



## Path to IPv4 Exhaustion

*Are we Ready to face it?*

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- In brief, this presentation will briefly go through the topics of AFRINIC as RIR, its membership trends, status of the IPv4 pool , current soft landing policy ratified, how fast can the last /8 run out and the dire reality of the state of IPv6 on the AFRICAN continent. We shall also cover the implications of not deploying IPv6 and to highlight some policies that have been proposed and currently being discussed at AFRINIC

# Introduction

- AFRINIC is the Regional Internet Registry (AFRICAN continent as service region)
- Manages IP Number Resource Pools(IPv4, IPv6 & ASNs)
- Membership based organisation

# Membership

- Organisations that operate an IP network from various industries - Internet Service Providers, Mobile operators, Hosting/Cloud providers, Research and Education Networks , Banking , Government , Critical infrastructure providers etc

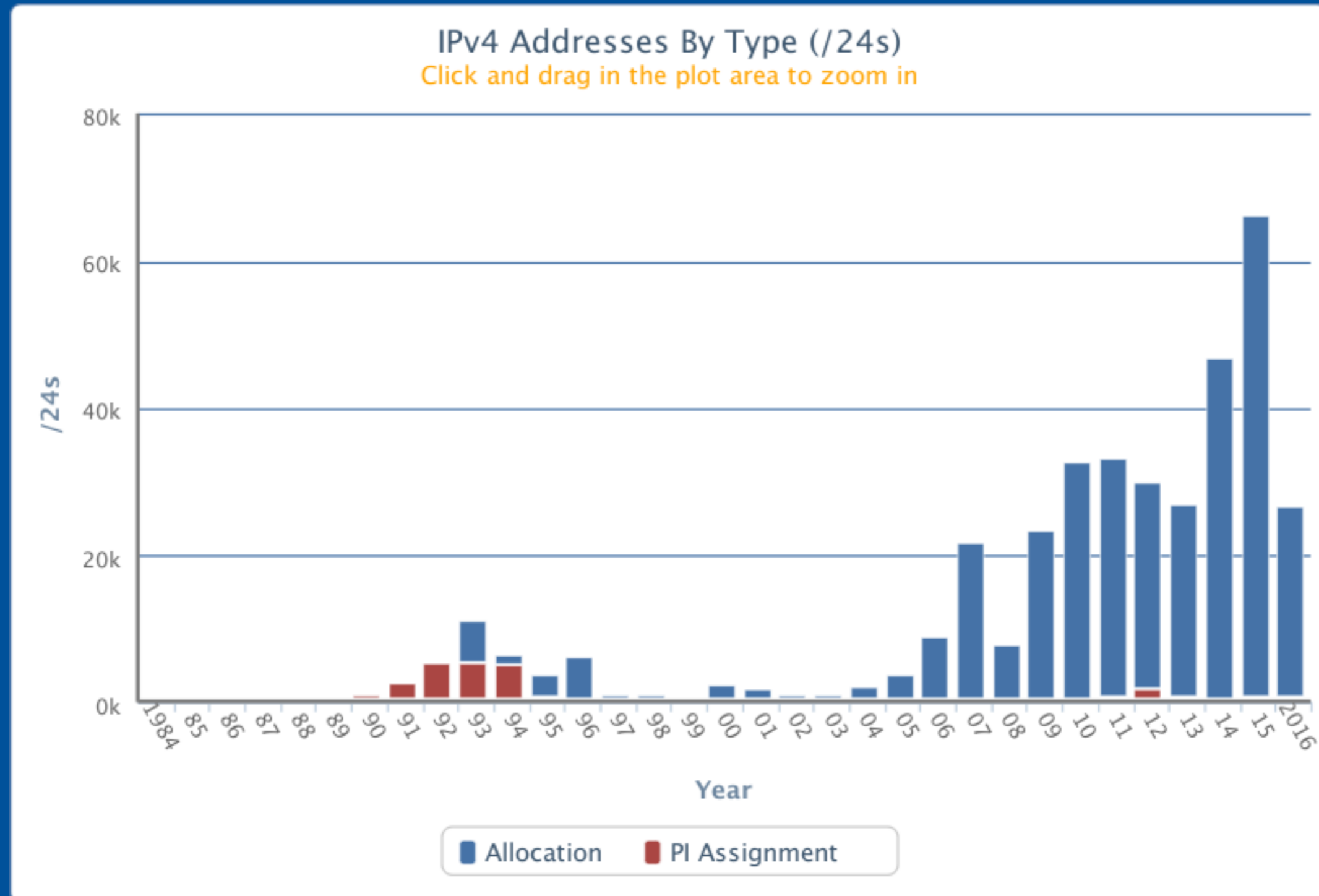
**ANY ENTITY in service region that originates services**

# Membership

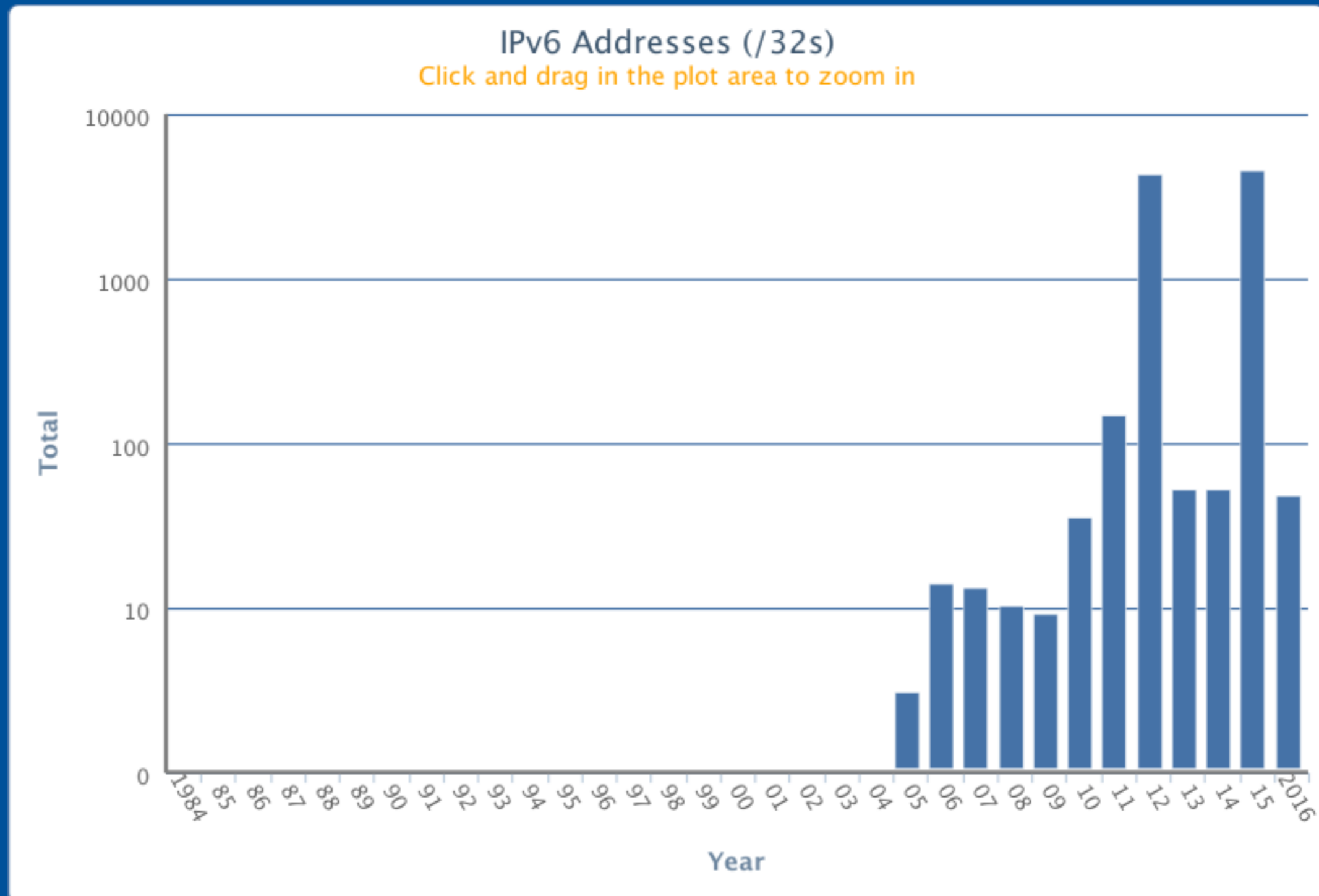


More LIR members than End Users

# IPv4 issuance trend



# IPv6 issuance trend



# Status of IPv4 Resources

- Amount of IPv4 addresses in the Inventory
- @June 2016 - 1.6 /8 . 10 Million IPv4 away from last /8
- Amount of IPv4 addresses under evaluation  
~ /10 + /11 (6 Million IPv4)
- Amount of IPv4 addresses issued (2015 & 2016)
- ~ 1 /8 (16 Million)



# Inventory

Prefix size	/8	/10	/11	/12	/13	/15	/16	/17	/18	/19	/20	/21	/22	/24
Total	1	1	1	1	1	3	17	4	1	2	3	3	32	232

- As we near exhaustion, aggregation is not being guaranteed
- Cleanliness (not blacklisted) of IPs not guaranteed

# When shall we hit the last /8(softlanding)?

- As from 1 July 2016. Resource issuance will only happen after member has paid allocation/assignment fee.
- Impact on resource uptake still being determined.
- Late 2016 if allocation rates are similar to 2015 or 2017

# IPv4 Exhaustion

- When AFRINIC has reached the last /8
- Soft landing policy
- Allocation/Assignment Rules change

# Softlanding or Last /8

- A policy AFPUB-2010-v4-005 that has been ratified by AFRINIC BoD in Nov 2011
- Kicks in when

an otherwise-valid request for IPv4 address space from any LIR or end user to AfriNIC either

**(a) cannot be fulfilled with the IPv4 address space available in the AFRINIC pool (with the exception of the Final /8), OR**

**(b) can be fulfilled, but would leave the AFRINIC IPv4 address pool empty (with the exception of the Final /8).**

# Softlanding or Last /8

- EXHAUSTION PHASE 1
- A /12 IPv4 address block will be reserved out of the Final /8. This /12 IPv4 address block shall be preserved by AfriNIC for some future uses, as yet unforeseen.
- Allocations/Assignments (LIR/EU members) will get IP addresses as per current phase with minimum set to /22 and /24 for LIR & End-user Resource Members respectively
- **Maximum Allocation/Assignment shall be a /13 prefix**
- **No explicit limit on the number of times an organisation may request additional IPv4 space**
- **Allocation/Assignment period changes from 12 months to 8 months**
- **Existing Resource Members eligible to get additional blocks if 90% usage of all Resources it has (Current & Exhaustion Phase)**

# Softlanding or Last /8

- EXHAUSTION PHASE 2
- AFRINIC has a /11 on non-RESERVED space available in the Final /8
- **Minimum/Maximum Allocation&Assignment shall be a /24 and /22**
- **No explicit limit on the number of times an organisation may request additional IPv4 space**
- **Allocation/Assignment period changes from 12 months to 8 months**
- **Existing Resource Members eligible to get additional blocks if 90% usage of all Resources it has (Current & Exhaustion Phase)**

# How fast can AFRINIC move from Phase 1 to Phase 2?

- 13,631,488 IPv4 Addresses
- Average rate of consumption /per month in 2016 = 1,398,100
- No. of months = ~10 months
- It could be less - /13 limit per prefix size x no explicit limit of number of times

***Can we agree that Phases 1 & 2 can be short?***

# Impact of exhaustion on operators network

Increase in customers

Higher demand for Value Added Services

LESS IPv4 available from AFRINIC

Higher demand for Value Added Services

NAT

INCREASE IN Operation COSTS



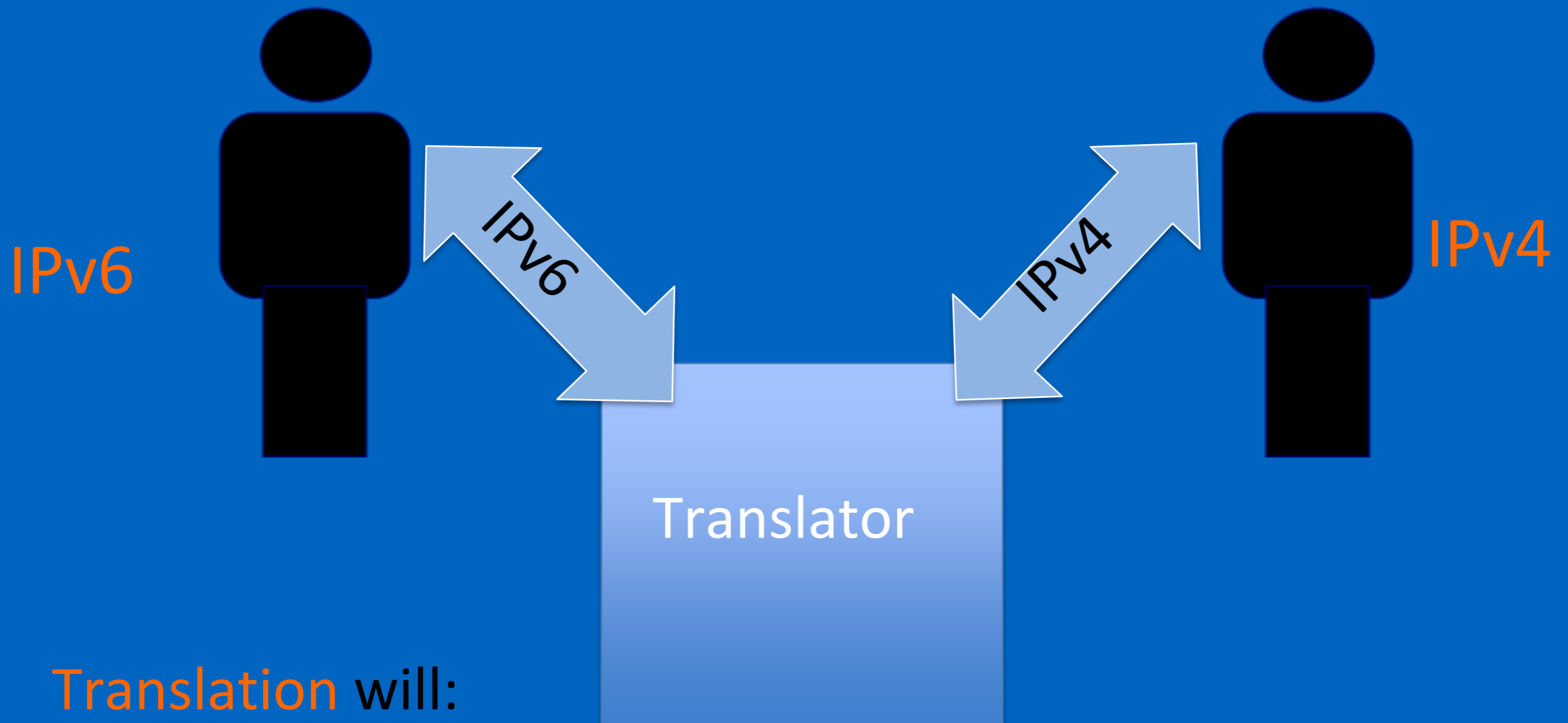
# What you already know?

- Carrier Grad NAT (CGN)
- Large Scale NAT (LSN)
- NAT 444

NAT is NOT a Sustainable Solution to Address Depletion

IPv6 and IPv4 are not compatible

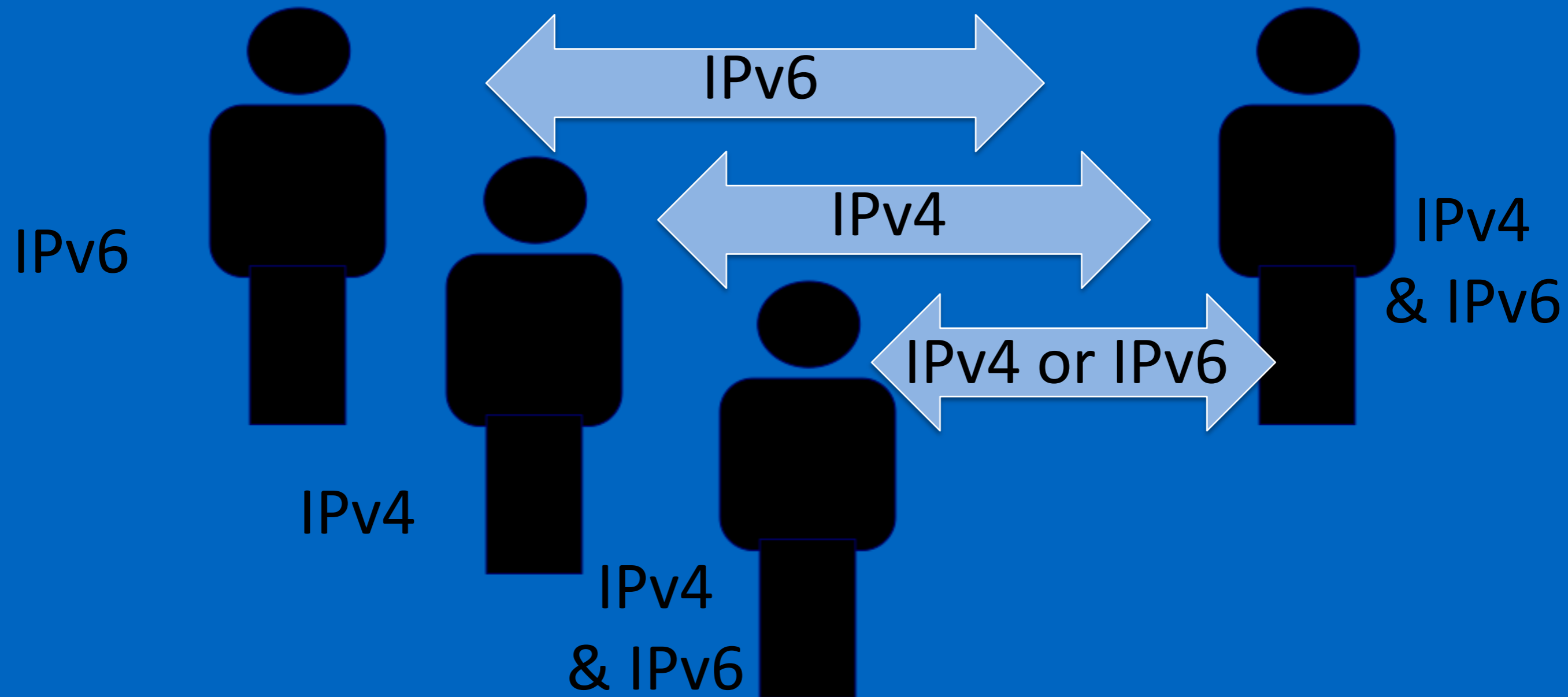
# Proposed Technical Solutions



**Translation** will:

- 1) Add extra cost and equipment to the network
- 2) Break the communication

# Proposed Technical Solutions



Dual Stacking

# What shall happen during/after IPv4 Exhaustion

## Nationally:

## Governments and Regulators

Networks would grow

Deployment of network infrastructure Interconnection,  
infrastructure & rural areas

Cyber security

E – projects

Content and ccTLDs growth

Research and Innovation

Internet governance and critical Internet resources

Internet of Things (IoT)

Shall happen only with IPv6

# IPv4 Exhaustion - What happens next??

## PRIVATE SECTOR

Telecoms, Service Providers, organisations doing business on the Internet, need to be able to:

- Scale their networks; more clients
- Support a large mobile workforce
- Support large multiple sites
- Ensure that their content and information will be reached by more viewers

# IPv4 Exhaustion - What happens next??

## Cyber Security & LEAs

**Accurate IPv6 record-keeping does more than help law enforcement.**

- Useful for
  1. combating abuse.
  2. anti-spam measures.
  3. figuring out what's going on with distributed denial of service attacks.

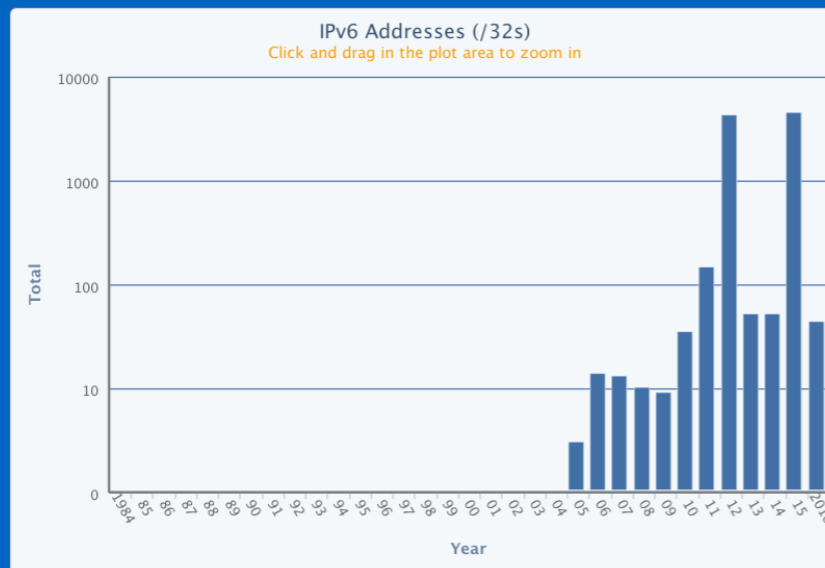
# National Research & Education Networks (NRENs)

Specialized Internet service provider dedicated to supporting the needs of the research and education communities within a country.

With thousands of online students and researchers, NRENs are the ideal places to start implementing and testing new Internet protocols (IPv6) and architectures (Cloud Computing).

# IPv6 in AFRICA

- IPv6 Allocations Trend



- 46% of Internet Exchange Points have an IPv6 prefix for peering or management purposes
- 28% New-members requesting for their IPv6 prefix along with IPv4 in 2016
- 50% of NRENs have an IPv6 prefix
- 72% of Large—→ Extra Large AFRINIC Resource members have an IPv6 prefix



# IPv6 in AFRICA

36% of total resource members

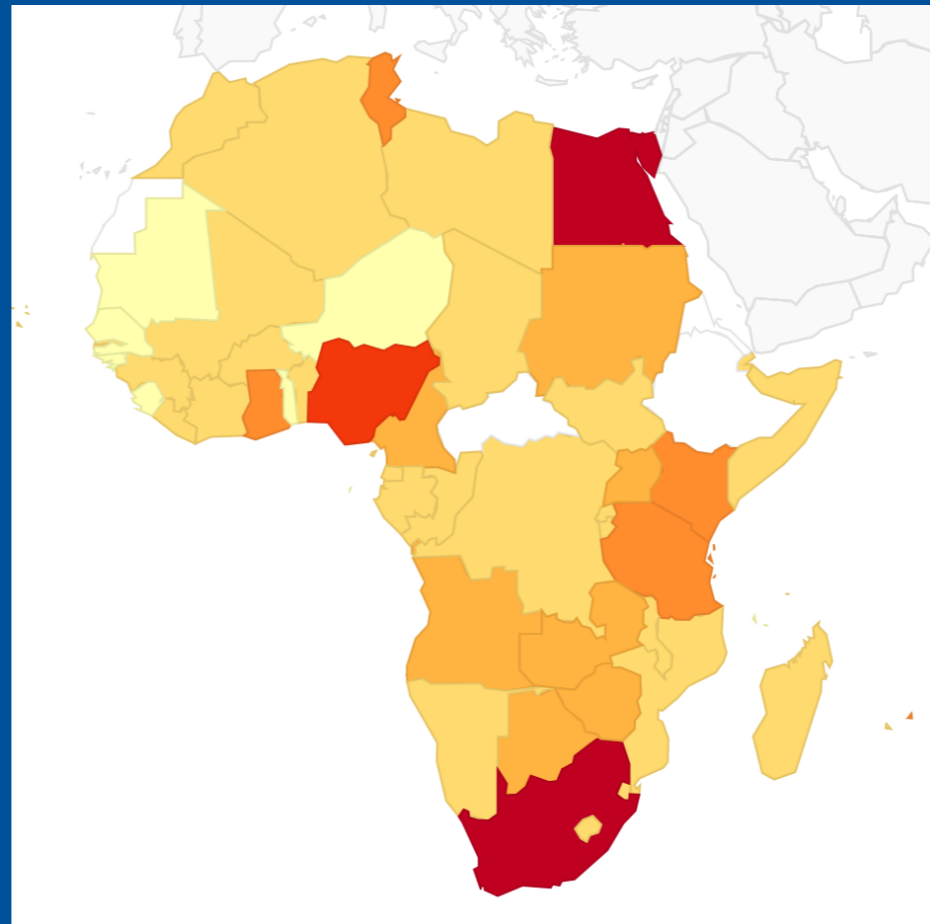
have an IPv6 prefix

- 32 IPv6 prefixes

issued to members

in Tanzania(~50%)

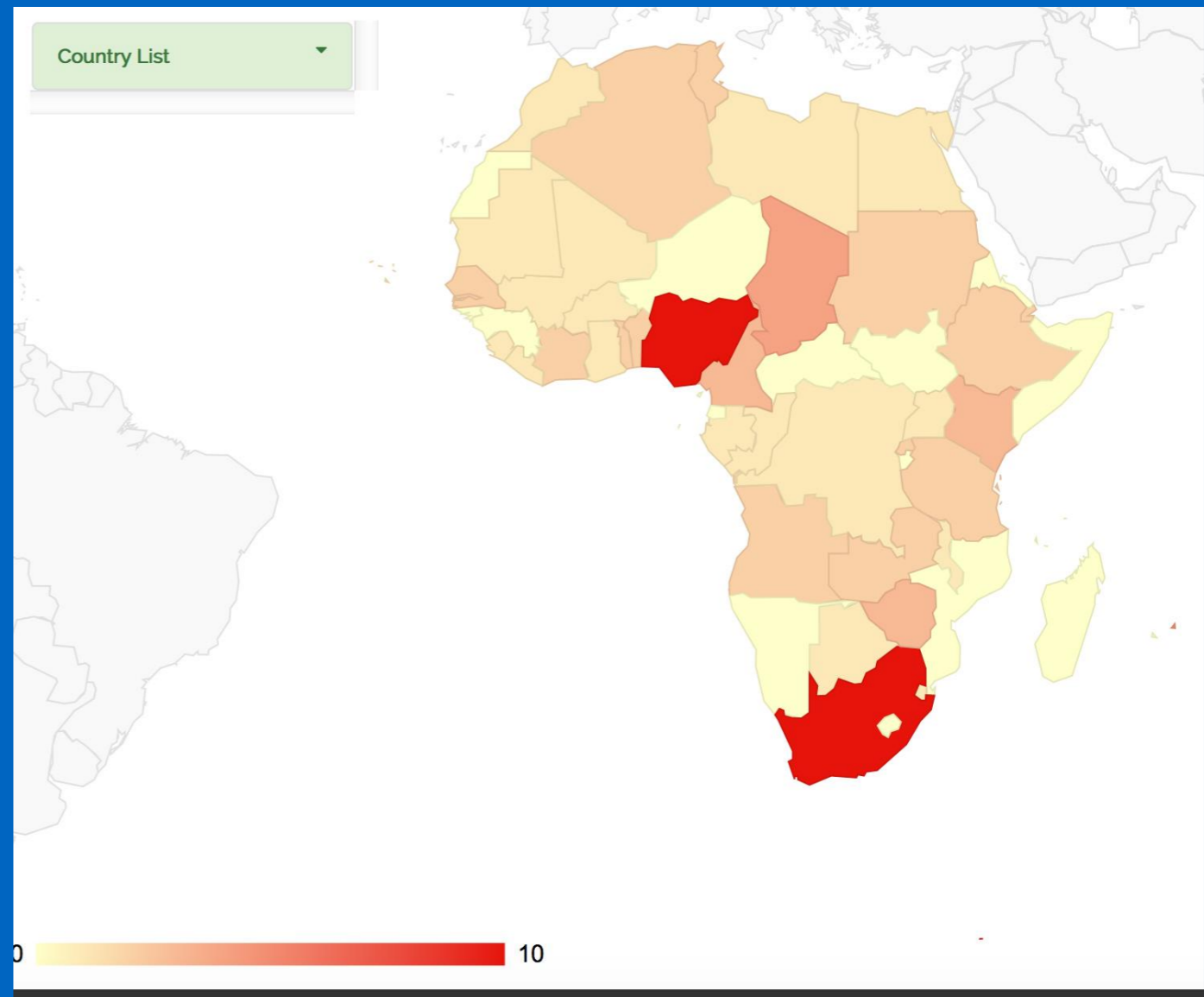
IPv6 visible in routing tables



# IPv6 trainings in AFRICA

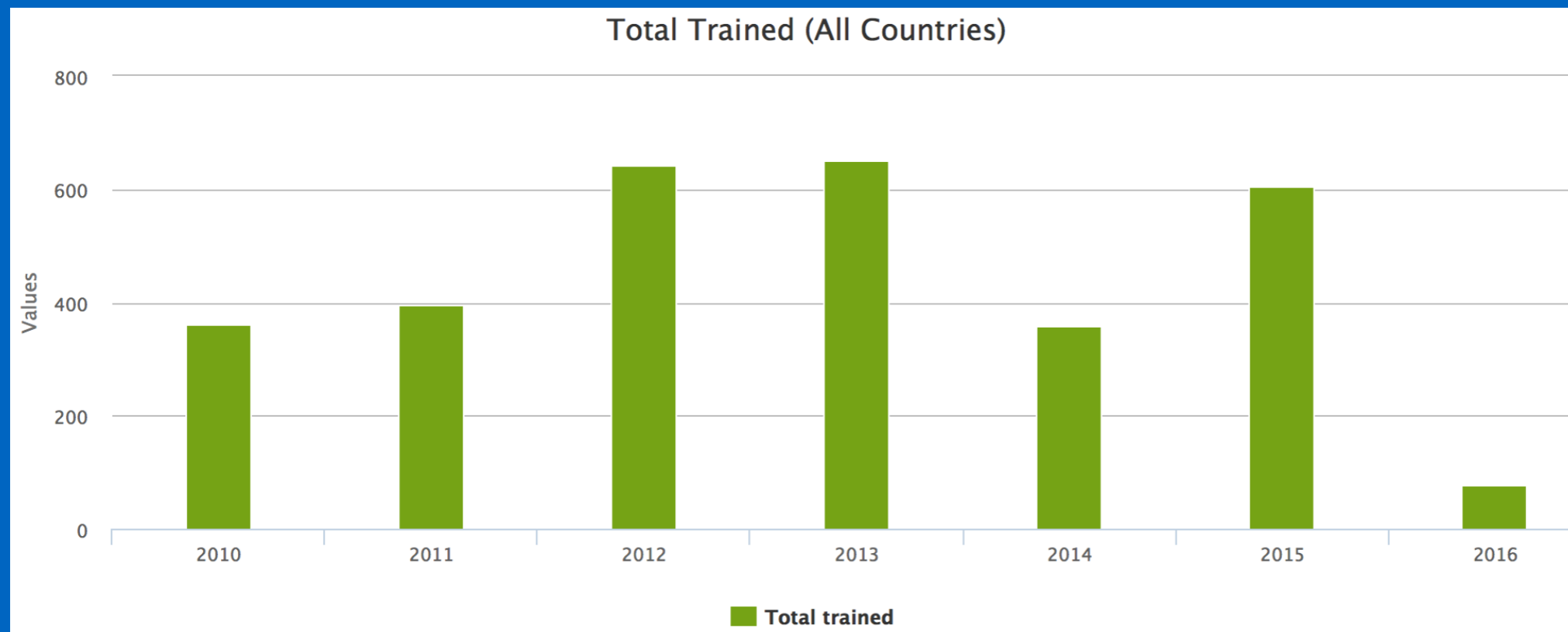
23% of economies  
in service region not  
covered yet

Present more than  
one in certain economies



# IPv6 trainings in AFRICA

- Over 3000 engineers trained



# IPv6 Adoption

Very slow adoption of IPv6 despite incentives(discounts) provided by AFRINIC

- Free IPv6 prefix(no allocation/assignment fees)
- Free Training (technical & decision makers)
- Webinars in regard to sensitisation and deployment of IPv6 networks
- Campaign of information in regard to what operators should do prior to deploying an IPv6 network

# In Practice

- COST OF MAINTAINING AN IPV4 NETWORK WILL INCREASE
- COST OF DOING CGN WILL INCREASE
- Reliance on transition techniques
- Customer dissatisfaction
- Loss in market share

# Innovation

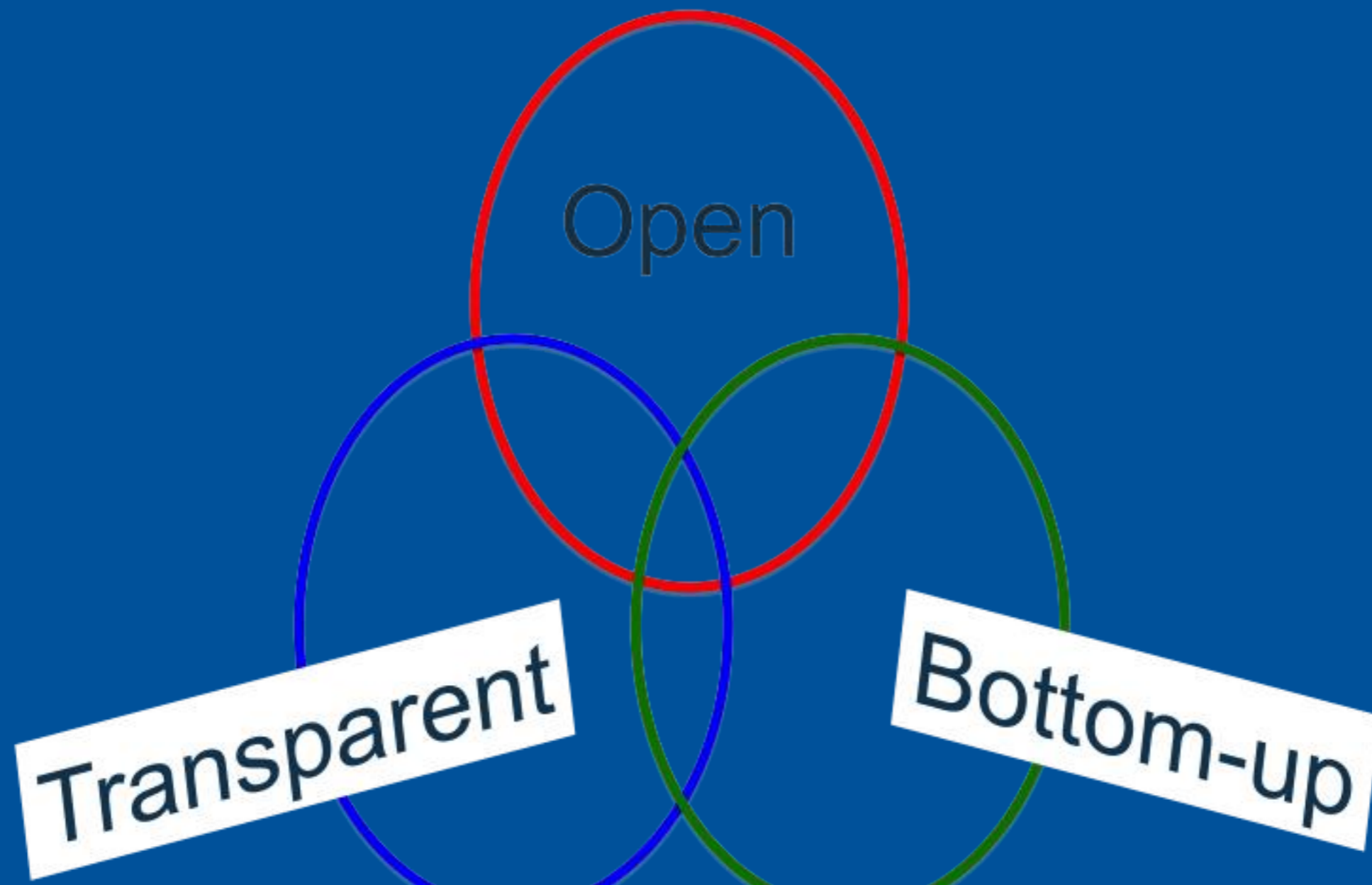
- Shall happen with IPv6
- Internet of Things
- Mobile Internet subscribers

# Resource Policies under discussion at AFRINIC

Policy	Title
1	Softlanding-Bis Draft 02
2	Softlanding Overhaul
3	Number Resources Transfer Policy
4	IPv4 Transfers within the AFRINIC Region
5	Inbound Transfer Policy

# PDP Process

The principles of the PDP





# Engage

- Read the policies - they are online

<http://www.afrinic.net/en/community/policy-development/policy-proposals>

- Participate in the discussions on the policies on the **RPD** mailing list
- How to participate?

Subscribe to the mailing list, read archives of discussions and contribute

<http://www.afrinic.net/en/community/email-a-mailing-lists>

# Make your voice heard!!!

- Resource policies impact your organisation's future
- Now is the time to analyse the policy proposals and express your concerns as well as your approvals
- Discussions Not limited to AFRINIC resource members only

# way forward

- Get the IPv4 you need for services & growth for the next 10 months
- Get an IPv6 allocation
- Activate IPv6 deployment
- What are the challenges that some of you are facing while deploying IPv6? Speak out on our mailing lists if you feel that AFRINIC can help you address them
- Look forward to seeing your engagement and participation in the discussions about AFRINIC policies

# AFRINIC-25 meeting



- 25-30 November 2016 Mauritius
- AIS'17 Nairobi Kenya (May/June 2017)

Please drop by the AFRINIC Booth

Thank You!!  
Questions??