

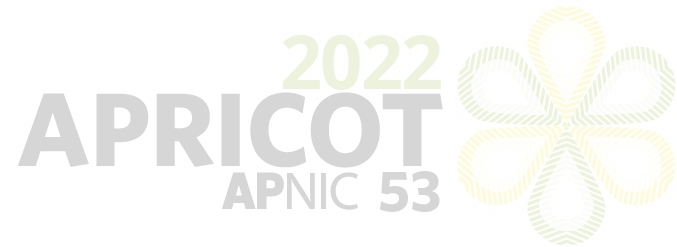
# Addressing 2021



Geoff Huston  
APNIC Labs

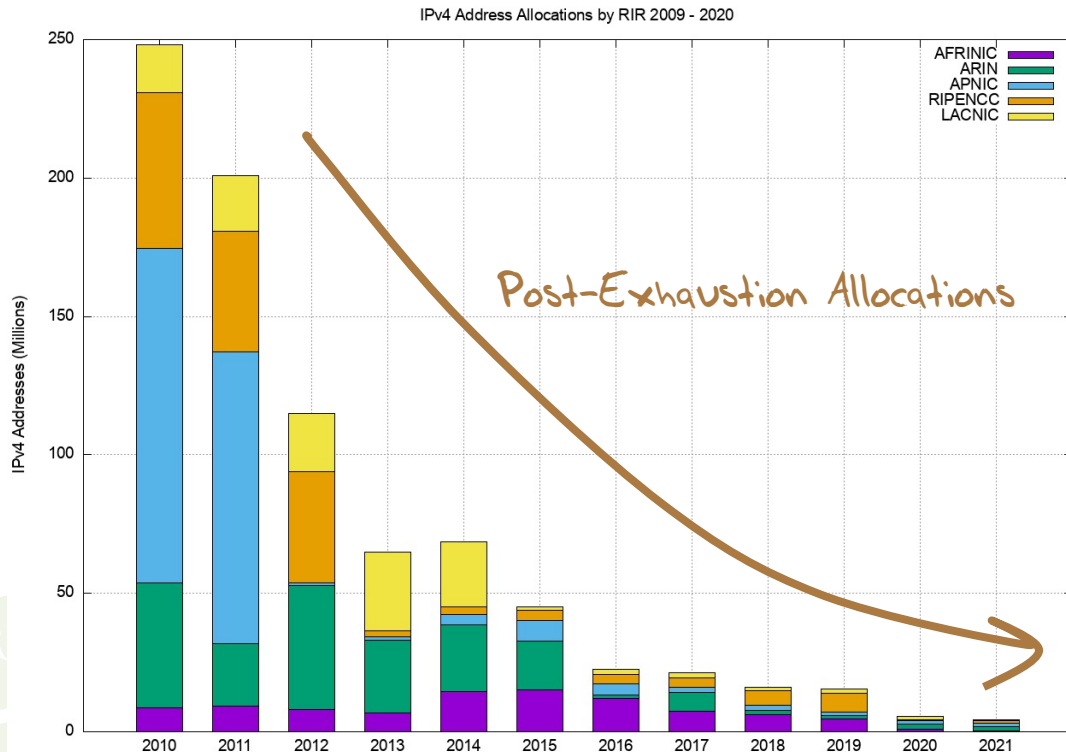


IPv4



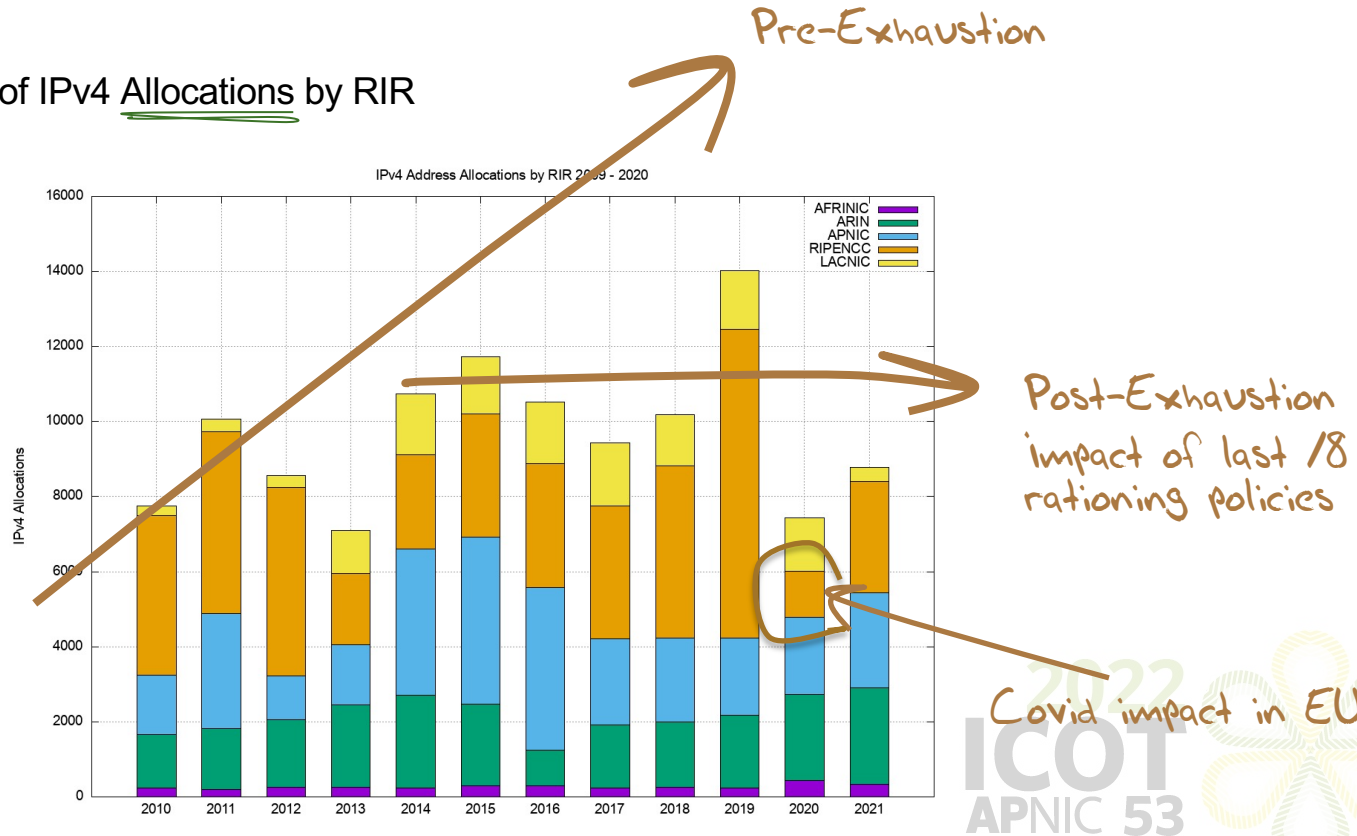
# IPv4 - Over the Exhaustion Cliff

## IPv4 Address Allocations by RIR



# IPv4 - Over the Exhaustion Cliff

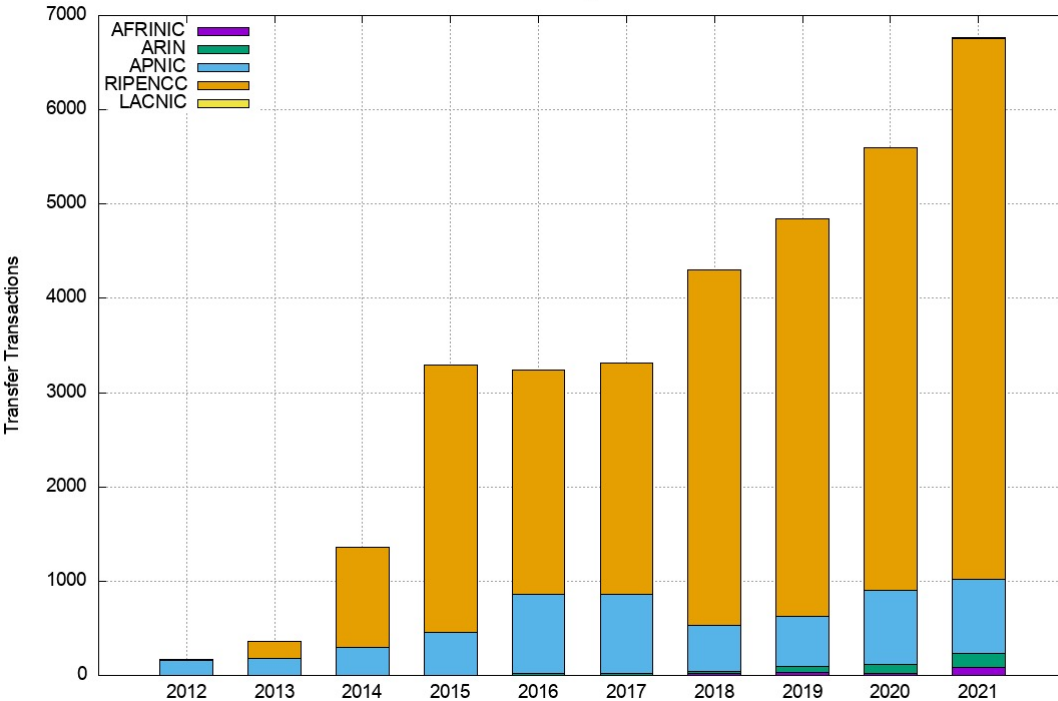
Number of IPv4 Allocations by RIR



# IPv4 Transfers

## Volume of Recorded Transfers

IPv4 Transfers, 2012 - 2021



## Number of Recorded Transfers

Receiving RIR	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
APNIC	159	185	302	451	841	834	487	528	781	786
RIPE NCC	10	171	1,054	2,836	2,373	2,451	3,774	4,221	4,696	5,743
ARIN				3	22	26	26	68	94	150
LACNIC							2	3	9	9
AFRINIC							17	27	26	80
<b>Total</b>	<b>169</b>	<b>356</b>	<b>1,356</b>	<b>3,290</b>	<b>3,236</b>	<b>3,311</b>	<b>4,306</b>	<b>4,844</b>	<b>5,600</b>	<b>6,768</b>

Why are 85% of all transfers occurring in the RIPE region?



# Imports and Exports: 2015 - 2021

## Exports

Rank	From	Addrs (M)
1	United States	20.7
2	Australia	15.9
3	United Kingdom	4.0
4	Canada	3.8
5	Netherlands	3.2
6	Romania	3.2
7	Singapore	2.8
8	Russian Federation	2.3
9	China	2.2
10	Germany	1.7
11	Ukraine	1.3
12	Hong Kong SAR	1.3
13	India	1.2
14	European Union	1.2
15	Denmark	0.8
16	France	0.6
17	Austria	0.6
18	Belgium	0.5
19	Italy	0.5
20	Poland	0.4



## Imports

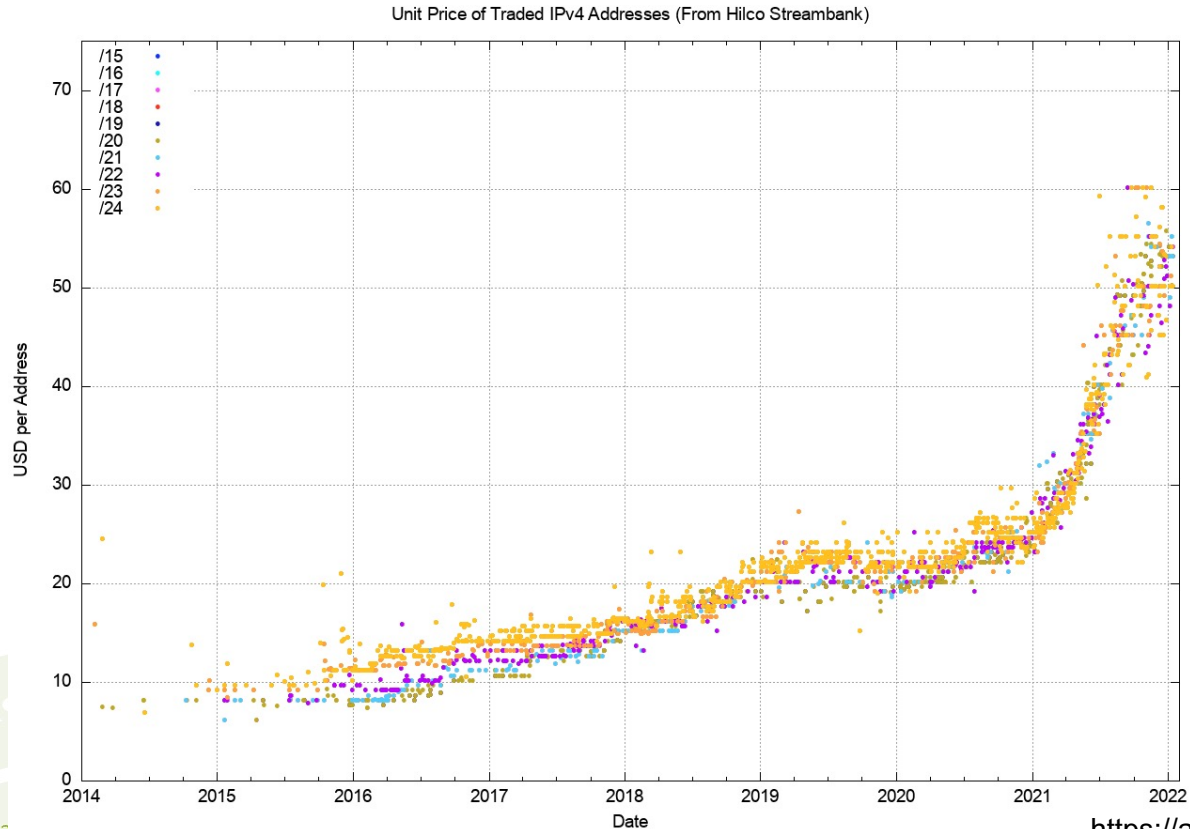
Rank	From	Addrs (M)
1	Singapore	14.8
2	China	6.4
3	Hong Kong	6.1
4	USA	5.7
5	India	5.6
6	UK	3.7
7	Japan	3.3
8	Germany	3.1
9	Saudi Arabia	2.9
10	Spain	2.2
11	Netherlands	2.0
12	France	2.0
13	Iran	1.9
14	Italy	1.6
15	Ireland	0.8
16	Australia	0.6
17	Brazil	0.6
18	Russian Federation	0.5
19	Finland	0.5
20	Philippines	0.5

## Bilateral Trade

Rank	From	To	Addrs (M)
1	Australia	Singapore	8.6
2	USA	Singapore	5.5
3	Australia	Hong Kong	4.3
4	USA	India	2.5
5	Canada	China	2.5
6	Singapore	India	2.4
7	Australia	USA	2.2
8	USA	Japan	1.8
9	USA	China	1.7
10	USA	UK	1.7
11	USA	Saudi Arabia	1.1
12	China	Hong Kong	1.0
13	USA	Germany	0.9
14	Hong Kong	China	0.9
15	USA	France	0.8
16	EU	UK	0.8
17	Netherlands	China	0.7
18	Netherlands	USA	0.7
19	Romania	Saudi Arabia	0.6
20	India	Italy	0.5



# Market Data on Transfer Pricing



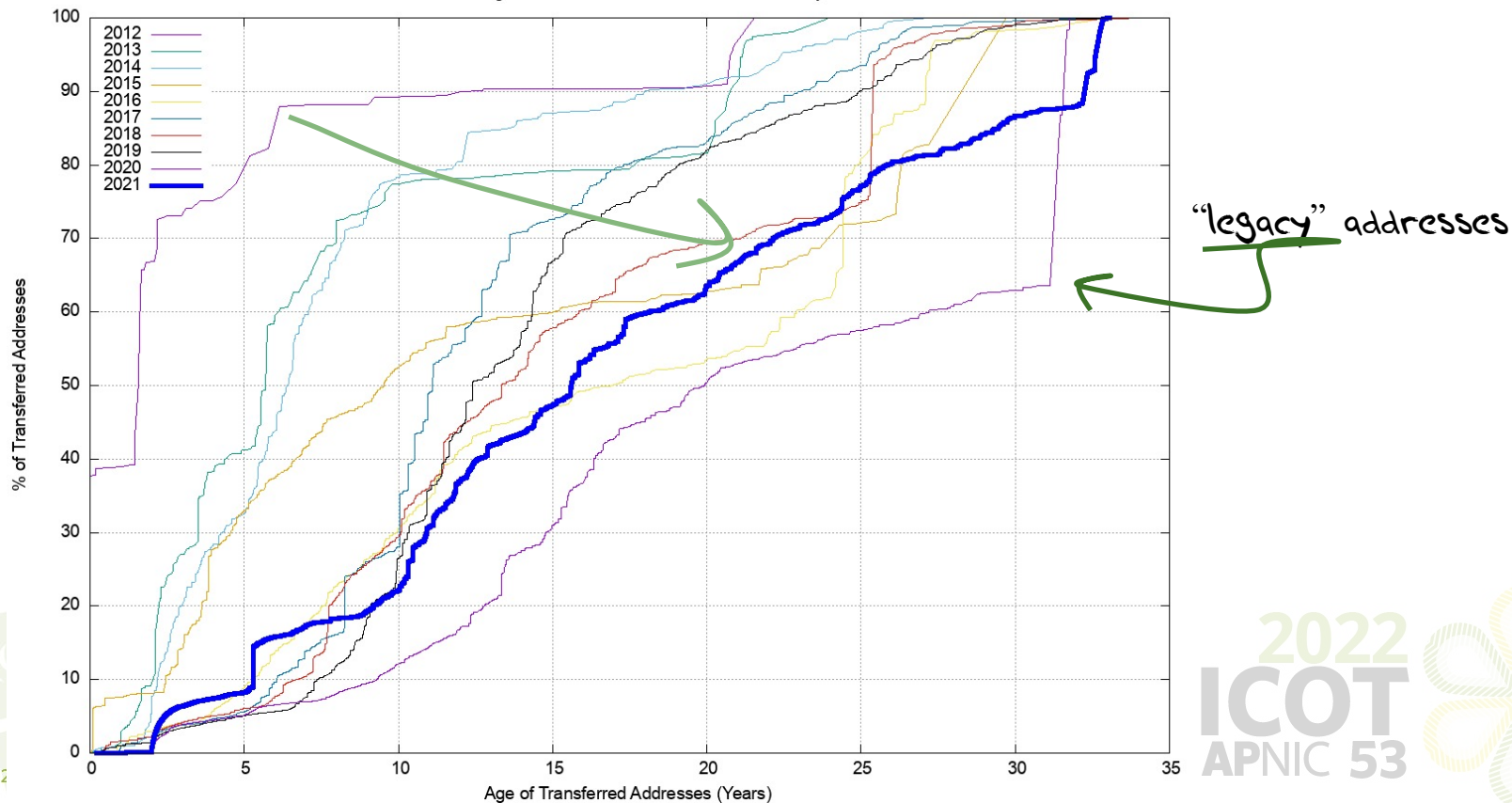
#apricot2022



<https://auctions.ipv4.global/prior-sales>  
IPv4.Global - Hilco Streambank

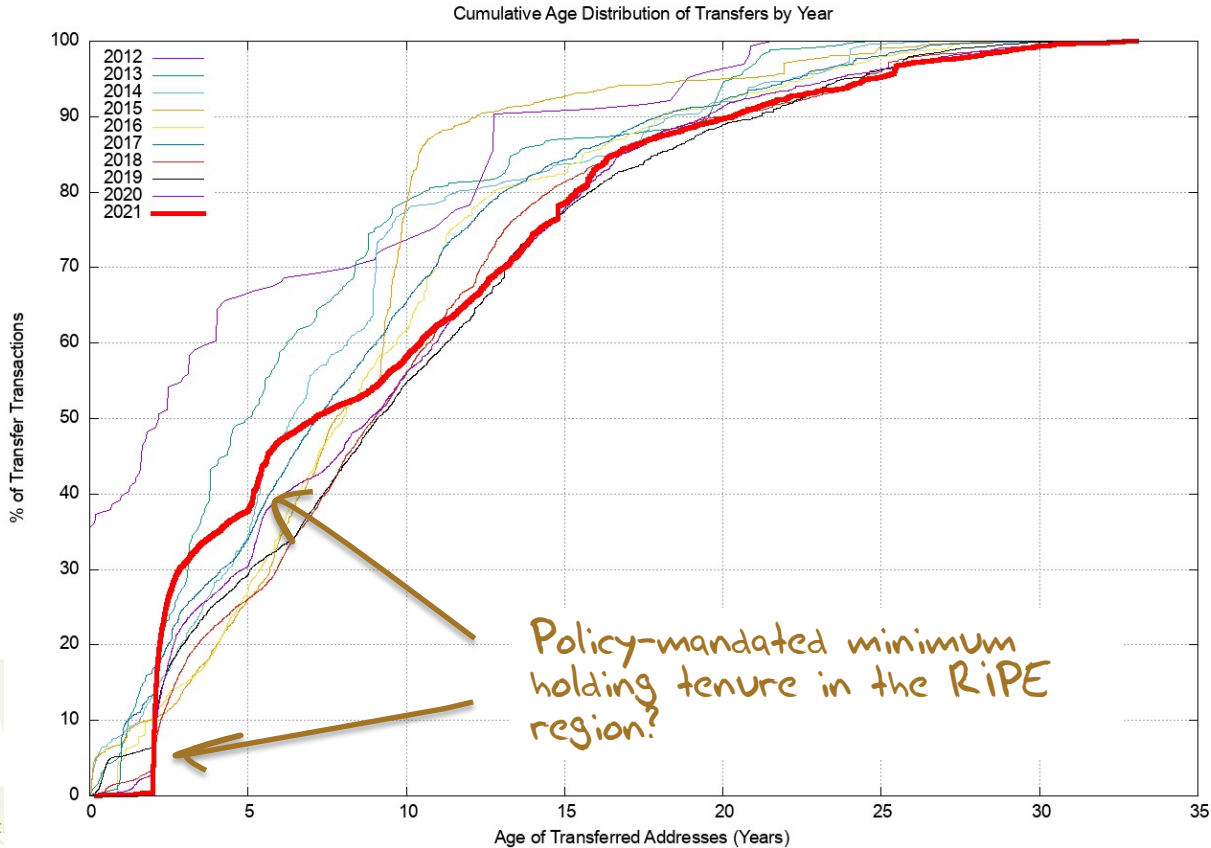
# Age of Transferred Addresses

Cumulative Age Distribution of Transferred Addresses by Year



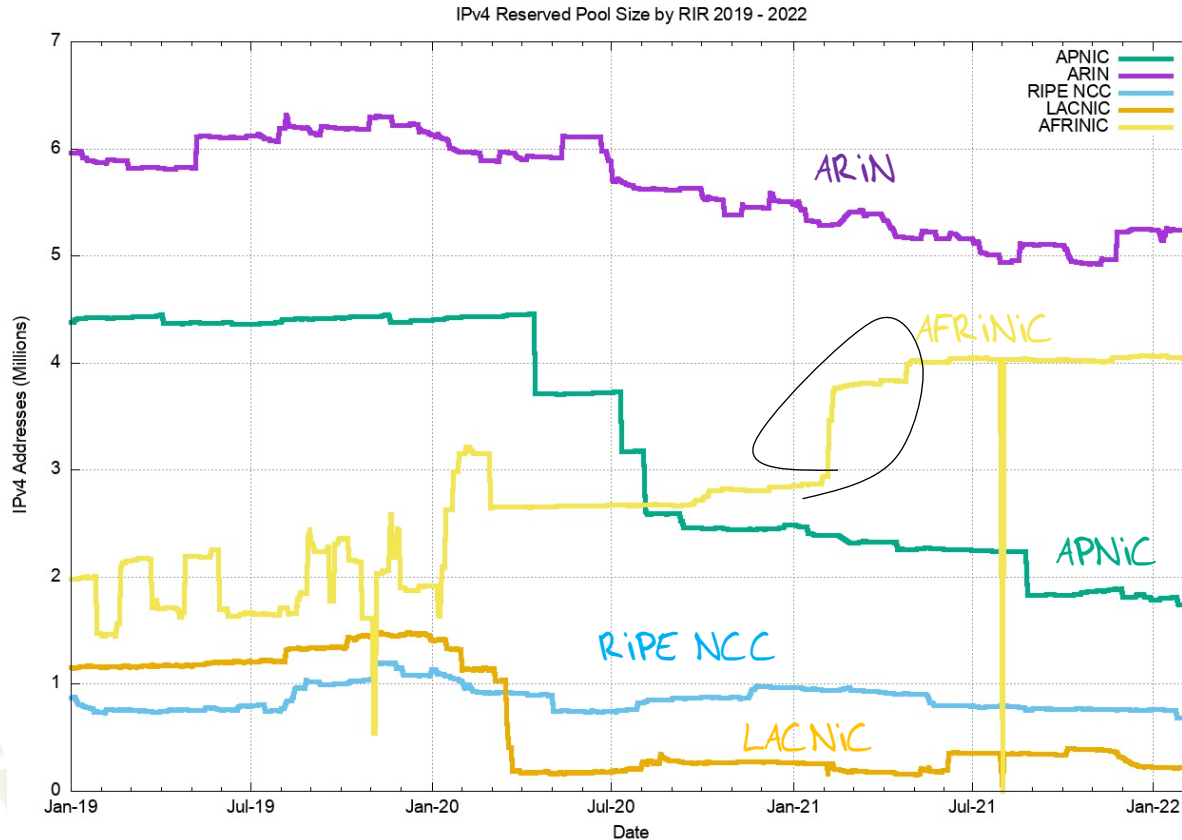


# Age of Transfer Transactions

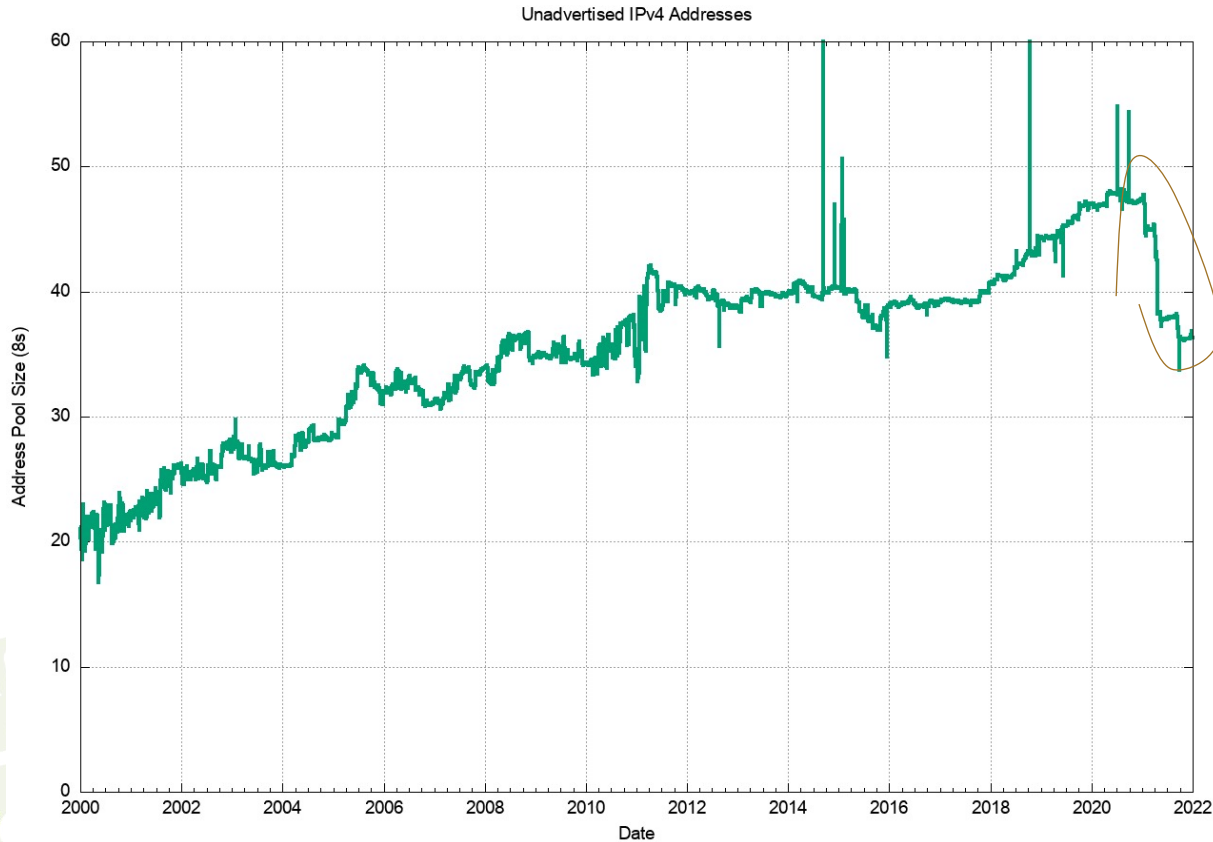


Policy-mandated minimum holding tenure in the RIPE region?

# Recycling from the Reserved Pools

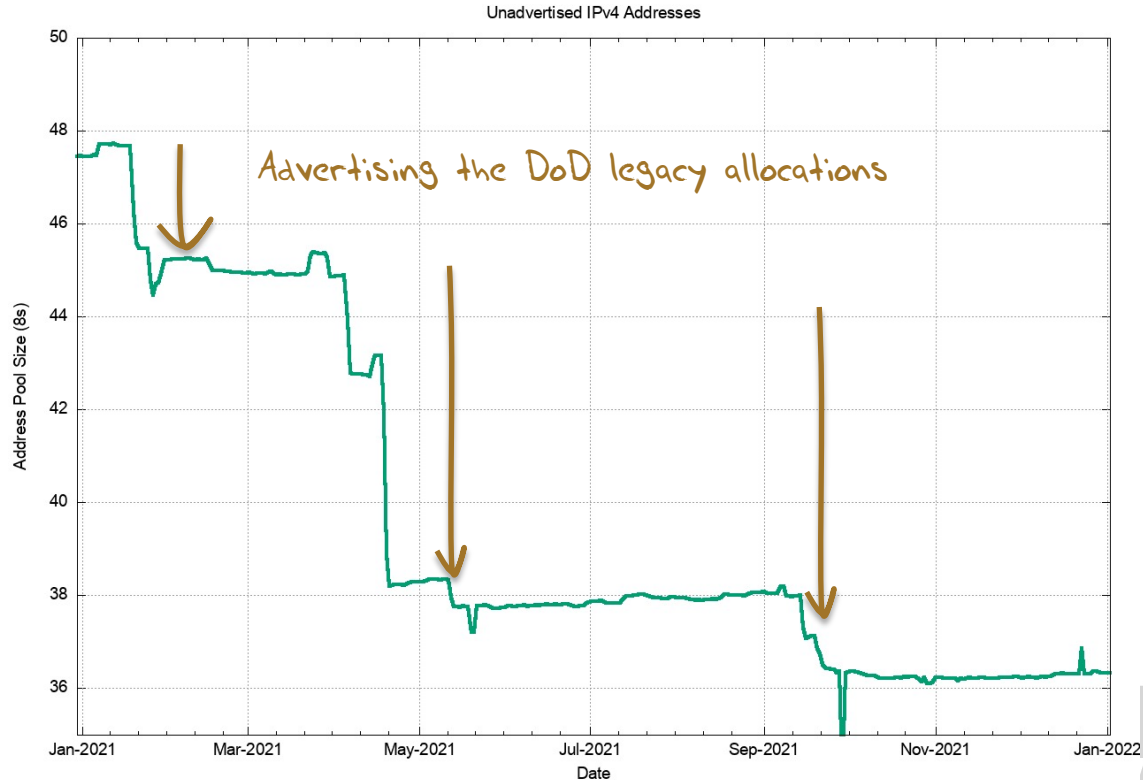


# Unadvertised IPv4 Addresses

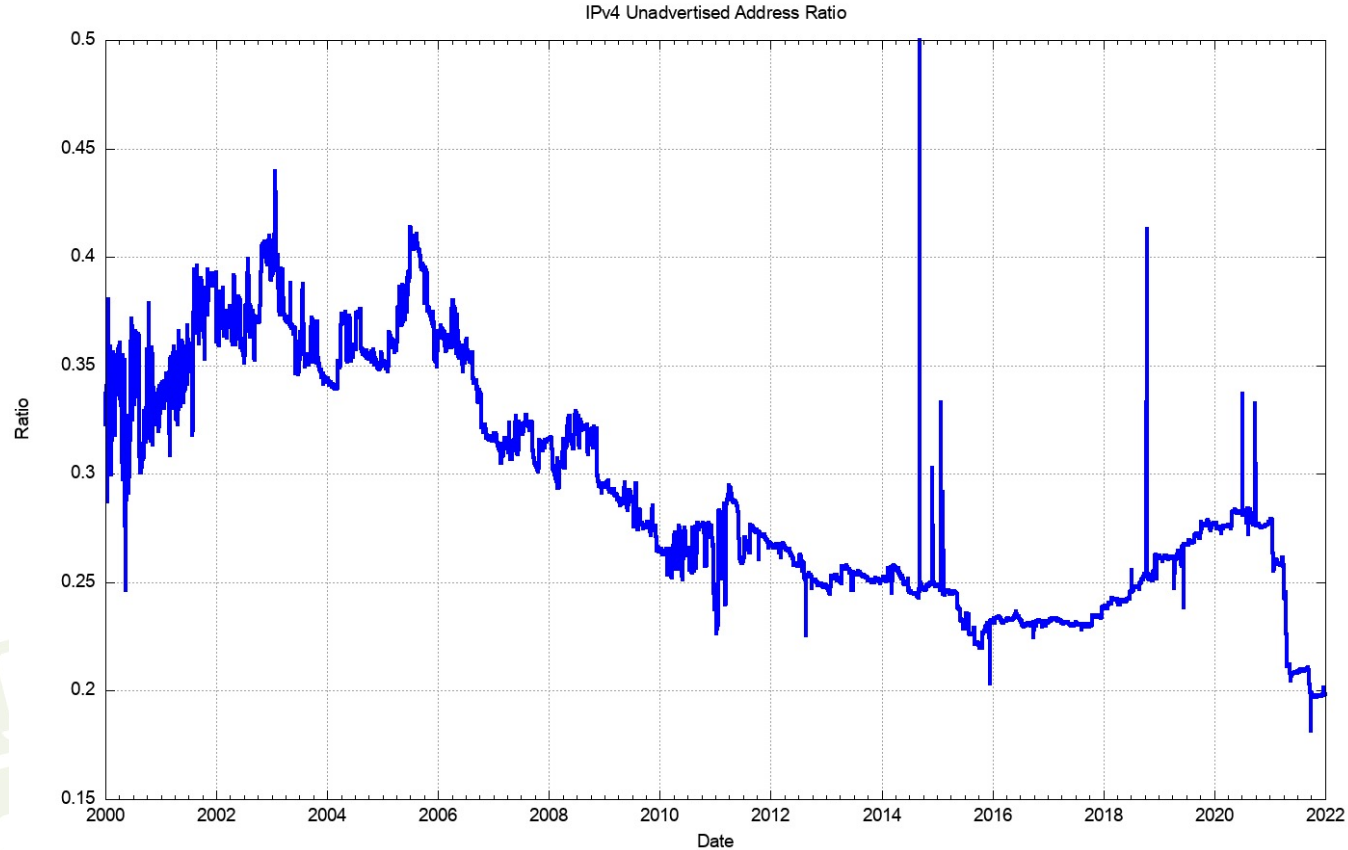


Advertising the DoD legacy /8s

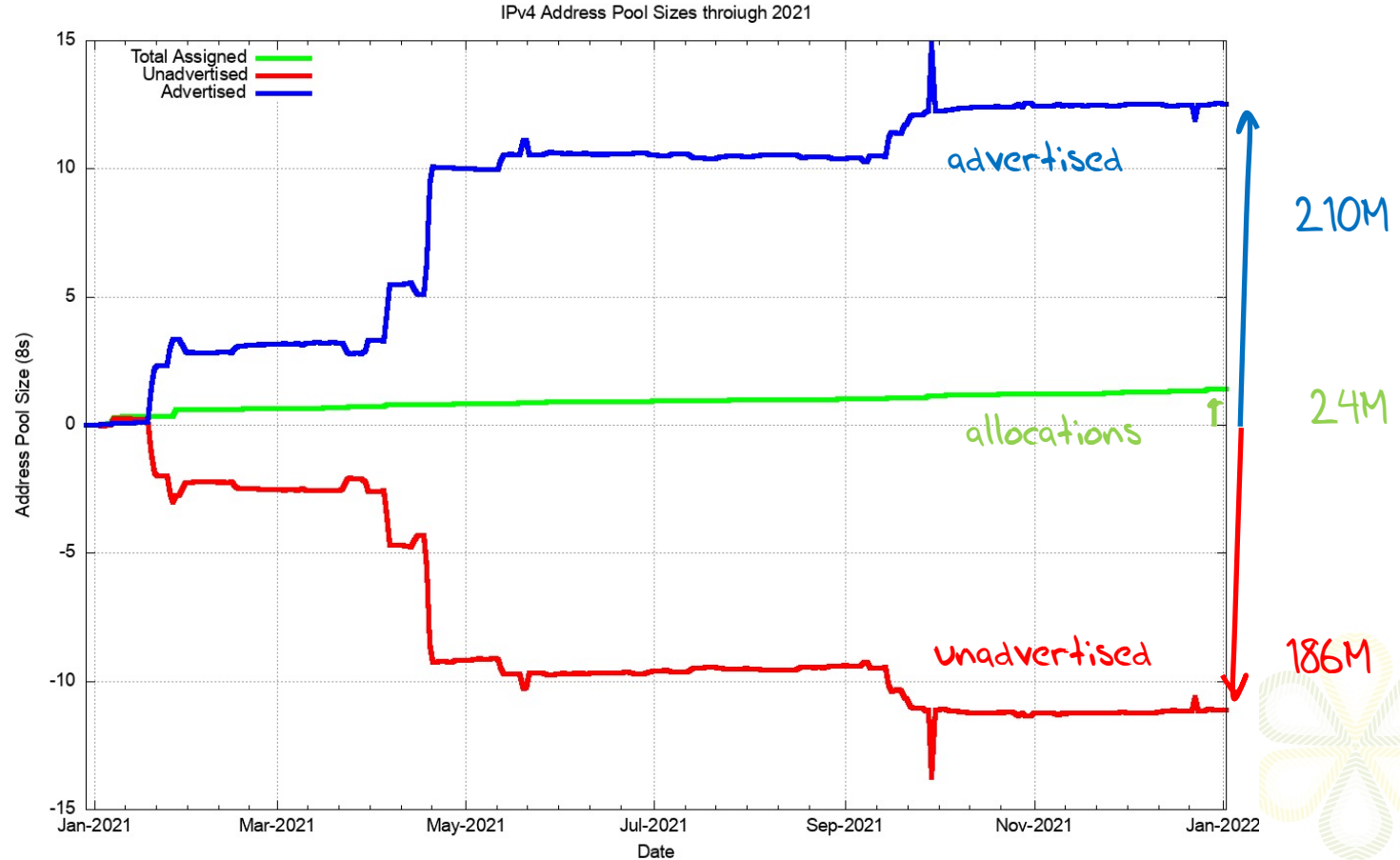
# Unadvertised IPv4 Addresses - 2021



# Unadvertised vs Advertised Ratio



# IPv4 Address Pool Movements - 2021



# Where have IPv4 Addresses ended up?

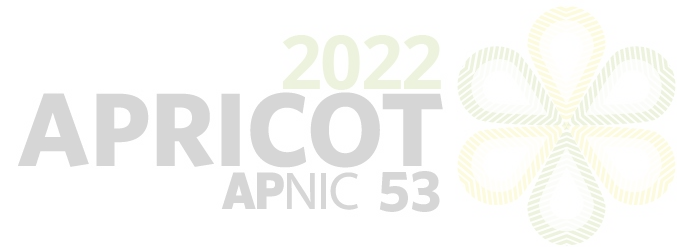
## Allocated Address Pools

Rank	Addr (M)	% Alloc		Name
1	1,619.3	44%	US	USA
2	344.2	9%	CN	China
3	190.3	5%	JP	Japan
4	124.0	3%	DE	Germany
5	112.5	3%	KR	Korea
6	112.1	3%	GB	UK
7	87.1	2%	BR	Brazil
8	83.1	2%	FR	France
9	69.7	2%	CA	Canada
10	55.1	2%	IT	Italy
11	50.2	1%	NL	Netherlands
12	48.8	1%	AU	Australia
13	45.7	1%	RU	Russia
14	41.6	1%	IN	India
15	35.7	1%	TW	Taiwan

## Allocated Addresses Per Capita

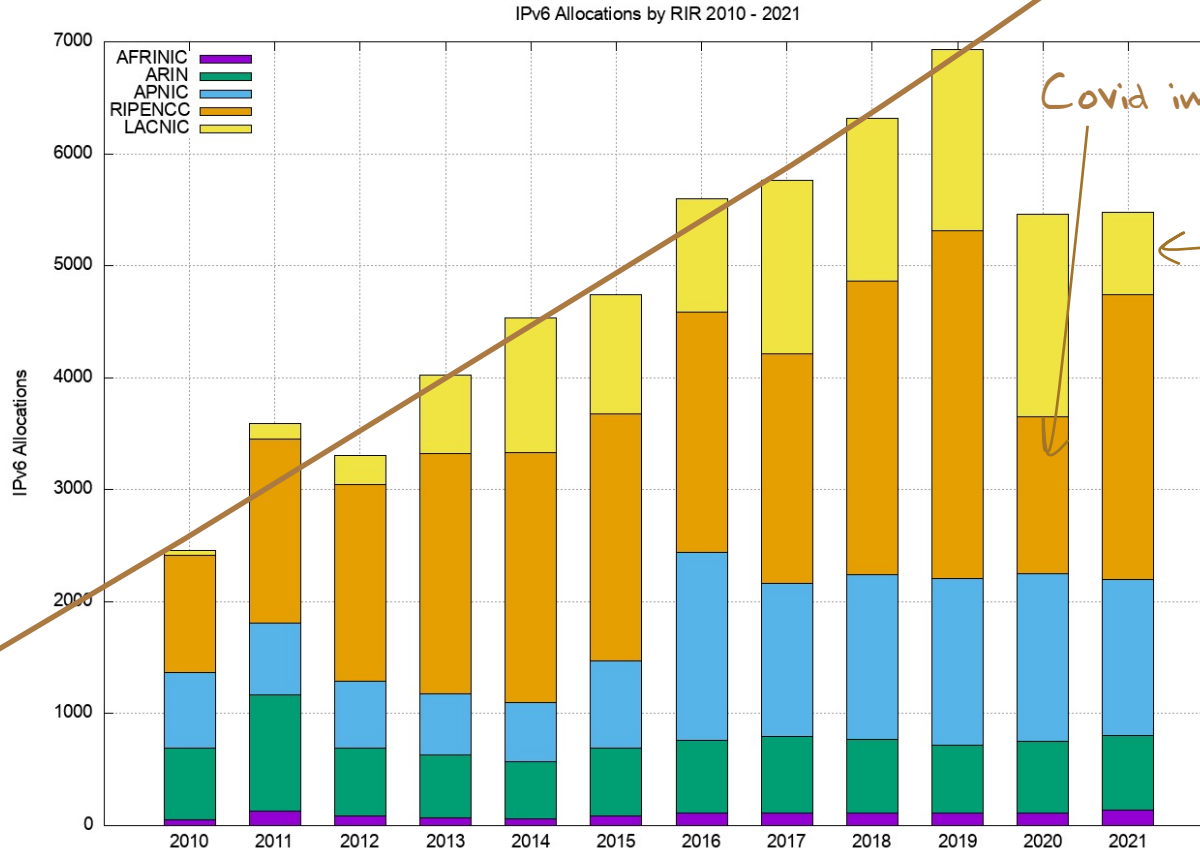
Rank	Addr (M)	Per Capita		Name
1	7.2	73.7	SC	Seychelles
2	0.0	13.4	VA	Holy See
3	0.3	7.6	GI	Gibraltar
4	1,619.3	4.9	US	USA
5	24.0	4.1	SG	Singapore
6	4.8	3.8	MU	Mauritius
7	0.1	3.0	LI	Liechtenstein
8	30.0	3.0	SE	Sweden
9	50.2	2.9	NL	Netherlands
10	15.7	2.9	NO	Norway
11	1.8	2.8	LU	Luxembourg
12	23.4	2.7	CH	Switzerland
13	0.9	2.6	IS	Iceland
14	13.6	2.5	FI	Finland
15	0.1	2.3	VG	British Virgin Islands

# IPv6





# IPv6 Allocations

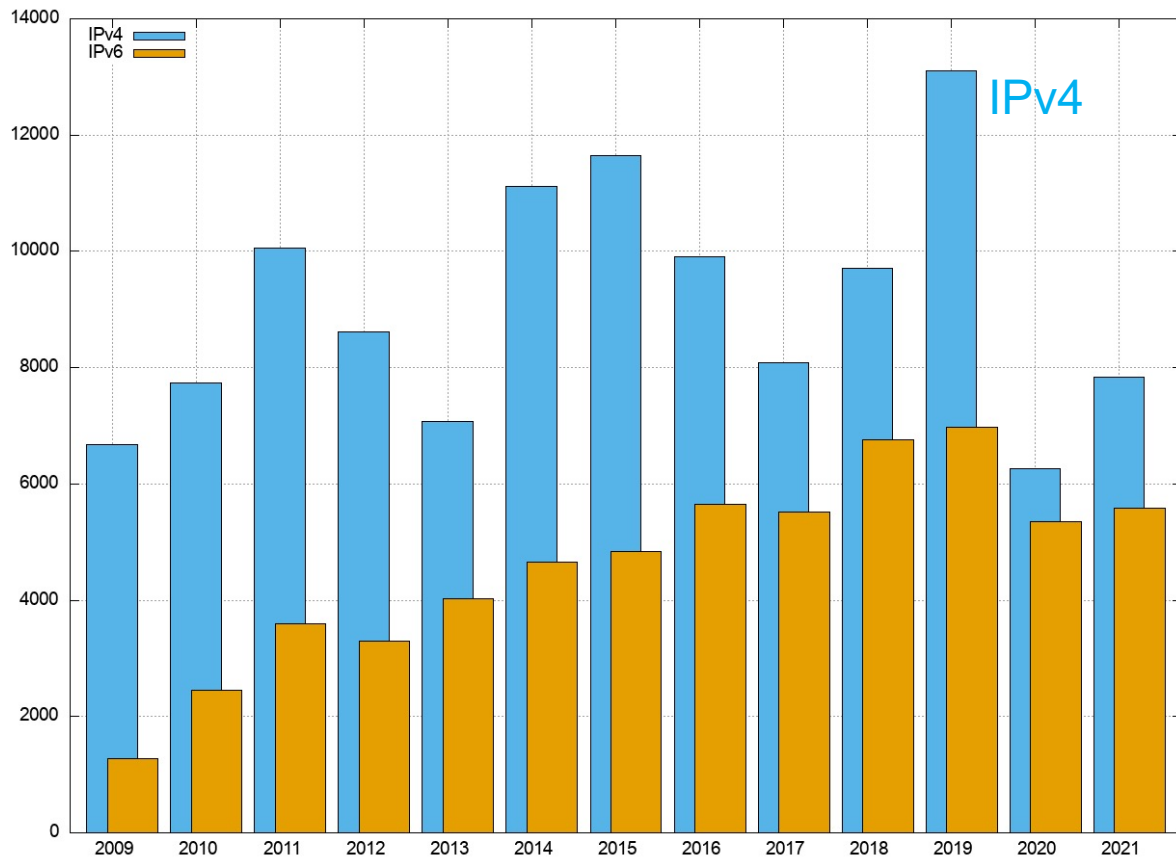


Covid impact in EU?

Covid impact in LATAM?



# IPv4 / IPv6 RIR Allocations

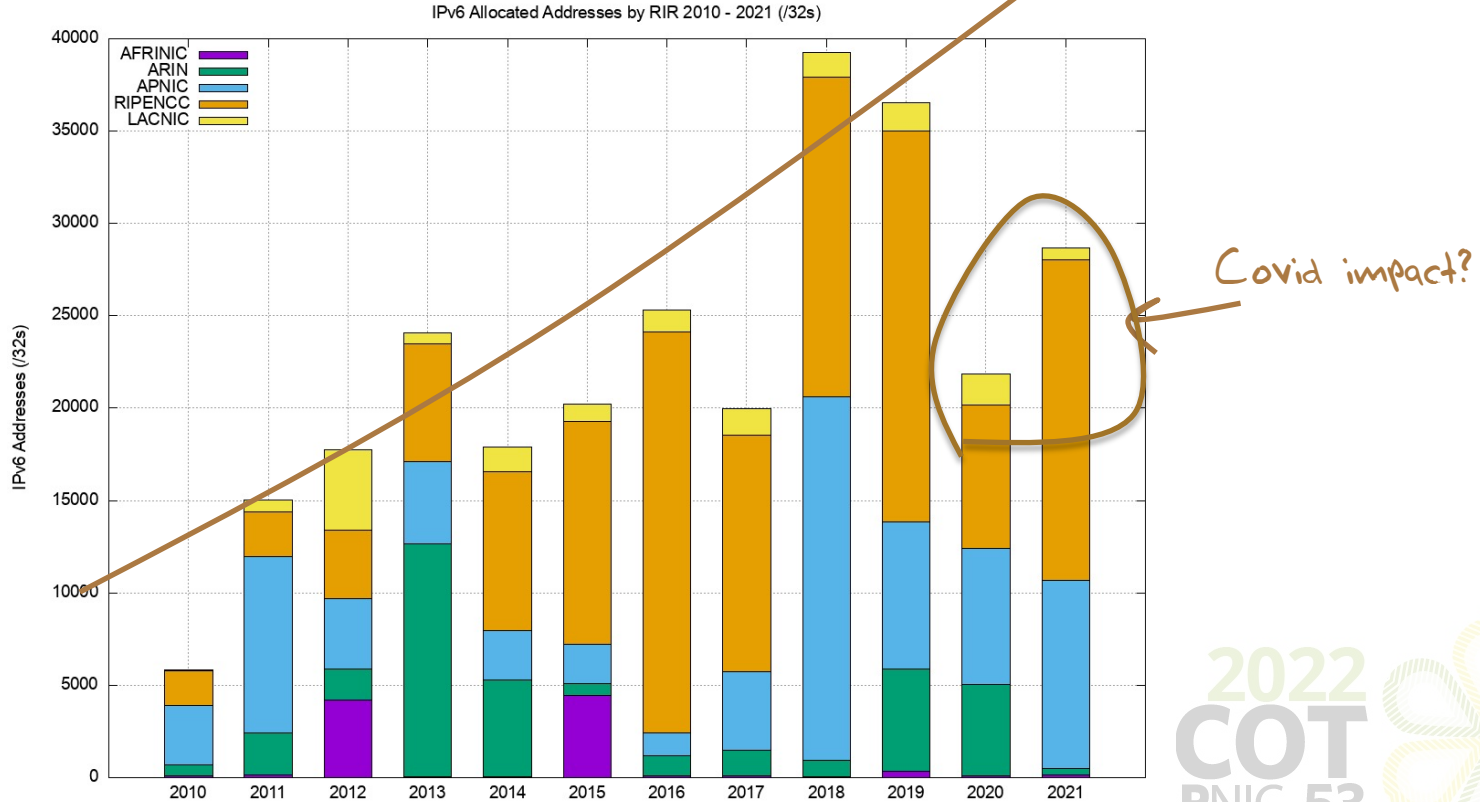


IPv6

IPv4



# IPv6 Addresses Allocated



# Where did those addresses go each year?

## IPv6 Allocations (/32s)

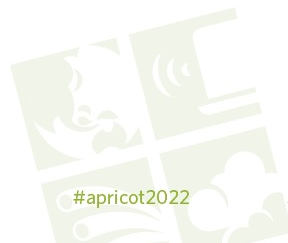
Rank	2017	2018	2019	2020	2021
1	Brazil 1,114	Brazil 1,049	Brazil 1,112	Brazil 1,394	USA 619
2	USA 634	Russia 638	USA 538	USA 588	Russia 576
3	Germany 270	USA 595	Russia 502	Indonesia 389	Brazil 508
4	Russia 220	Germany 308	Germany 407	India 226	Netherlands 448
5	Australia 211	China 253	Indonesia 366	Netherlands 199	India 390
6	China 208	Indonesia 213	Netherlands 342	Germany 192	UK 304
7	Netherlands 194	UK 184	UK 223	Bangladesh 182	Bangladesh 213
8	UK 190	Bangladesh 183	Bangladesh 202	Russia 128	Germany 196
9	Indonesia 187	India 168	France 179	Australia 118	Indonesia 110
10	Argentina 178	Netherlands 162	China 165	China 115	Hong Kong 108



# What's the total picture so far?

Rank	Allocated /48s	% Alloc	/48s p.c.	Advert /48s	Util %	Name
1	3,935,895,641	8.7%	2.7	1,653,209,907	42%	China
2	3,792,870,791	8.3%	11.5	1,285,400,632	34%	USA
3	1,495,597,738	3.3%	17.9	1,014,063,396	68%	Germany
4	1,462,567,146	3.2%	21.5	408,882,366	28%	Ukraine
5	1,101,070,646	2.4%	7.5	182,214,358	17%	Russia
6	954,077,585	2.1%	14.6	160,941,809	17%	France
7	805,044,528	1.8%	47	372,779,283	46%	Netherlands
8	663,363,785	1.5%	5.2	507,761,324	77%	Japan
9	651,366,430	1.4%	10.8	410,311,962	63%	Italy
10	618,595,518	1.4%	24.3	308,144,893	50%	Australia
11	536,633,745	1.2%	2.5	349,049,644	65%	Brazil
12	435,683,668	1.0%	43.1	354,673,448	81%	Sweden
13	426,312,530	0.9%	0.3	87,418,647	21%	India
14	389,480,682	0.9%	10.3	217,710,656	56%	Poland
15	382,861,348	0.8%	8.2	116,707,622	31%	Spain
16	349,636,710	0.8%	7.7	282,569,431	81%	Argentina
17	344,981,515	0.8%	6.7	4,202,786	1%	Korea
18	317,986,504	0.7%	5.4	289,469,714	91%	South Africa
19	270,139,396	0.6%	2.6	269,942,784	100%	Egypt
20	238,485,939	0.5%	27.6	110,620,777	46%	Switzerland
21	217,579,546	0.5%	2.6	44,449,846	20%	Turkey
22	188,547,184	0.4%	17.6	110,110,496	58%	Czechia
23	182,255,789	0.4%	4.2	70,165,085	39%	Ukraine
24	178,454,535	0.4%	2.1	28,946,521	16%	Iran
25	168,558,607	0.4%	7.1	154,767,902	92%	Taiwan

Advertised / Allocated



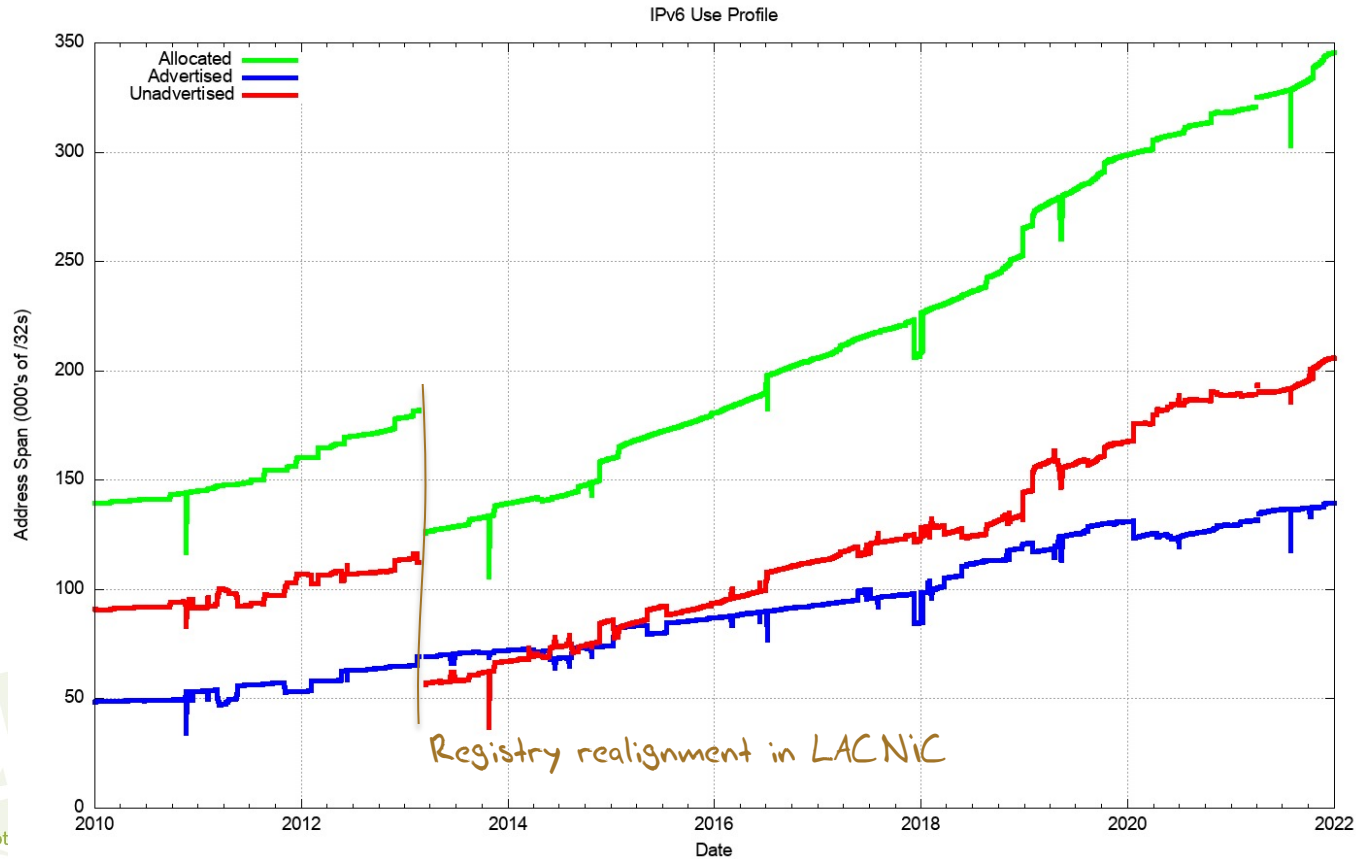
#apricot2022

2022  
APRICOT  
APNIC 53



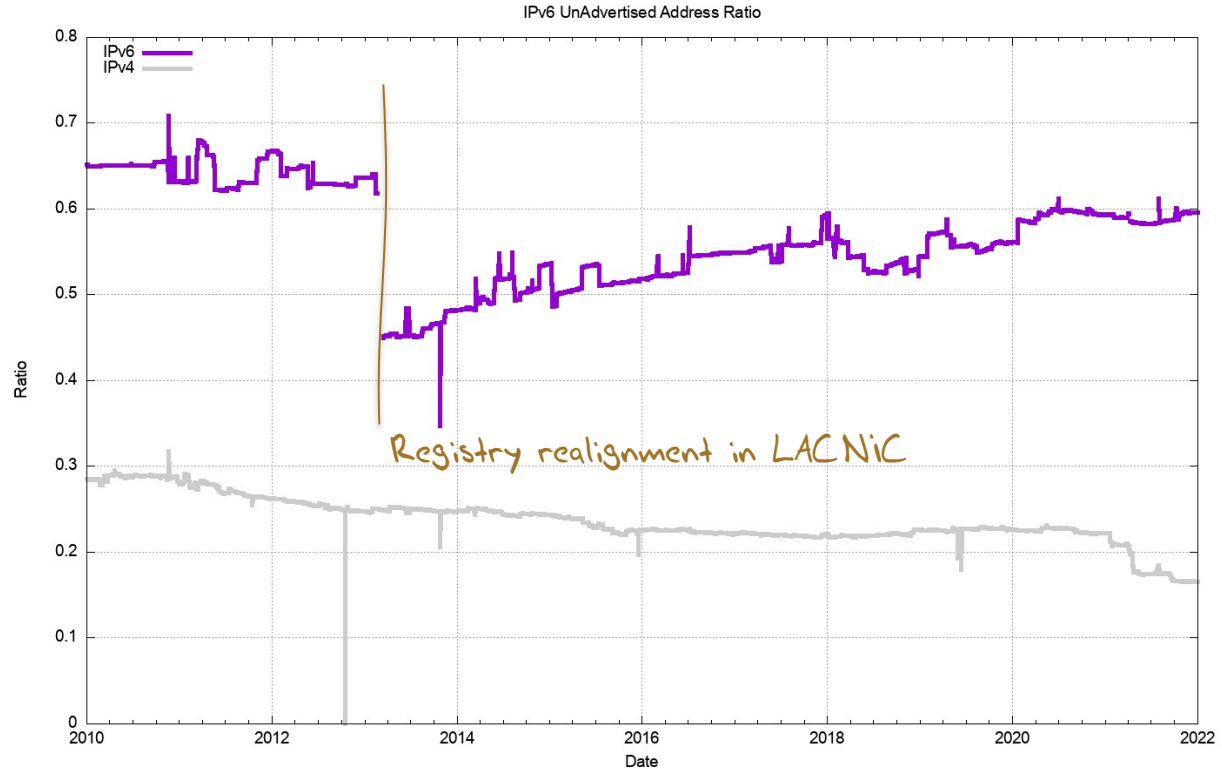
\* i'm using a count of /48s here to get the per capita numbers to make sense

# Advertised vs Unadvertised

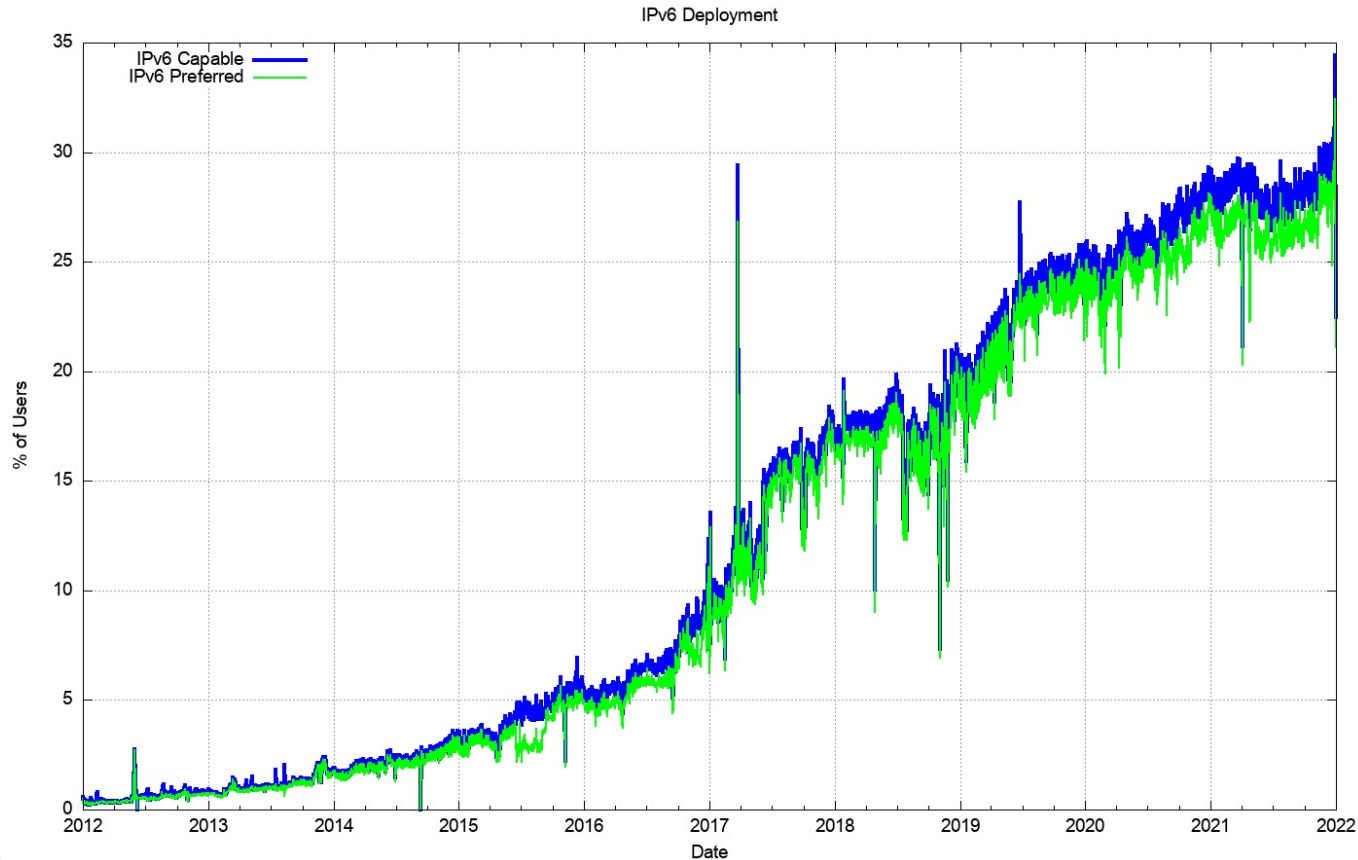


# Comparing IPv4 to IPv6

Unadvertised Pool  
/ Allocated Pool

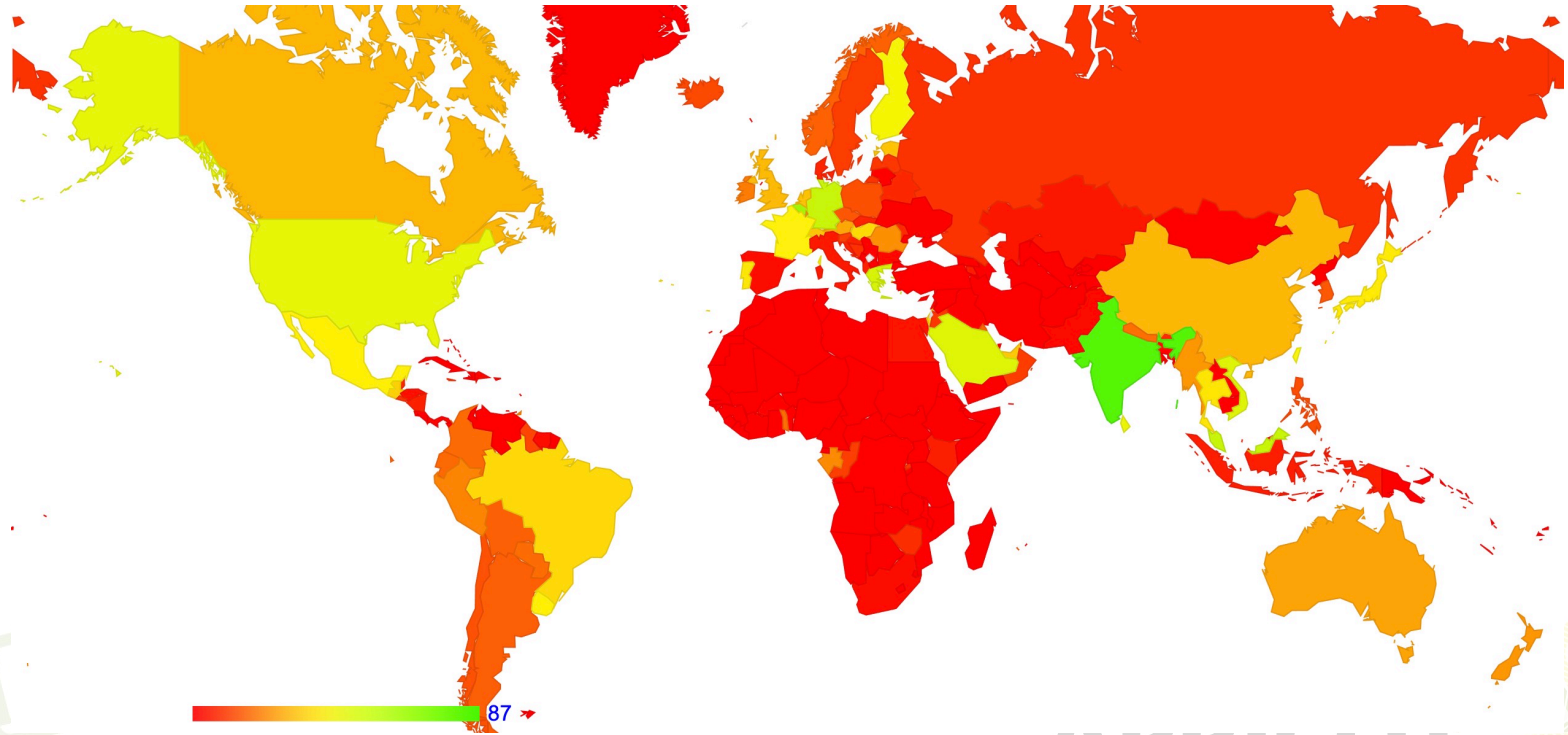


# IPv6 Use by % of users





# IPv6 Use by geo location



# 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!



The logo features the word "APRICOT" in large white letters, with "2022" in yellow above it and "APNIC 53" in white below it. The background is a vibrant green with a repeating pattern of stylized apricot leaves and fruit, some filled with yellow and white stripes. A faint, larger version of the logo is visible in the background on the left side.

# 2022 APRICOT APNIC 53

21 February – 3 March 2022

[#apricot2022](https://twitter.com/apricot2022)