Transferred IPv4 Addresses

Geoff Huston

APNiC, February 2016

APRICOT 2016   APNIC 41

APNIC Numbers for Transfers
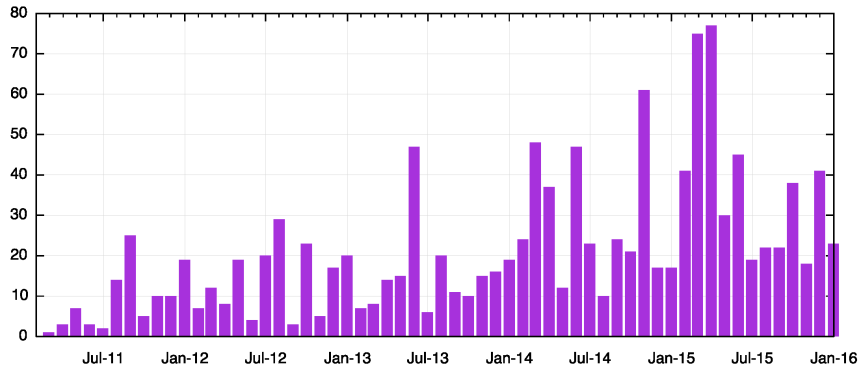
Total Transfers Registered with APNIC: 1,260

    Internal (APNIC -> APNIC):   1,064

    Inter-RIR (ARIN->APNIC):   193

    Inter-RIR (APNIC->ARIN):   3

Total Address Volume Transferred: 15,823,616

    Internal (APNIC -> APNIC):   10,385,920

    Inter-RIR (ARIN->APNIC):   5,427,456
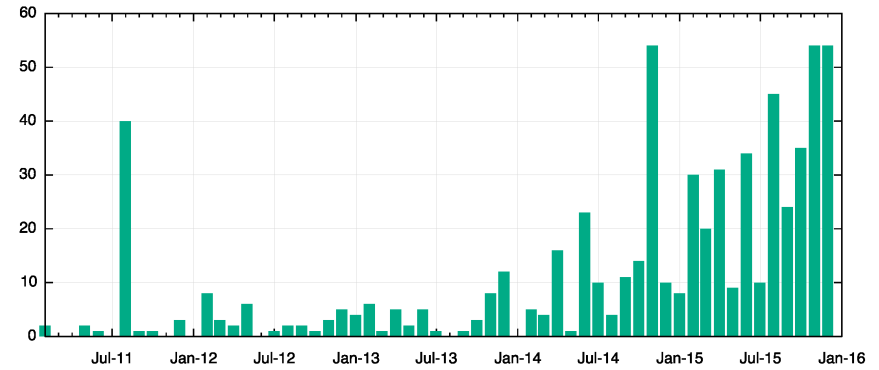
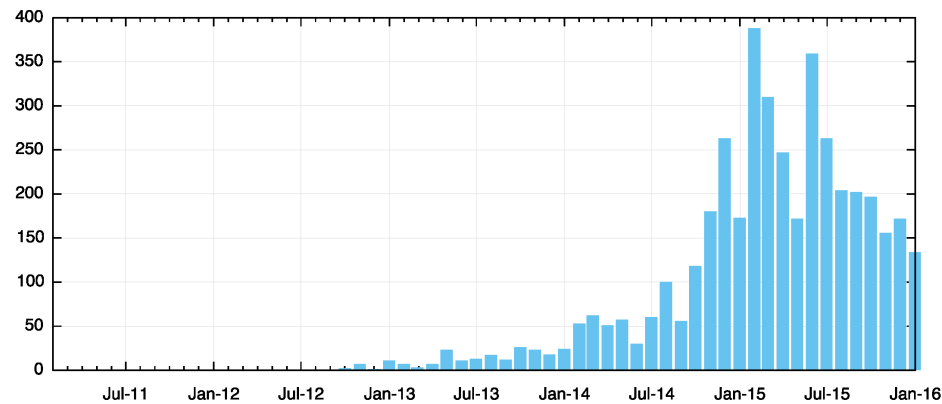   Inter-RIR (APNIC->ARIN):   10,240

Transfers per Month

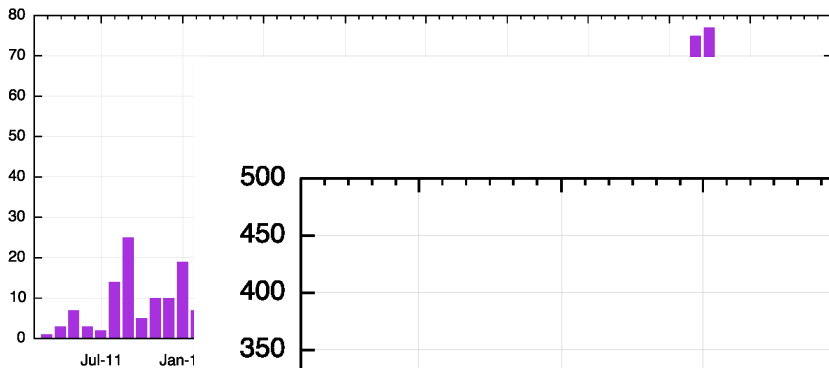APNIC Transfers per month

ARIN Transfers per month

RIPENCC Transfers per month

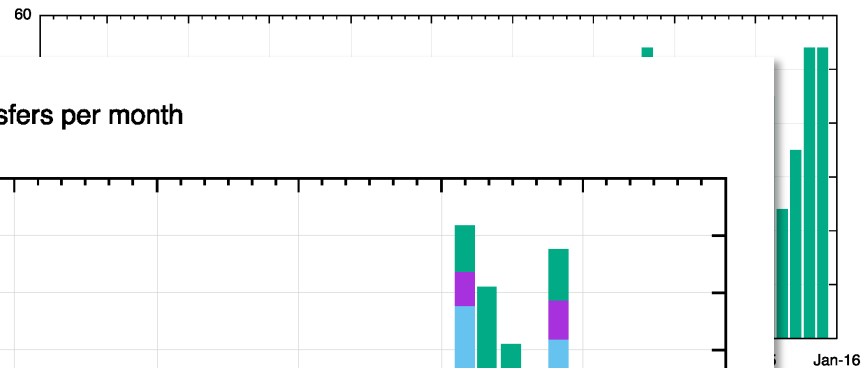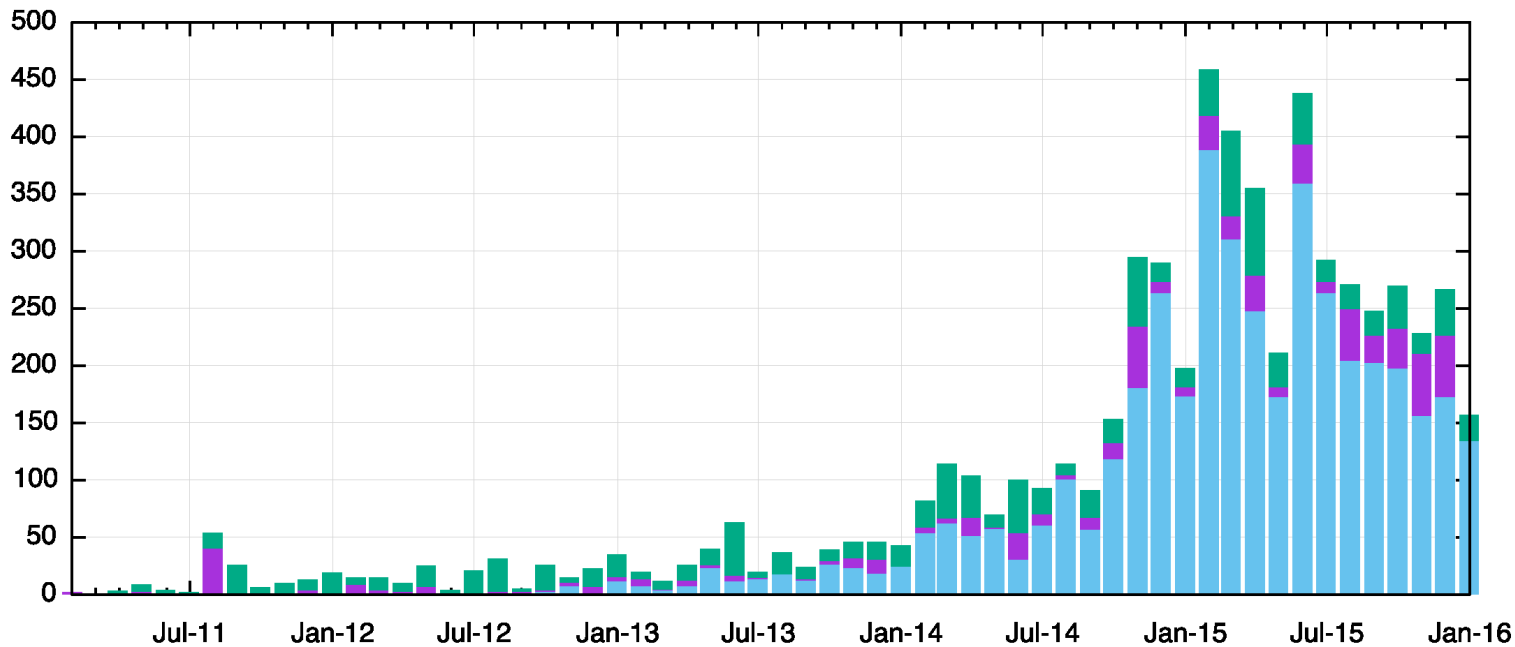APRICOT 2016   APNIC 41

Transfers per Month

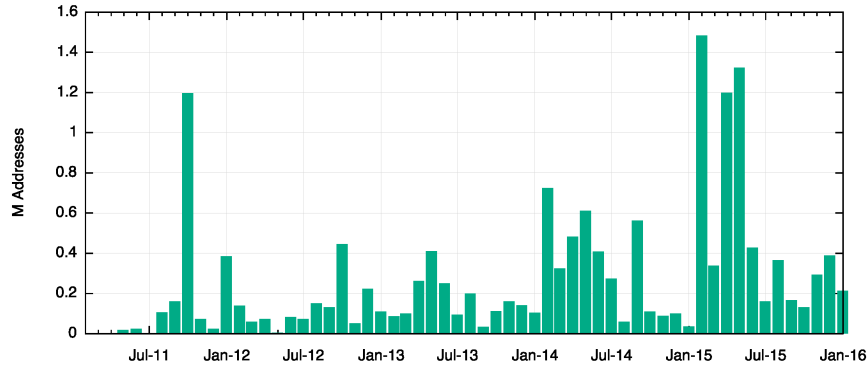APNIC Transfers per month

ARIN Transfers per month

Total Transfers per month

Transferred Address Volumes

APNIC Transferred Addresses per month

ARIN Transferred Addresses per month

RIPENCC Transferred Addresses per month
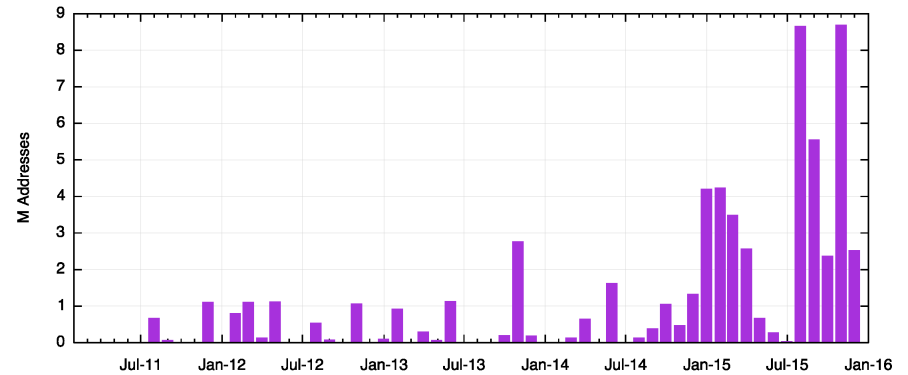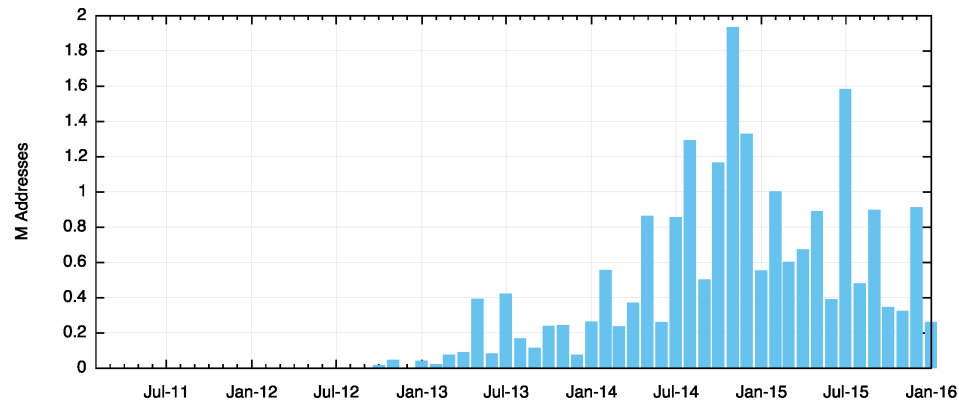
APRICOT 2016   APNIC 41

Transferred Address Volumes

APNIC Transferred Addresses per month

ARIN Transferred Addresses per month

Total Transferred Addresses per month

M Addresses

Jul-11 Jan-12 Jul-12 Jan-13 Jul-13 Jan-14 Jul-14 Jan-15 Jul-15 Jan-16

APRICOT 2016   APNIC 41

Transferred Address "Age"

APNIC Transferred Address - First Registration Date

ARIN Transferred Address - First Registration Date

RIPE NCC Transferred Address - First Registration Date

Transferred Address "Age"

APNIC Transferred Address - First Registration Date

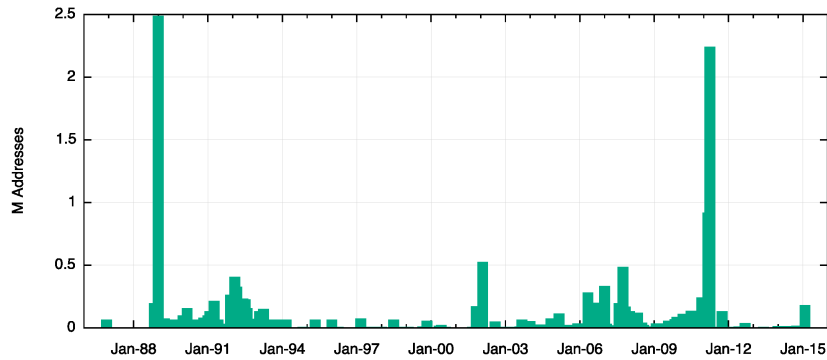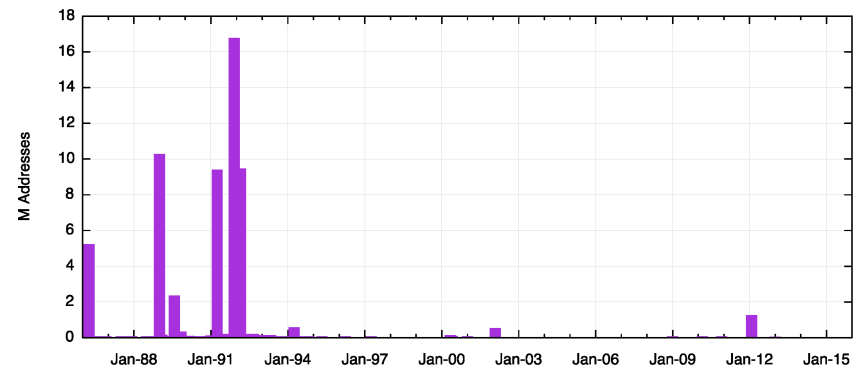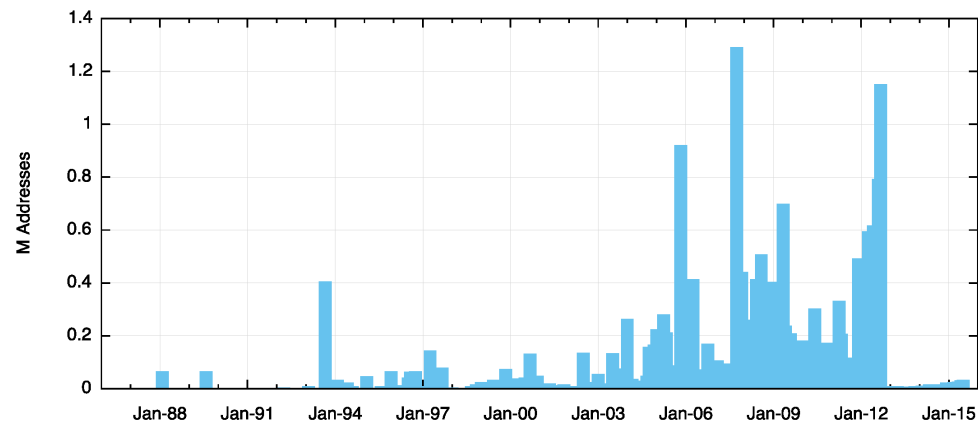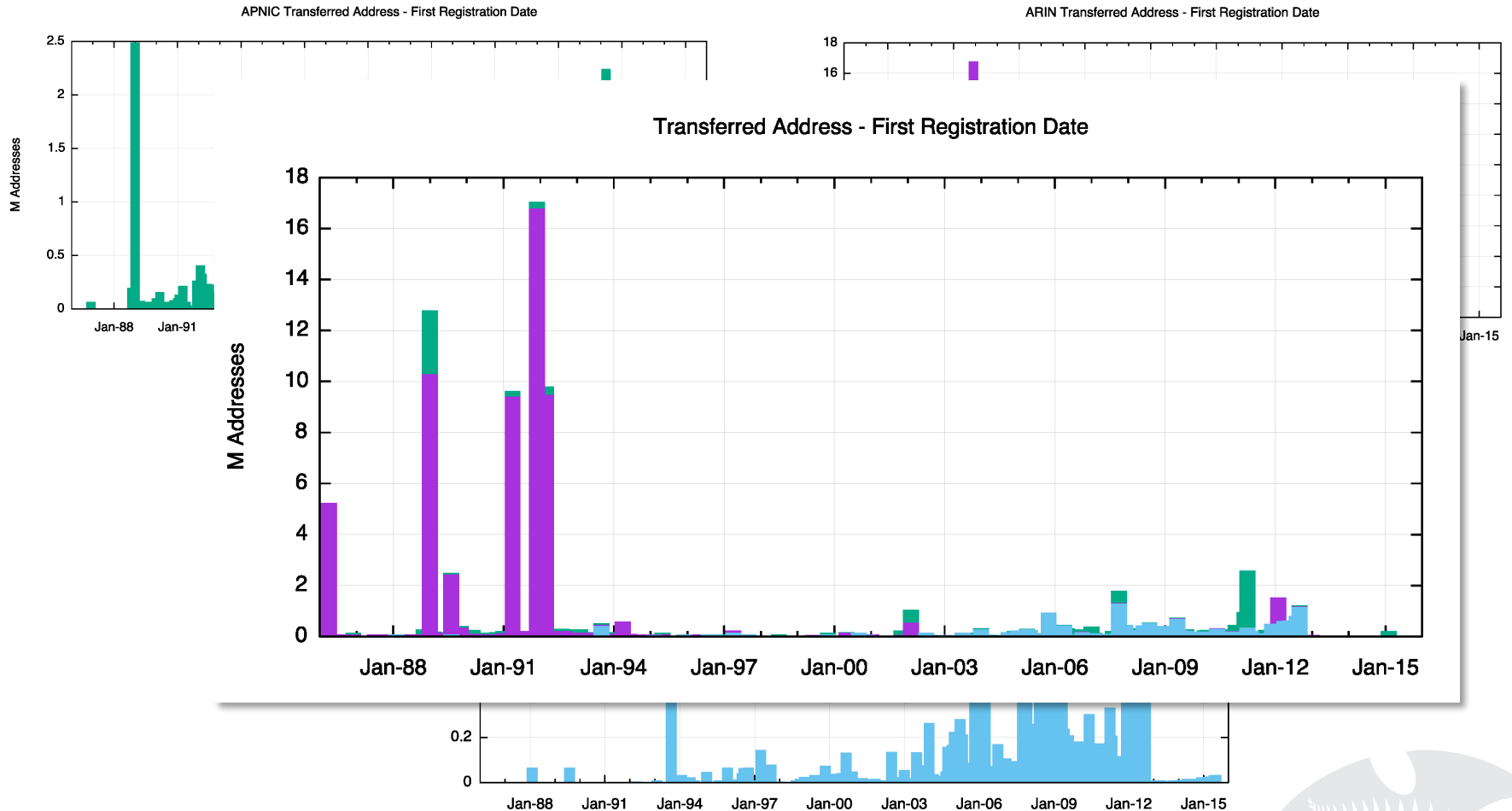ARIN Transferred Address - First Registration Date

Transferred Address - First Registration Date

Transferred Address "Age"

#apricot2016
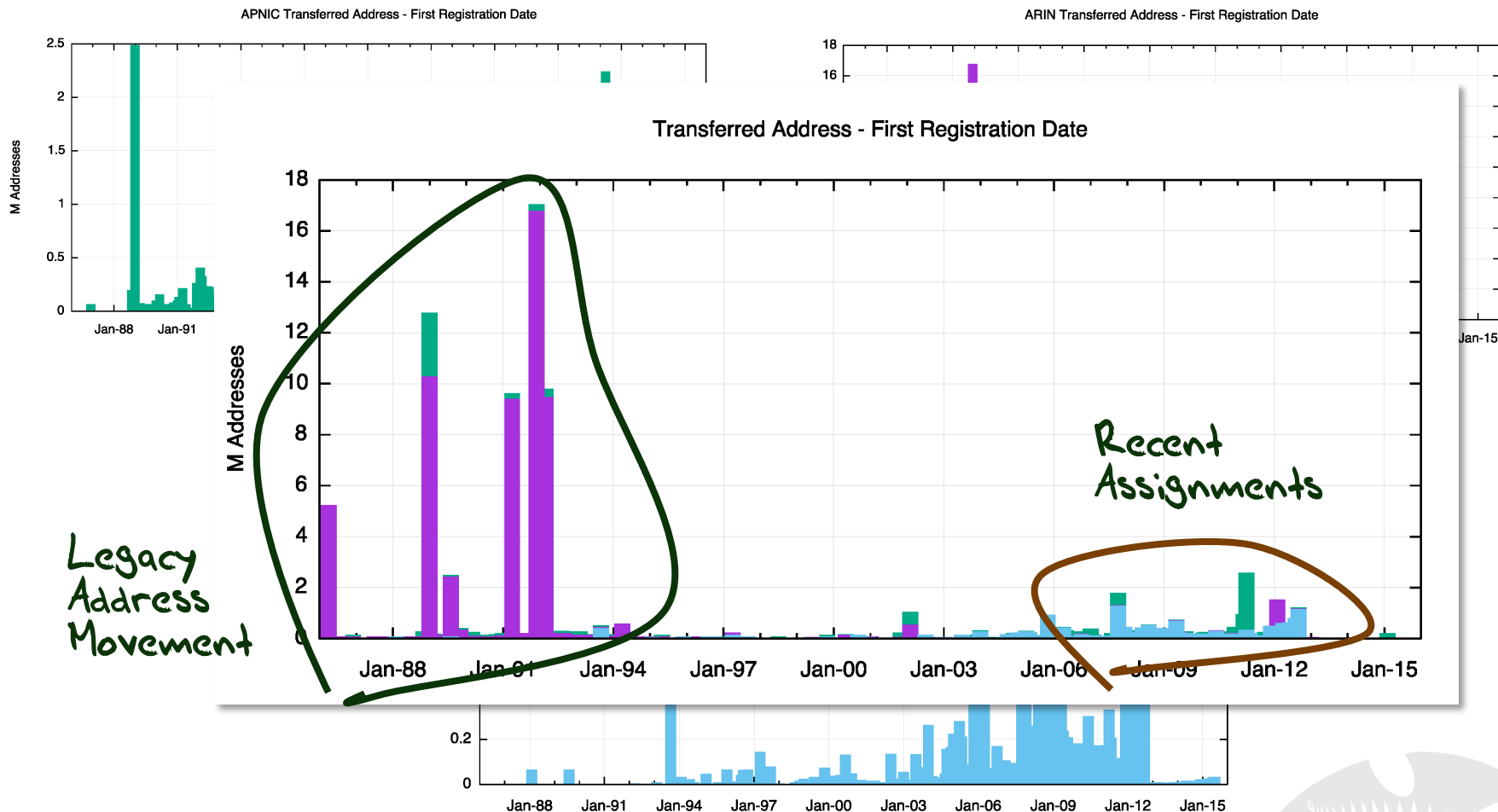
Allocations in the Last Years of IPv4

Address Transfers

Receiving RIR	2012	2013	2014	2015
ARIN	79	31	58	277
APNIC	255	206	437	514
RIPE NCC	10	171	1,050	2,852
Total	**344**	**408**	**1,545**	**3,643**

Number of registered Address transfers per year

Volume of addresses transferred per year (millions of /32s p.a.)

Receiving RIR	2012	2013	2014	2015
ARIN	6,728,448	5,136,640	4,737,280	37,637,888
APNIC	3,434,496	2,504,960	4,953,088	9,836,288
RIPE NCC	65,536	1,977,344	9,635,328	10,835,712
Total	**10,228,480**	**9,618,944**	**19,325,696**	**58,309,888**

APRICOT 2016   APNIC 41

Address Transfers

Receiving RIR	2012	2013	2014	2015
ARIN	79	31	58	277
APNIC	255	206	437	514
RIPE NCC	10	171	1,050	2,852
Total	344	408	1,545	3,643

Number of registered Address transfers per year

Volume of addresses transferred per year (millions of /32s p.a.)

Receiving RIR	2012	2013	2014	2015
ARIN	6,728,448	5,136,640	4,737,280	37,637,888
APNIC	3,434,496	2,504,960	4,953,088	9,836,288
RIPE NCC	65,536	1,977,344	9,635,328	10,835,712
Total	10,228,480	9,618,944	19,325,696	58,309,888

Movement of legacy addresses in 47/8 (to Microsoft) and 52/8 (to Amazon EC2)

APRICOT 2016   APNIC 41

How old are transferred addresses?

Legend:
- 2012
- 2013
- 2014
- 2015

Y-axis: % of Addresses transferred
X-axis: Age of Transferred Addresses (Years)

Handwritten annotation: 80÷ of transferred addresses are >20 years old in 2015

#apric
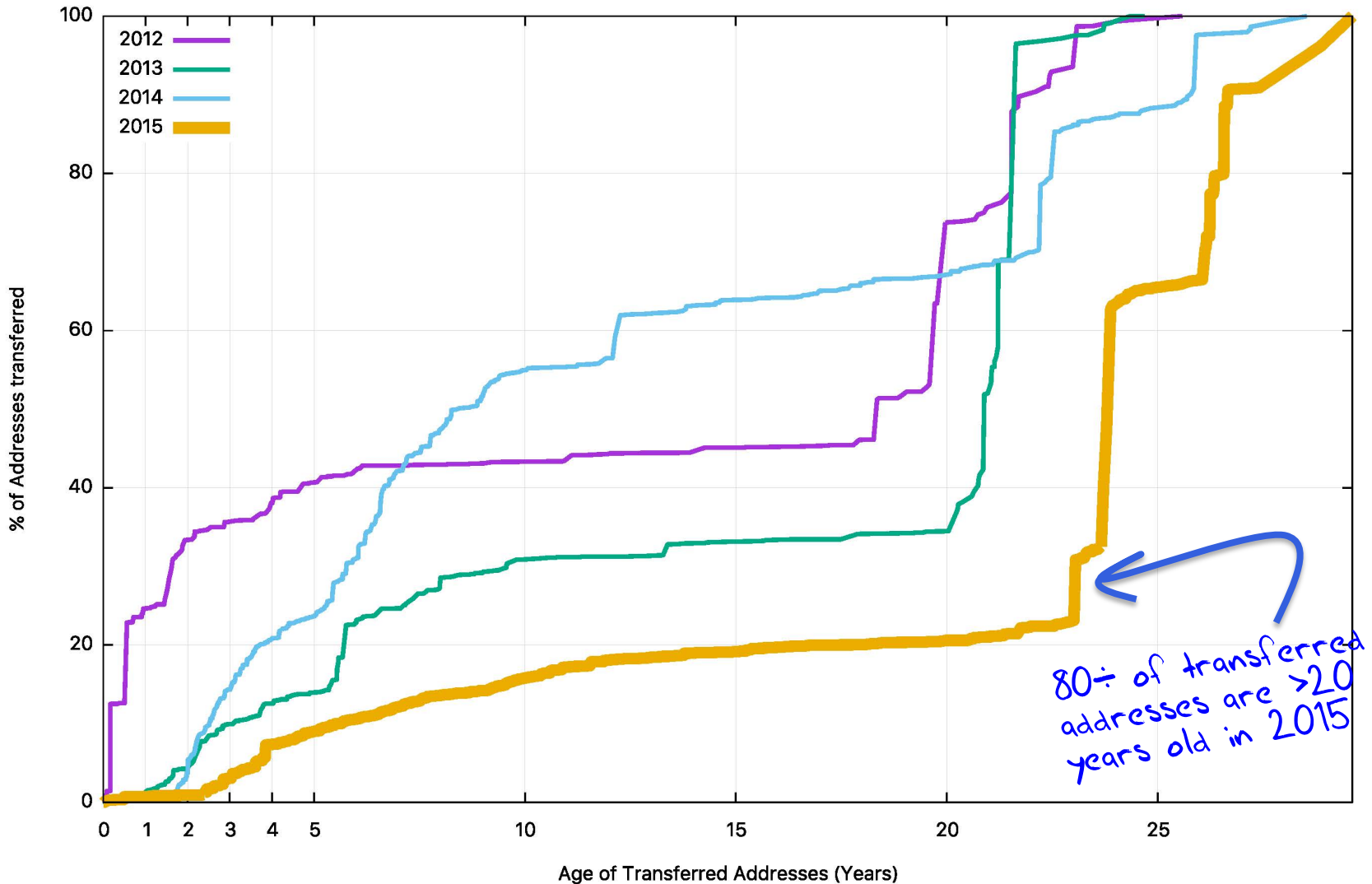
How old are new announced addresses each year?

Cumulative Address Age Distribution
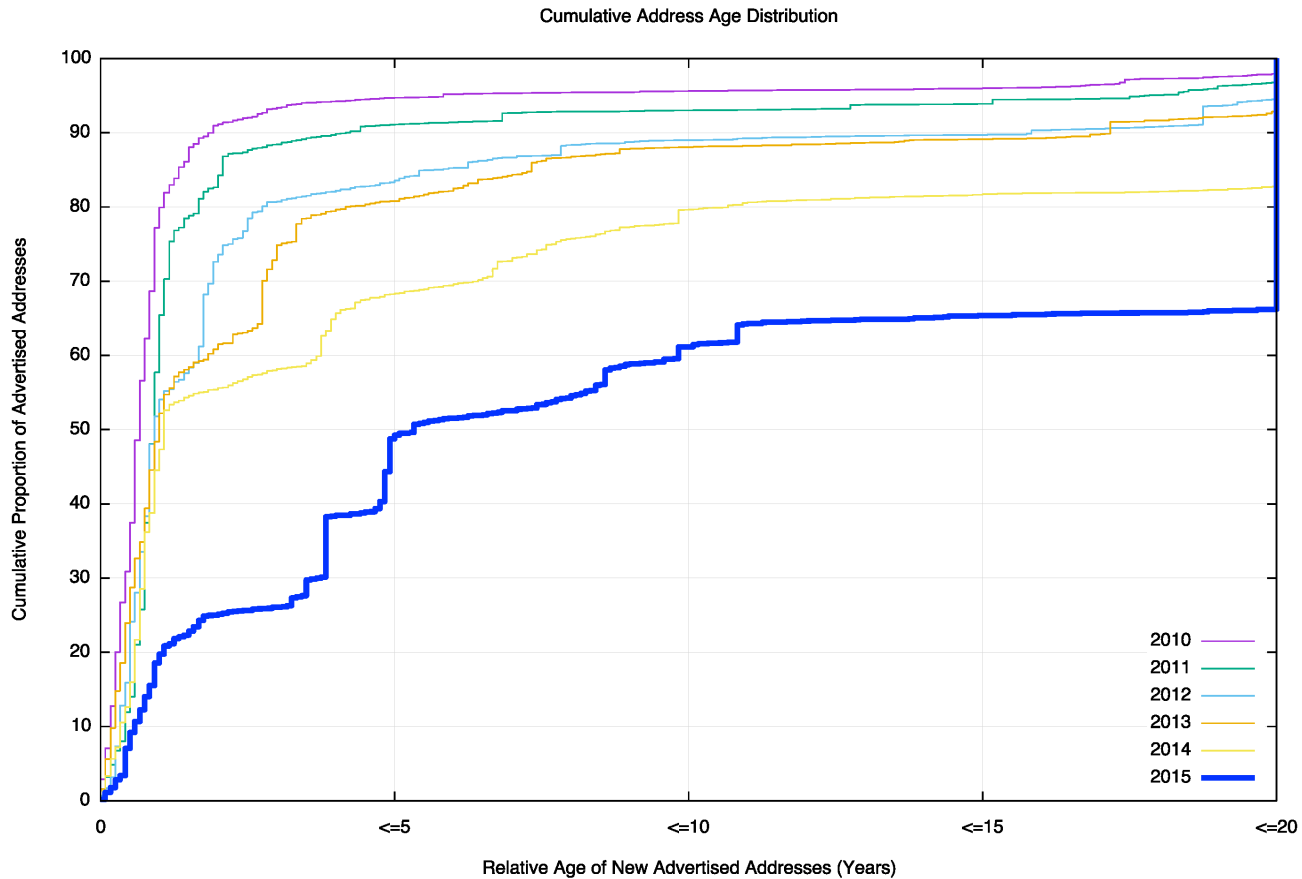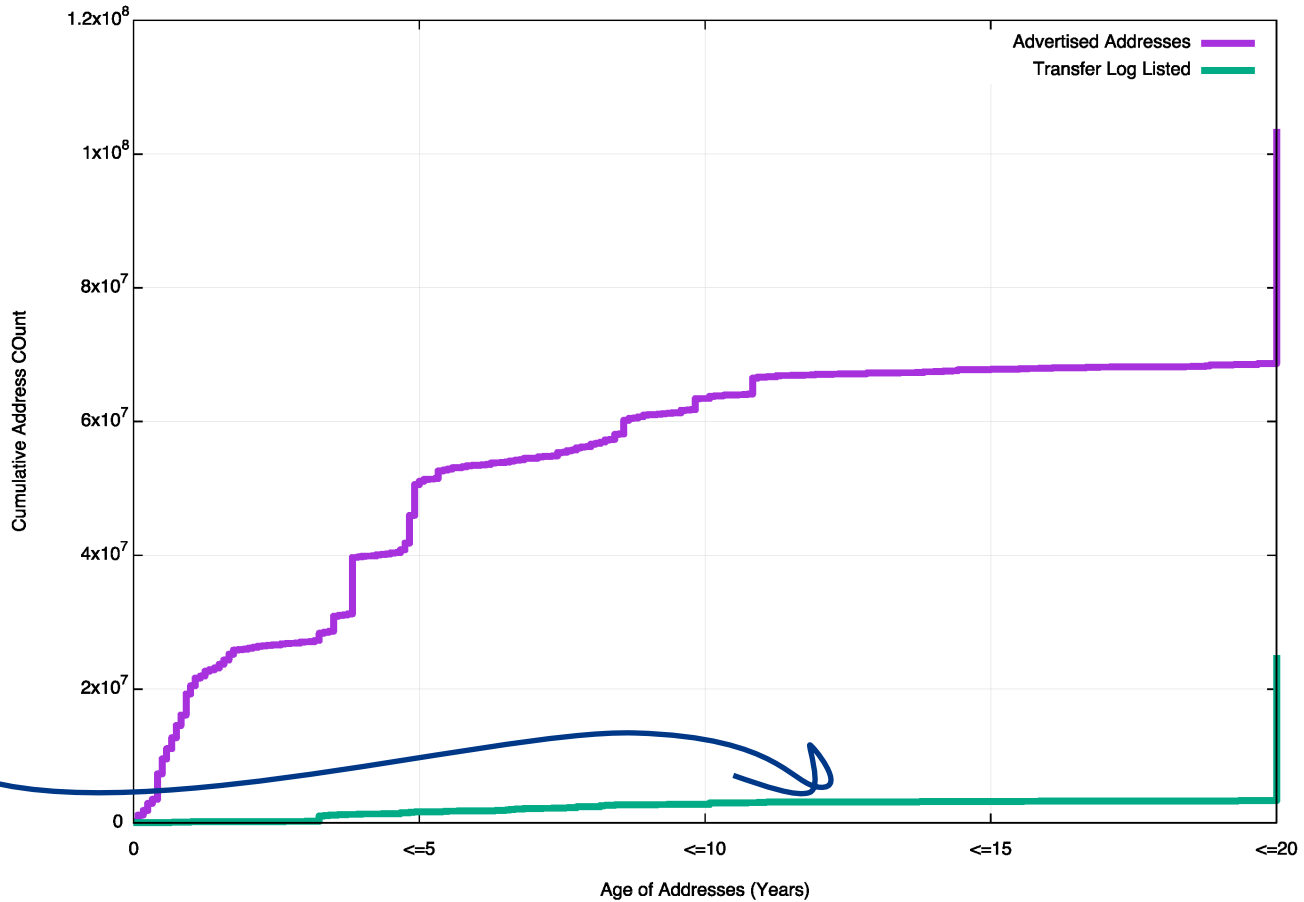
Transfer Logs

Transfer Logs
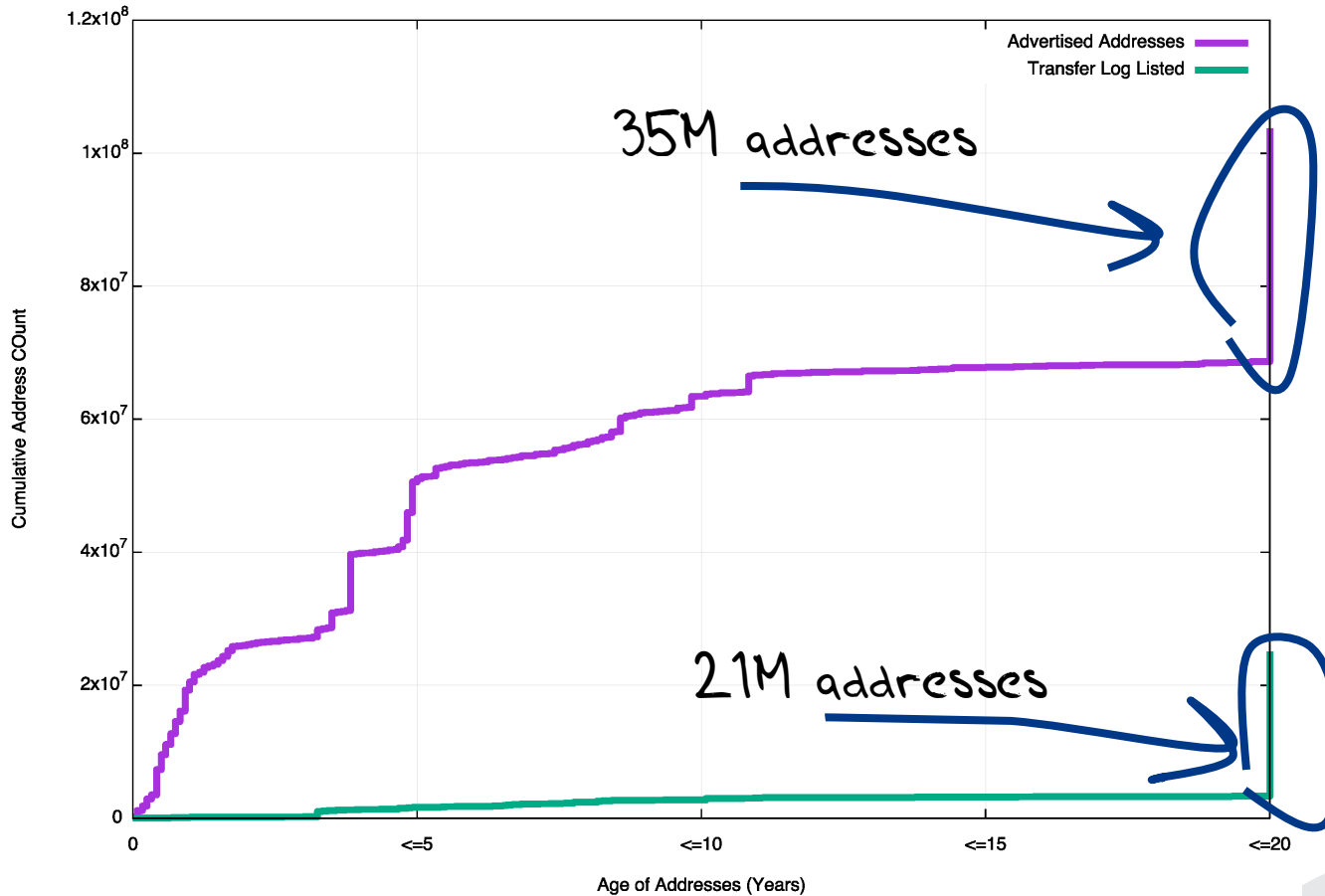
A Bigger Picture

Addresses	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
IPv6 (/32s)	9,854	6,916	15,634	1,555	4,754	20,009	18,136	23,935	17,513	20,225
IPv4 (/32s)(M)	168.1	203.9	203.3	189.4	248.8	201	114.9	65.1	63.9	34.8
IPv4 xfers (reg)							10.2	9.6	19.3	58.3
IPv4 xfers (xreg)	?	?	?	?	?	?	?	?	?	?
IPv4 NAT	?	?	?	?	?	?	?	?	?	?

What we don't know is:
- the volume of unregistered address transfers
- the volume of address hijacks
- the volume of re-activating previously dormant / privately used address space
- the populations of devices using private addresses located behind NATs

APRICOT 2016   APNIC 41

Some questions to ponder

- What's in the registry?
  - Who is the 'title holder' of an address
  - Who is the operational controller of an address
  - Why can't we have both?

- What's the registry showing us?
  - A snapshot of today?
  - A change log of how we got to today

- What makes the registry useful?

- How can we preserve the utility of the registry?

That's it!

Questions?

APRICOT 2016   APNIC 41