



# Impact of IPv4 Exhaustion

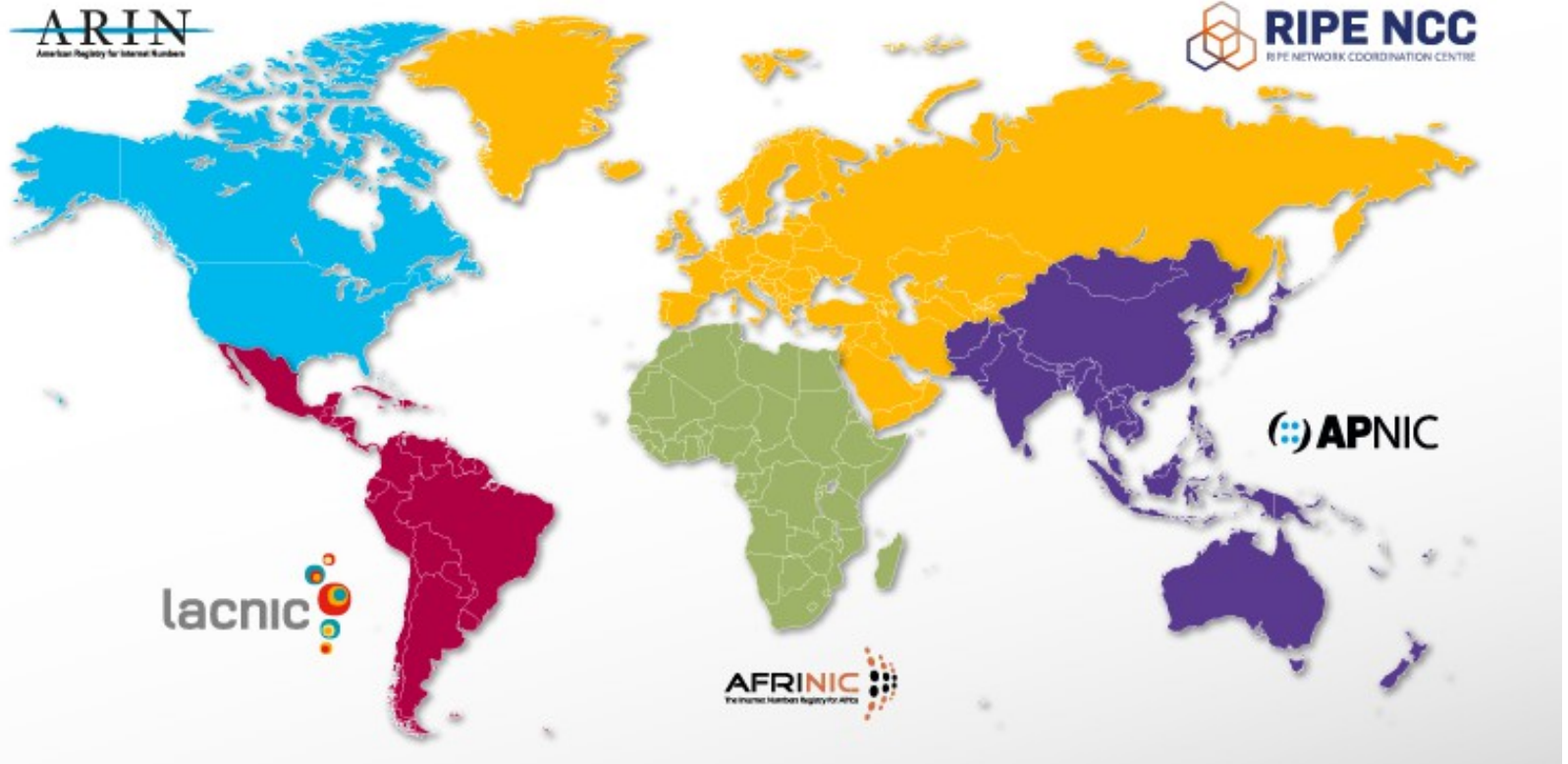
**Alan Barrett**  
**Chief Executive Officer AFRINIC**

**SAFNOG-3 | September 2017**

IPv4 allocation as of May 1992 (from RFC 1466)

	Total	Allocated	Allocated (%)
Class A	126	49	38%
Class B	16383	7354	45%
Class C	2097151	44014	2%
Total /24s	14548735	5137902	35%

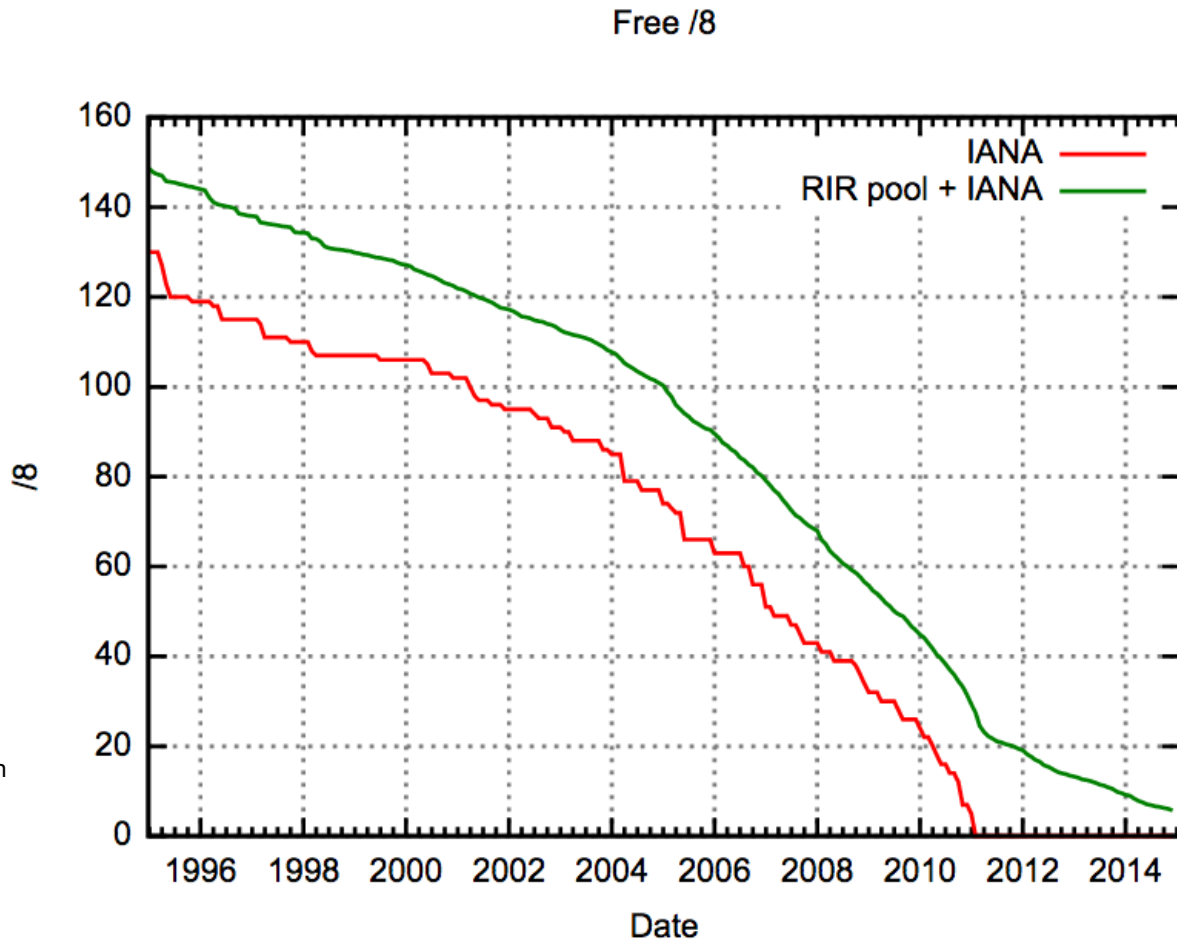
# RIR Service Regions



Source: NRO

<https://www.nro.net/about-the-nro/regional-internet-registries/>

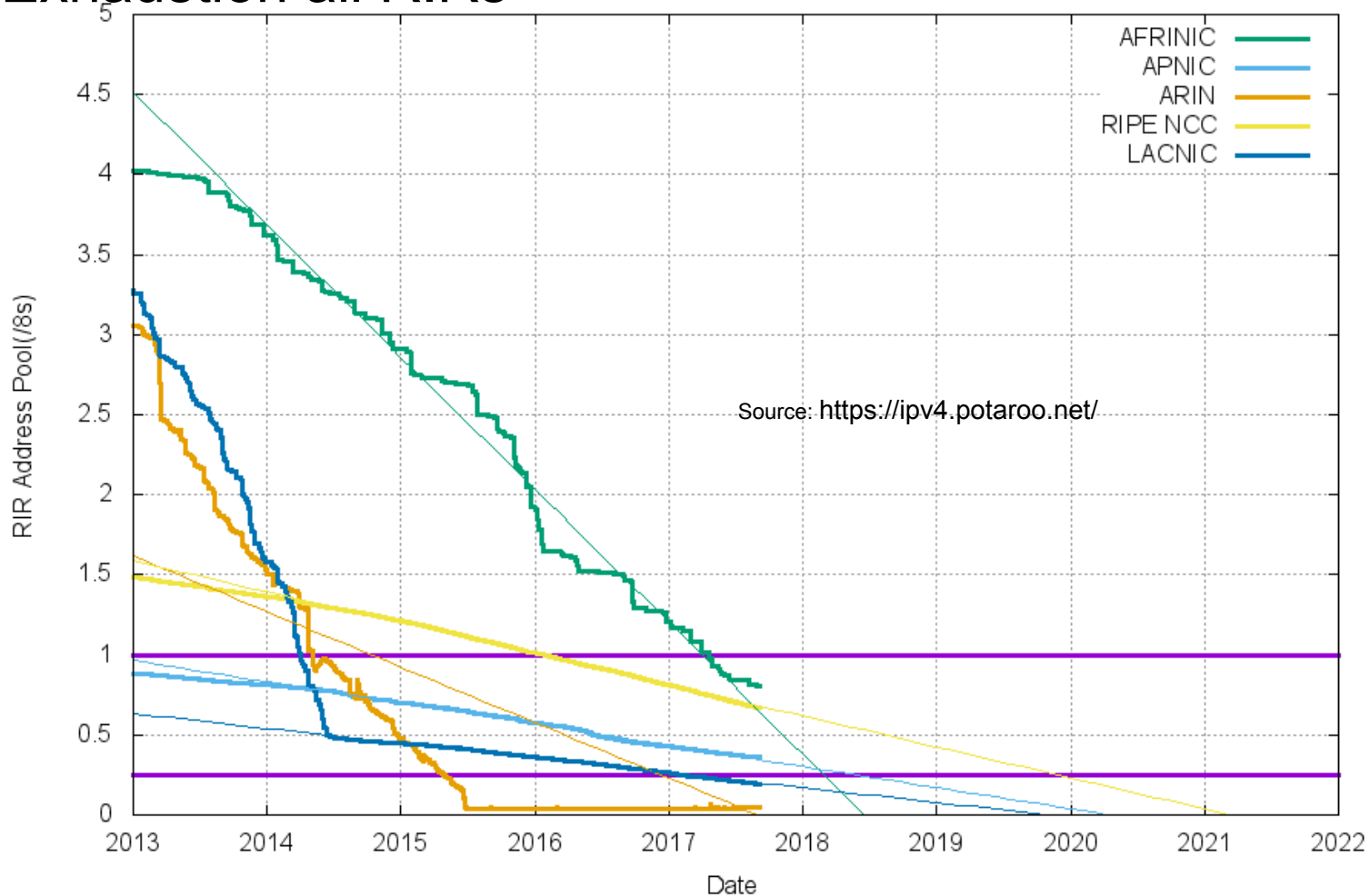
# IPv4 Depletion at IANA and RIRs (1995 - 2015)



Source: Wikipedia  
[https://en.wikipedia.org/wiki/IPv4\\_address\\_exhaustion](https://en.wikipedia.org/wiki/IPv4_address_exhaustion)

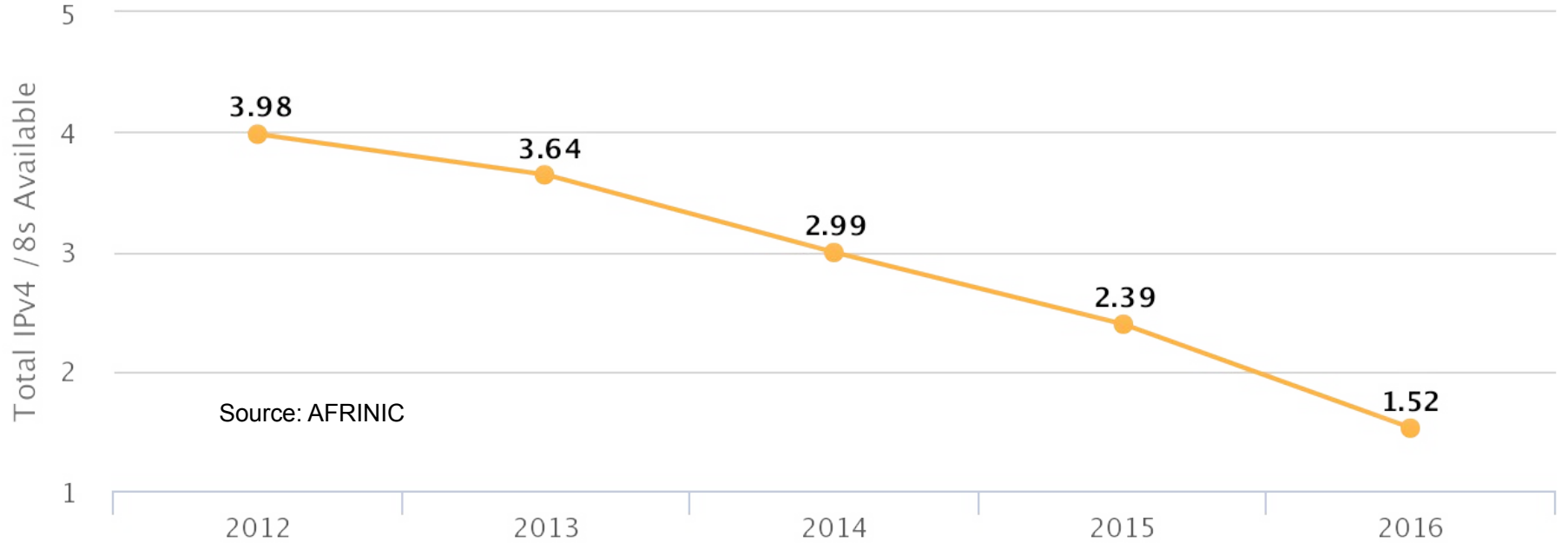
# IPv4 Exhaustion all RIRs

RIR IPv4 Address Run-Down Model



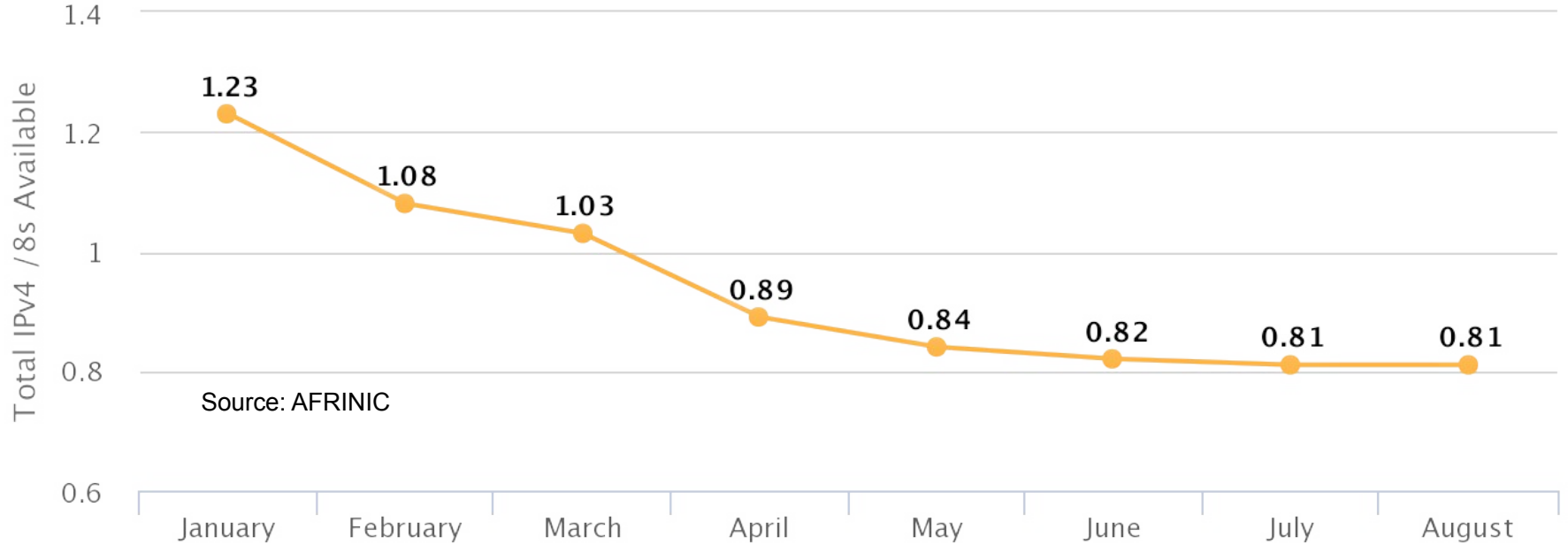
# Exhaustion (AFRINIC, last 5 years)

IPv4 available /8s per year from 2012 to 2017



# Last /8 (AFRINIC 2017)

## IPv4 available /8s per month in 2017



# AFRINIC “Soft Landing” Policy

Exhaustion Phase 1 (when final /8 is reached -- April 2017)

- Maximum /13 at one time, no limit to number of times

- Must have used 90% of previous allocations

- Out-of-region use “solely in support of connectivity back to the AfriNIC region”

Exhaustion Phase 2 (when only a /11 is available)

- Maximum /22 at one time, no limit to number of times

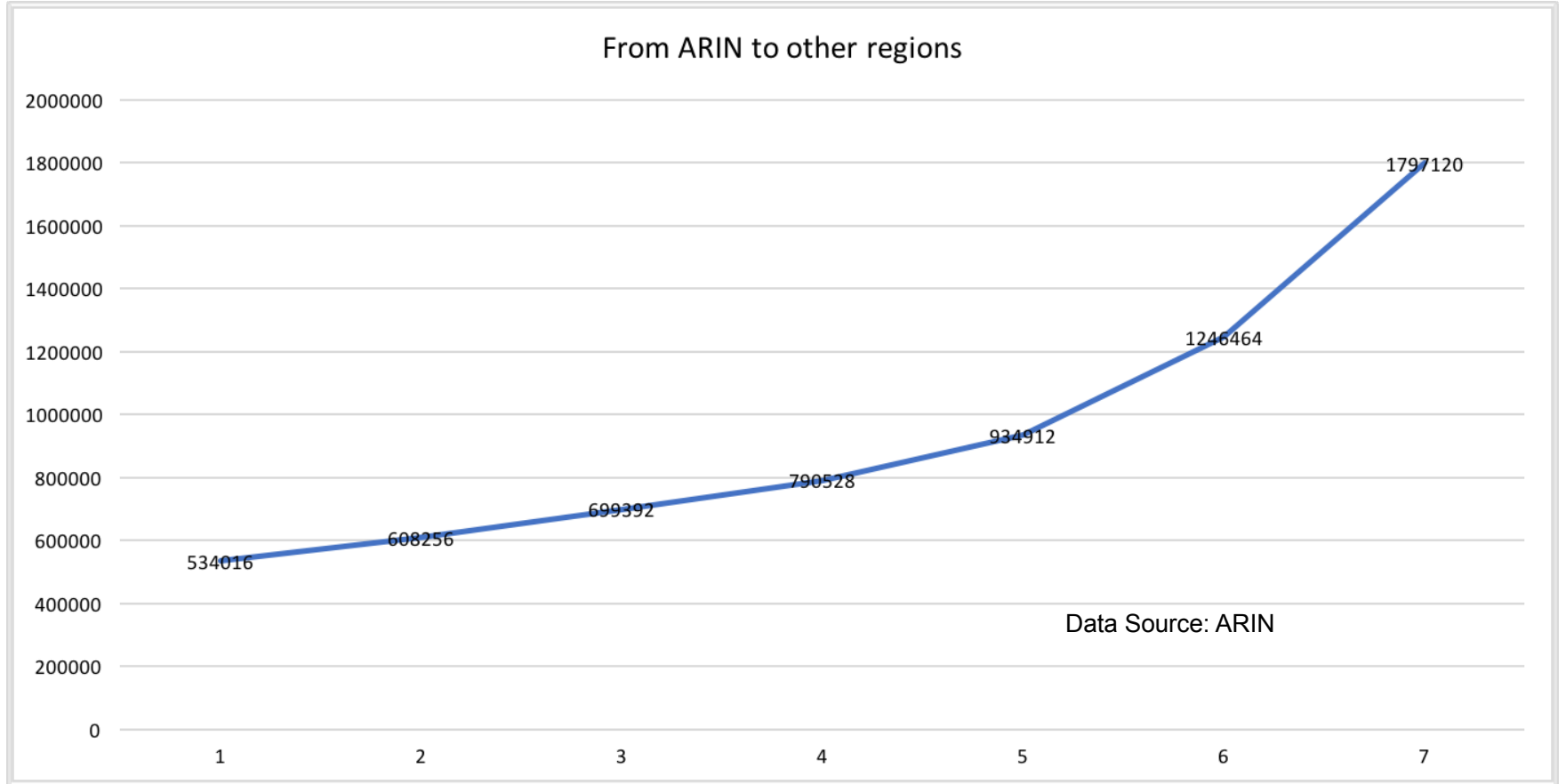
“Soft Landing Bis” proposal under discussion

- Phase 1: Max /18 per 24 months

- Phase 2: Max /22 per 24 months



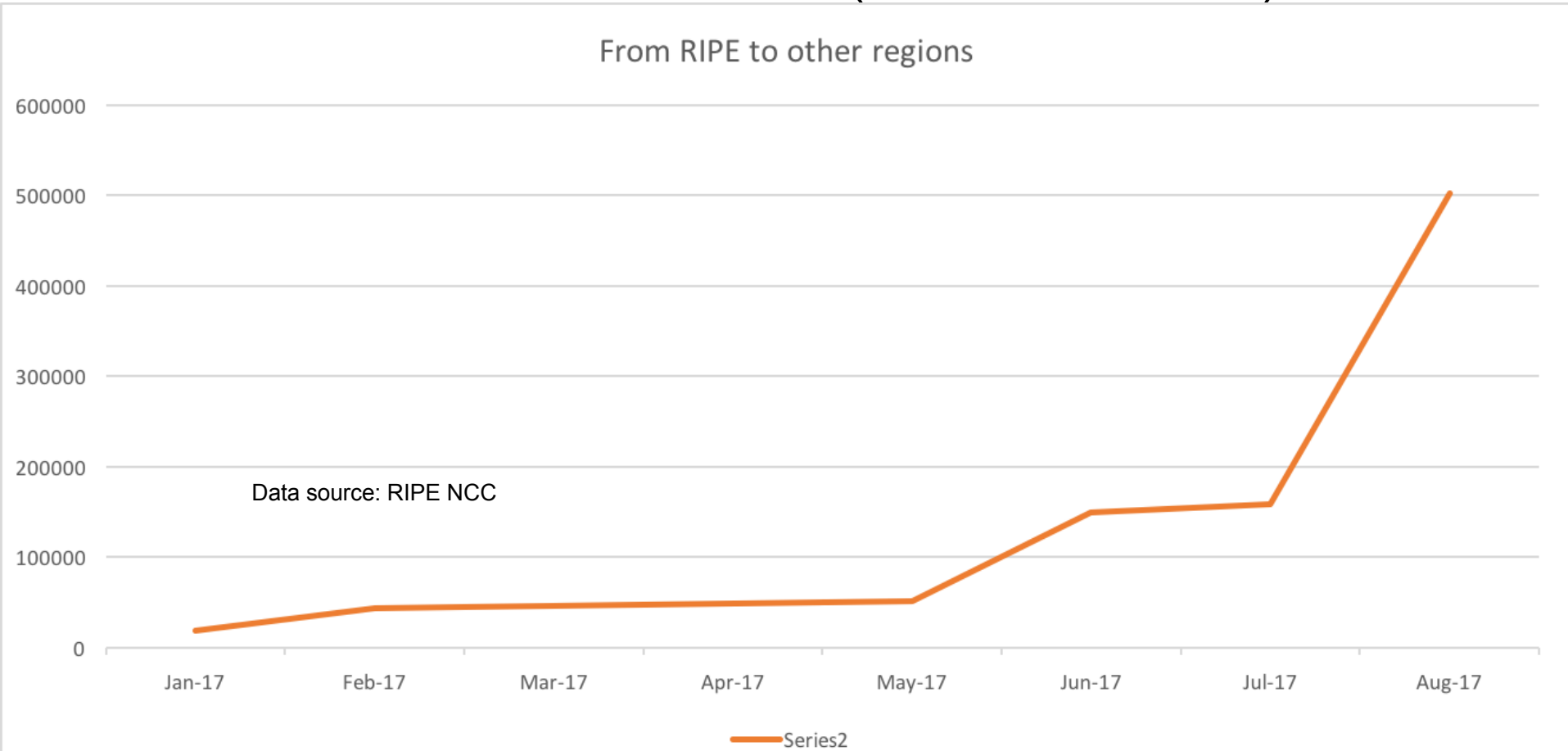
# IPv4 Transfer from ARIN to others (2017, cumulative)



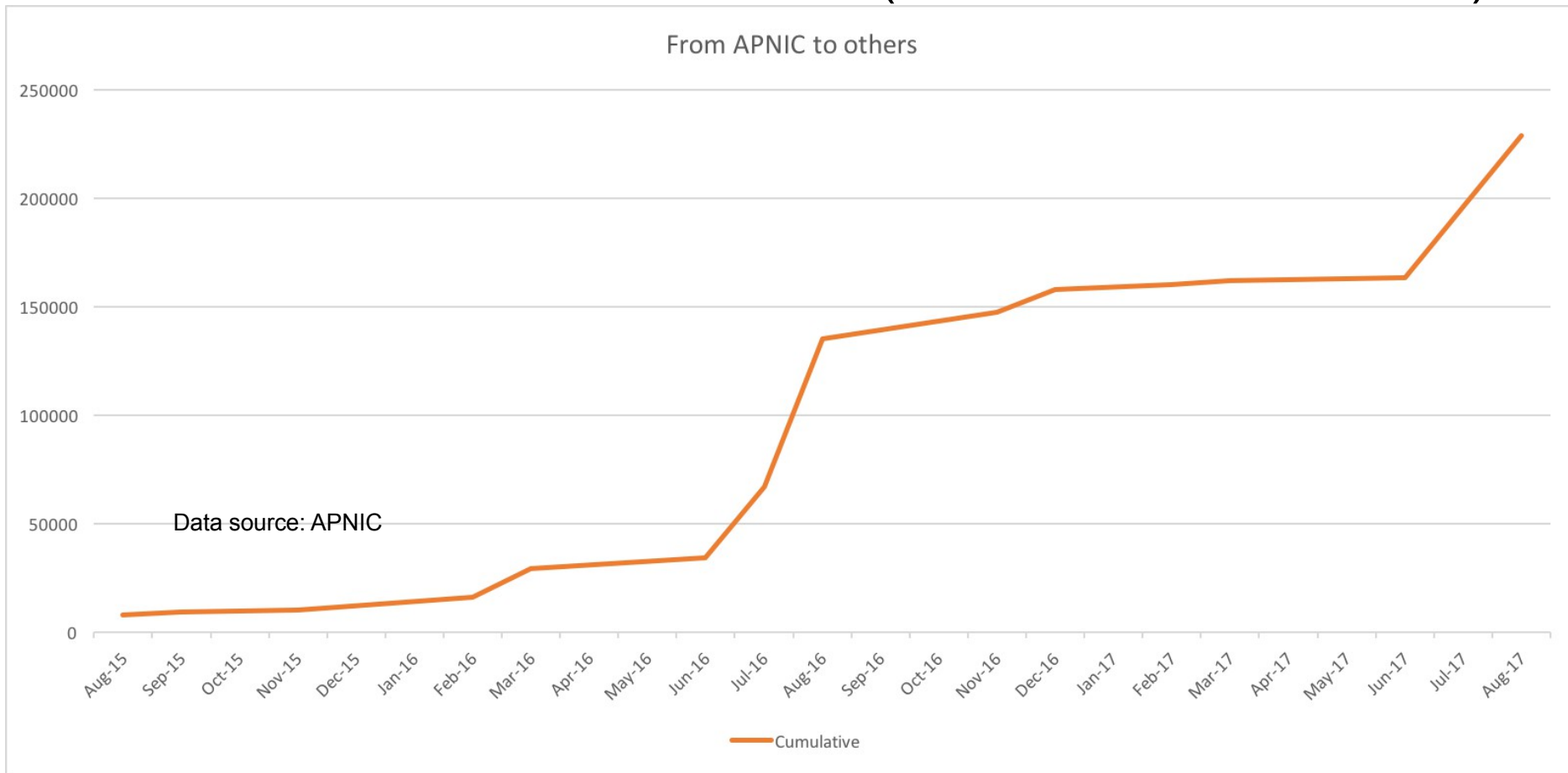
# IPv4 Transfer from RIPE to others (2017, cumulative)

From RIPE to other regions

Data source: RIPE NCC

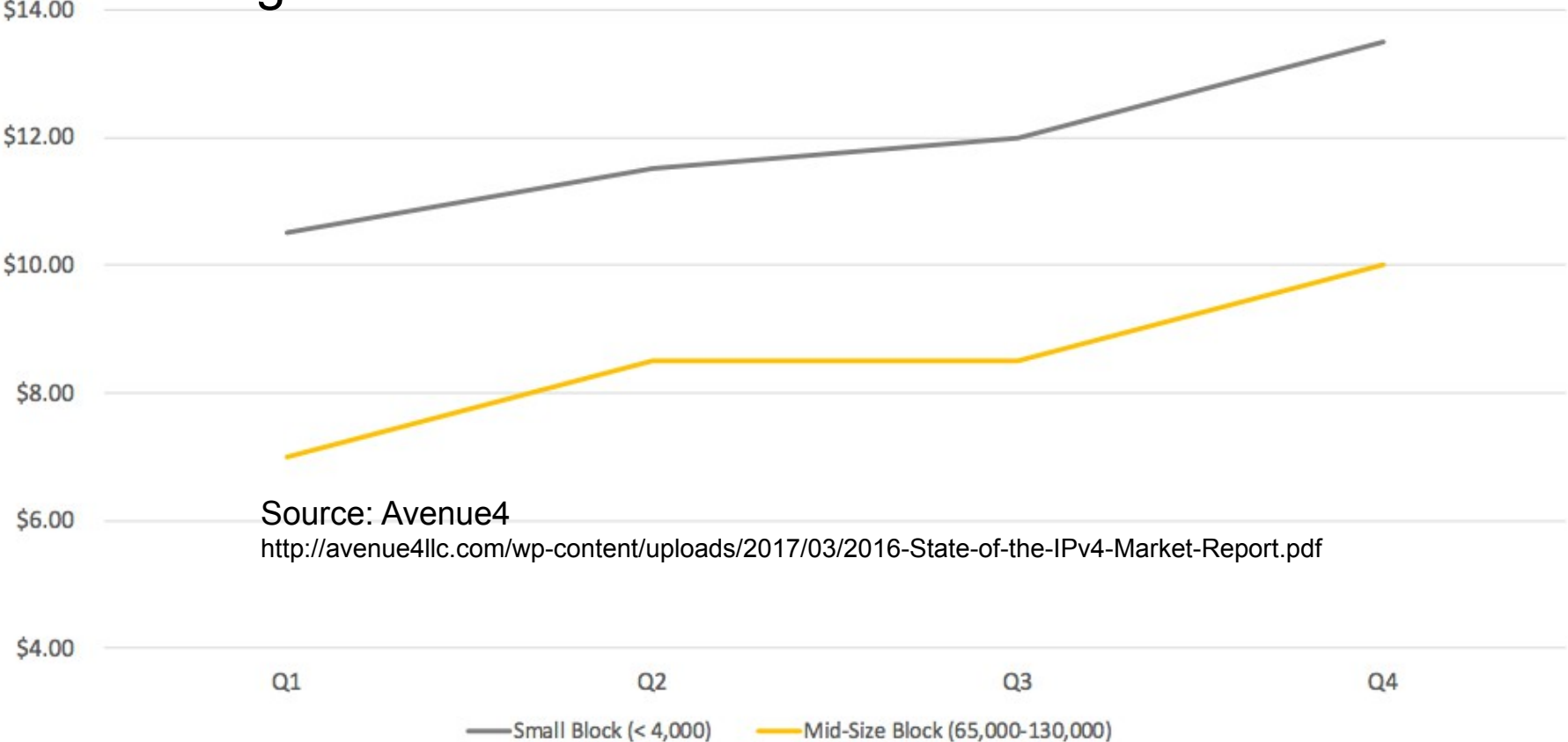


# IPv4 Transfer from APNIC to others (2015 - 2017, cumulative)



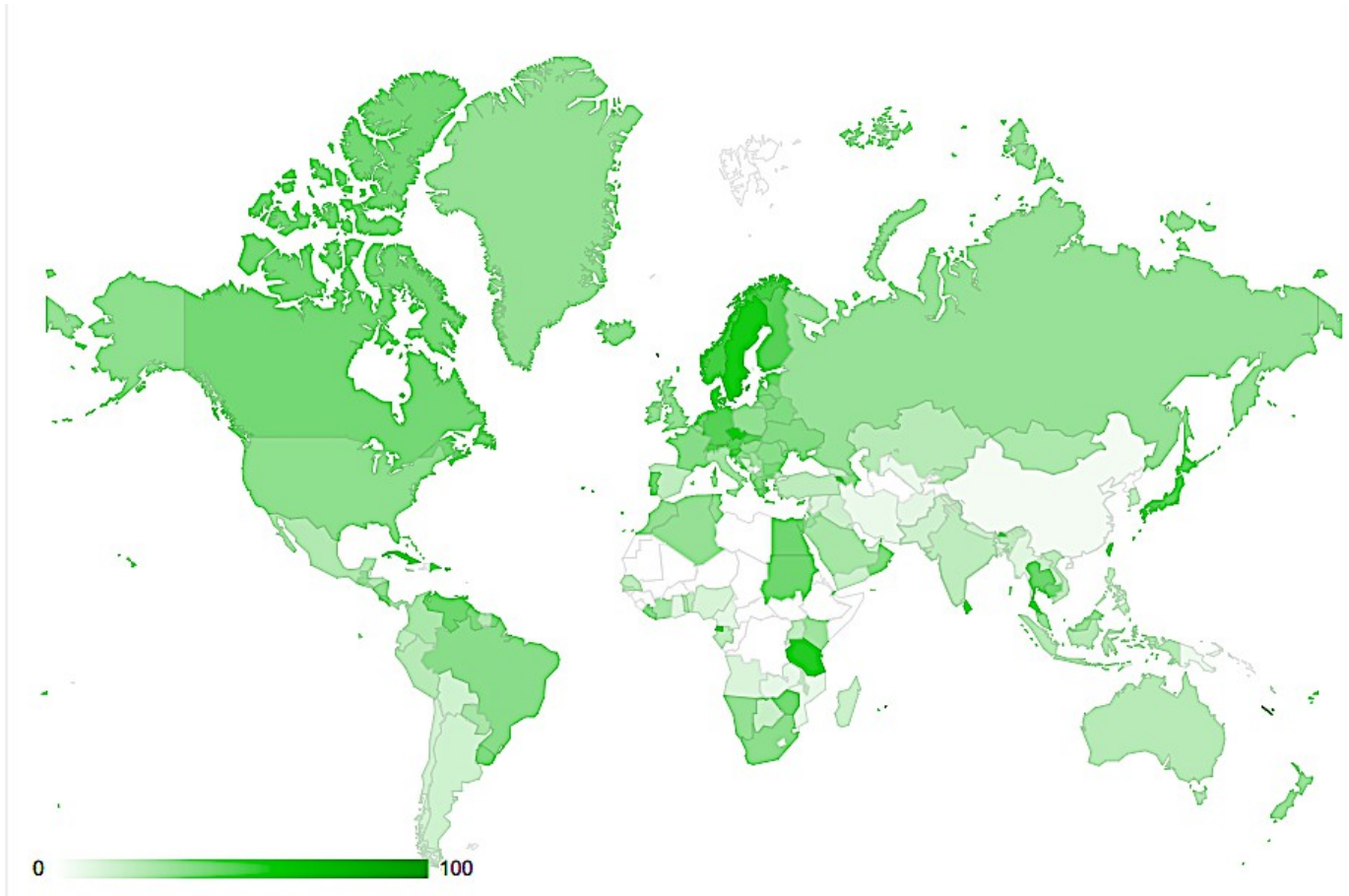
# ARIN region IPv4 transfer market

## 2016 Pricing Trends Small & Mid-Size Blocks



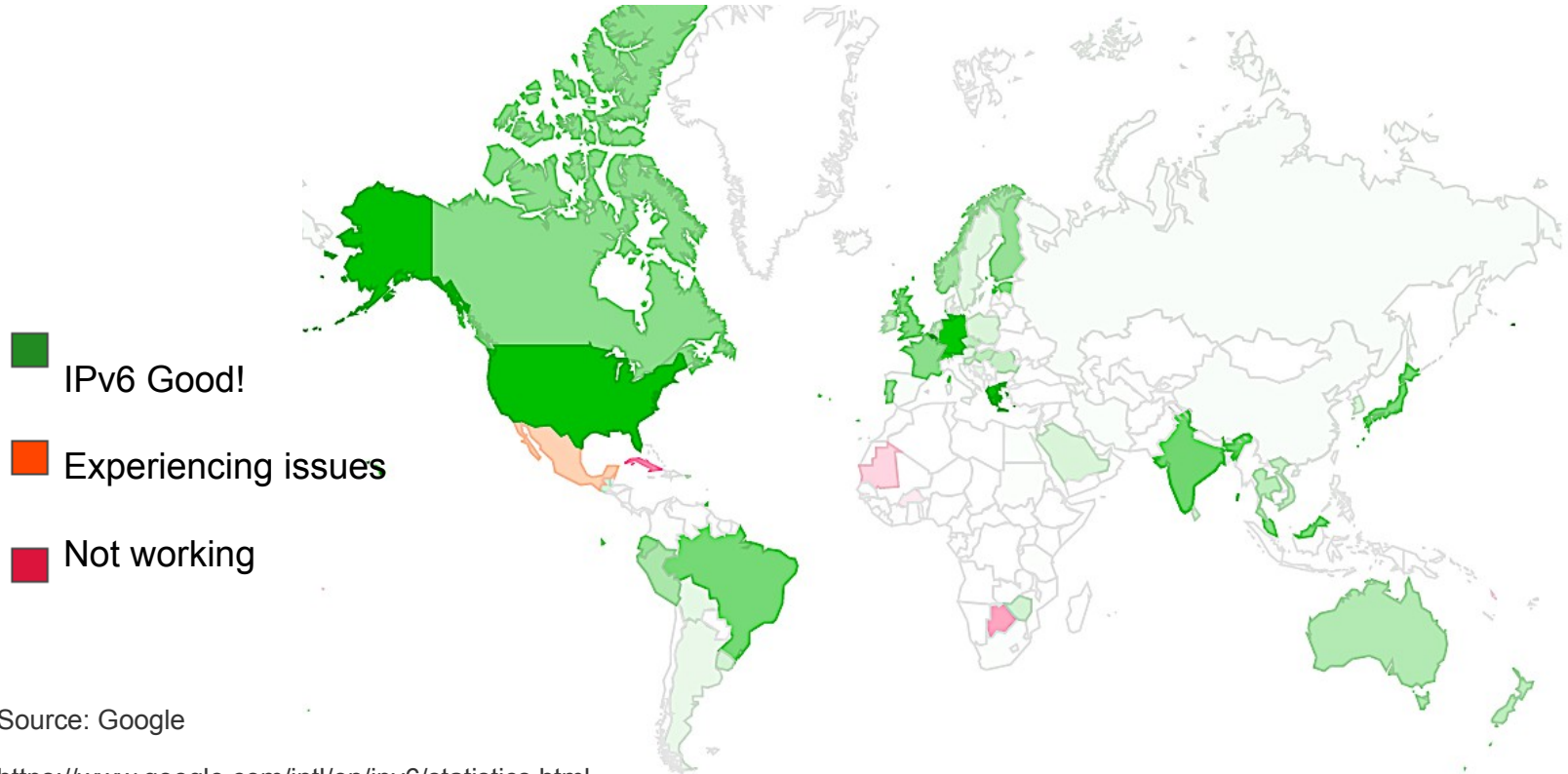
Source: Avenue4  
<http://avenue4llc.com/wp-content/uploads/2017/03/2016-State-of-the-IPv4-Market-Report.pdf>

# Cisco IPv6 Statistics (% ASs with IPv6 Allocation)



Source: CISCO 6LAB

# Google IPv6 Statistics (Clients using IPv6)



Source: Google

<https://www.google.com/intl/en/ipv6/statistics.html>

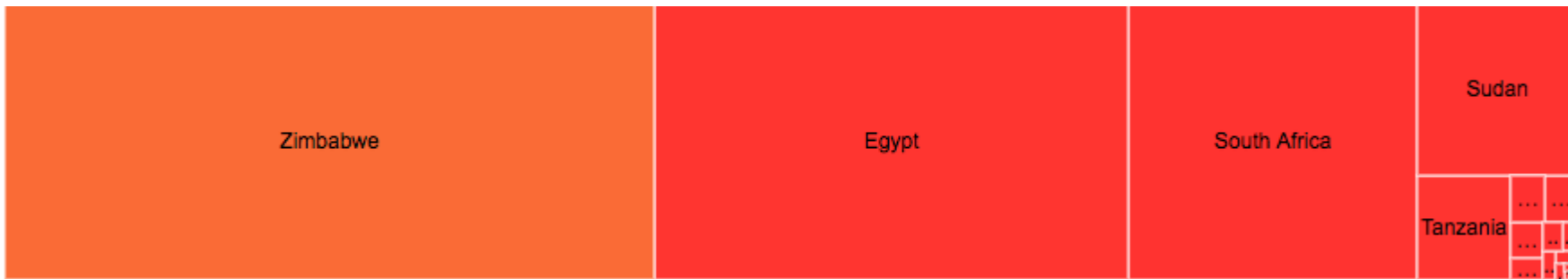


Source: CISCO 6LAB

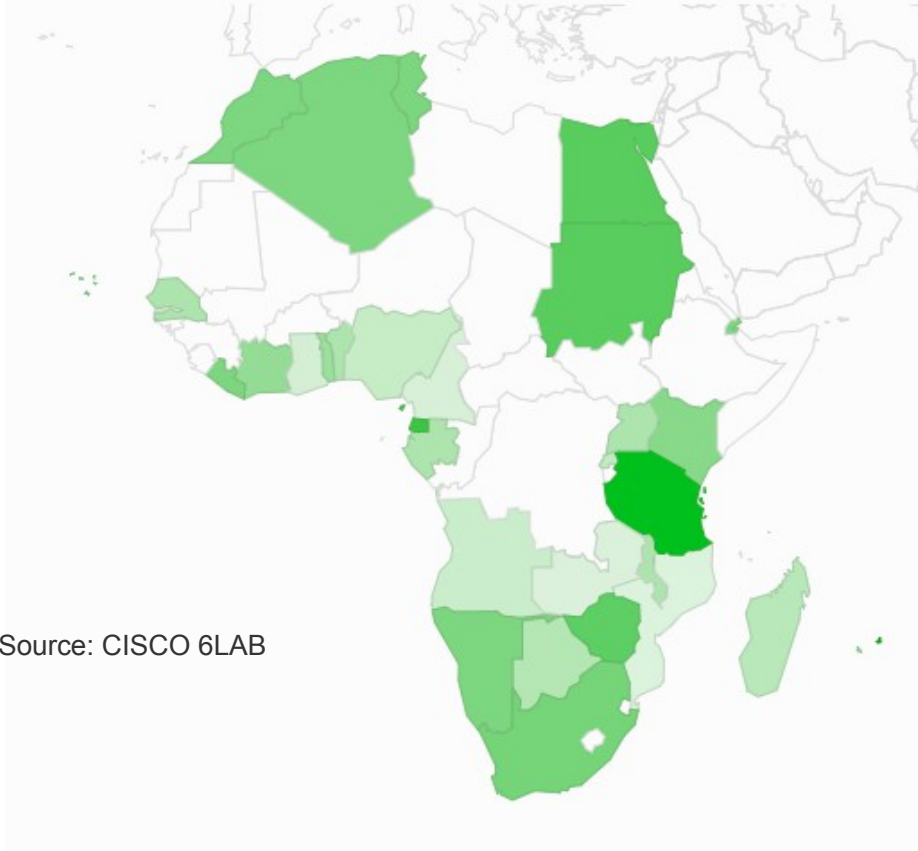
# IPv6 Usage % of clients

Country	Google	APNIC
Zimbabwe	7.15%	9.15%
Egypt	0.57%	0.4%
South Africa	0.38%	1%
Sudan	0.34%	0%
Tanzania	0.44%	0%

## Number of IPv6-capable clients



# Ratio of routable IPv6 prefixes (seen in BGP vs allocated)

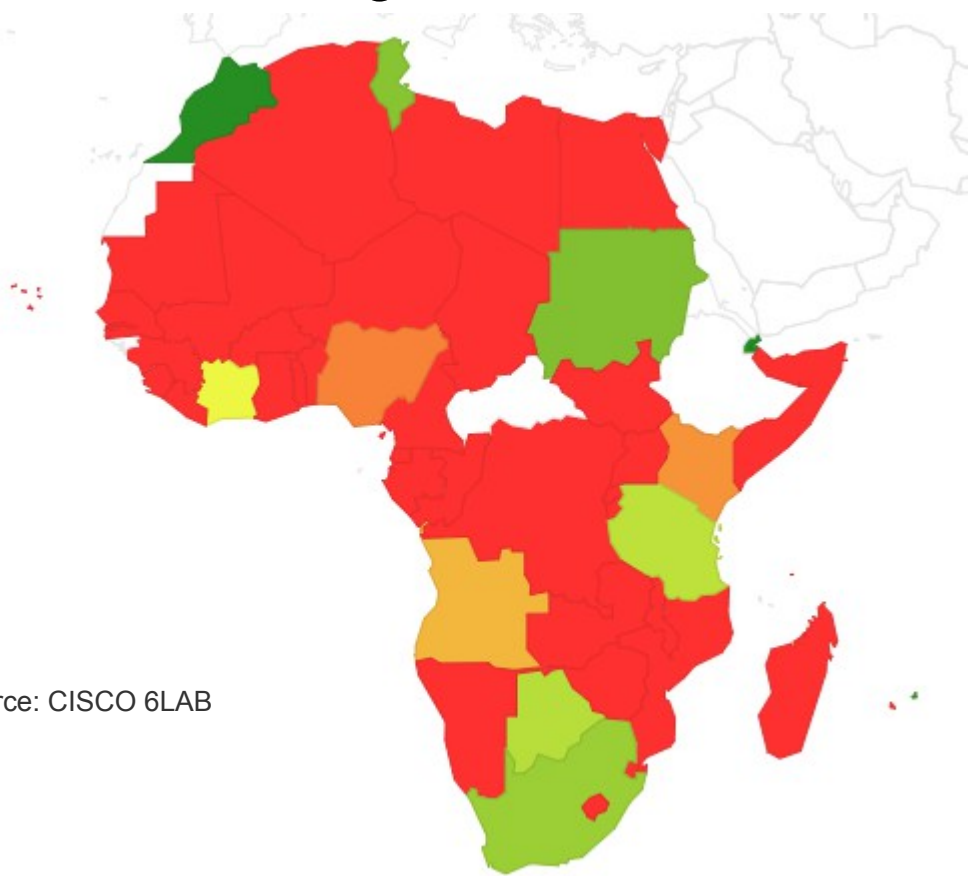


Source: CISCO 6LAB

<b>Mauritius</b>	<b>68%</b>
<b>Tanzania</b>	<b>56%</b>
<b>Equa. Guinea</b>	<b>50%</b>
<b>Zimbabwe</b>	<b>42%</b>
<b>Egypt</b>	<b>42%</b>
<b>South Africa</b>	<b>35%</b>
<b>Namibia</b>	<b>33%</b>
<b>Algeria</b>	<b>33%</b>
<b>Botswana</b>	<b>18%</b>



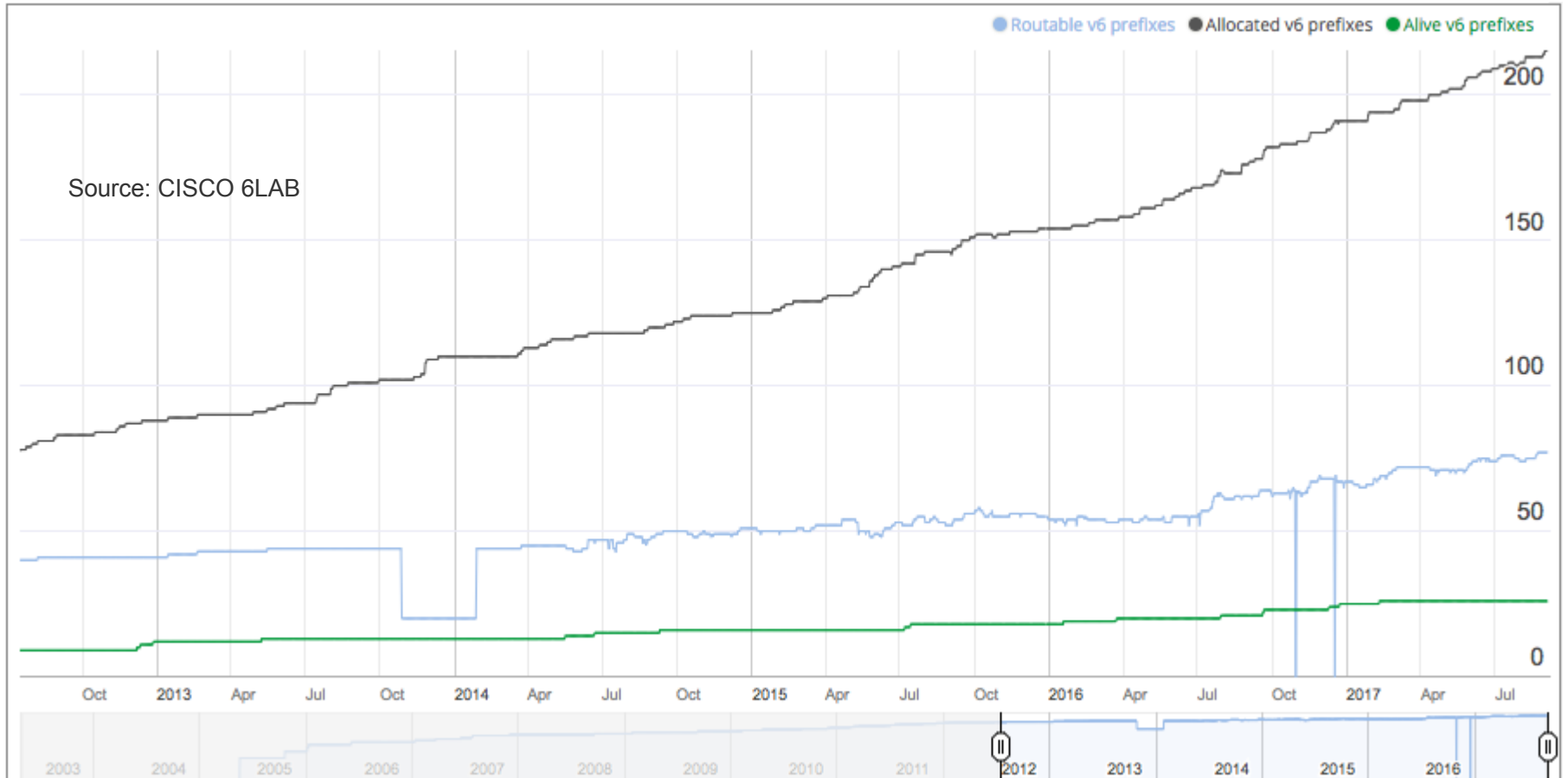
# ASs offering IPv6 transit versus all transit ASs



Source: CISCO 6LAB

Country	Dual-stack	IPv6 Enabled
Djibouti	100%	100%
Morocco	98%	98%
Mauritius	95%	96%
Sudan	76%	86%
South Africa	70%	79%
Botswana	63%	63%
Tanzania	61%	69%
Angola	33%	64%

# IPv6 Uptake last 5 years (South Africa)

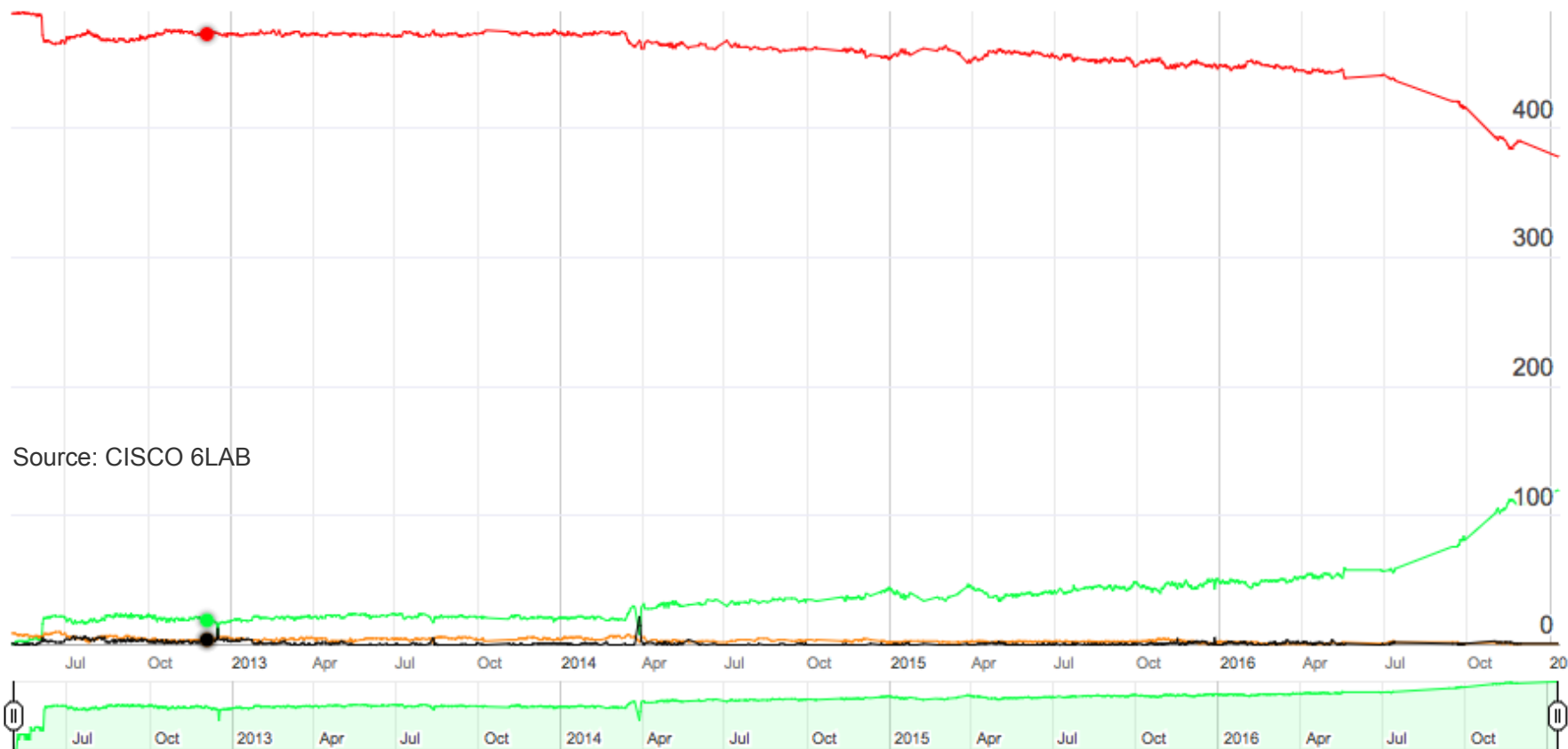


# IPv6 Enabled top 500 web sites

## South Africa

Display Content Data ⓘ

● IPv6 websites : 19 ● In construction / test : 4 ● failing websites with IPv6 : 4 ● not IPv6 enabled : 473 | December 05, 2012

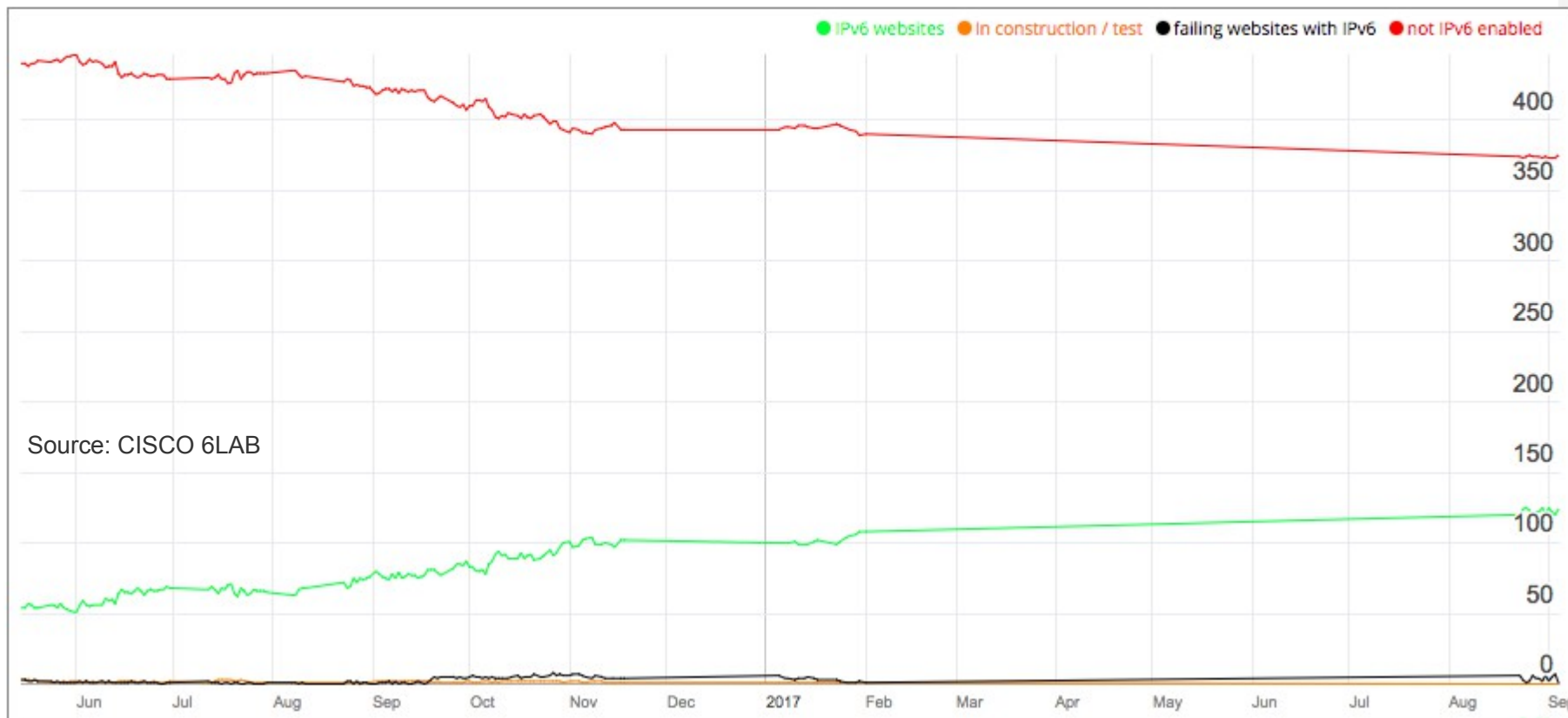


Source: CISCO 6LAB

# IPv6 Enabled top 500 web sites

## Zimbabwe

Display Content Data ⓘ

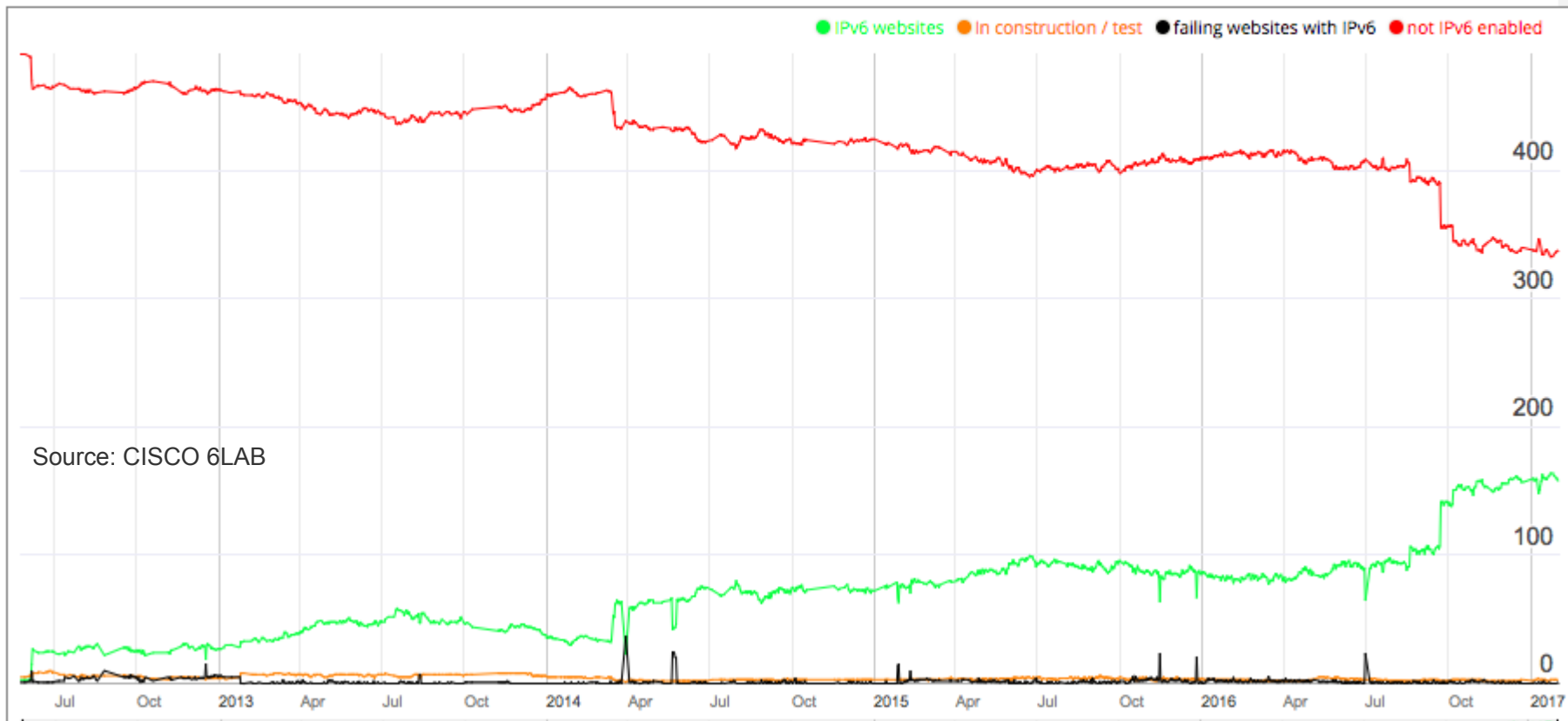


Source: CISCO 6LAB

# IPv6 Enabled top 500 web sites

## Egypt

Display Content Data ⓘ



Thank you  
for your  
Attention

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