# ITU FORUM ON IMPLEMENTATION OF DECISIONS OF WTSA-08

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# IPv6: How is Africa Prepared

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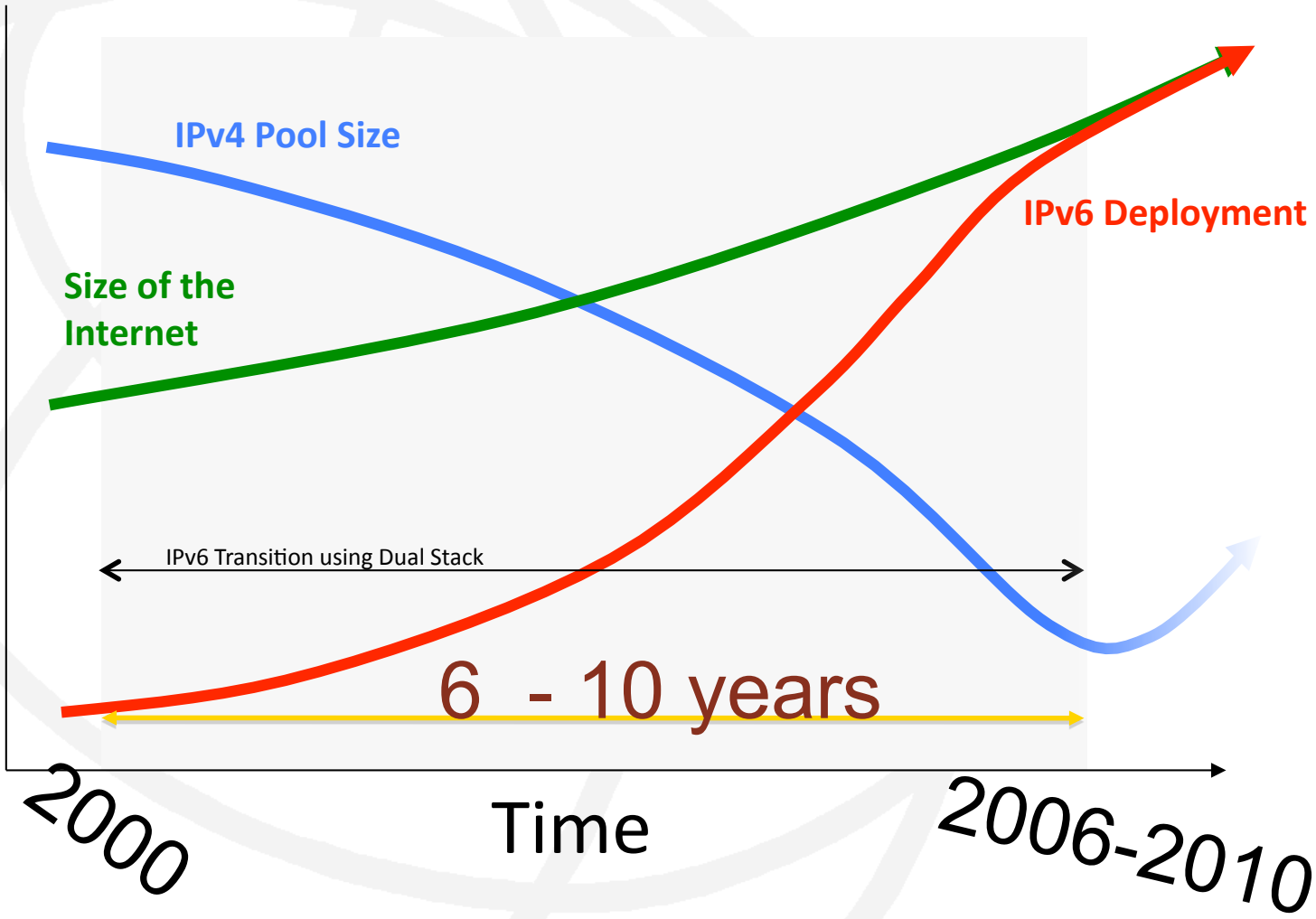
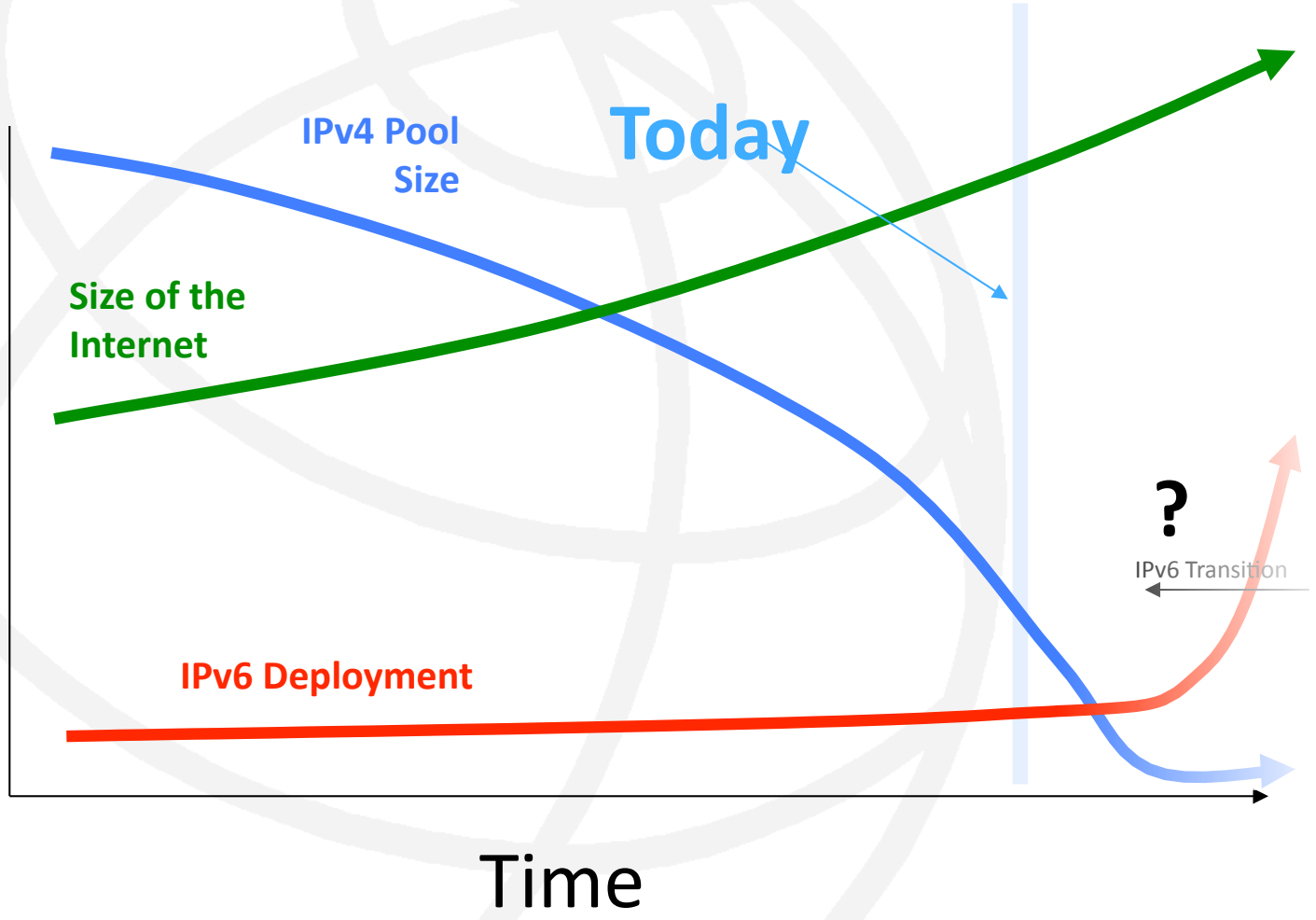
# Content

- IPv4 exhaustion – Current situation
- IPv6 deployment – Current Situation
- Financial Aspect and constraint?
- AfriNIC and IPv6
- Conclusion

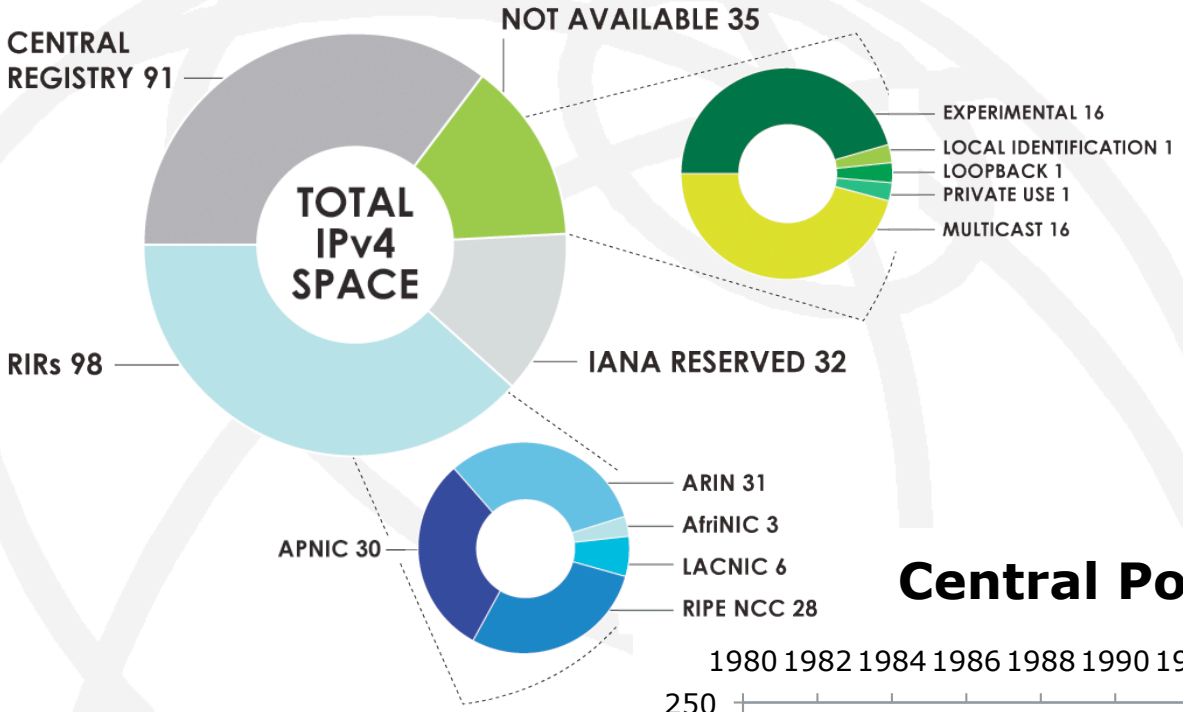
# What was planned 10 years ago?



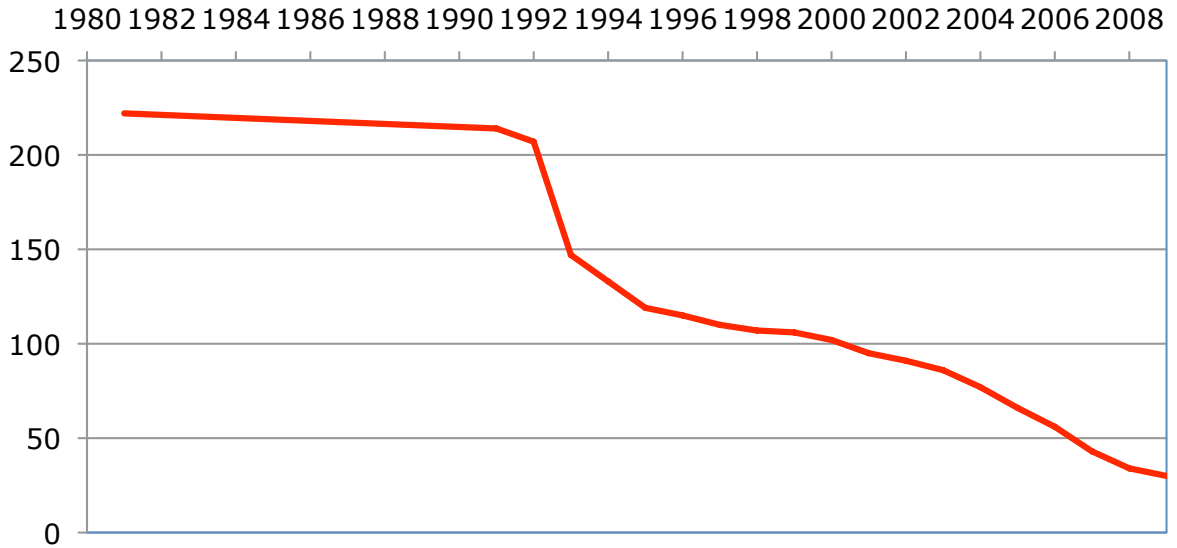
# What is happening today?



# Status of IPv4 Address Space




## Central Pool Consumption



# IPv4 – we are going to hitting the wall!!

- IPv4 address space will be fully allocated by 19-Jun-2011 (as per 15.05.2009 data)
- RIRs will globally continue to allocate up to 13-Mar-2012 (AfriNIC around Jun-2013)
  - See http://ipv4.potaroo.net/
- Existing IPv4 allocations will continue to be routed and used around the world
  - IPv4 Internet won't go away, but its growth will slow down significantly.
  - 'IPv4-only' solutions being deployed now will have increasingly limited connectivity to the network.

# Advantages of IPv6?

1. Continue to grow your network business

   - Business case for IPv6 deployment?

     **Stay in business!**

2. Restore the end-to-end paradigm for Internet communication

   - P2P technology is well-established as an efficient and popular solution for many different applications (e.g. VoIP, file sharing, IPTV)

     **Look for killer apps OR killer constraints?**

# Killer application?

- IPv6 is ***NOT*** a feature of the Internet! While everyone wants a source of additional revenue, "***fundamental transport is difficult to monetize"*** *(Tony Hain – Cisco System))*.
  - Carriers use IPv6 deployment costs as a defensive play but the reality is that they may probably still have to absorb the costs of an IPv4 routing system (that will be growing unconstrained once the central pool is gone and addresses may start to be traded in small chunk) … and this until they can get their customers to leave IPv4 behind.
  - Revenue generating applications are most likely to be **peer-to-peer**, because client-servers can be hacked in using techniques like NAT.

# Or Killer Constraint? Restoring end-to-end

- Google Maps open ~ 70 parallel connections
- iTunes store has been shown to open as many as 300 parallel connections
- *New applications that have not emerged yet ???*
  - *IPv4/nat multiplexes multiple users through the port range (2 bytes), so 64k divided by 300 parallel connections results in ~200 customers per ISP based NAT address (assuming each customer is only allowed to run one simultaneous instance of iTunes or similar apps).*

# Cost of deployment

- The largest cost for most network managers will be training.
  - *It is packet based (IP), but other than that it is a different protocol.*
- Another major cost may be retooling custom apps and scripts.
  - *Frequent shortcuts assuming an address will always be 32 bits.*
- But then to take it positively, for some, IPv6 deployment could be seen as an opportunity to integrate some engineering changes/ improvement that have not been large enough to be justified by themselves?
  - *What costs will be attributed to IPv6 vs. general evolution?*

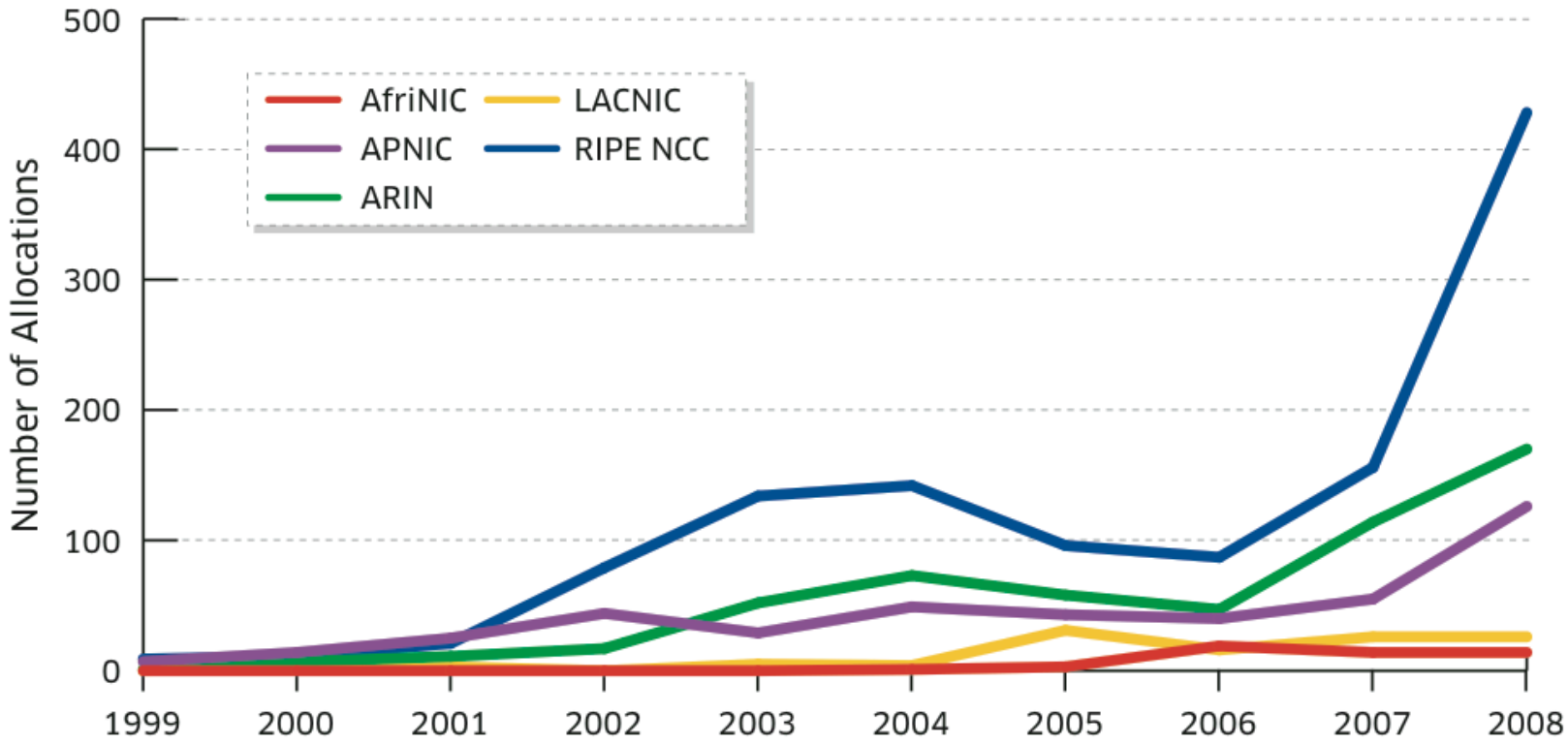
# Need to Start Early, to Start Now

- IPv6 will become a business necessity in the medium term.
- Initiating deployment now reduces business risk.
- It takes time to audit existing systems, bring vendors on board, plan IPv6 network, raise awareness among software developers and end-users …. etc.
  - Starting early will reduce the cost of the transition

# Content providers and application Developers also have to react

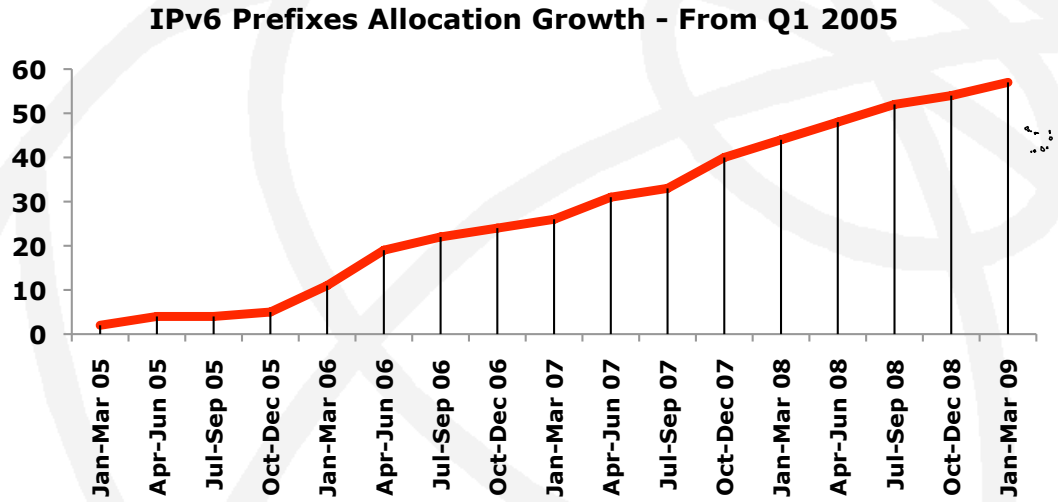
- ISPs are going to start connecting end-users via IPv6 and/or severely limited IPv4 connectivity through deployment of shared addressing solutions
- Application innovation will become more challenging and expensive for IPv4.
- We will start to see applications that may perform better and offer additional features in the presence of IPv6.

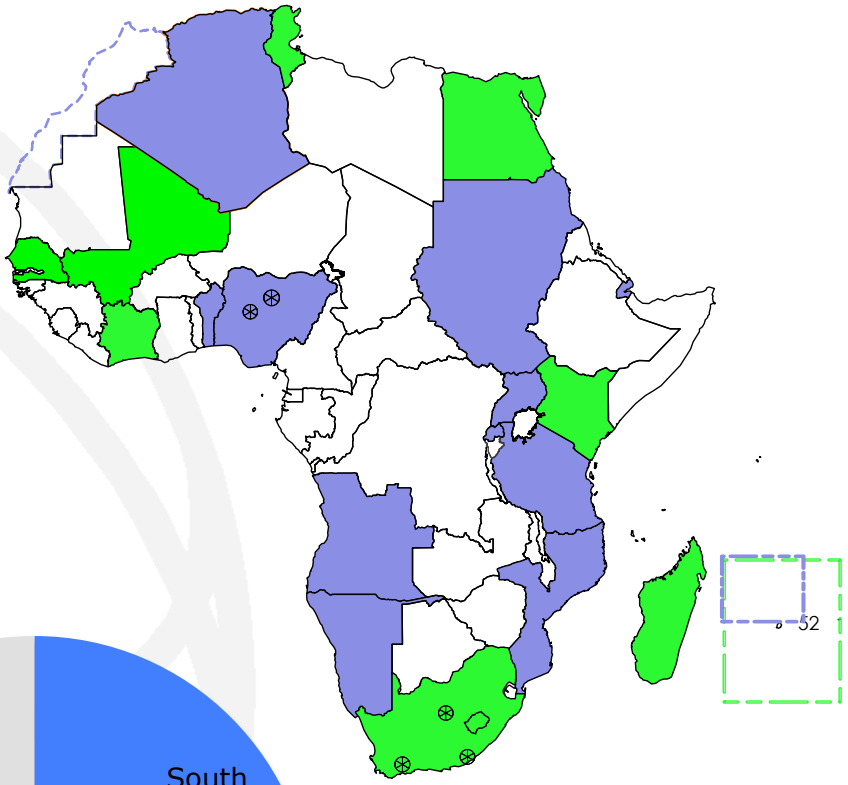
# IPv6 Allocations per RIR per year



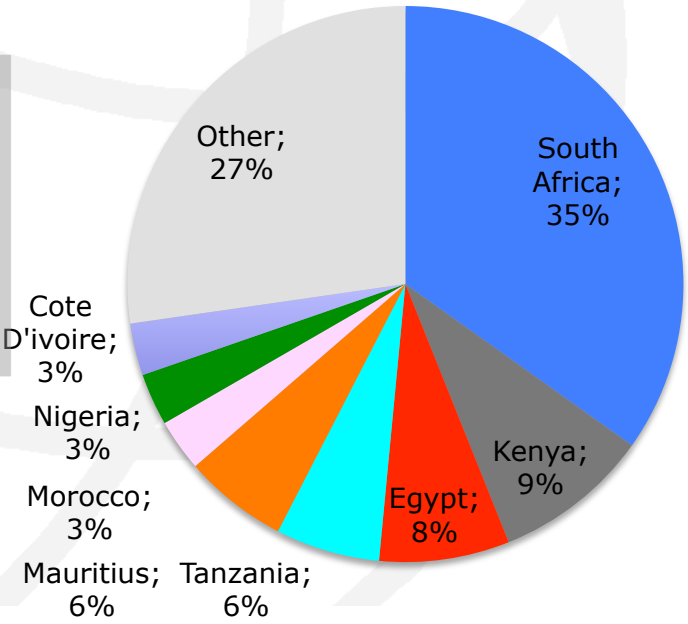

From these allocations, only **42%** are announced and visible in the global routing table

# IPv6 map of Africa




From these allocations **33.33 %** routed from AfriNIC Region).




Source: NRO Quarterly statistic data
AfriNIC Statistic page

# What to do?

- Some platforms are still missing IPv6 features
  - Speak to your vendor
  - Don’t accept ‘nobody else is asking for this’ as an answer!
- Licensing terms may impose additional costs for IPv6 features
  - Negotiate with your vendor (Although this is starting to diminish as a transition cost)
- Education is critically important
  - IPv6 is not just IPv4 with larger addresses. It is a new protocol that comes with its own features.

# How long does it take?

I decided to put the timetable to the test. On Wednesday at 2:30PM uk time, I applied for a /32. One hour later, we were allocated 2a02:c30::/32. I straight away assigned a /48 for our network infrastruture, and another for our production hosting lan, another for our development hosting lan. From these /48s, several /64s were reserved, one for router loopbacks, another for point to point links, more for individual hosting applications. An hour later, this was implemented on our network - routers had loopbacks, and a v6 IGP was up and running, and working. I filed a ticket with our upstreams, and the first announcement was turned up minutes later - check BGPlay for exact times. Around 2 hours after making our application to RIPE, we were participants on the IPv6 internet.

Andy Davidson, NetSumo and LoNAP
http://www.andyd.net/index.php/2009/03/29/18-months-and-google-are-nimble/

- In reality, Andy started months earlier by
  - Monitoring advice on operational mailing lists
  - Attending IPv6 seminars and workshops
  - Working on IPv6 rollout for customer networks

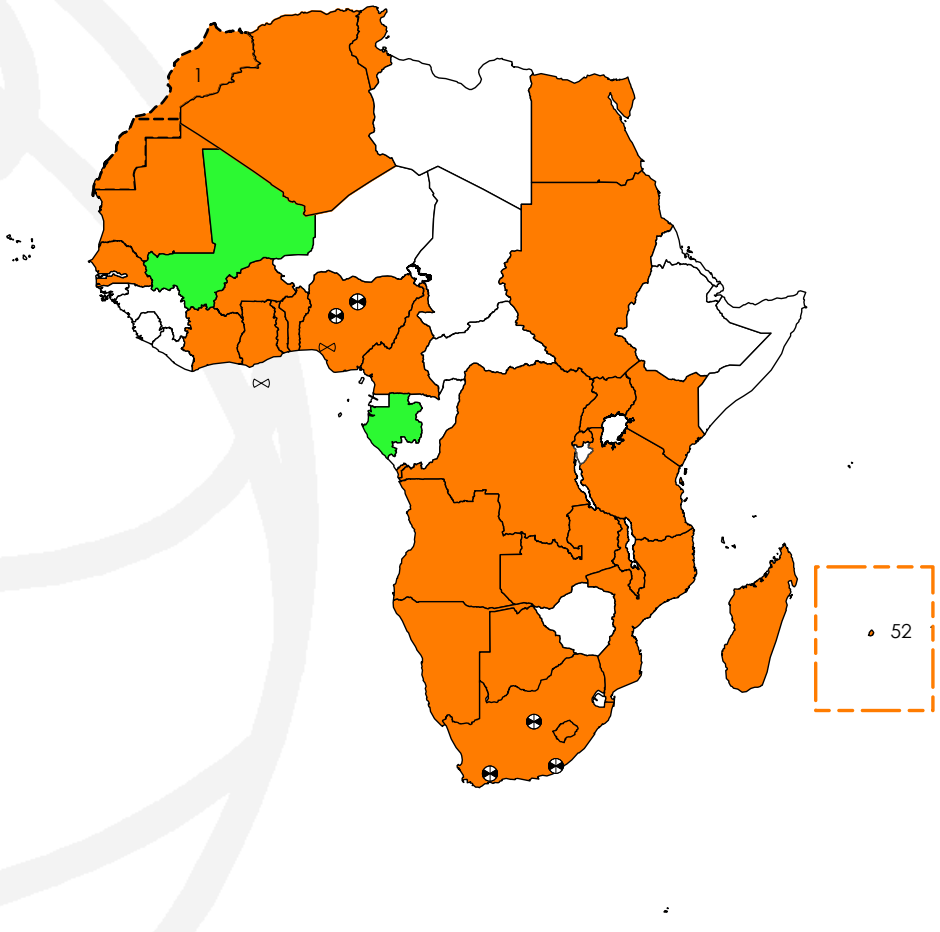
# AfriNIC IPv6 Allocation Policy

- To qualify for an initial allocation of IPv6 address space, an organization must:
  - a) be an LIR;
  - b) not be an end site;
  - c) show a detailed plan to provide IPv6 connectivity to organizations in the AfriNIC region.
  - d) show a reasonable plan for making /48 IPv6 assignments to end sites in the AfriNIC region within twelve months. The LIR should also plan to announce the allocation as a single aggregated block in the inter-domain routing system within twelve months.
- Organizations that meet the initial allocation criteria are eligible to receive a minimum allocation of **/32.**
- Organizations may qualify for an initial allocation greater than **/32** by submitting documentation that reasonably justifies the request. If so, the allocation size will be based on the number of existing users and the extent of the organization's infrastructure.

# Training: fundamental element of success

Training has been an important part of the success of IPv6 allocation growth

- More than 40 training sessions have been conducted in different countries in the region since 2005.
- 15 training session is planned for 2009 (4 already conducted).



# IPv6 initiatives by AfriNIC

- AfriNIC has been engaged in IPv6 awareness since 2005 with the aims at:
  - Creating an environment which allows exchange within IPv6 initiatives throughout the Continent**. (afripv6-discuss@afrinic.net)**
  - Creating an IPv6 Forum for Africa. **(3rd during AfriNIC-9, next during AfriNIC-11)**
  - Conducting IPv6 Training across the Continent **(more than 40 IPv6 sessions so far).**
  - Providing Lab and Internships to Engineers to play live with IPv6 **(a lab is since Dec-2008)**
  - Supporting research based on IPv6 and Mobile Infrastructure
  - Provide IPv6 direct support to the community **(6Deploy)**
  - Bringing major African connectivity/content providers to the game
  - Developing a case study documentation for the use of African operators **(based on local experiences – 6Deploy).**

# International involvement

- 6Deploy consortium of partners to offer training to organisations in Europe and developing countries, and support real IPv6 deployments, Case studies of installations will be used to gain valuable practical experience which will help the 6DEPLOY team to become the centre of European and African expertise regarding IPv6 deployment.

- Members of the 6Deploy consortium are composed of organisations from various sectors:

  - **AfriNIC (MU)**
  - **BREN (BG)**
  - **Cisco (NL)**
  - **Consulintel (SP)**
  - **FCCN (PT)**
  - **GRNET (GR)**
  - **LACNIC (UY)**
  - **Martel (CH)**
  - **NIIFI (HU)**
  - **Renater (FR)**
  - **Soton-ECS (UK)**
  - **UCL (UK)**
  - **UNINETT (NO)**

# So how Africa is preparing for IPv6?

- Very slowly
- Following the trend of the rest of the world
- Trying to understand what is at stake

- We need to
  - Push for more action from Operators (Train, Plan and implement Dual-stack, allow user to access v6 network)
  - Be innovative and explore the opportunity of developing applications that can directly benefit from IPv6 and its "features".
  - Involve Research and Education community into the game.
- Governments need to lead by making sure:
  - their own Internet-based services are IPv6-ready (early adopters)
  - The public is aware and educated on the transition
  - Appropriate policies are developed to foster national transition to IPv6

***Education seems to be the critical part of this long journey***

# Financial Constraint vs. Reason

- Do we believe in the Internet as a development and economics tool for growth? Do we believe that we are part of the next billion of Internet users?

**YES**

- If Yes, then there are no more questions to ask, no more contemplation about financial implication. Let's just move with the facts, time is against us.

# Conclusion

- IPv6 is an opportunity for Africa (innovation and sustainable growth)
- With all the initiatives, we are hoping to make Operators in the Africa region not be the one who are always catching up with others but be ready to take the challenge at the same time as other region … and be ready to take opportunities that may arise

**Let's act …. right now!**

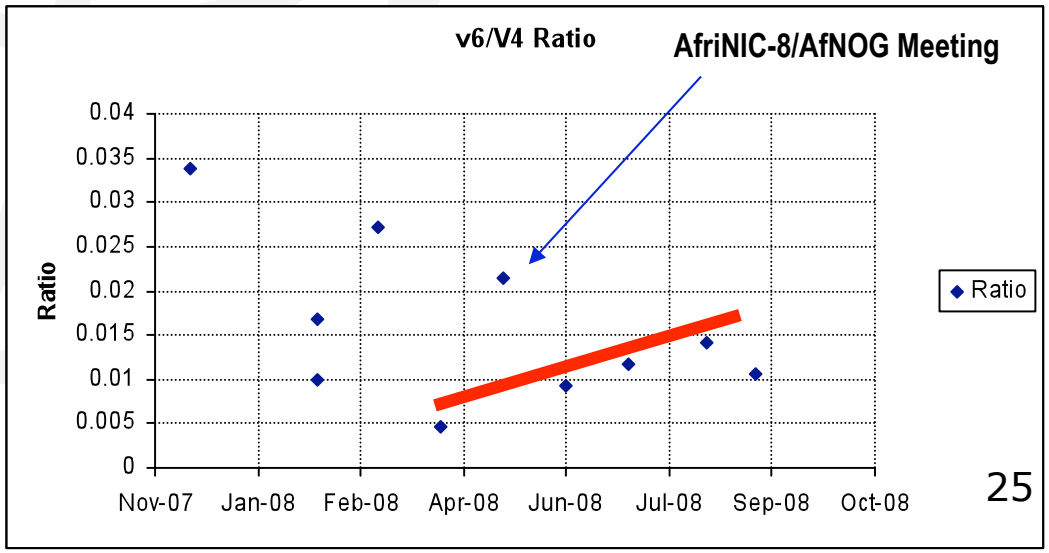
# Thank You

- www.afrinic.net
- www.afrinic.net/IPv6/
- www.afrinic.net/statistics/
- www.6deploy.org
- www.afrinic.net/mailinglist.htm
  - **afripv6-discuss@afrinic.net**
  - **rpd@afrinic.net**

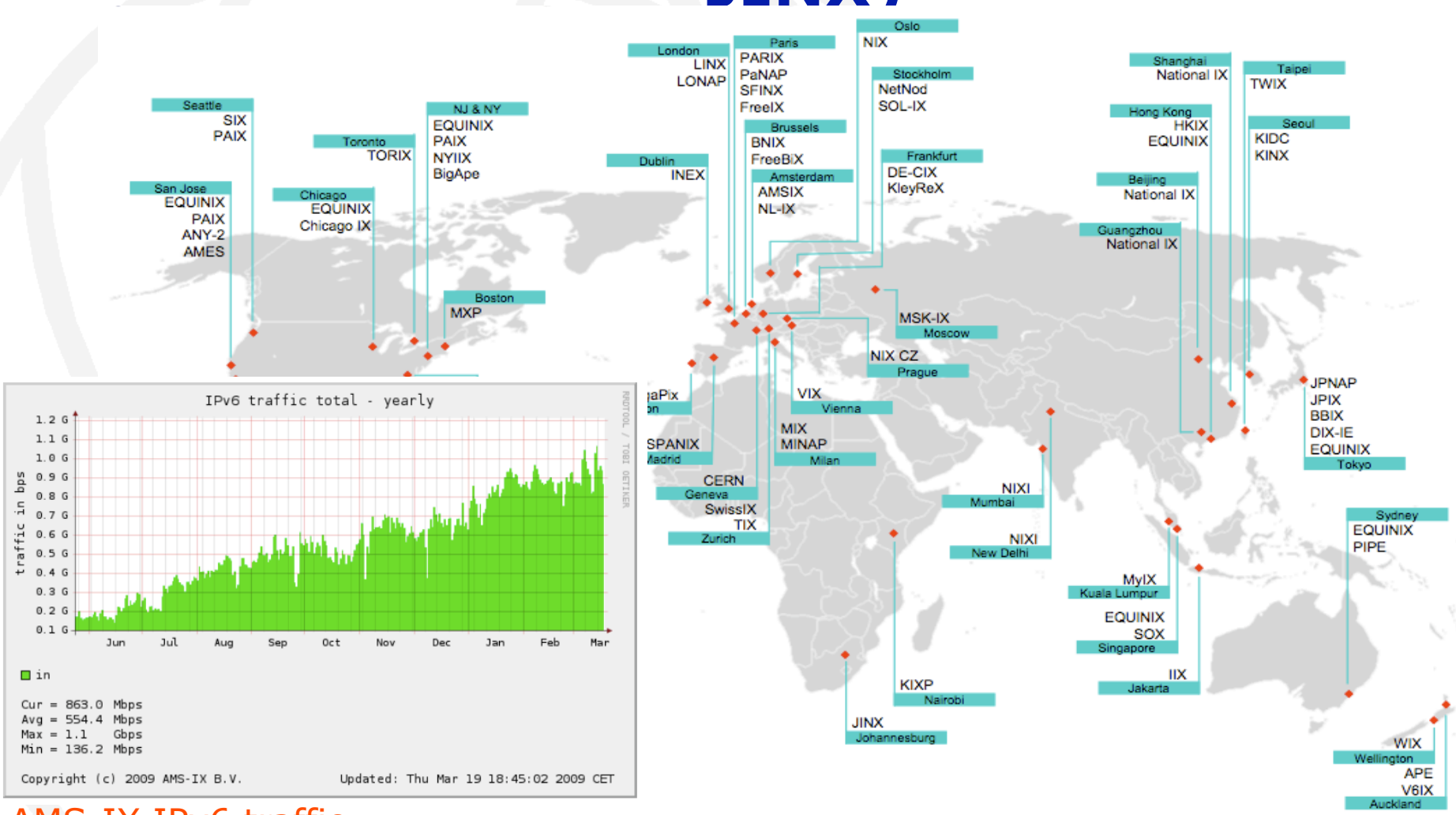
# Deployment is happening *now*

- Major enterprises are deploying IPv6
  - e.g. Microsoft, Google, etc…
- Content providers are starting to deploy
  - Google, Yahoo, etc…
- NRENs are deploying worldwide (Egypt, South Africa)
- Enterprises are starting to deploy

**www.afrinic.net**



# Many Internet exchanges worldwide now support IPv6 peering (KIXP and JINX)




AMS-IX IPv6 traffic