APNIC 40

The Status of APNIC's IPv4 Resources: Exhaustion & Transfers

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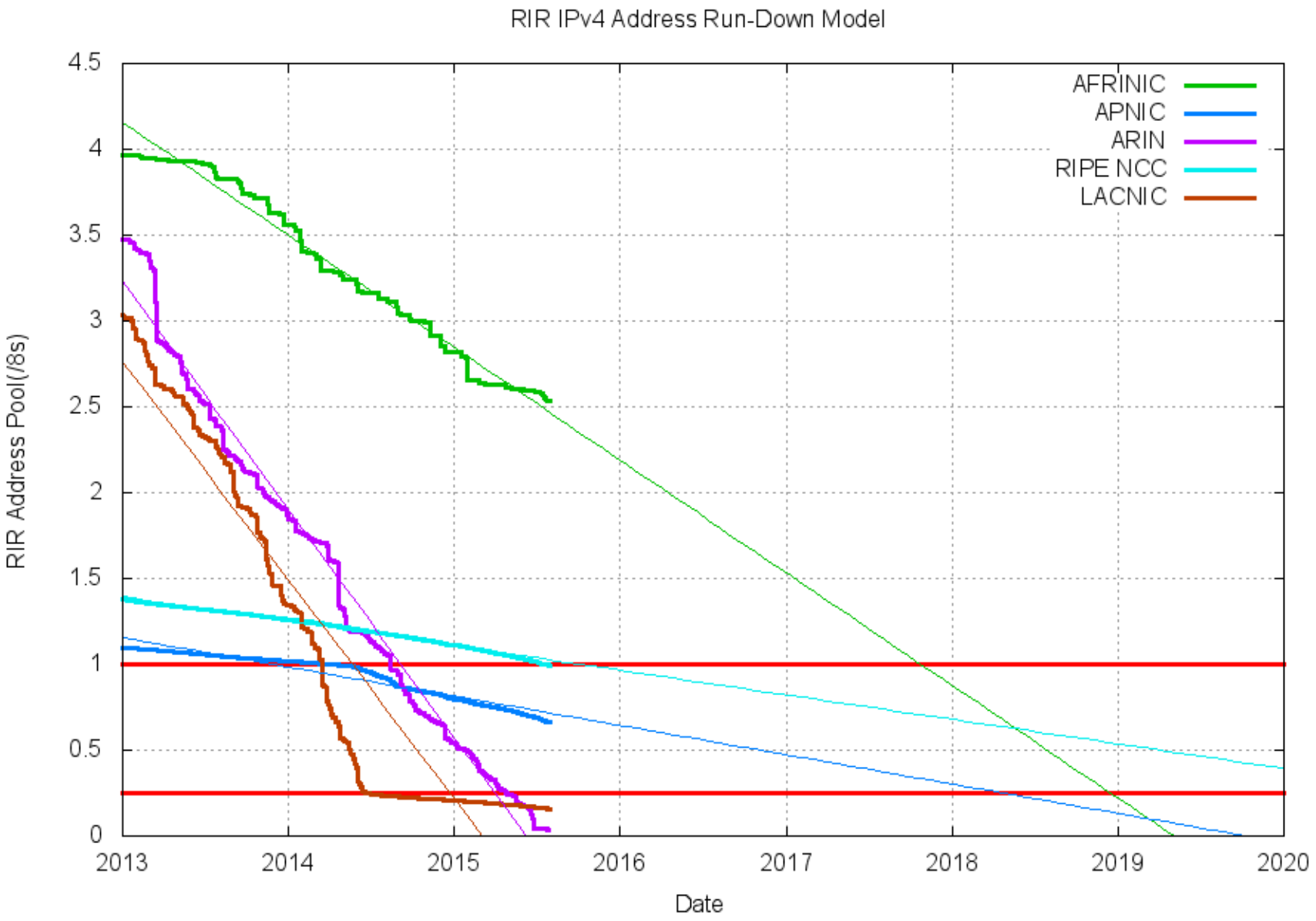
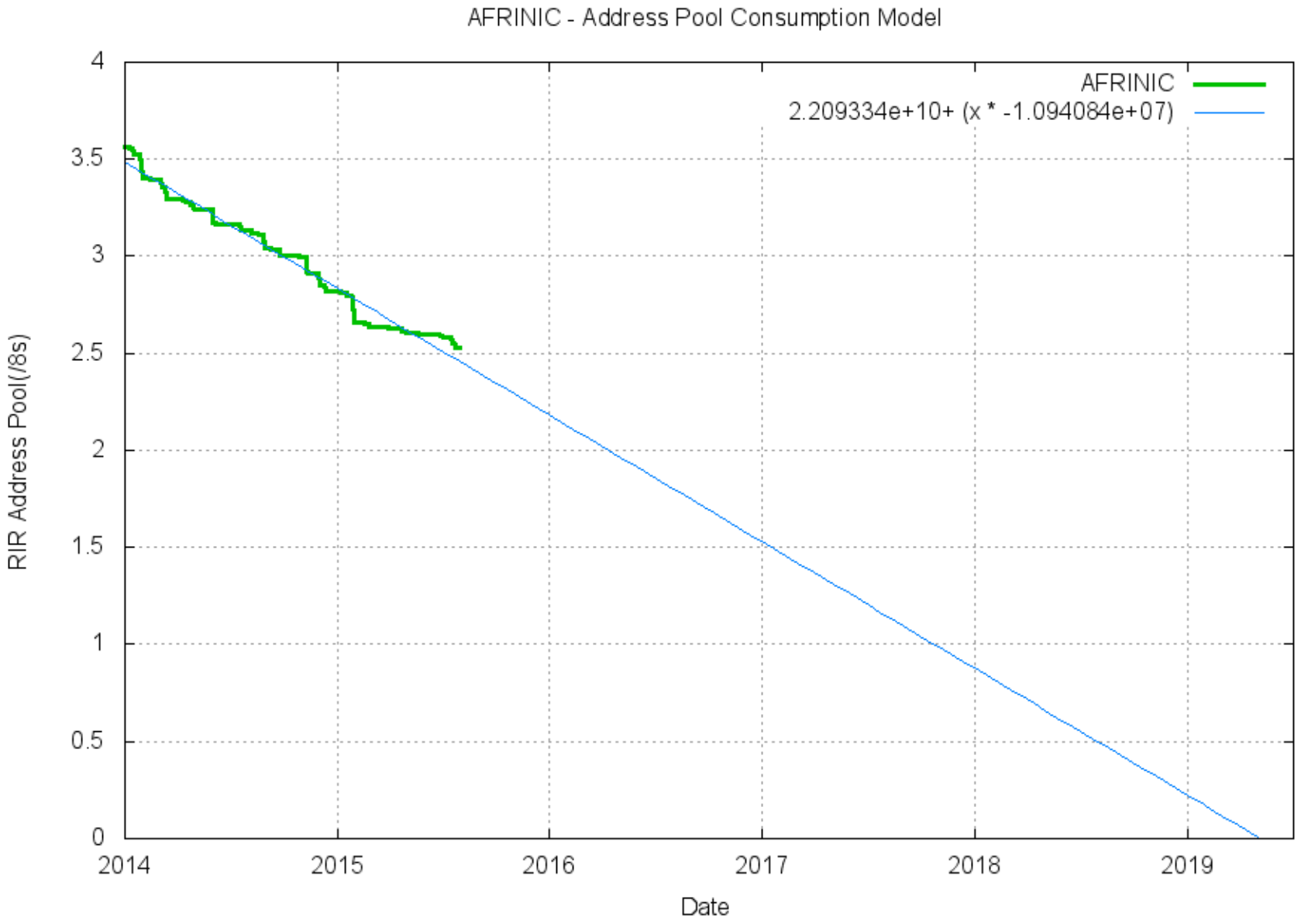
#apnic40

IPv4 Exhaustion

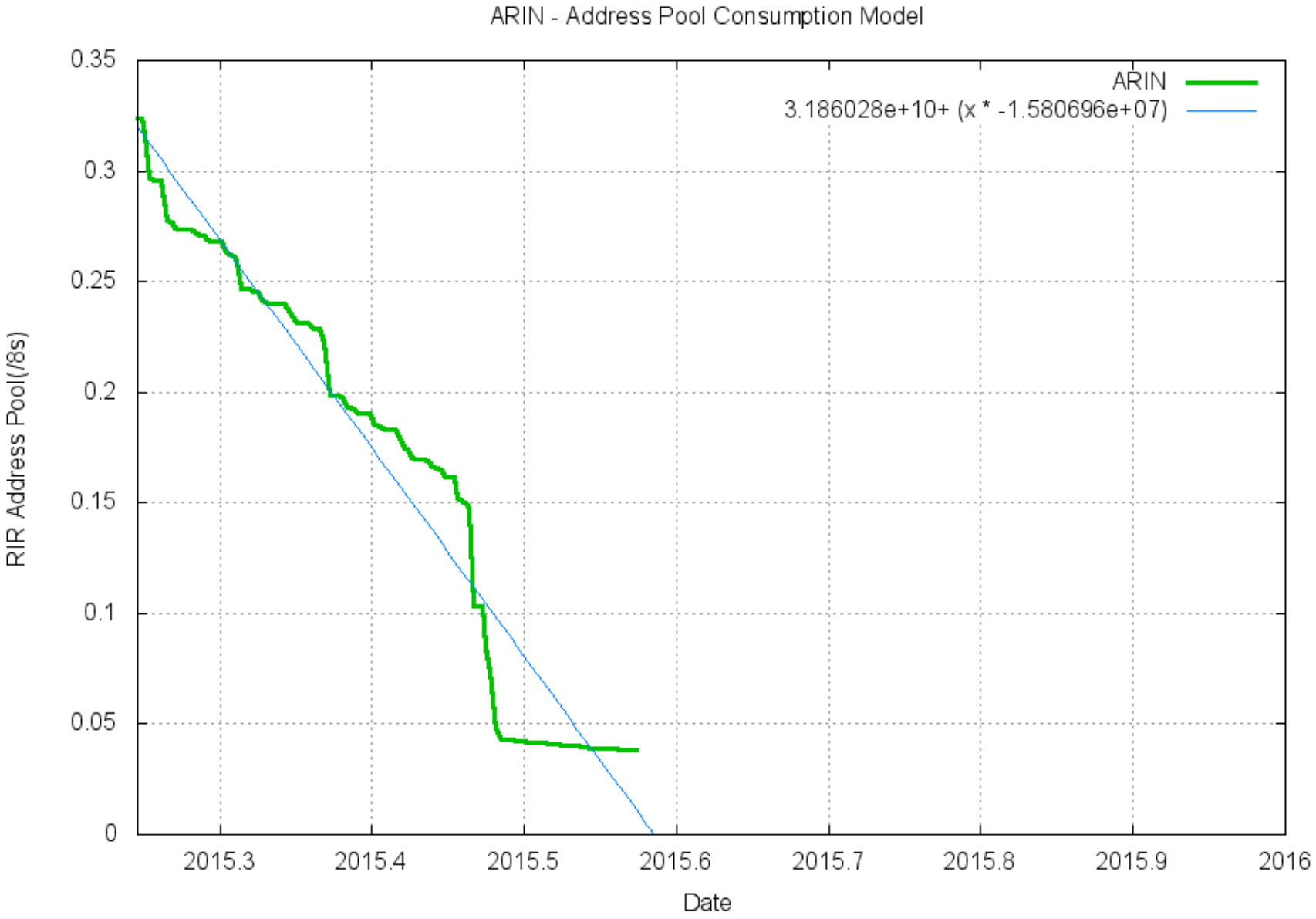
What's Left in IPv4



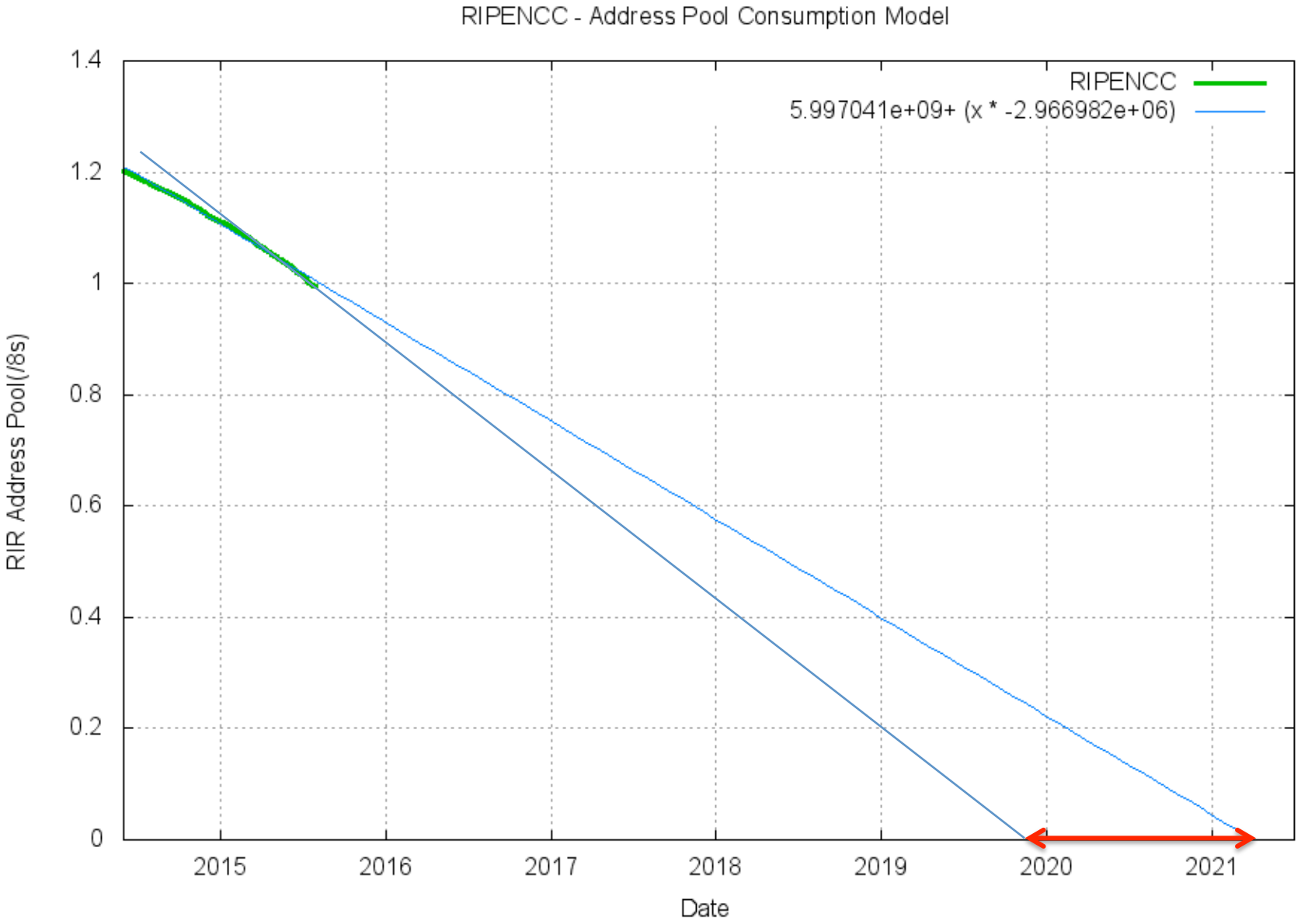
Exhaustion: AFRINIC



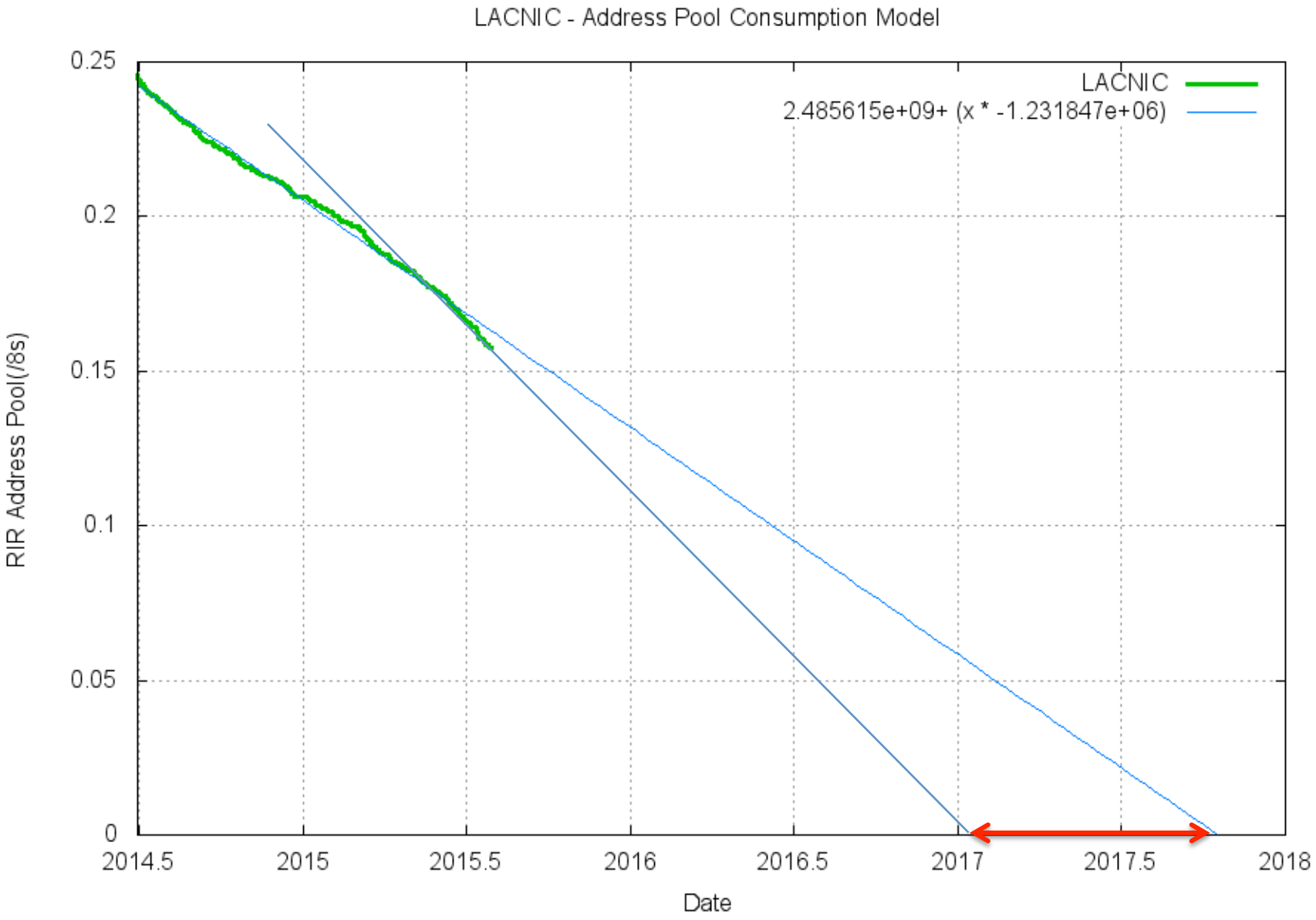
Exhaustion: ARIN



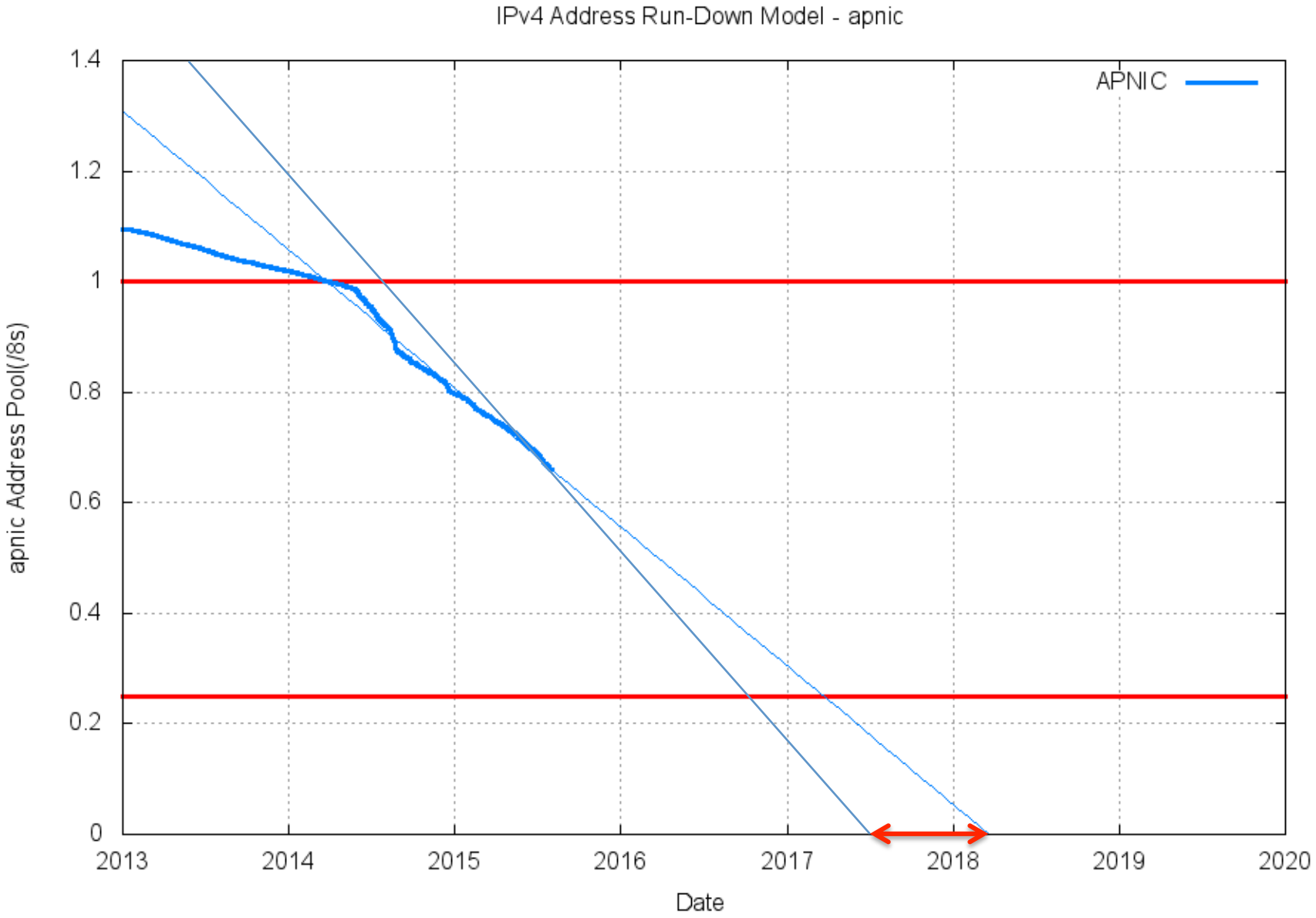
Exhaustion, Pt 2: RIPE NCC's final /8



Exhaustion, Pt 2: LACNIC's 2 final /11's



Exhaustion, Pt 2: APNIC's final /8



Where Are We?

- LACNIC running a split pool of two /11 blocks
  - 1 ½ - 2 years to go
- APNIC running out of their last /8 plus IANA Return Pool (max allocation is a /22 from each pool)
  - 2 - 2 ½ years to go
- AFRINIC still have a pool of 2.5 /8s to go
  - 4 years to go
- RIPE NCC running out of their last /8 plus IANA Return Pool (max allocation is a /22)
  - 4 ½ - 5 ½ years to go
- ARIN reserved a /10 for V6 transition, running the remaining pool to complete exhaustion
  - Inadequate data

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  - 4 ½ - 5 ½ ye[illegible]
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Really?

Lets take a more detailed look at APNIC's situation

APNIC’s Last /8

APNIC's Address Pools

	Pool	Assigned	Available	Reserved
Last /8	16,777,216	6,147,328	10,317,312	312,576
IANA Returns	3,670,016	2,916,352	737,280	16,384
Various	51,817,728	49,132,032	0	2,685,696
APNIC Allocations	803,663,616	802,066,688	0	1,596,928
Total	875,928,576	860,262,400	11,054,592	4,611,584

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APNIC Allocation from the last /8

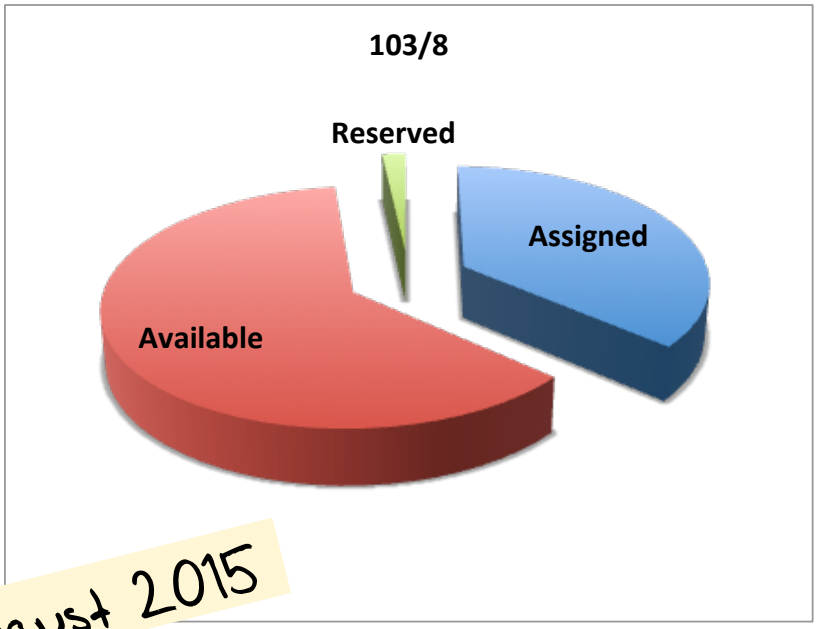
“This means that Members can still get IPv4 address space; however, each Member is entitled to a total maximum of a /22 (or 1,024 addresses) from each pool.”

Status of 103/8

Assigned: 6,101,760

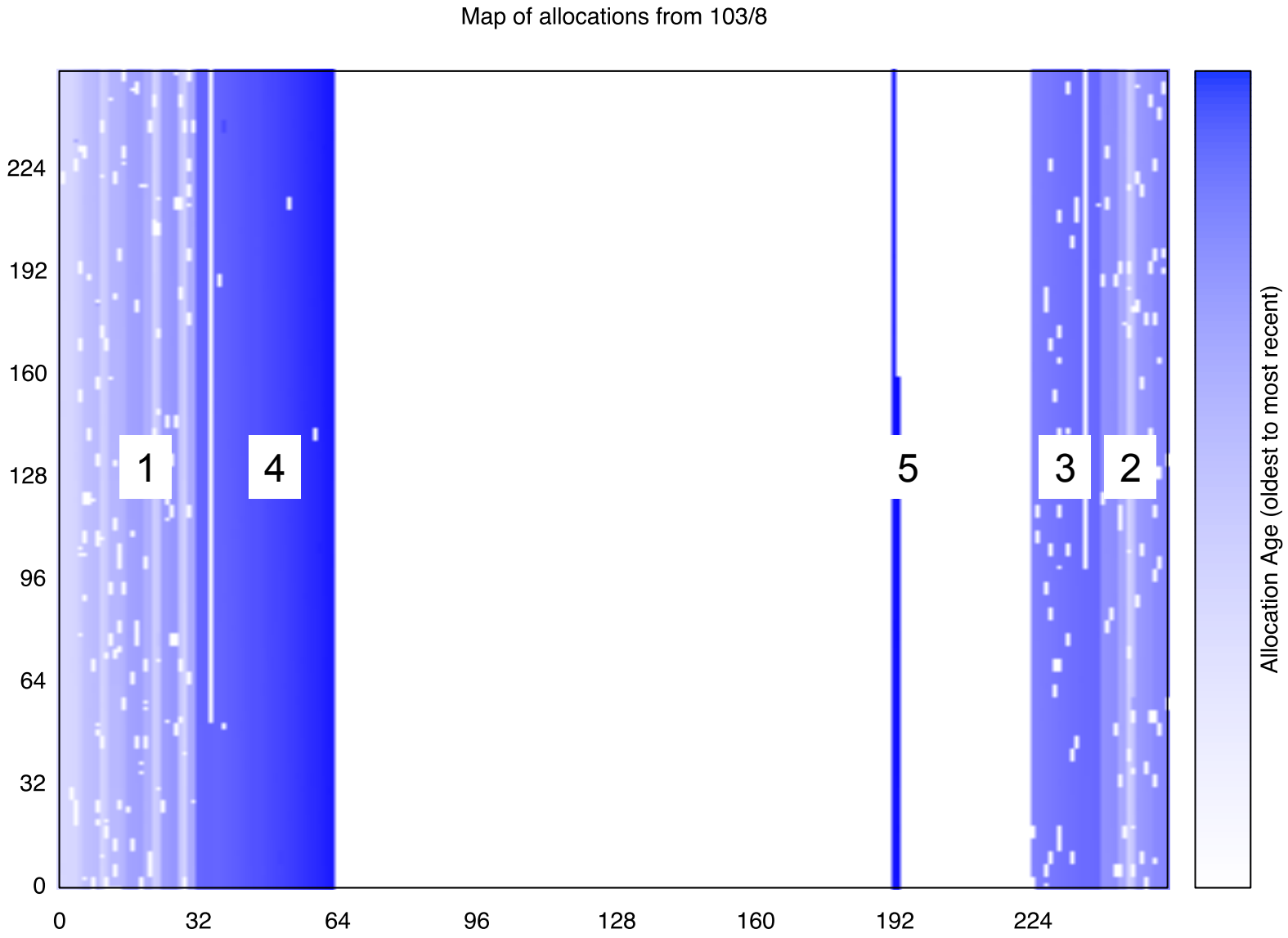
Available: 10,379,264

Reserved: 296,192

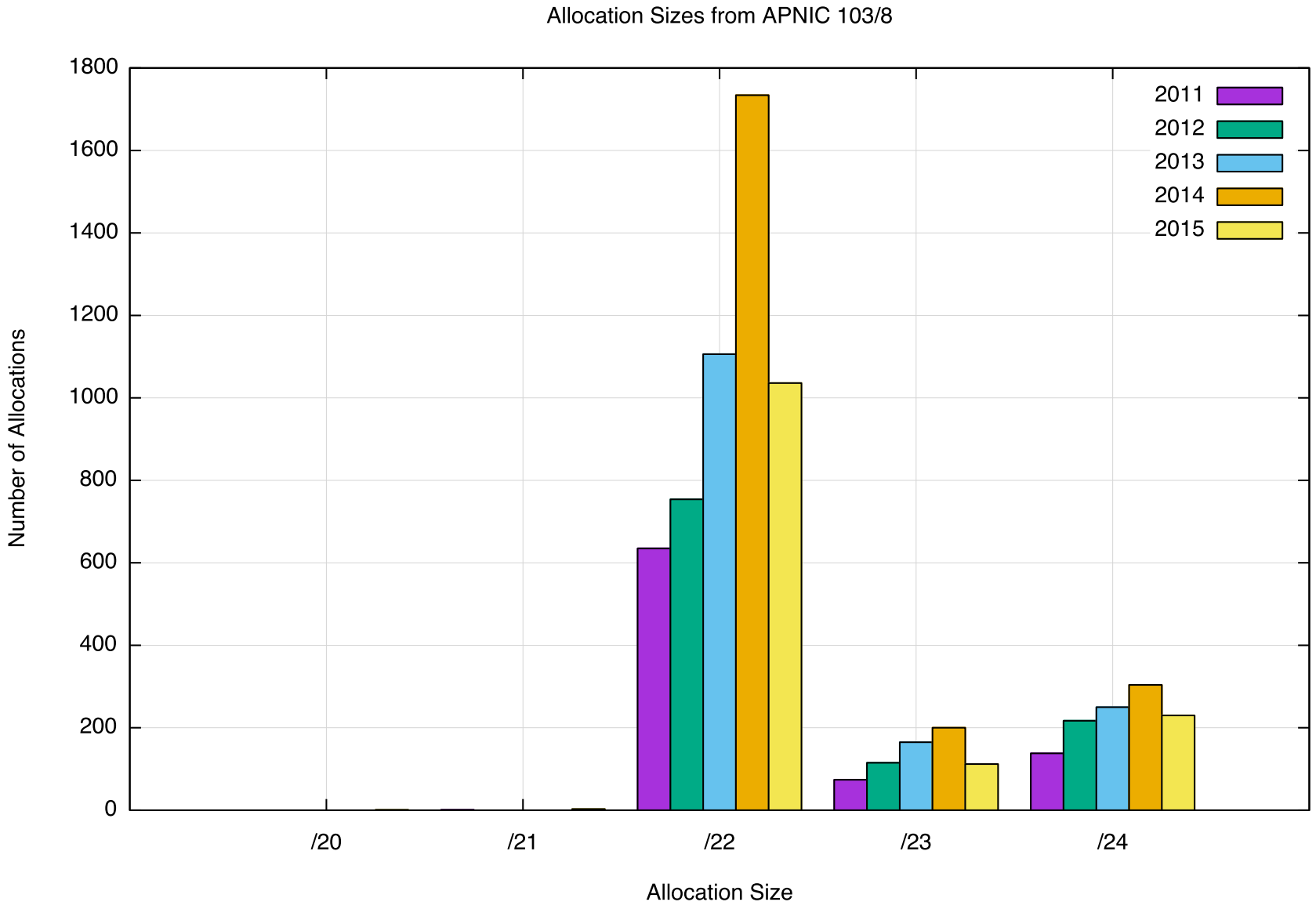


As of mid August 2015

APNIC's Last /8



Allocation Sizes - APNIC



Larger Holdings in 103/8?

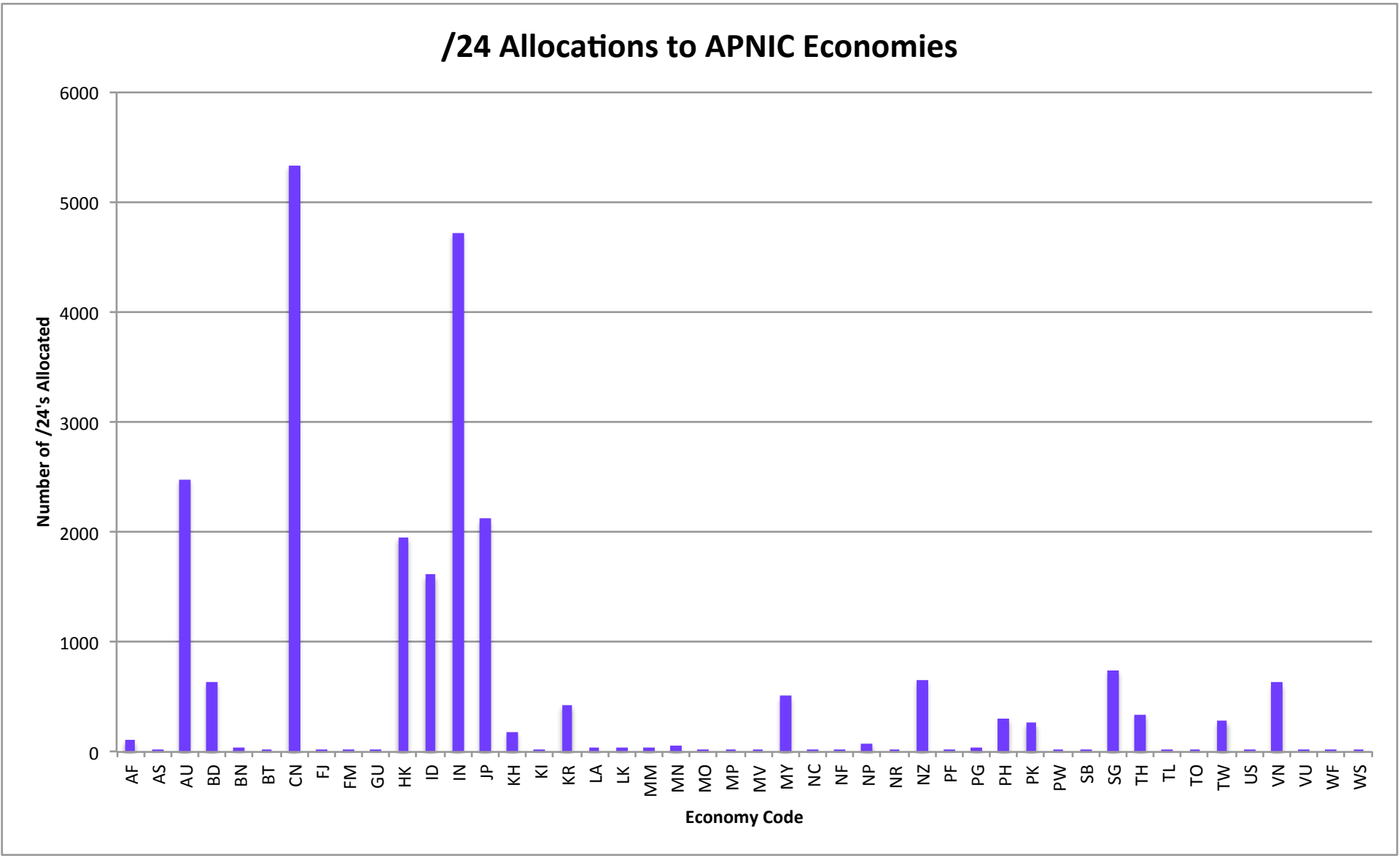
There are 100 instances where the same end entity is listed as holding more than 1,024 addresses assigned from 103/8

These are probably the result of post allocations mergers, acquisitions and transfers

1 x	1,280
4 x	1,536
70 x	2,048
2 x	2,560
15 x	3,072
3 x	4,096
3 x	5,120
1 x	7,168
1 x	14,336

For a full list of the grouped allocations to a single holding entity of more than 1,024 addresses from the last /8 see http://labs.apnic.net/103-multi-allocations.txt

Allocations from 103/8

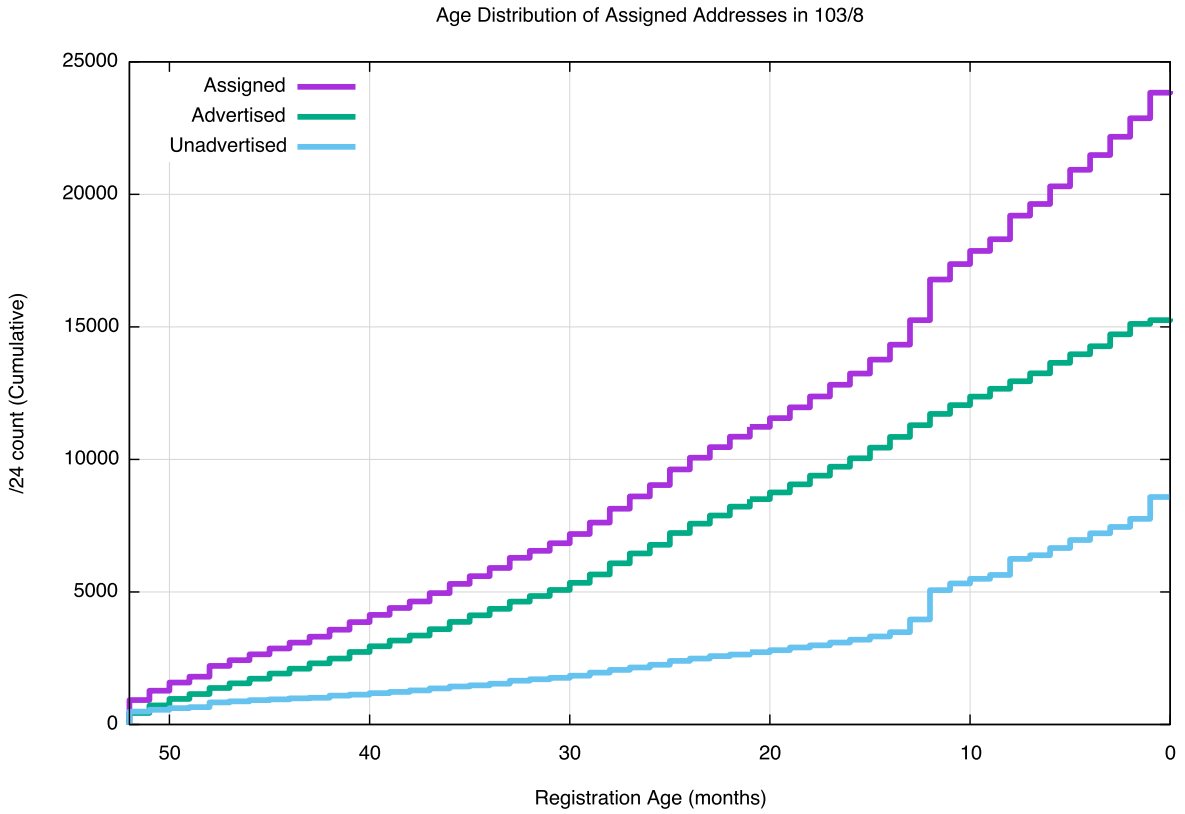


Advertised vs Assigned in 103/8

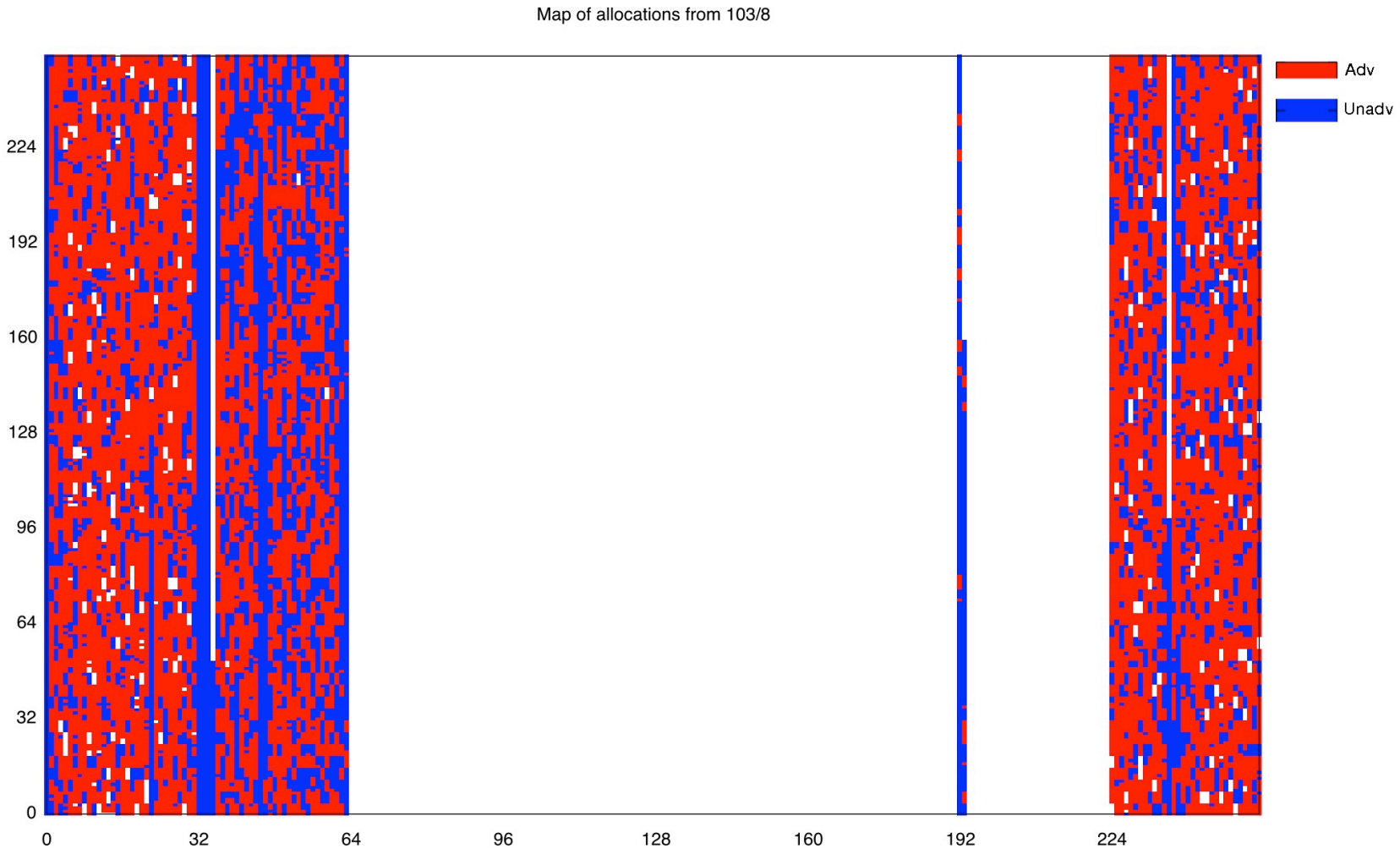
Assigned Addresses: 6,101,760

Advertised Addresses: 4,582,784

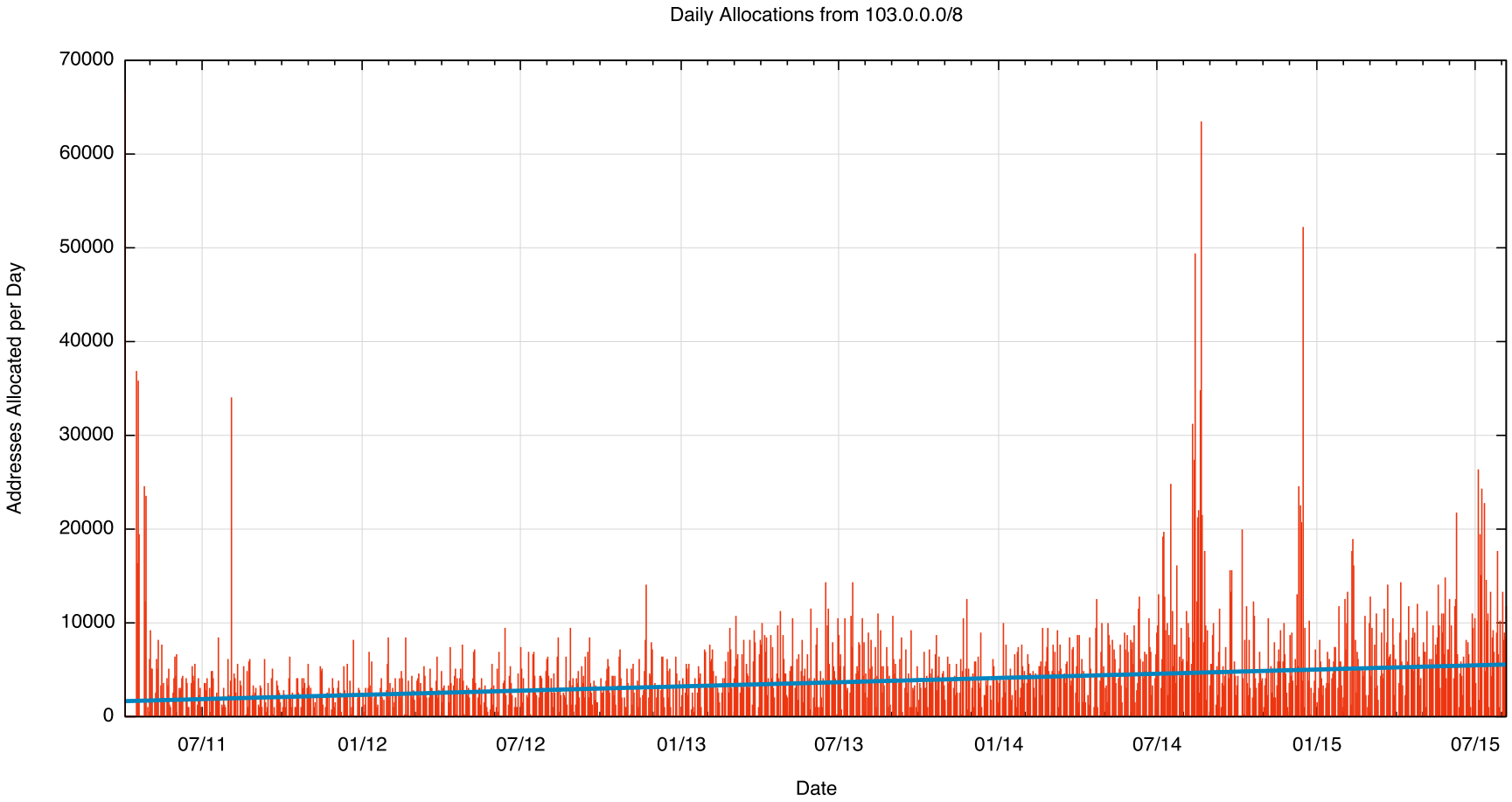
Unadvertised Addresses: 1,518,976



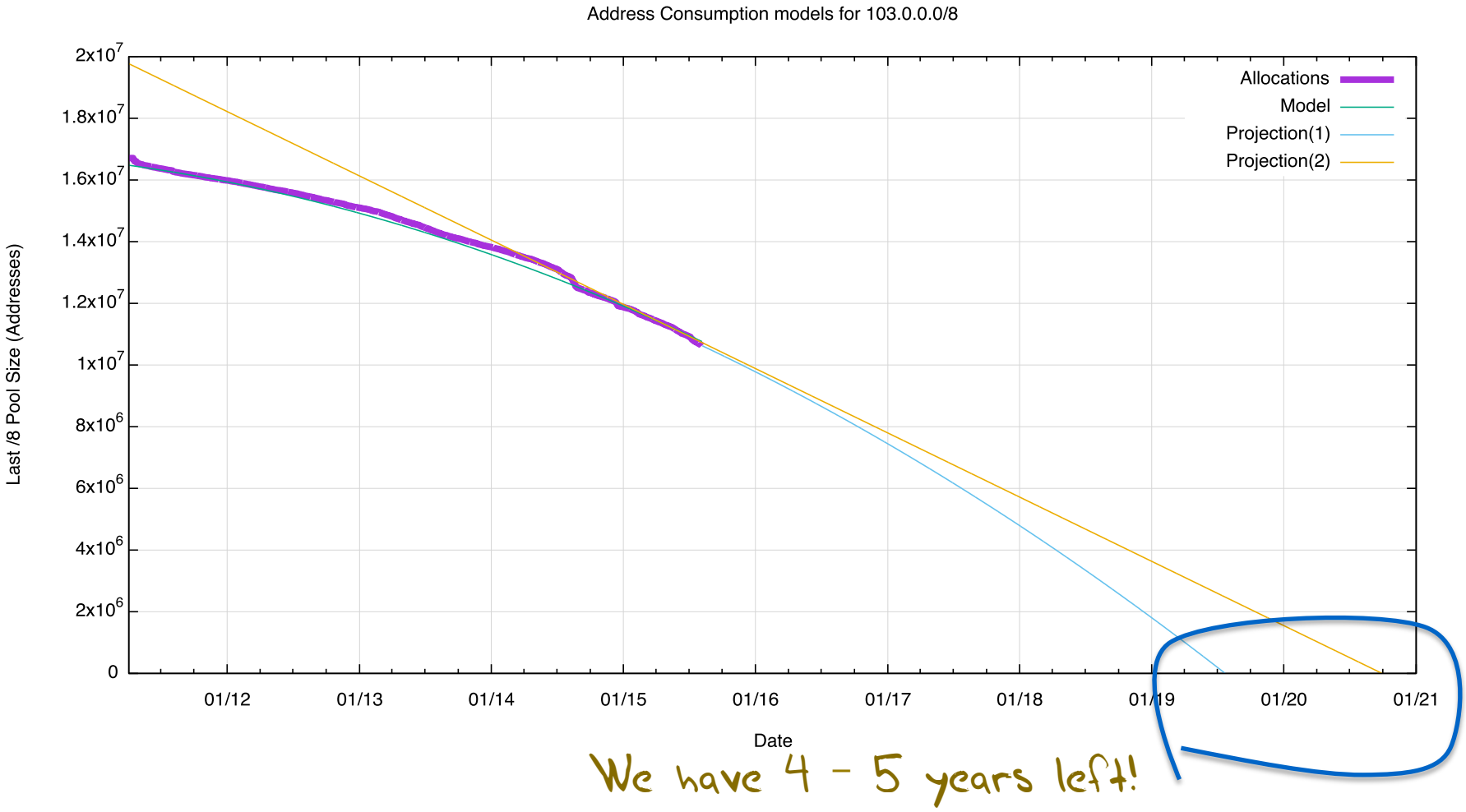
Advertised/Unadvertised Map of 103/8



Consumption



Projection for the last /8



IANA Recovered Space: Returns to APNIC

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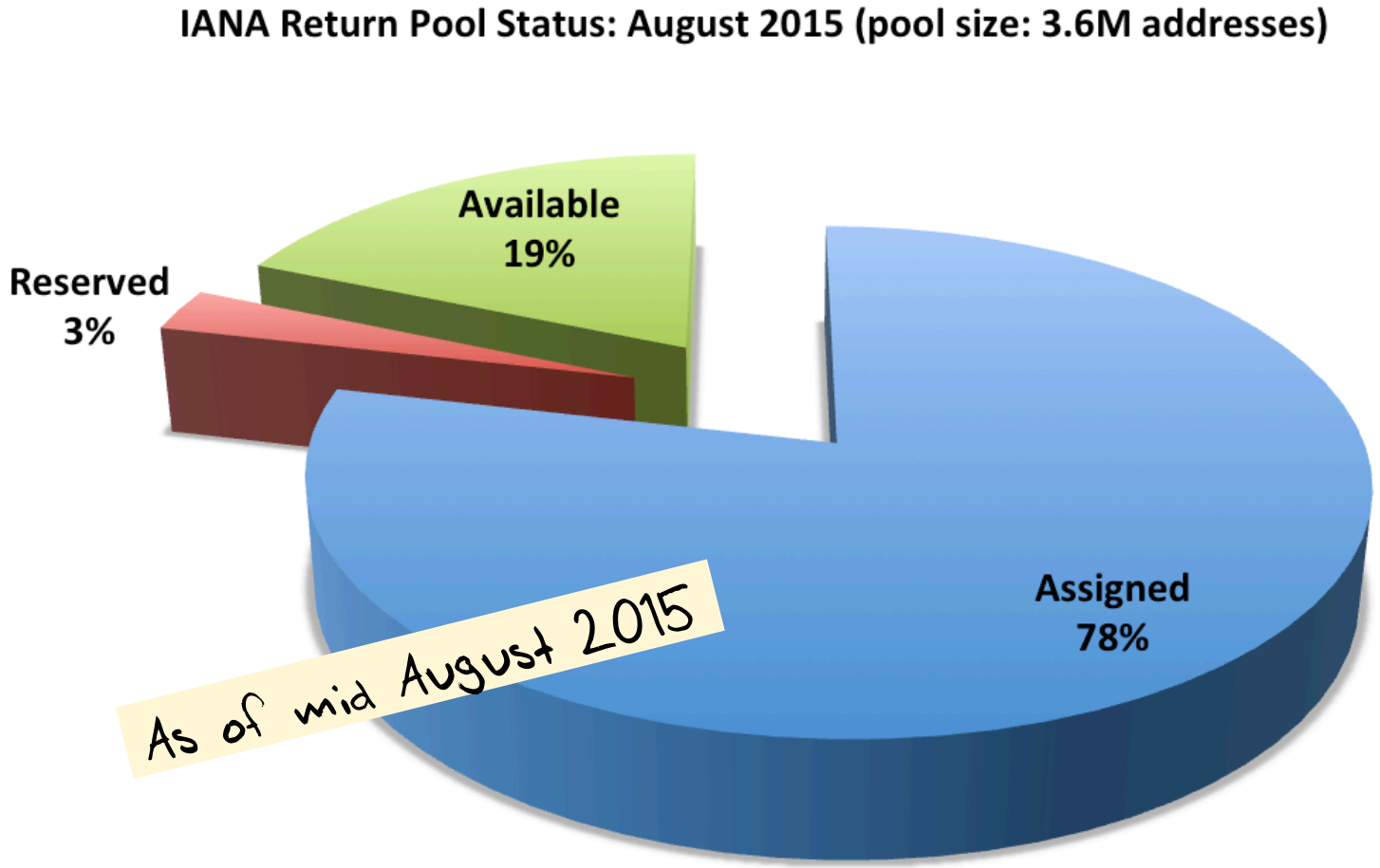
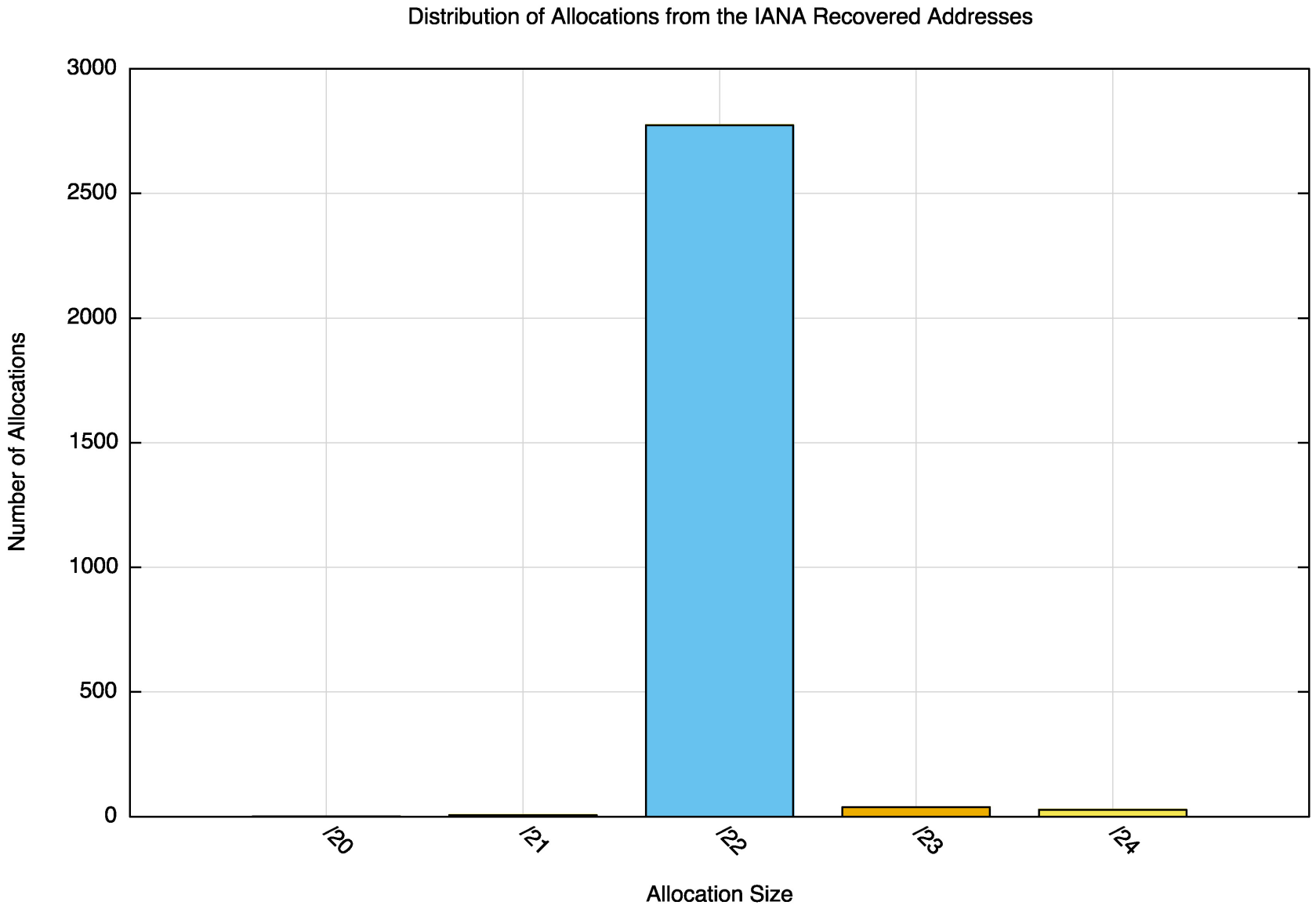
APNIC's IANA Return Pool

Start	End	Date
43.224.0.0	43.231.255.255	2014-05
43.236.0.0	43.243.255.255	2014-05
43.245.0.0	43.252.255.255	2014-05
43.254.0.0	43.255.255.255	2014-05
45.64.0.0	45.65.15.255	2014-05
45.112.0.0	45.127.255.255	2014-09
45.248.0.0	45.255.255.255	2015-03
150.107.0.0	150.107.255.255	2014-05
150.129.0.0	150.129.255.255	2014-05
150.242.0.0	150.242.255.255	2014-05
163.47.4.0	163.47.18.255	2014-05
163.47.20.0	163.47.21.255	2014-05
163.47.32.0	163.47.45.255	2014-05
163.47.47.0	163.47.255.255	2014-05
163.53.0.0	163.53.255.255	2014-05

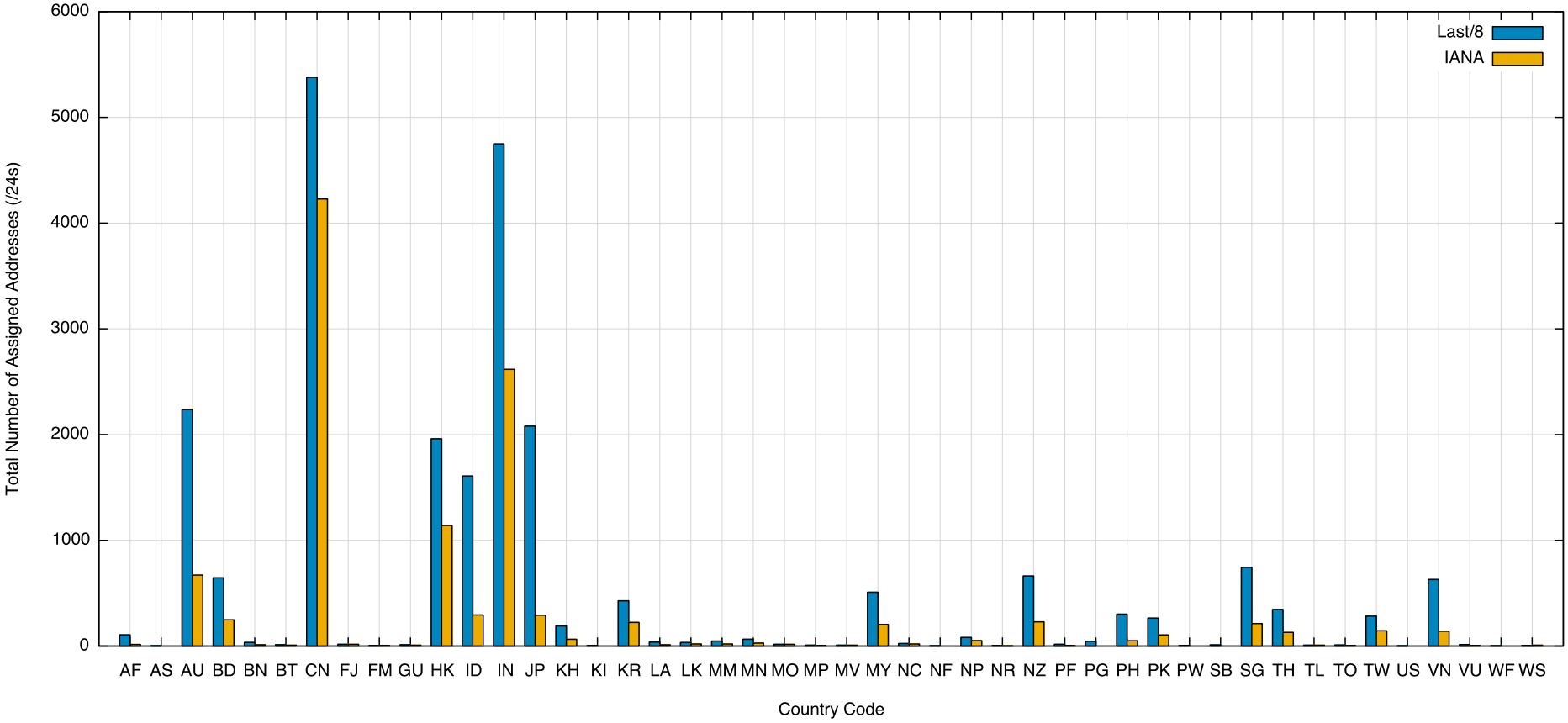
Pool Status


IANA Return Pool Status: August 2015 (pool size: 3.6M addresses)
Available
19%
Reserved
3%
Assigned
78%
As of mid August 2015

Allocation Size Distribution



Economy Distribution



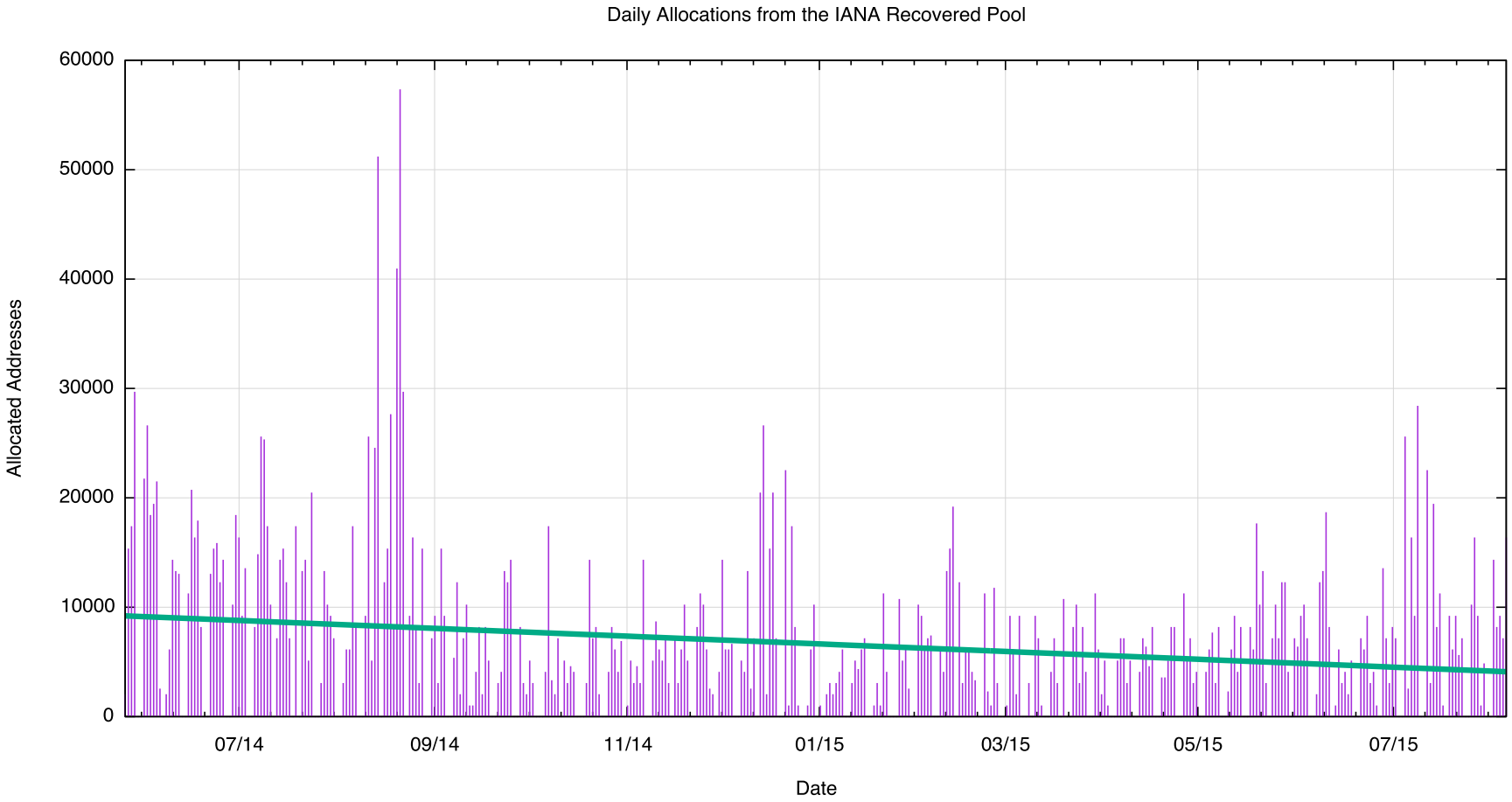
Advertised vs Unadvertised

	Last /8	IANA Returned
Advertised	4,037,376	1,334,528
UnAdvertised	2,015,232	1,549,056
Total	6,052,608	2,883,584
	66÷ advertised	46÷ advertised

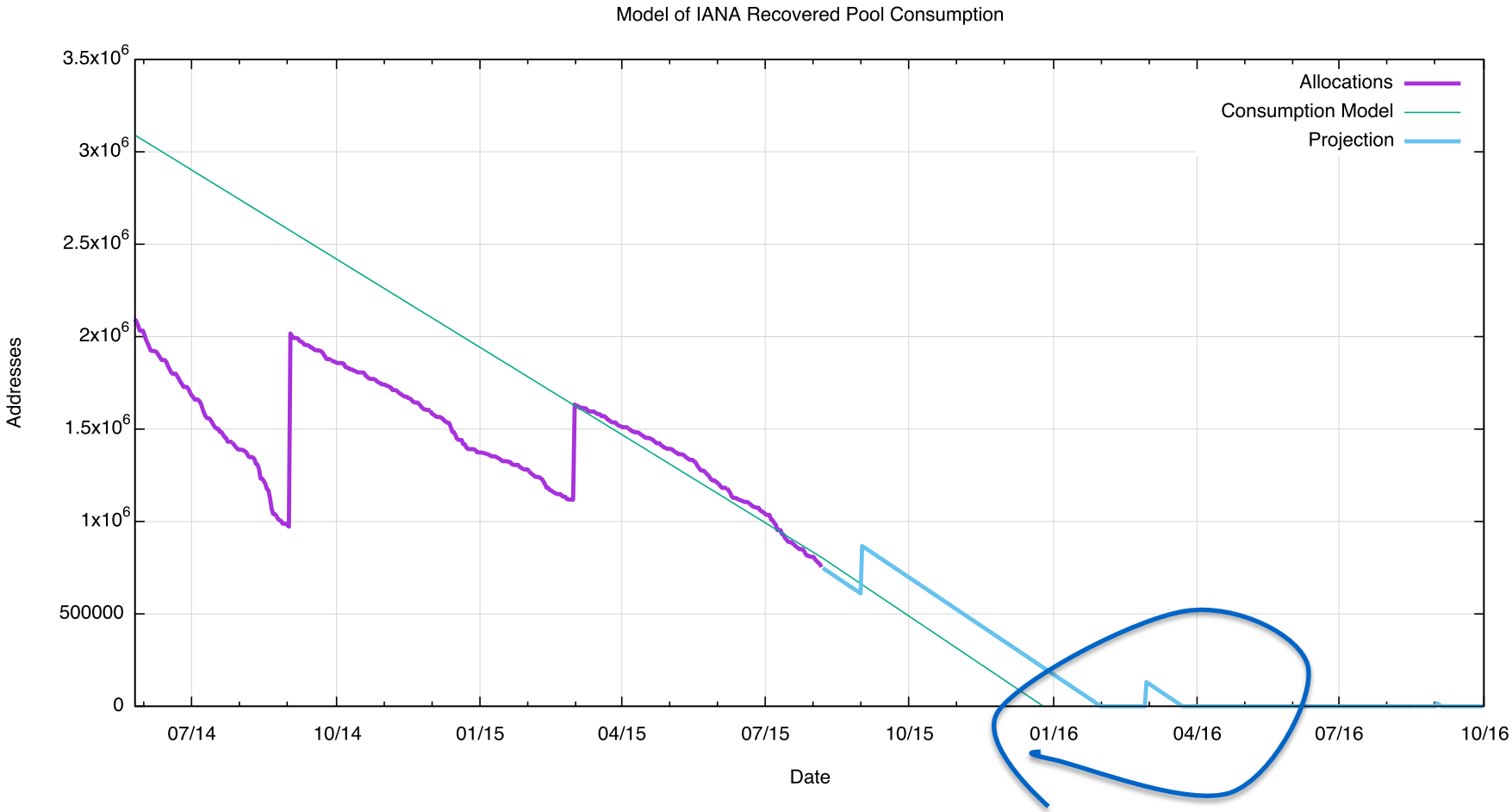
Who Has What

Pre-Exhaustion	Last /8	IANA Return	Count
✔			4,803
	✔		3,051
✔	✔		671
		✔	14
✔		✔	4
	✔	✔	2,276
✔	✔	✔	509
5,987	6,507	2,803	11,328

Consumption



Projection for the Returned Pool



We have ~7 months left

Transfers

IPv4 Address Transfers

Total Transfers Registered with APNIC: 1,086

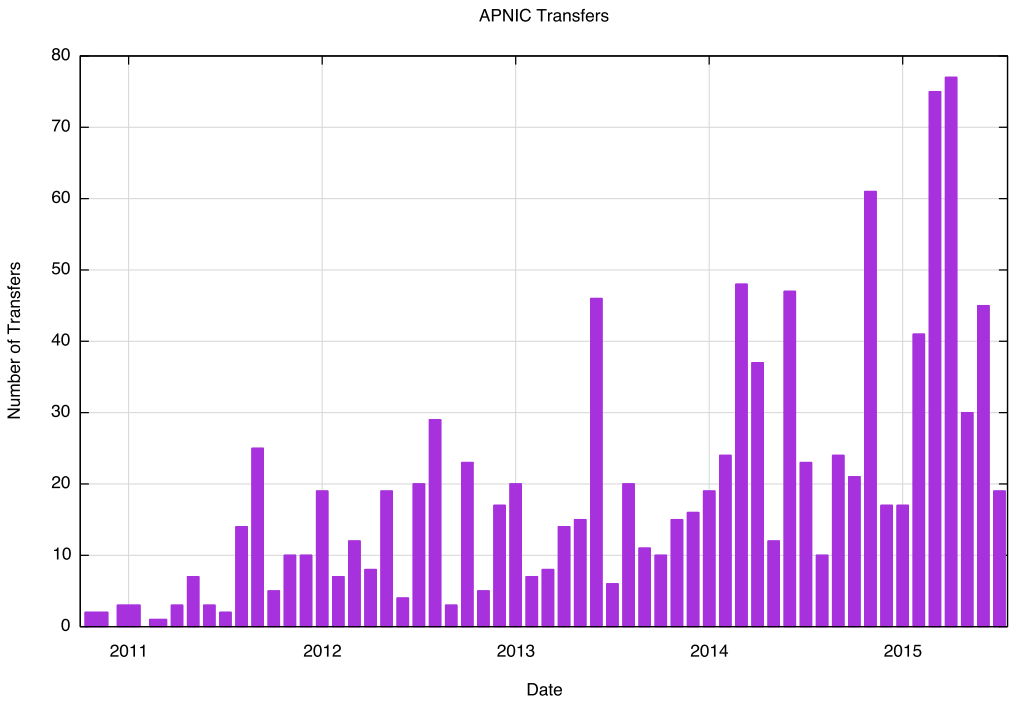
Internal (APNIC -> APNIC): 914

Inter-RIR (ARIN->APNIC): 172

Total Address Volume Transferred: 14,210,816

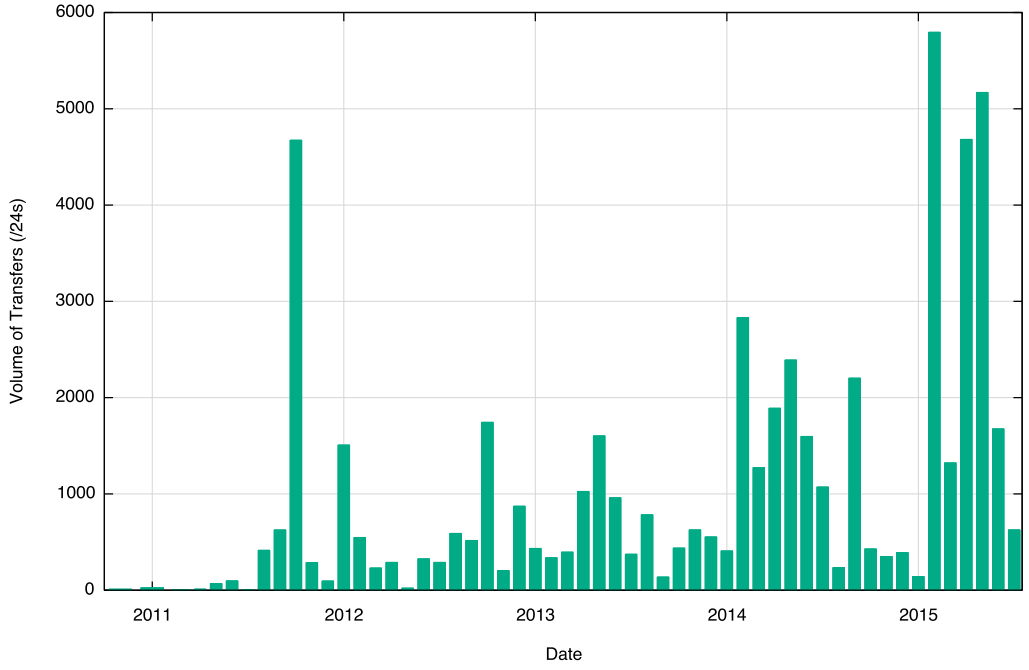
Internal (APNIC -> APNIC): 9,674,496

Inter-RIR (ARIN->APNIC): 4,536,320

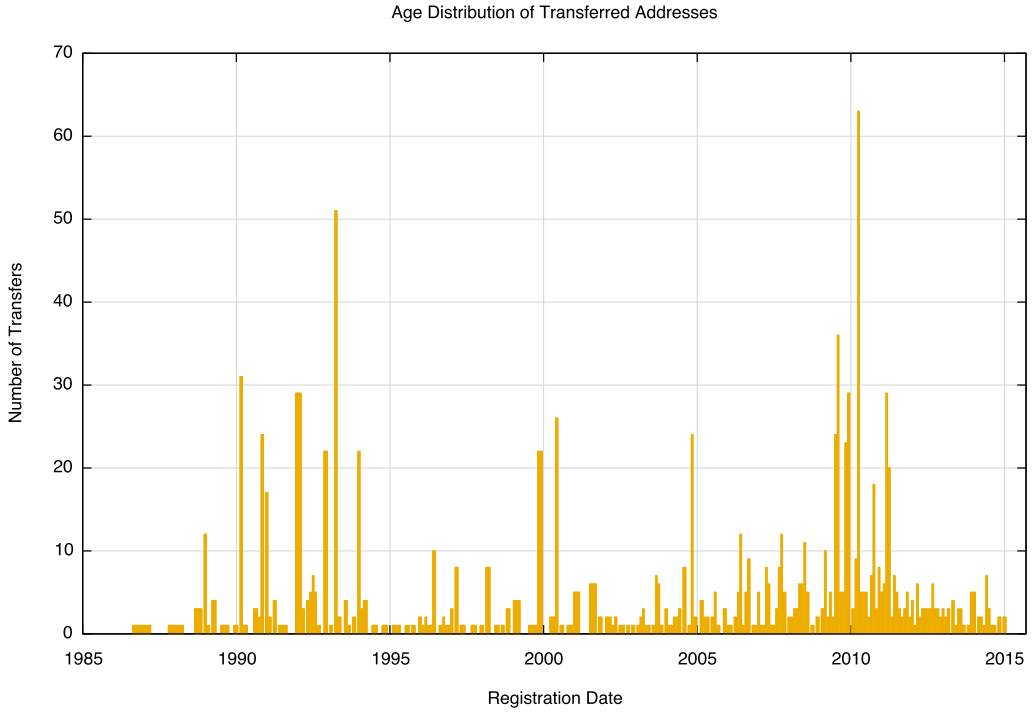


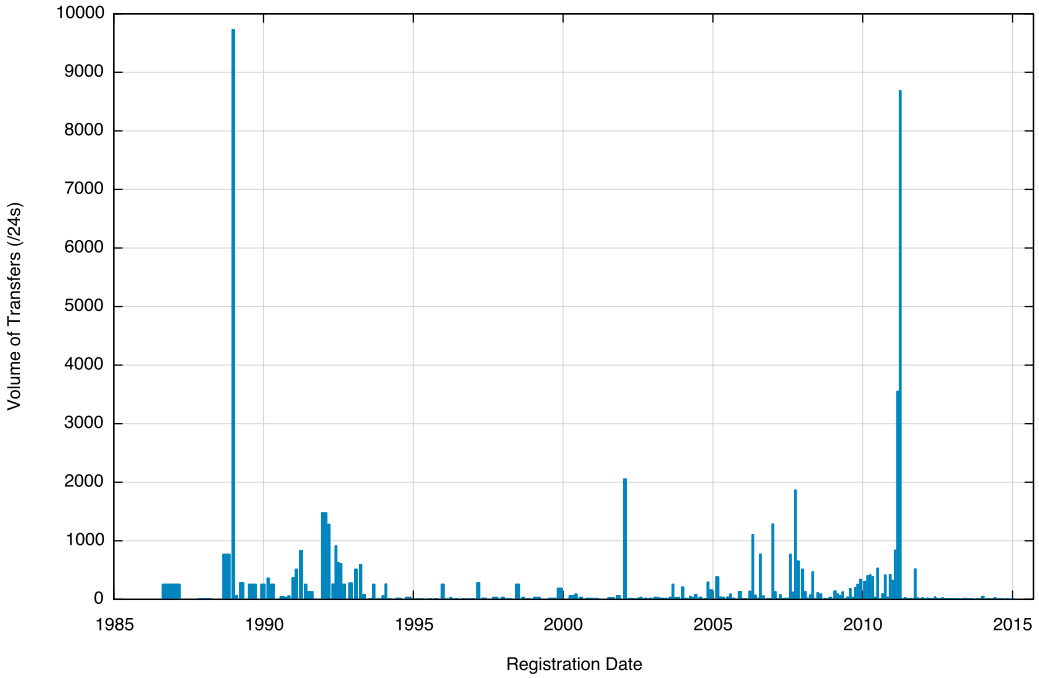
Transfers started in APNIC in late 2010

The average number of transfers per month has risen from 2 – 3 per month to 30 – 80 per month in 2015



The volume of addresses transferred has risen from some 10 x /24s per to a total monthly volume of of 1,000 – 6,000 /24s in 2015. This is double the 2014 volumes

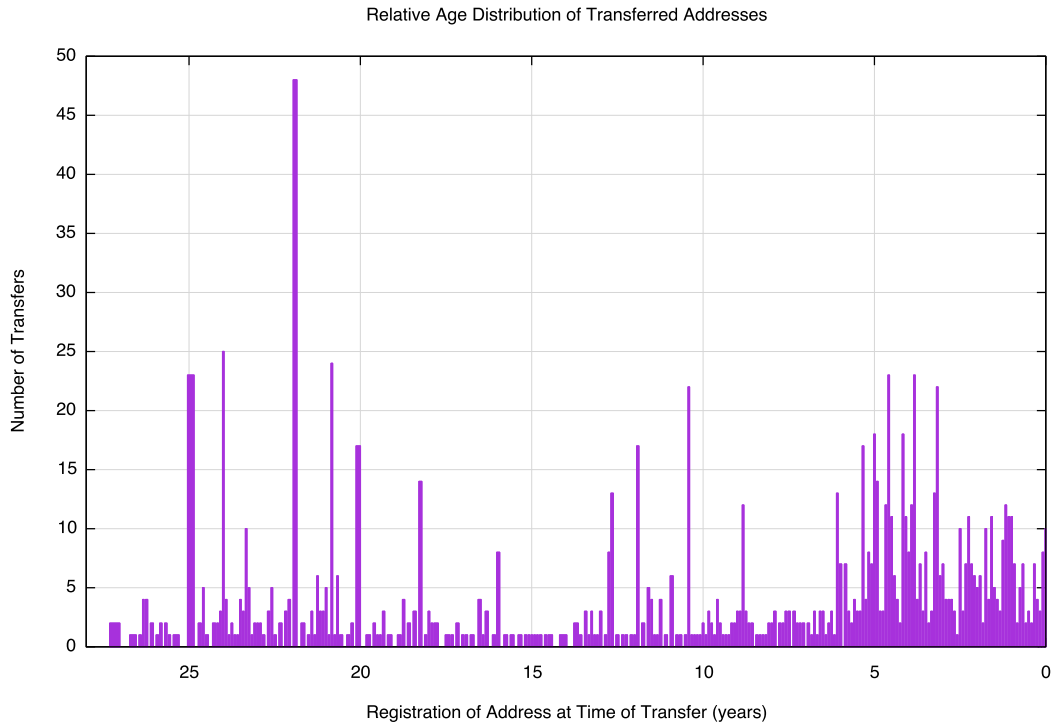


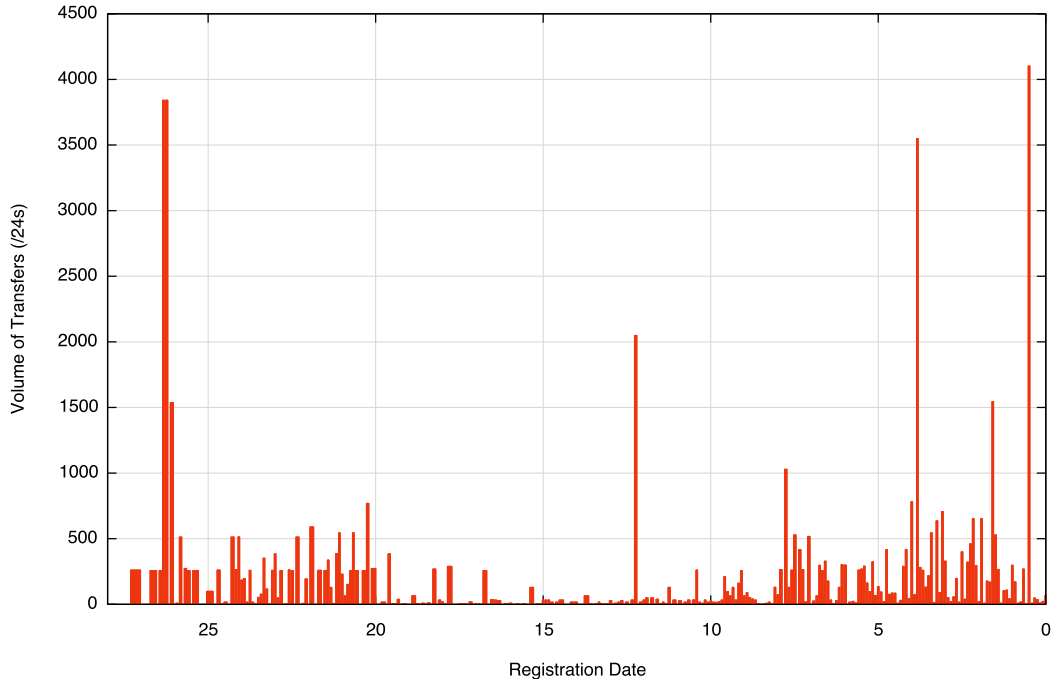


Original Allocation (Registration) date of the Transferred Addresses

There are two visible peaks here: one is the so-called “legacy” space which was originally allocated pre 1994 The other is the address blocks allocated in 2009 – 2011, immediately prior to APNIC address exhaustion.

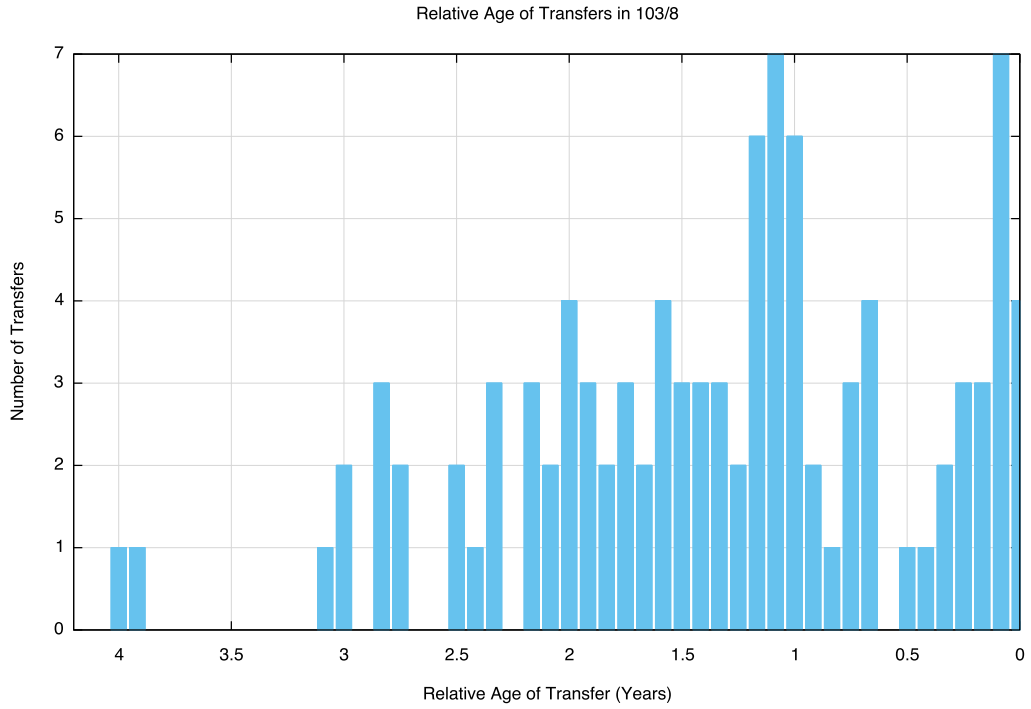
These relative peaks are visible when looking at the volumes of transferred addresses,

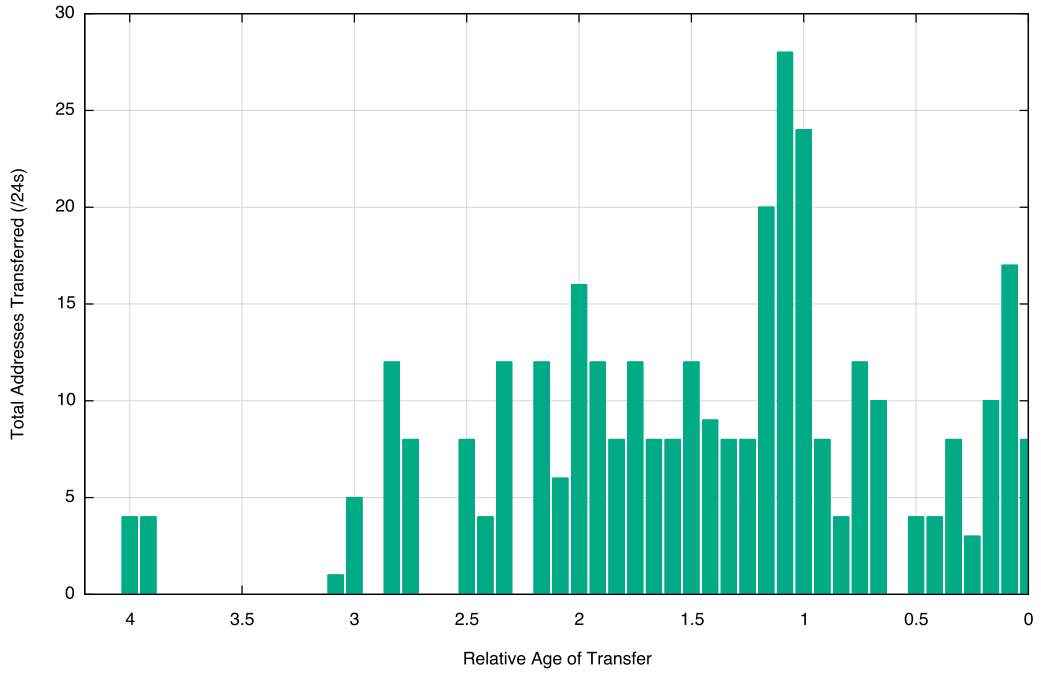




Age (since allocation) of the Transferred Addresses

There are again two visible peaks here: one is the so-called “legacy” space which is transferred some 20 years after the initial allocation and the second is a peak of transferred addresses that were transferred within 5 years of the initial allocation. This is visible both in the number of transfers, and the amount of addresses transferred that share a common age





Original Allocation (Registration) date of the Transferred Addresses for addresses in 103/8

This shows the same data (relative age of transferred addresses) but looks in particular at transfers of addresses from APNIC's final /8 (103/8).

It appears that 1 and 12 months of tenure of an allocation from 103/8 are the most common for allocations from 103/8

An Economy View of Transfers

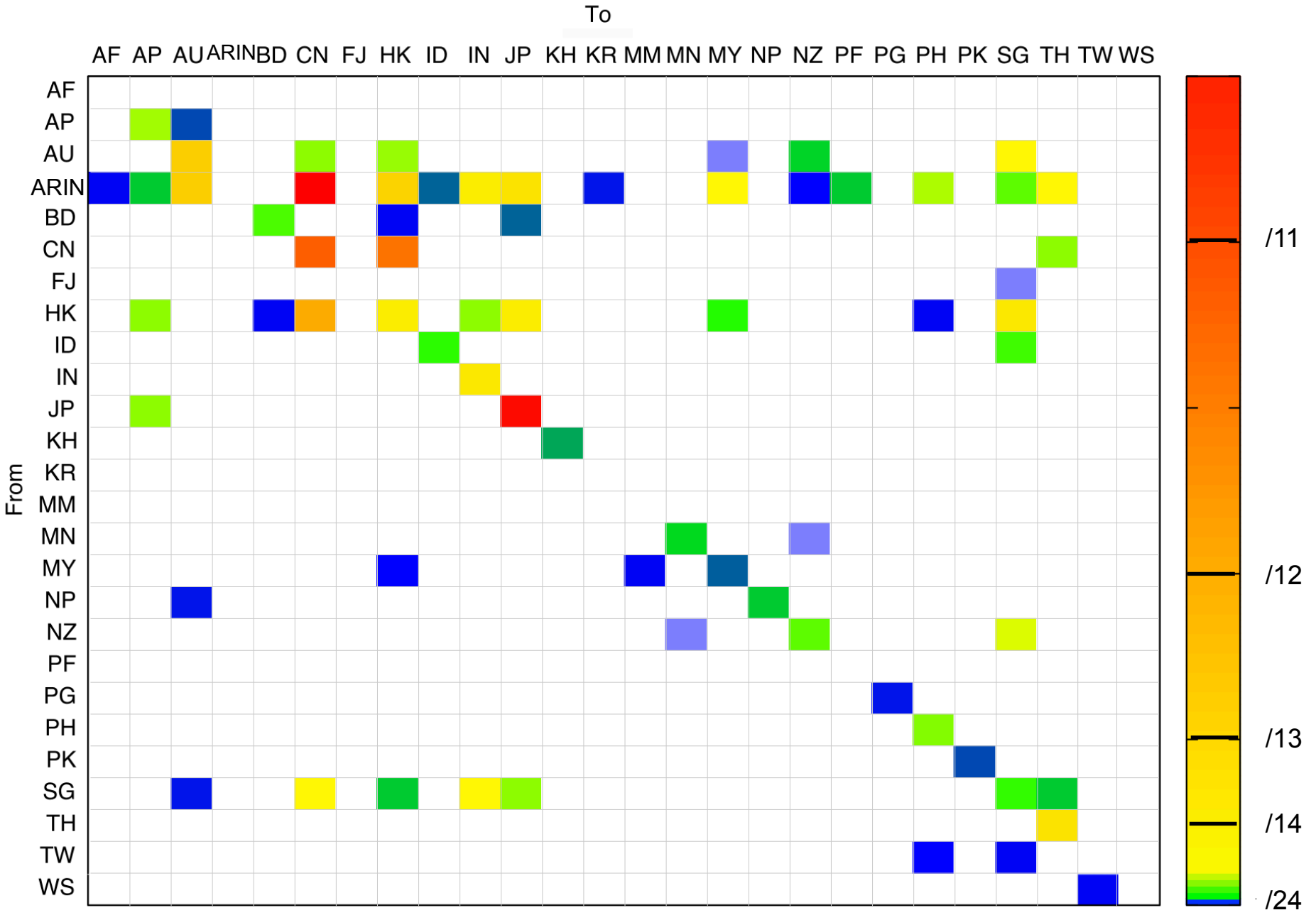
- The next few slides look at transfers from a national perspective.
- An “**Import**” is where the receiver of the transferred address is registered within the country
- An “**Export**” is where the disposer of the transferred address is registered within the country
- A “**Domestic**” transfer is where the dfisposer and receiver are both in the same country

Imports and Exports

CC Code	Imports		Exports		Domestic		Total		Name
	Number	Addresses	Number	Addresses	Number	Addresses	Number	Addresses	
CN	22	3,574,272	10	1,445,888	35	1,570,304	67	6,590,464	China
ARIN	0	0	172	4,536,320	0	0	172	4,536,320	ARIN RIR
HK	34	1,942,272	24	1,626,368	69	261,632	127	3,830,272	Hong Kong
JP	15	659,712	1	65,536	366	2,350,336	382	3,075,584	Japan
AU	19	540,160	13	294,400	143	539,648	175	1,374,208	Australia
SG	25	636,160	10	363,520	5	36,864	40	1,036,544	Singapore
IN	92	464,128	0	0	102	314,368	194	778,496	India
TH	5	221,184	0	0	18	325,632	23	546,816	Thailand
AP	10	147,456	2	6,144	4	72,704	16	226,304	Asia Pacific Code
MY	10	173,824	3	1,536	7	7,936	20	183,296	Malaysia
NZ	5	17,664	5	90,368	11	50,432	21	158,464	New Zealand
PH	7	77,568	0	0	9	61,440	16	139,008	Philippines
ID	1	8,192	5	40,960	26	33,792	32	82,944	Indonesia
BD	1	1,024	2	9,216	17	45,056	20	55,296	Bangladesh
NP	0	0	1	2,048	1	16,384	2	18,432	Nepal
MN	1	256	1	256	3	17,408	5	17,920	Mongolia
PF	1	16,384	0	0	0	0	1	16,384	French Polynesia
KH	0	0	0	0	6	13,312	6	13,312	Cambodia
PK	0	0	0	0	9	6,144	9	6,144	Pakistan
TW	1	1,024	2	1,536	0	0	3	2,560	Taiwan
KR	2	2,048	0	0	0	0	2	2,048	Republic of Korea
PG	0	0	0	0	2	2,048	2	2,048	Papua New Guinea
WS	0	0	1	1,024	0	0	1	1,024	Samoa
MM	1	1,024	0	0	0	0	1	1,024	Myanmar
AF	1	1,024	0	0	0	0	1	1,024	Afghanistan
FJ	0	0	1	256	0	0	1	256	Fiji
Total	253	8,485,376	253	8,485,376	833	5,725,440	1139	22,696,192	

Imports and Exports

- The Asia Pacific region is a net importer of IPv4 addresses (4.5M addresses have been imported from ARIN via transfers)
- Most address transfers happen within a single economy. Japan is the largest domestic market for IPv4 addresses
- China is the largest regional net importer of addresses (2M), and New Zealand is the largest regional net exporter (72K)
- ARIN is the largest source of transferred addresses


To
AF AP AU ARIN BD CN FJ HK ID IN JP KH KR MM MN MY NP NZ PF PG PH PK SG TH TW WS
From
AF AP AU ARIN BD CN FJ HK ID IN JP KH KR MM MN MY NP NZ PF PG PH PK SG TH TW WS
/11
/12
/13
/14
/24

Largest Sellers into Asia Pacific

Seller	Address Count
Nortel, US (ARIN)	2,359,296
CNISP-Union Technology (Beijing) Co., Ltd, CN	1,409,024
Cloud-Sense Technology Corporation Ltd, HK	1,179,648
GuangXi Seehu Technology Co., Ltd, CN	827,832
DOMIRU, JP	587,776
AOL, US (ARIN)	524,288
JPNIC (no details)	421,888
Beyond Excellent Technology Ltd,HK	262,144
Northern Telecom Canada, CA (ARIN)	262,144
Outstanding Telecommunication Pte Ltd, SG	262,144
Renjiao International Technology Ltd, HK	245,760
Bank of America, US (ARIN)	197,632
Oak Point Partners, US (ARIN)	196,608
ShenZhen TC telecom Network Corp, CN	183,296
SPACENET, US (ARIN)	147,456

Largest Buyers in the Asia Pacific

Buyer	Address Count
ALISOFT, Aliyun Computing Co, CN	3,801,088
Cloud-Sense Technology Corporation Ltd, HK	1,179,648
SAKURA Internet, JP	541,696
Foxtel Management Pty Ltd, AU	524,288
True Internet Co., Ltd, TH	327,680
Beyond Excellent Technology Ltd, HK	262,144
Abitcool BroadBand Inc, CN	262,144
Vodafone Spacetel Limited, IN	229,376
NTT DoCoMo, JP	212,992
DIX Co, JP	199,936
Bank of America, N.A. HK	197,632
Telewings Communications Services Ltd, IN	196,608
IIJ, JP	196,608
FreeBit Co, JP	192,512
SingTel Optus Pty Ltd, AU	180,224

Multi-Transfers

A number of addresses have been transferred multiple times – For example:

39.96.0.0/12|CNISP-Union Technology|CN|APNIC|20110405|Cloud-Sense|HK|APNIC|20111028

39.110.0.0/15|Cloud-Sense|HK|APNIC|20110405|JPNIC/So-net|JP|APNIC|20140901

39.109.0.0/17|Cloud-Sense|HK|APNIC|20110405|Huayun Data Holdings|HK|APNIC|20141120

39.109.128.0/17|Cloud-Sense|HK|APNIC|20110405|Starhub Internet Pte Ltd|SG|APNIC|20141223

39.104.0.0/14|Cloud-Sense|HK|APNIC|20110405|CNNIC/ALISOFT|CN|APNIC|20150210

39.108.0.0/17|Cloud-Sense|HK|APNIC|20110405|CNNIC/ALISOFT|CN|APNIC|20150210

39.108.128.0/17|Cloud-Sense |HK|APNIC|20110405|CNNIC/ALISOFT|CN|APNIC|20150210

39.96.0.0/13|Cloud-Sense |HK|APNIC|20110405|CNNIC/ALISOFT|CN|APNIC|20150210

1,074,432 addresses have been transferred multiple times in APNIC

How Many are Buying and Selling?

319 different sellers

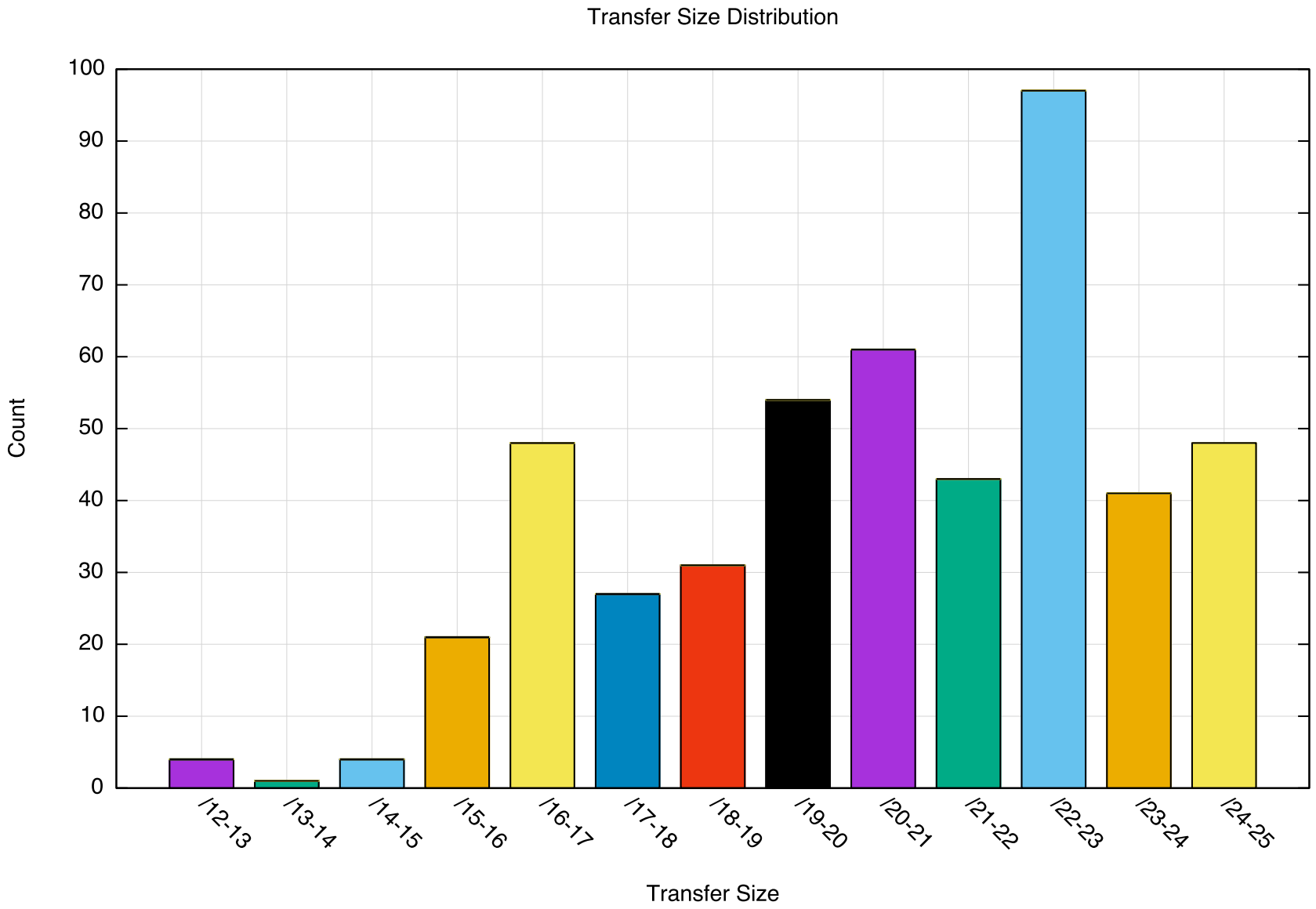
320 different buyers

596 participants

Transfer Size

- The transfer log records a transfer in terms of individual CIDR blocks
- We can group these together by using a common key of source entity, destination entity and date.
- Using this we see that the transfer log contains distinct 480 transactions

Transfer Size Distribution



Transfers

This is still a relatively small scale activity in this region.

Out of the 875,936,768 addresses in the APNIC registry, transfers account for the movement of 12,371,712 addresses (1.4%), involving 596 entities out of a total of 11,319 unique holders of IP addresses (5.2%)

The rise of IPv6 adoption in the past 12 months calls into question precisely how much longer we will need to keep IPv4 in circulation

APNIC 40

Questions?

JAKARTA, INDONESIA

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