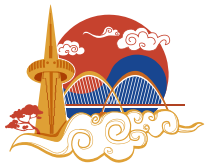
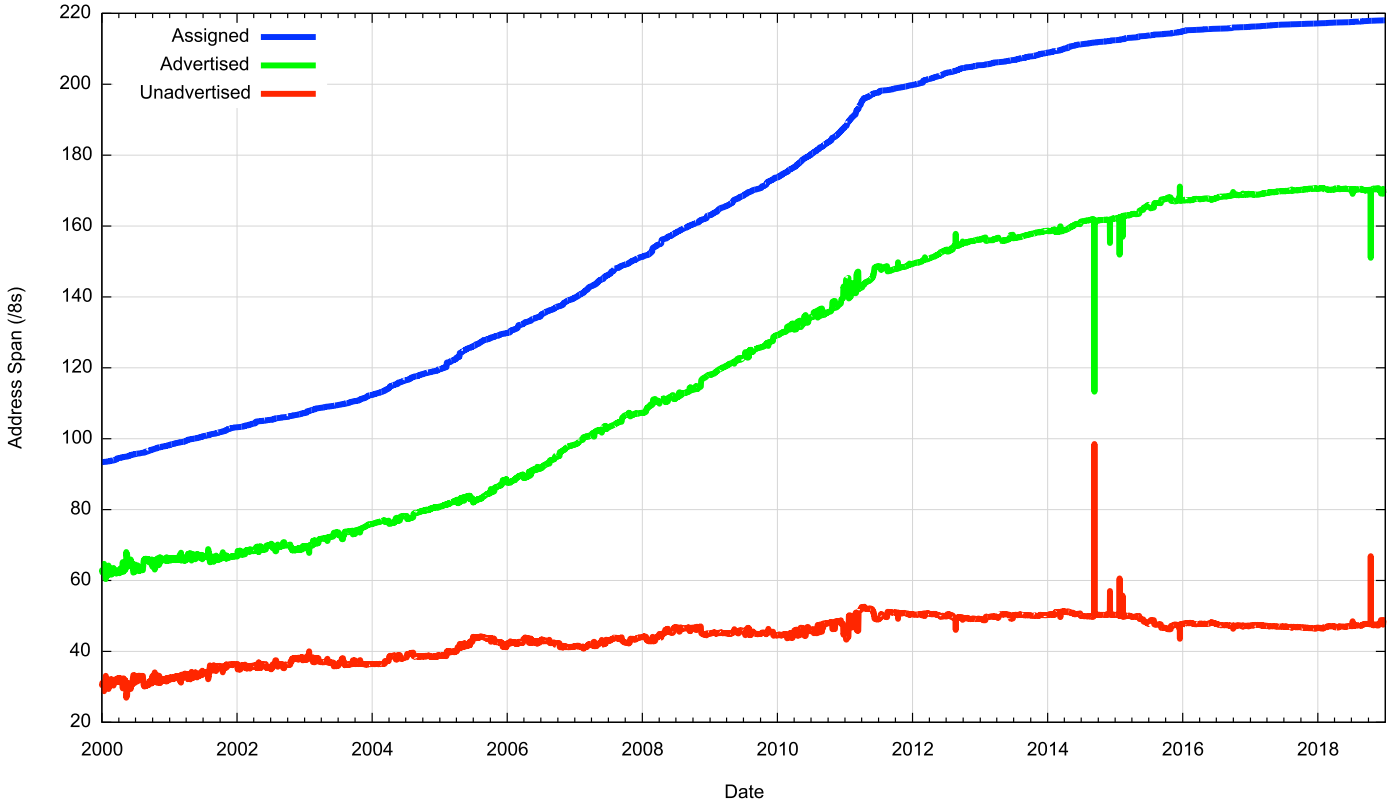
Unadvertised Addresses in APNIC's Registry

Geoff Huston

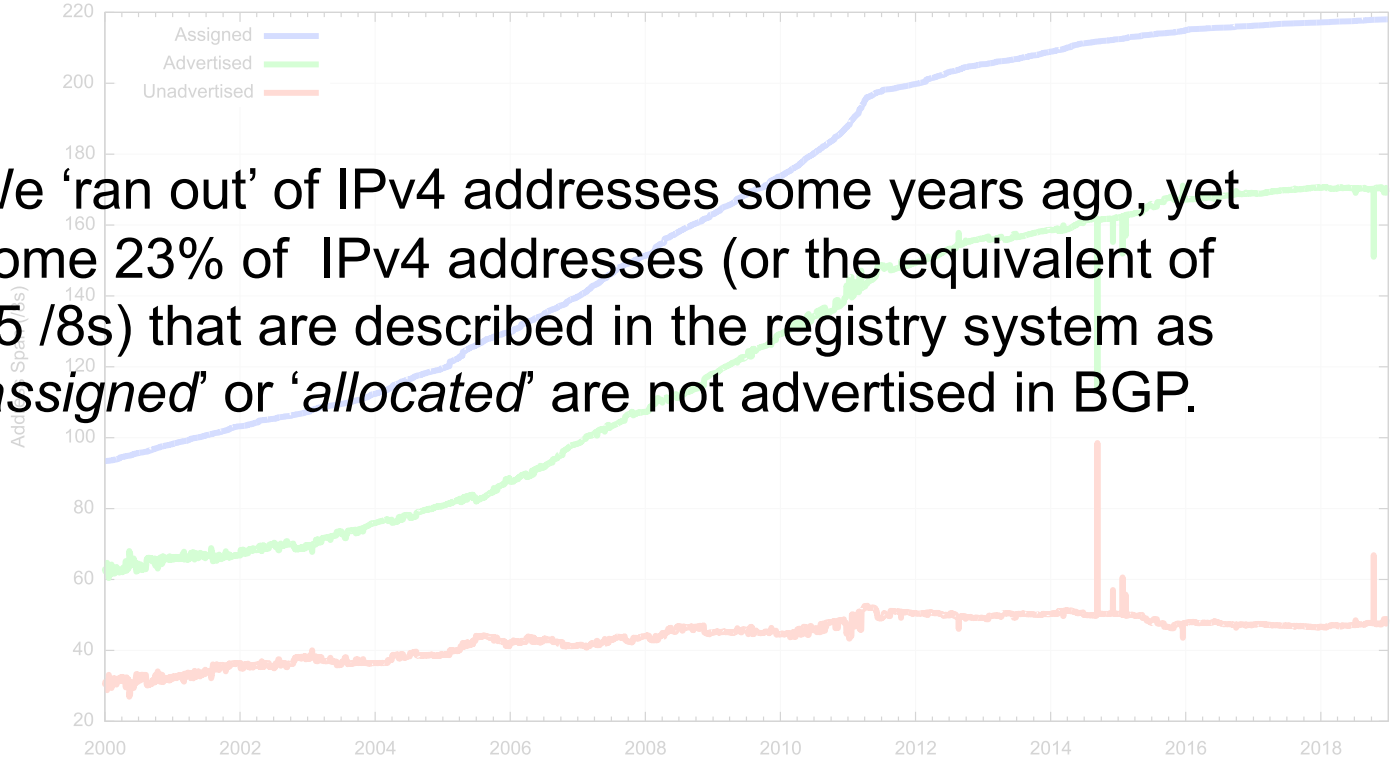
APNIC



2000 - 2018: IPv4 Adddresses

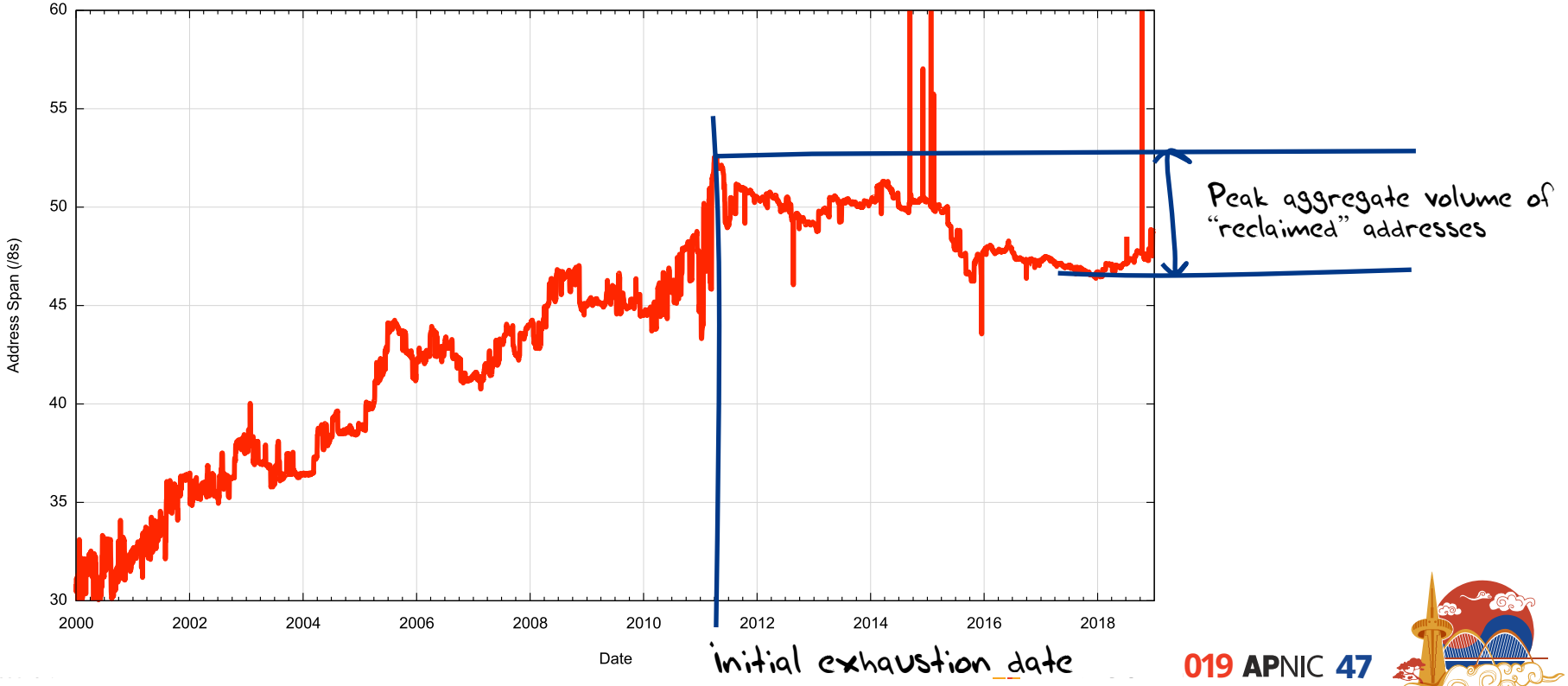


2000 - 2018: IPv4 Addresses

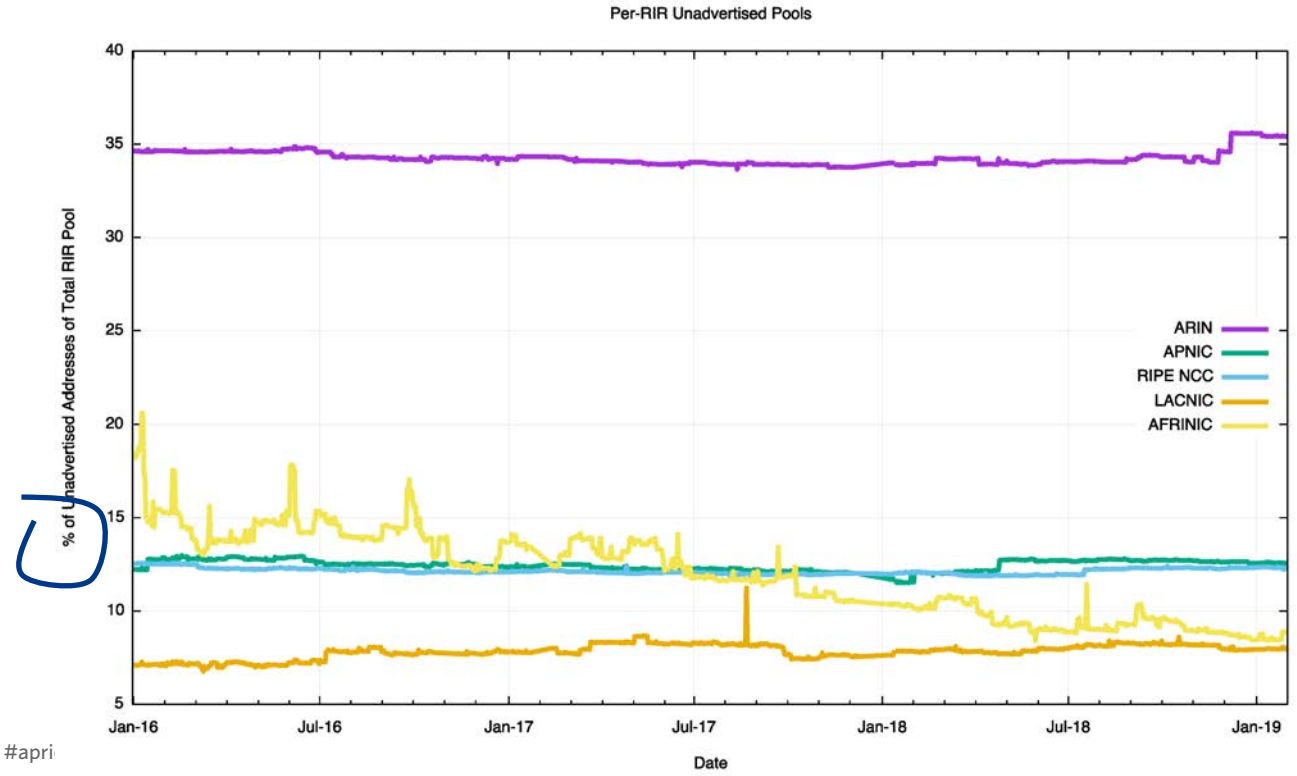


We ‘ran out’ of IPv4 addresses some years ago, yet some 23% of IPv4 addresses (or the equivalent of 45 /8s) that are described in the registry system as ‘*assigned*’ or ‘*allocated*’ are not advertised in BGP.

2000 - 2018: Unadvertised Addresses



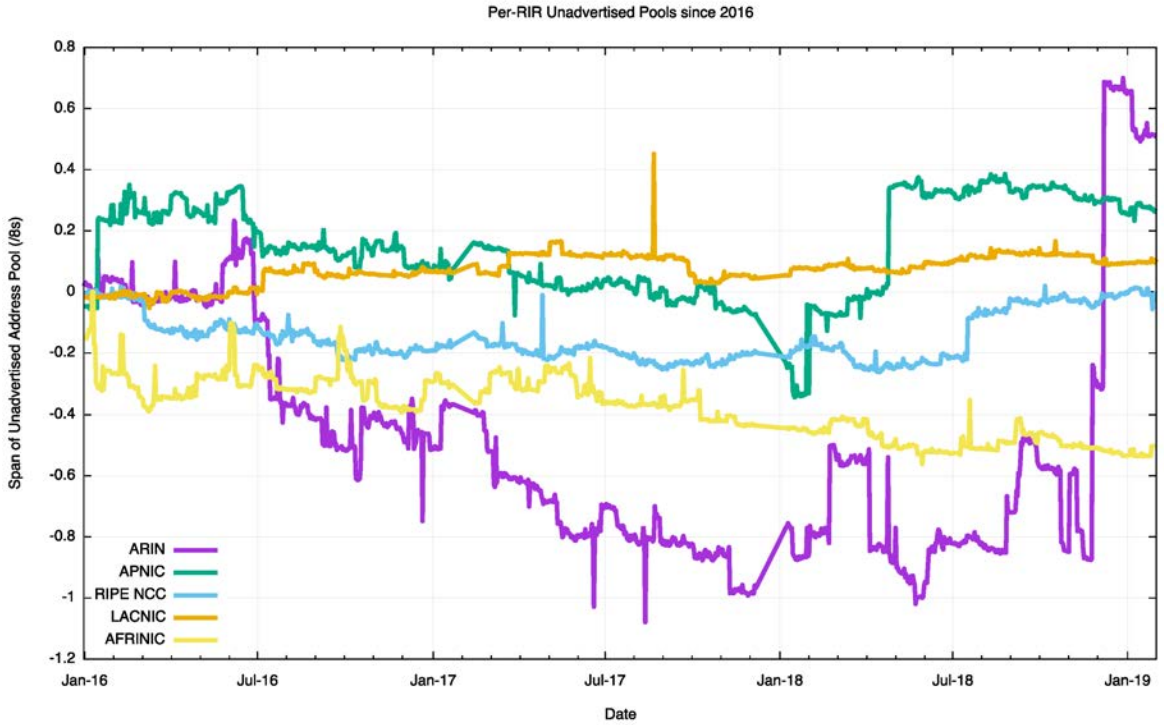
Per-RIR Breakdown - 2016 to now



ARiN's legacy pool has a high level of unadvertised addresses

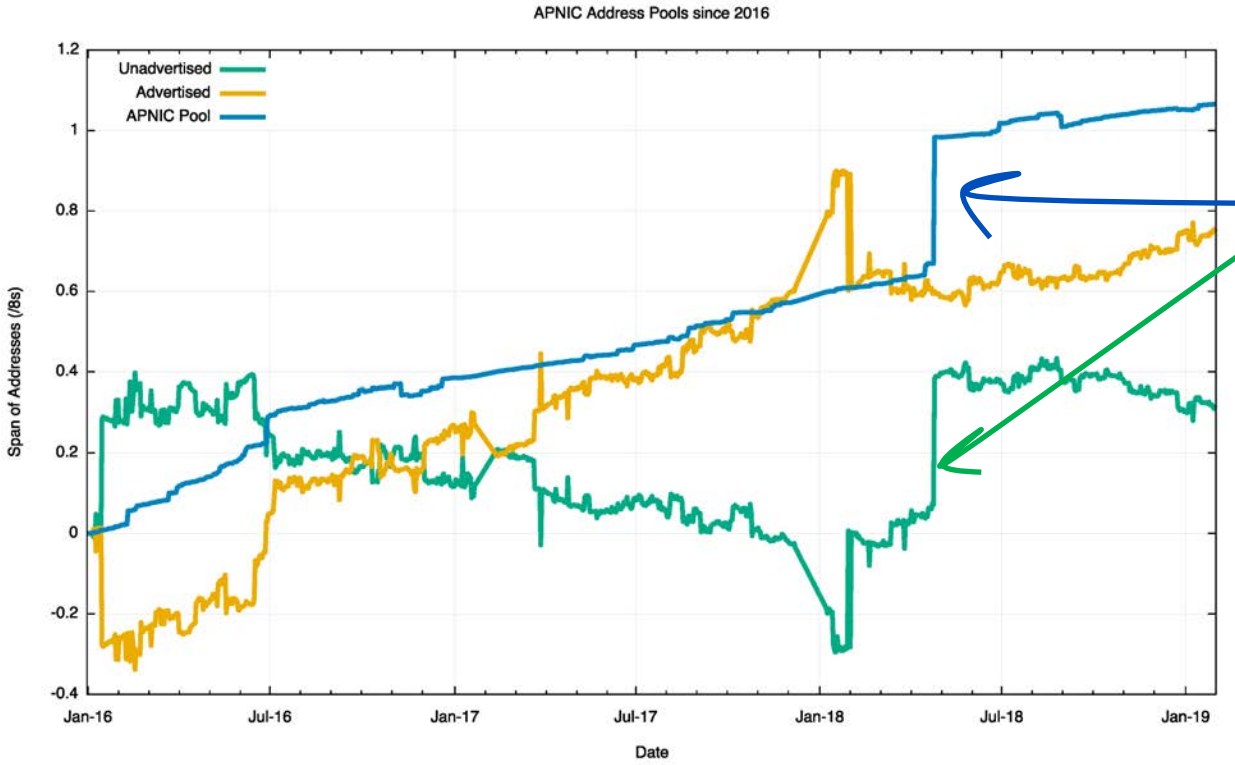
RiPE NCC and APNiC are both have 12÷ of their total iPv4 pool size as unadvertised addresses

Changes to the Unadvertised pool since 2016



Since 2016 the APNIC unadvertised pool has grown by 5M addresses

APNIC IPv4 data since 2016

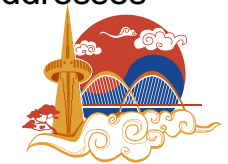


This is a transfer of a /10 + /12 from ARIN to AliCloud

APNIC IPv4 Status - 2019

- IPv4 Address span in Registry*: 880 M addresses
- Advertised Addresses: 770 M addresses
- Unadvertised Addresses: 110 M Addresses

* Excluding 4.4M ‘reserved’ addresses



APNIC IPv4 Status - 2019

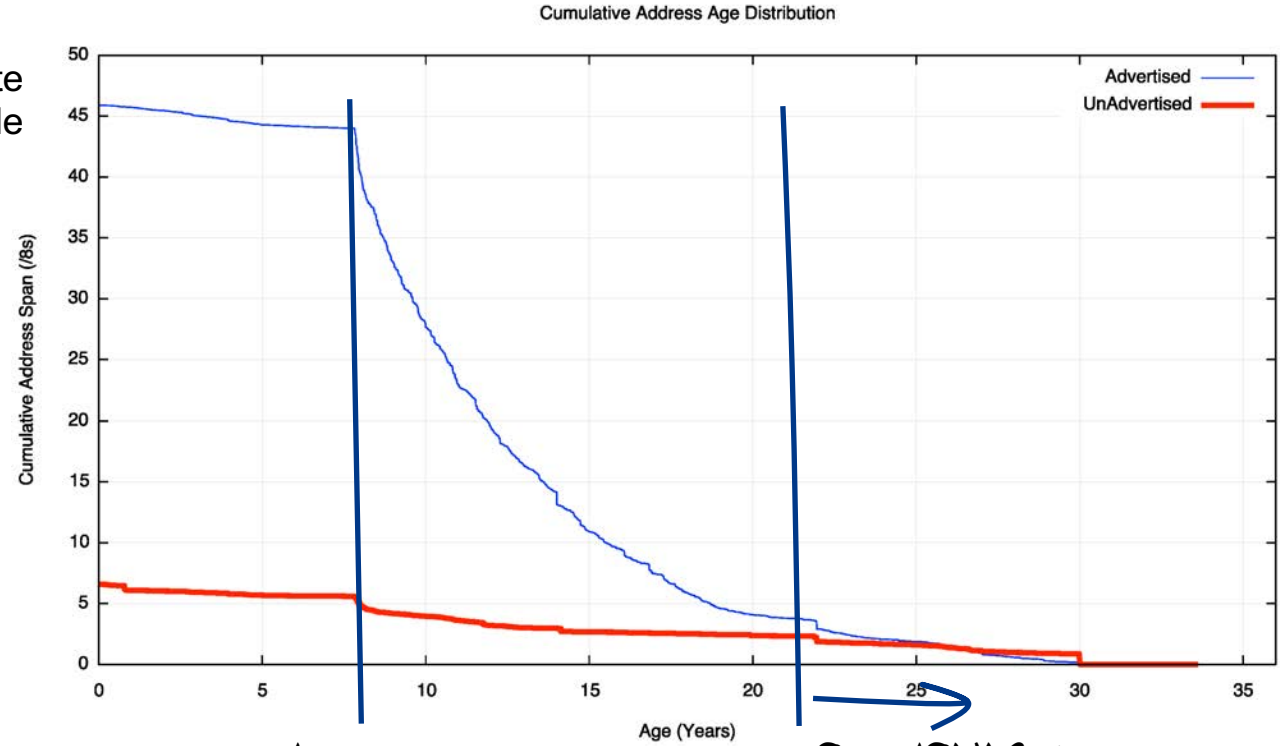
- IPv4 Address span in Registry*: 880 M addresses
- Advertised Addresses: 770 M addresses
- Unadvertised Addresses: 110 M Addresses

How "old" are these unadvertised addresses? Are they legacy addresses or are they more recently allocated addresses?

* Excluding 4.4M 'reserved' addresses

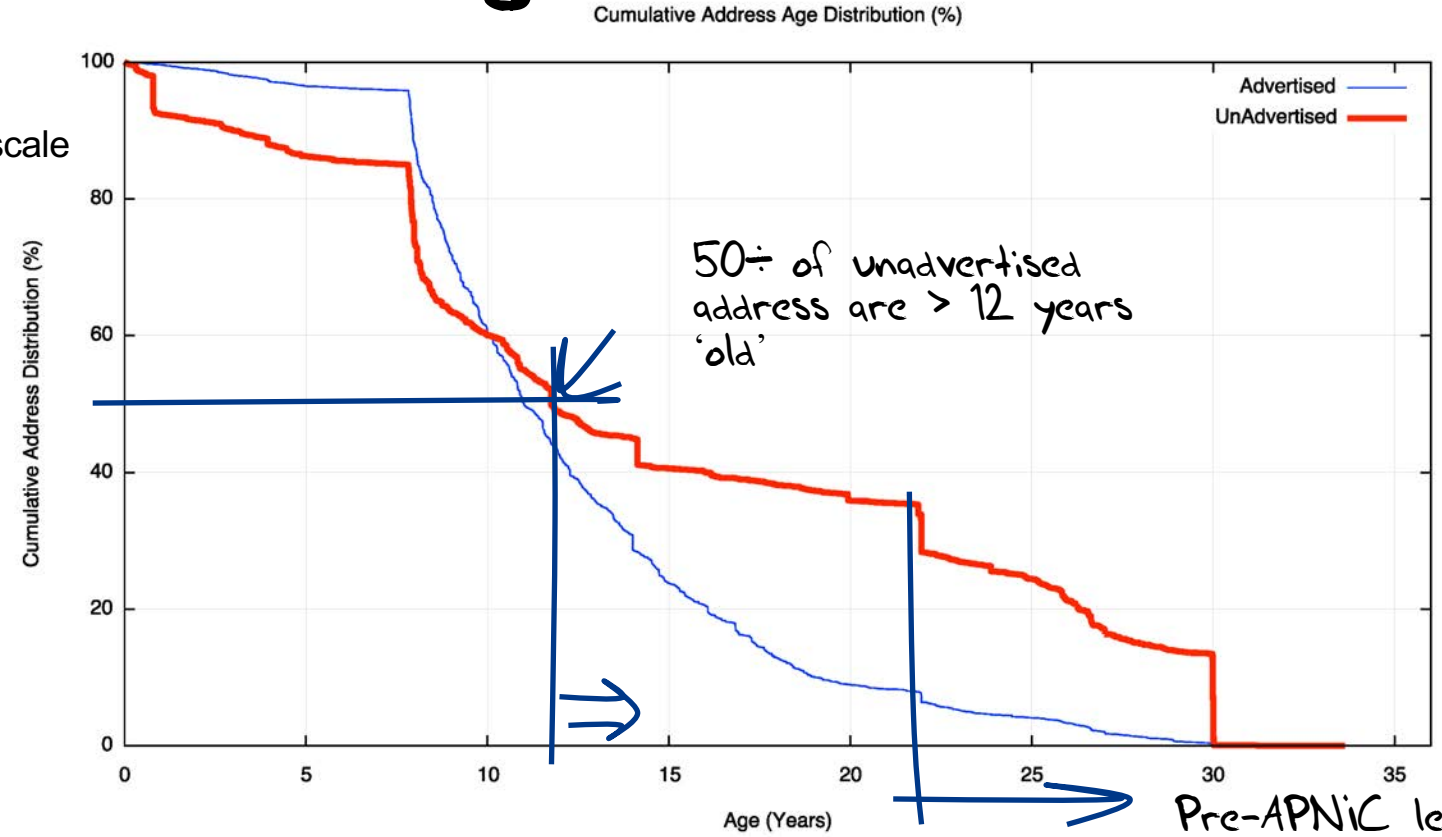
APNIC "Age" profile of addresses

absolute scale

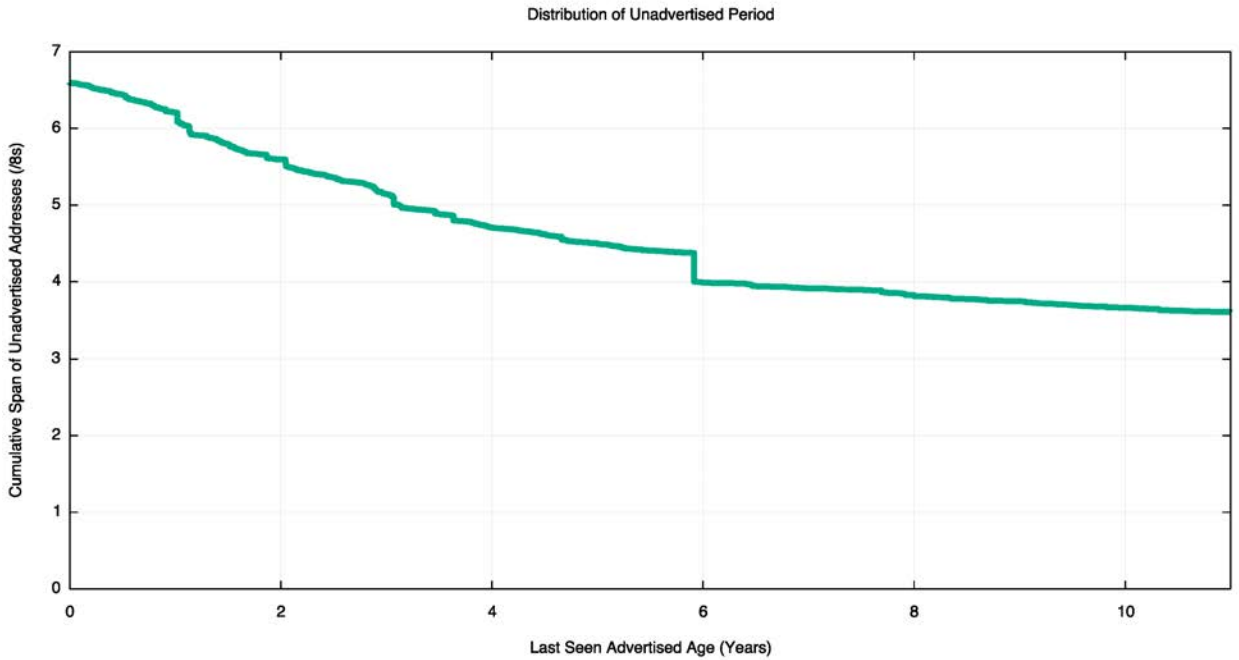


Relative Age Profile for APNIC

% scale



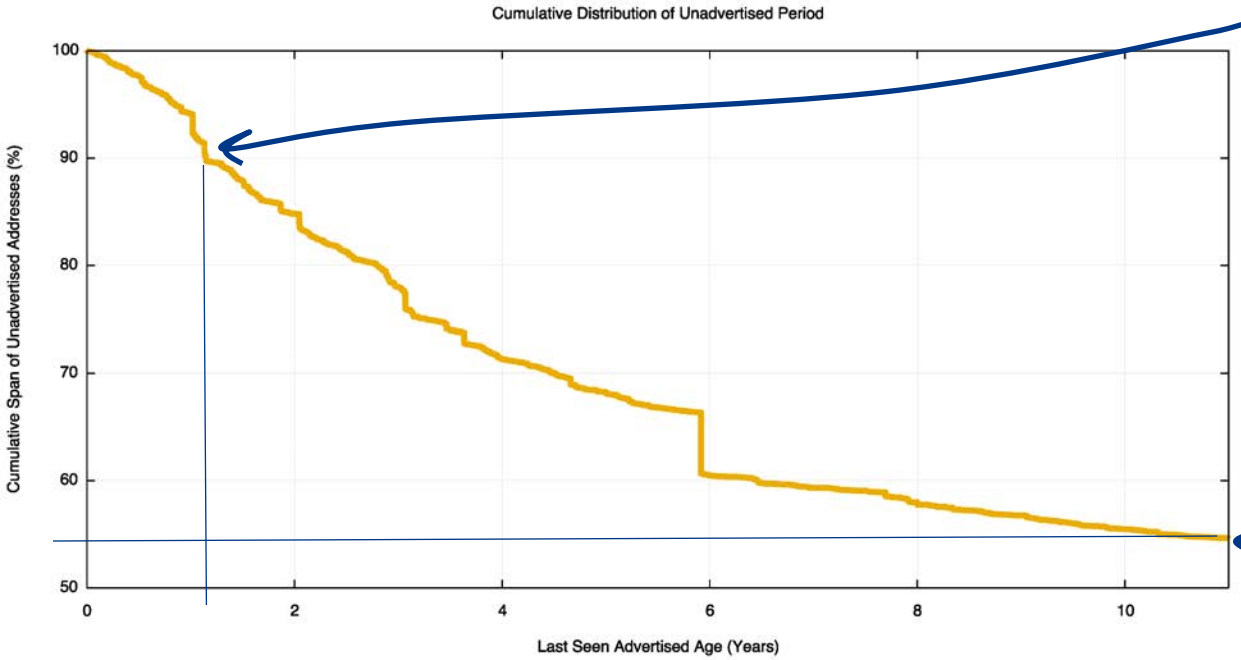
Unadvertised Period of APNIC Unadv Addresses



How long has it been since this address was last seen in BGP?

Unadvertised Period of APNIC Unadv Addresses

10÷ of unadvertised addresses were last seen in BGP in 2018

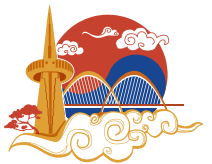


55÷ of unadvertised addresses have not been seen in BGP for more than 11 years

Where are these Unadvertised Addresses?

Rank	CC	Unadv Pool	Name
1	CN	39,250,176	China
2	JP	34,462,208	Japan
3	IN	9,285,888	India
4	SG	6,311,424	Singapore
5	AU	6,228,480	Australia
6	KR	5,376,768	Republic of Korea
7	ID	1,901,312	Indonesia
8	TW	1,621,504	Taiwan
9	NZ	1,450,240	New Zealand
10	VN	1,044,992	Vietnam
11	HK	773,632	Hong Kong SAR
12	TH	760,832	Thailand
13	PH	748,288	Philippines
14	MY	670,464	Malaysia
15	BD	169,984	Bangladesh
16	PK	145,664	Pakistan
17	BN	71,424	Brunei Darussalam
18	US	70,656	United States of America
19	AF	62,976	Afghanistan
20	MM	45,824	Myanmar

Using the APNIC registration Code in the registry

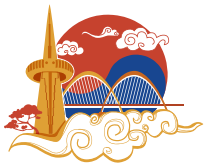


Where are these Unadvertised Addresses?

Rank	CC	Unadv Pool	Name
1	CN	38,491,648	China
2	JP	34,374,912	Japan
3	IN	9,546,496	India
4	AU	6,108,672	Australia
5	US	5,748,480	United States of America
6	KR	5,369,088	Republic of Korea
7	ID	1,898,240	Indonesia
8	TW	1,617,920	Taiwan
9	NZ	1,444,608	New Zealand
10	VN	1,037,312	Vietnam
11	SG	976,384	Singapore
12	PH	766,976	Philippines
13	TH	760,320	Thailand
14	HK	737,792	Hong Kong SAR
15	MY	655,872	Malaysia
16	NL	398,336	Netherlands
17	BD	167,936	Bangladesh
18	PK	117,504	Pakistan
19	BN	66,304	Brunei Darussalam
20	BE	65,536	Belgium

Using the Maxmind geoloc database

The differences between these two tables expose a larger issue with the interpretation of geolocation codes in the address registries which I won't delve into here



Observations

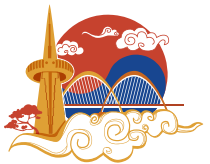
- 110M addresses in the APNIC registry are not visible in the BGP routing table at present.

  This is 12% of the total size of the allocated IPv4 address pool in the APNIC registry

- 30% of the unadvertised pool in the APNIC registry was allocated/assigned by APNIC in the 3 year run up to pool exhaustion in 2011

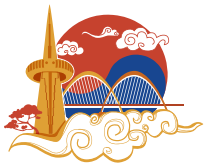
- Approximately 10% of the unadvertised pool is due to recent address transfers that are as-yet unadvertised

- Some 30% of the unadvertised pool is composed of pre-APNIC legacy address allocations (including AUNIC, and NZ registry transfers into APNIC that occurred in ~1999).



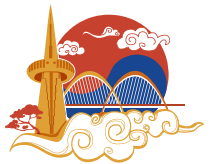
Notes

- This analysis used a local archive of the daily stats files generated by the RIRs
- If an address block is listed in the APNIC transfer log, I've used the date of the transfer rather than the original allocation/assignment date
- I have not included APNIC-***reserved*** blocks in this analysis.
  - 1,282 entries are marked "reserved"
  - Reserved addresses total 4,423,680 addresses (roughly a /10)
- The BGP feed is taken from AS131072



Thanks

Questions?



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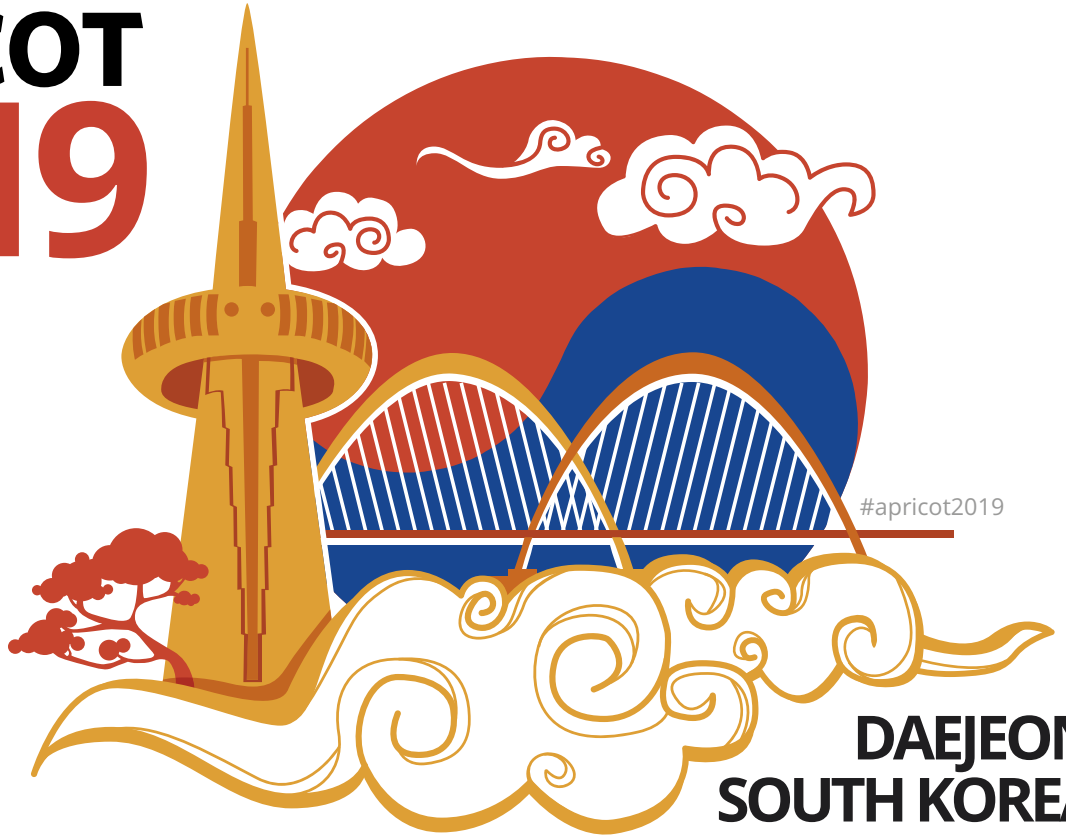

#apricot2019

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SOUTH KOREA

18 – 28 February 2019