



# ***Dataset Comparison***

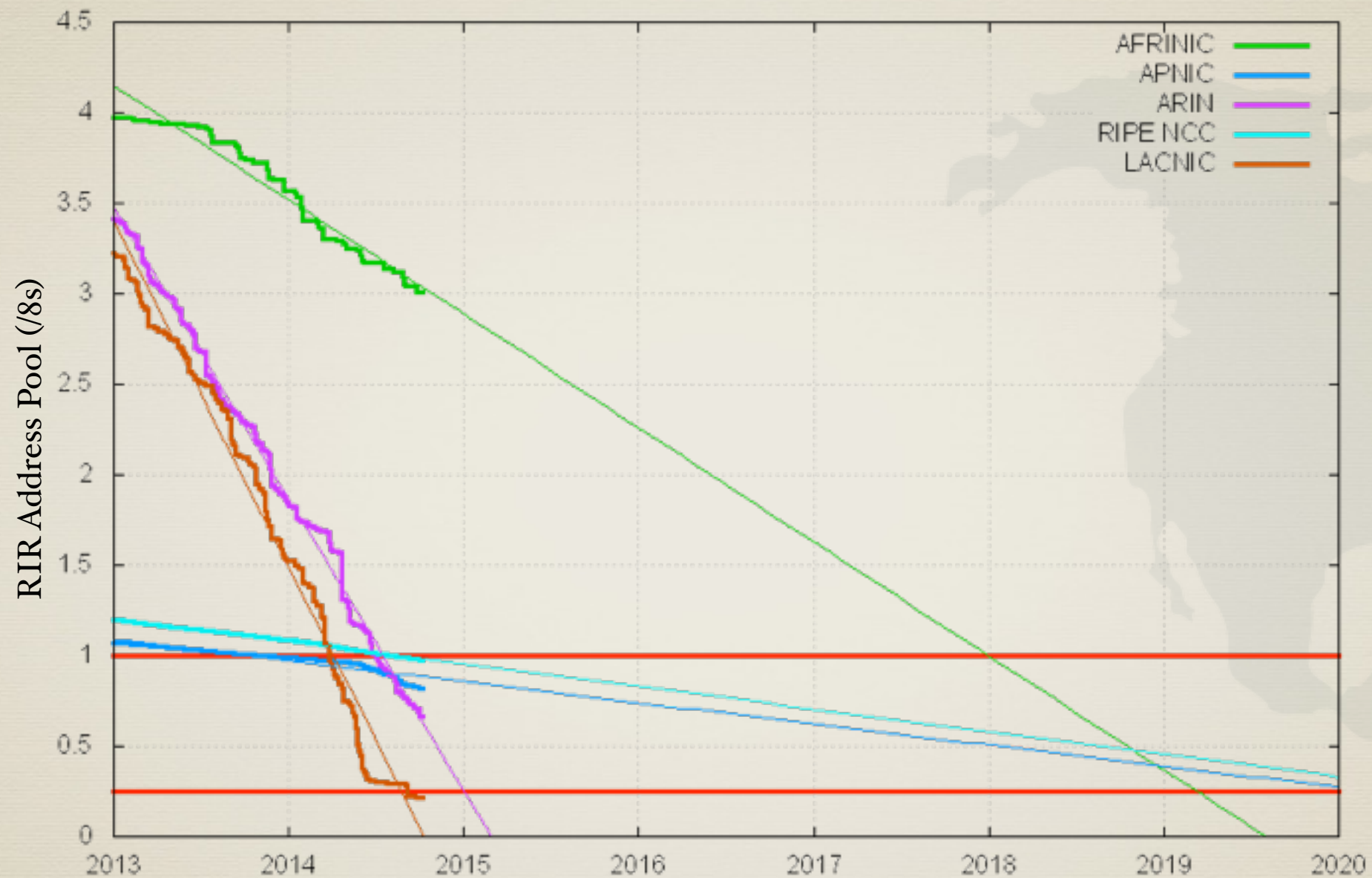
***IPv4 vs IPv6 traffic seen at DNS root servers***

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# IPv4 exhaustion



<http://www.potaroo.net/tools/ipv4/>

For most practical purposes IPv4 exhaustion is here.



# goal

We compare country level allocation and observed deployment of IPv4 and IPv6 by examining DNS root traffic collected by DNS-OARC members as part of the Day In The Life (DITL) measurements.

<http://www.dns-oarc.net/oarc/data/ditl>

# datasets

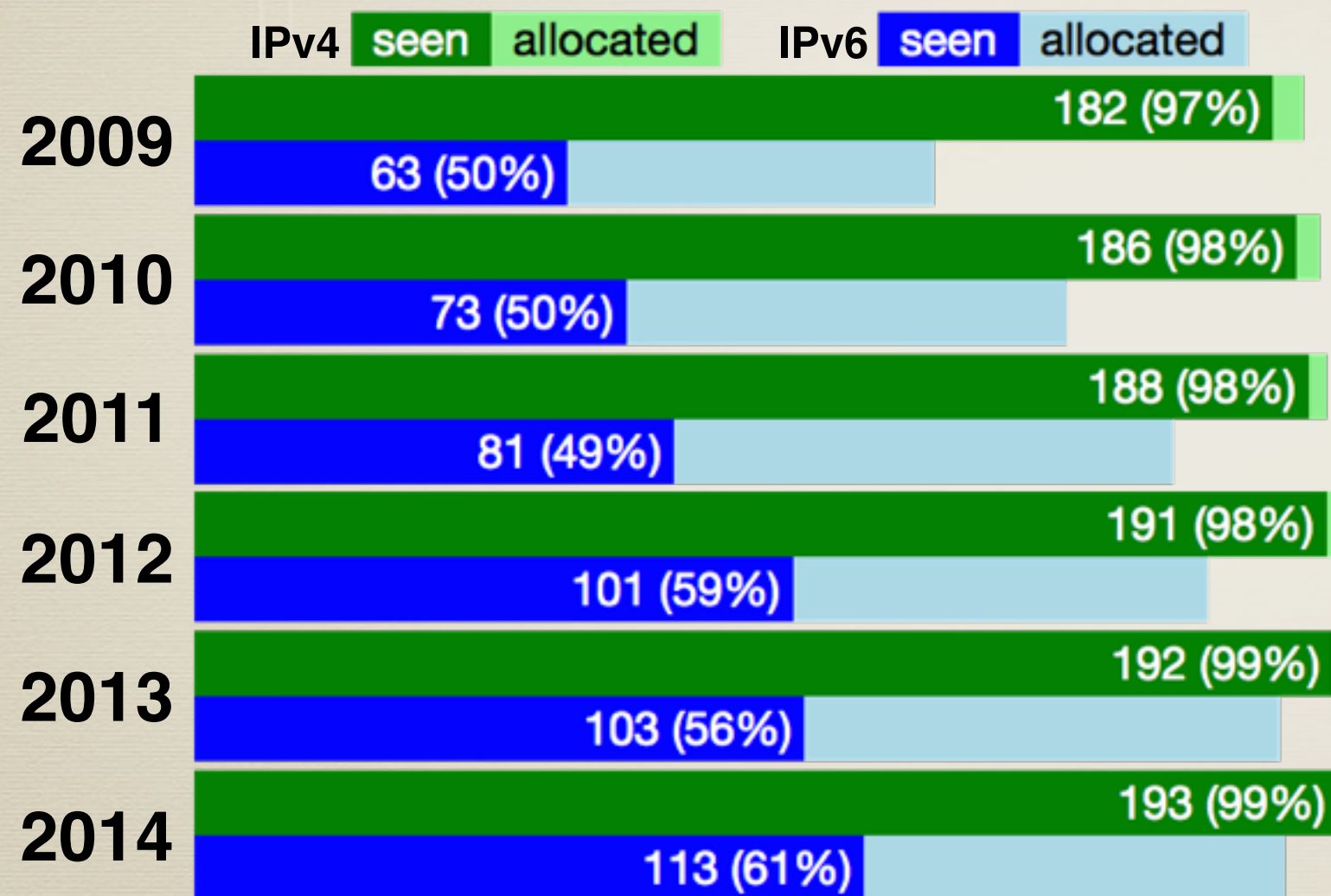
- DNS root traces  
DNS-OARC Day In The Life (DITL)
- IP allocated blocks  
RIR delegation files  
also used for country-level geolocation
- IP announced prefixes  
BGP tables collected by Route Views Project and  
RIPE NCC RIS
- Gross Domestic Product (GDP)  
World Bank



# Number of Countries

<http://www.caida.org/research/policy/dns-country/>

number of countries at least one allocation

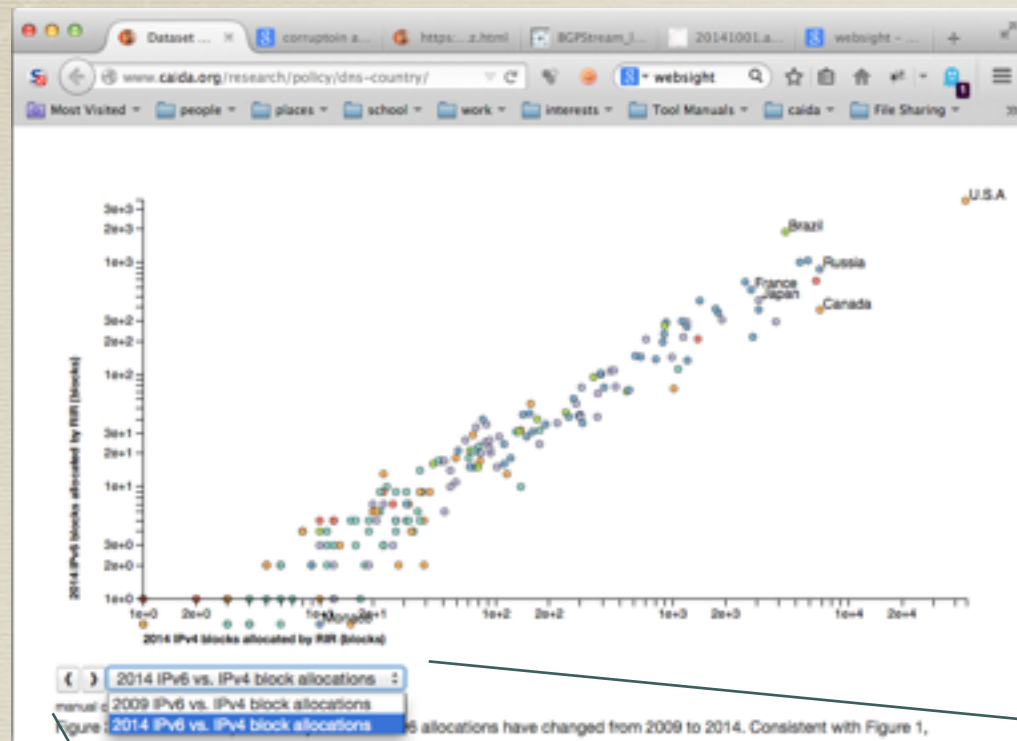


**Almost all countries now have at least one IPv6 allocation and a growing fraction were seen at the DNS roots.**



# interactive web site

<http://www.caida.org/research/policy/dns-country/>



presets

Allows users to switch between set views.

manual control switch

2014 IPv6 vs. IPv4 block allocations

manual control ☒

year: 2009

x: 2014 IPv4 blocks allocated by RIR (blocks) log

y: 2014 IPv6 blocks allocated by RIR (blocks) log

r: 2014 constant

manual control

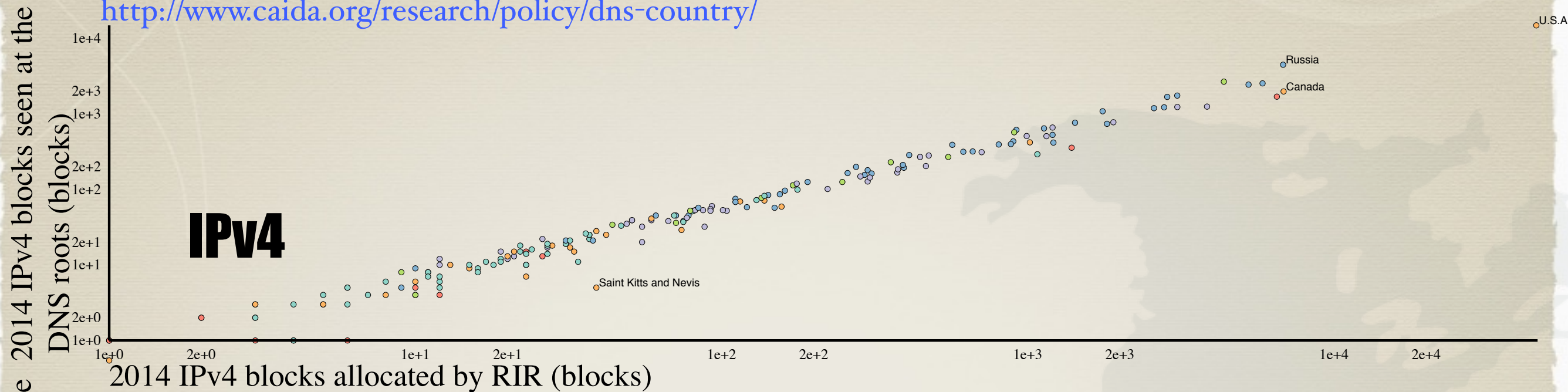
Allows full control over both axis and node size



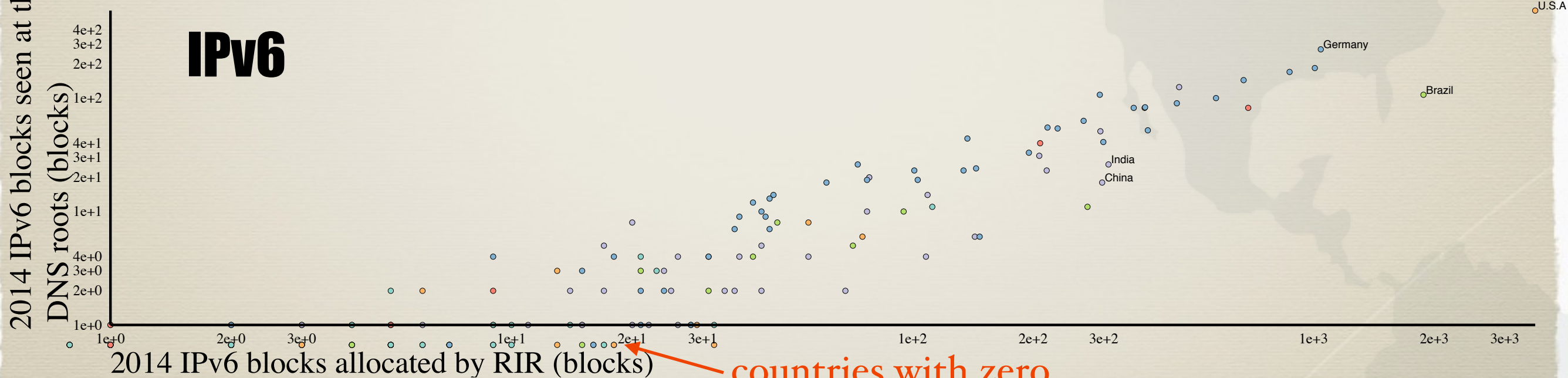
# fraction of blocks observed

<http://www.caida.org/research/policy/dns-country/>

## IPv4



## IPv6

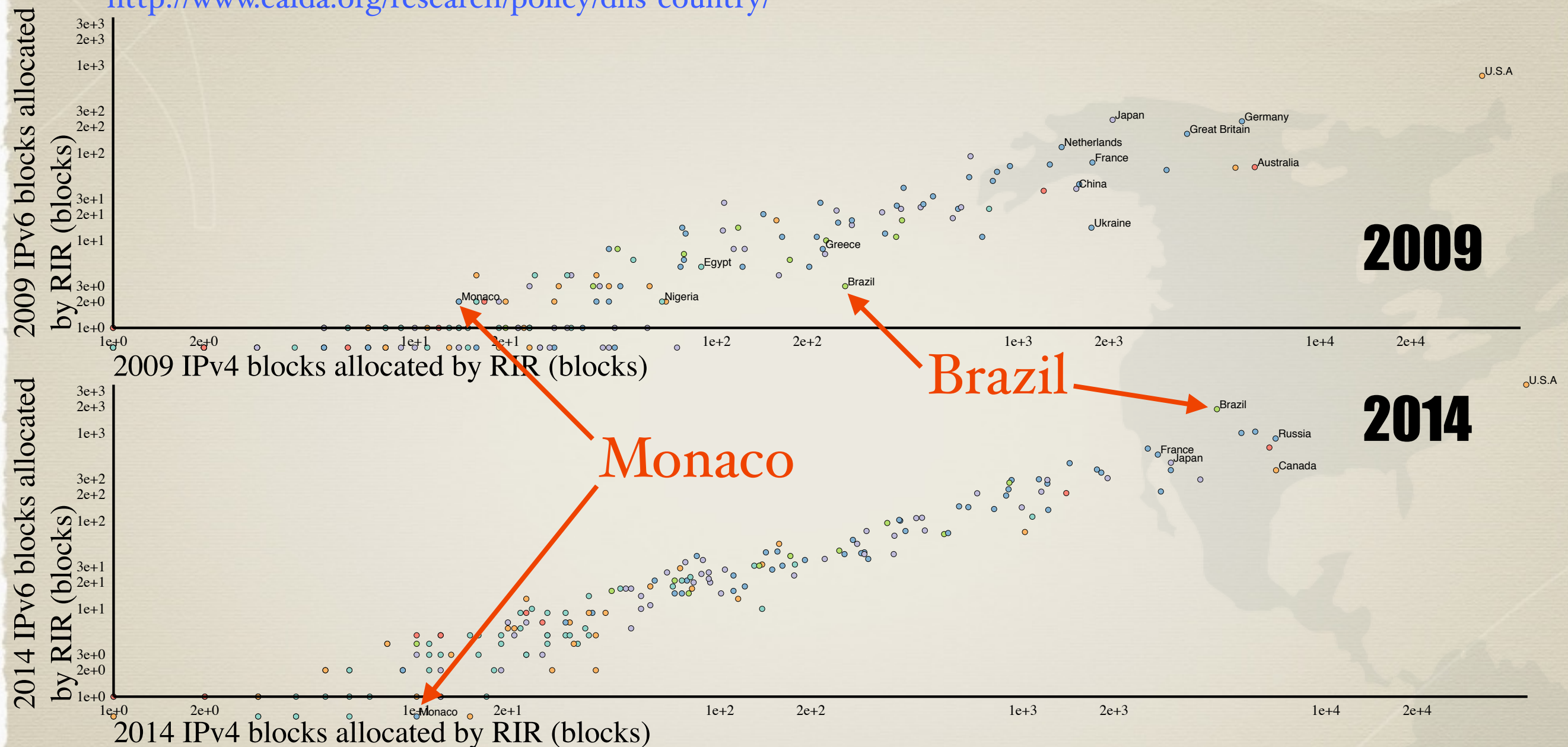


Fraction of address blocks seen at the roots much tighter for IPv4 and IPv6 address blocks. Reflects more uniform usage of IPv4 addresses.



# ratio IPv4 to IPv6 blocks

<http://www.caida.org/research/policy/dns-country/>



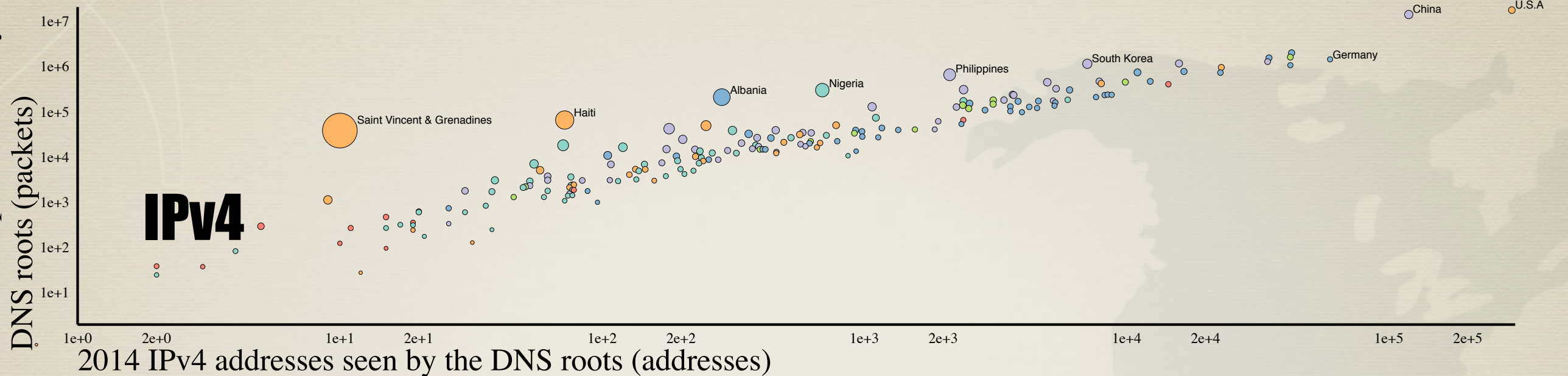
Only Monaco went to zero. Brazil went from unusually low ratio of IPv4 to IPv6, to higher than normal. Overall the ratio of IPv4 and IPv6 allocations was more similar in 2014.



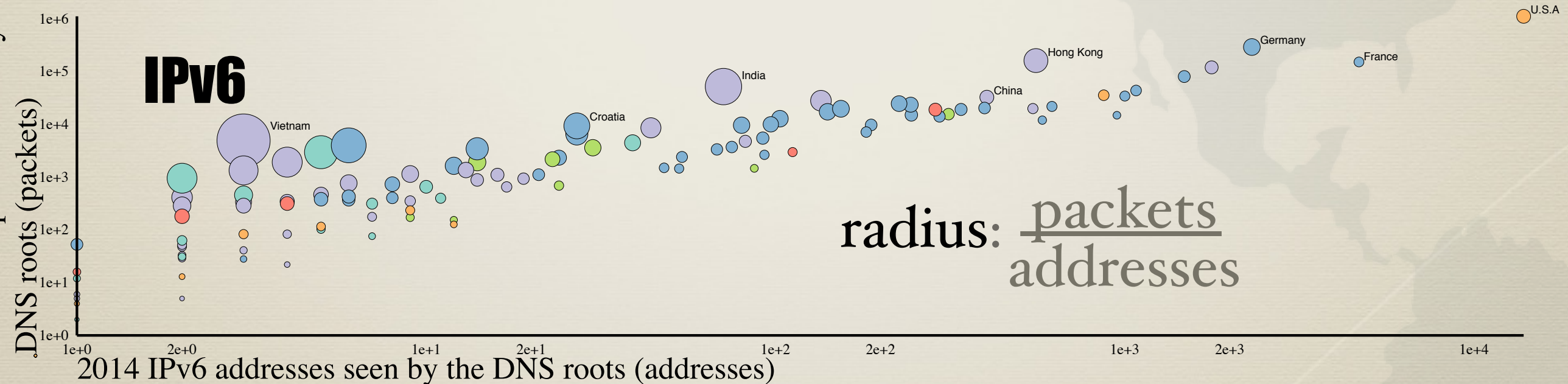
# packets and addresses

<http://www.caida.org/research/policy/dns-country/>

2014 IPv4 packets seen by the DNS roots (packets)



2014 IPv6 packets seen by the DNS roots (packets)

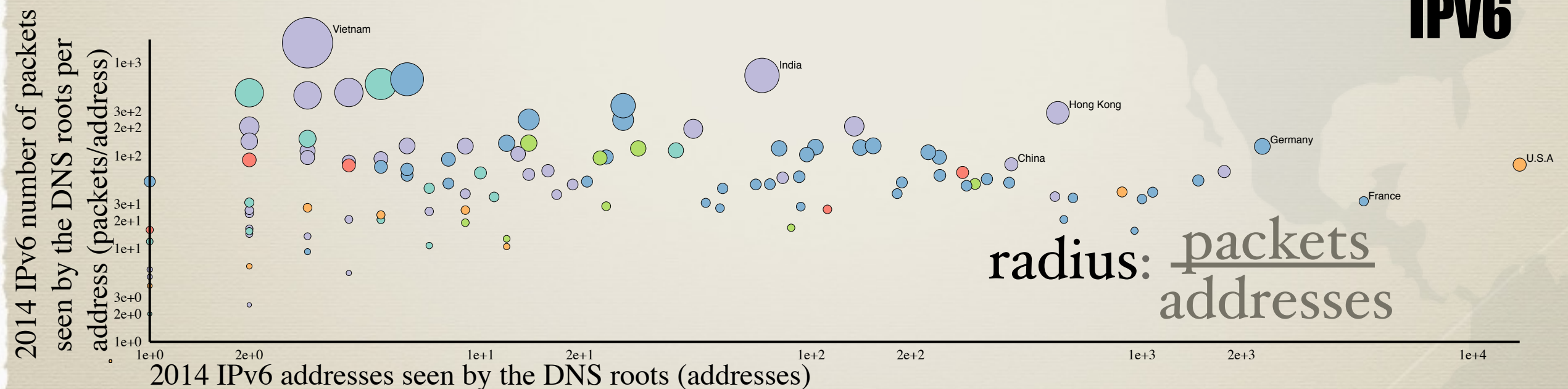
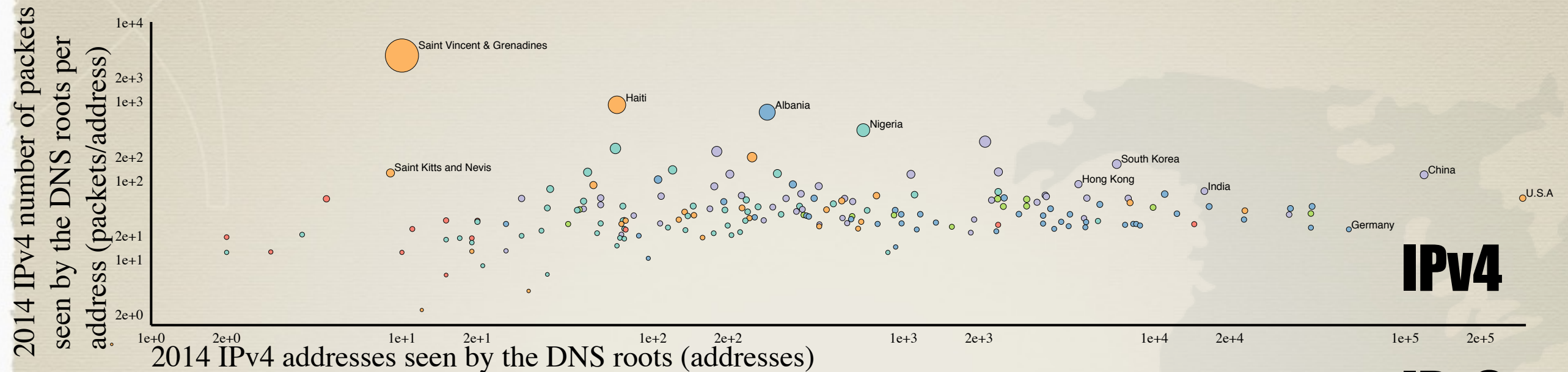


Similar with other metrics, IPv4 is less scattered than IPv6.



# ratio packets / addresses

<http://www.caida.org/research/policy/dns-country/>



The countries with the largest ratios tend to have fewer addresses. China has 40% of US IPv6 addresses, but 80% of it's IPv6 packets.



# Gross Domestic Product

<http://www.caida.org/research/policy/dns-country/>

**IPv4**

radius: IPv4 allocated blocks

**IPv6**

radius: IPv6 allocated blocks

There is a positive correlation between wealthier countries and the ratio of IPv4 blocks seen at the DNS roots, but not IPv6 blocks.



# conclusion

<http://www.caida.org/research/policy/dns-country/>

- number of countries with allocations
  - IPv4 allocations almost 100% seen
  - IPv6 allocations have gone from 50% to 61% seen
  - Almost all countries now have at least one for both
- IPv6 fraction of blocks seen more dissimilar than IPv4
- correlation between number of IPv4 and IPv6 blocks increased between 2009 and 2014
- negative correlation between wealth and ratio of blocks seen in IPv4, but not IPv6