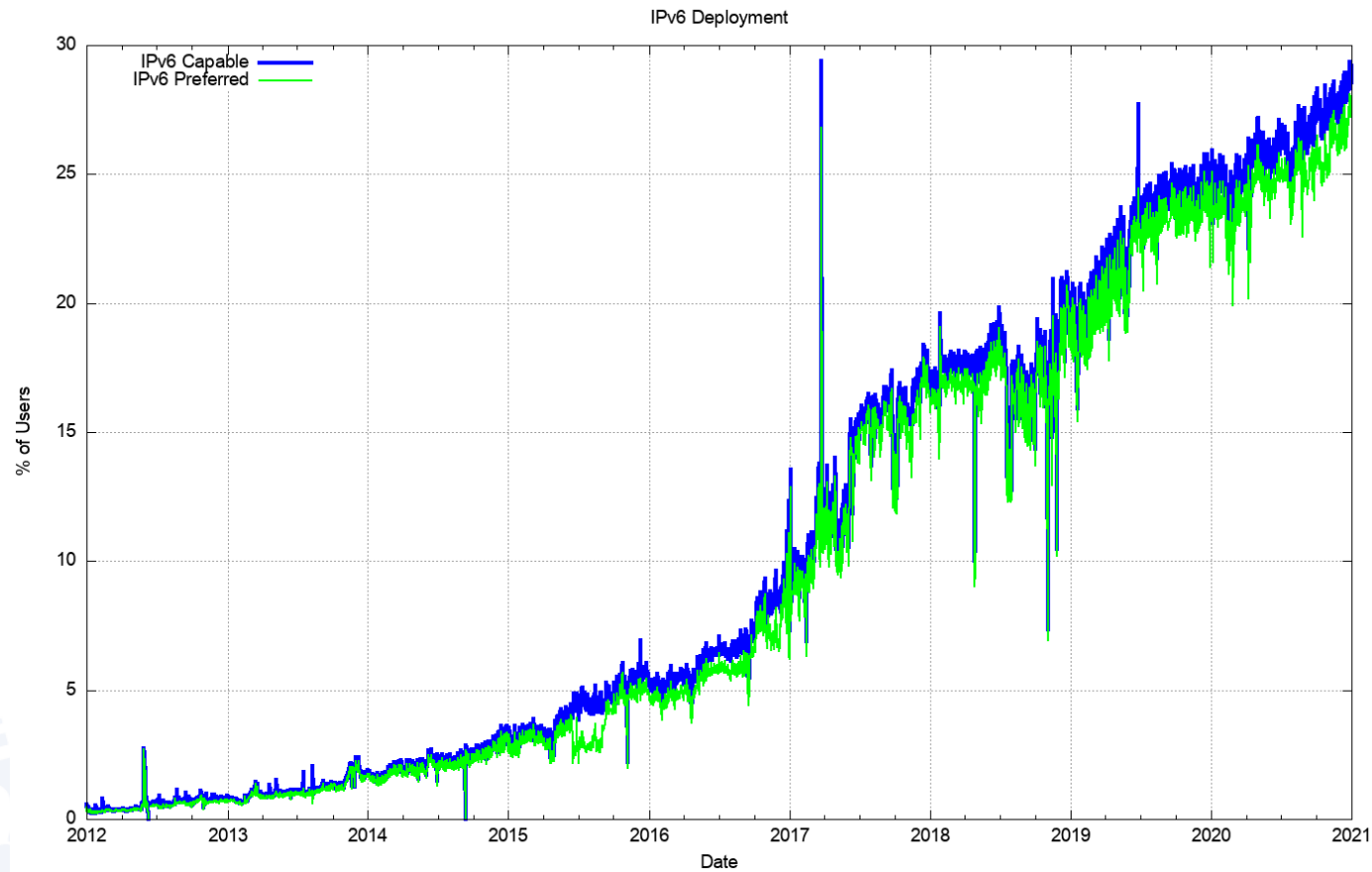


Comparing IPv4 to IPv6

Ratio
Unadvertised Pool : Allocated Pool



IPv6 Use



Resources

<https://stats.labs.apnic.net/ipv6>

<https://resources.potaroo.net/iso3166/v6cc.html>

<https://bgp.potaroo.net/v6/as2.0/index.html>

<https://www.cidr-report.org/v6/as2.0/>

That's it!

Thanks!

2021 APRICOT APNIC 51

ONLINE

22 February – 4 March 2021

#apricot2021

