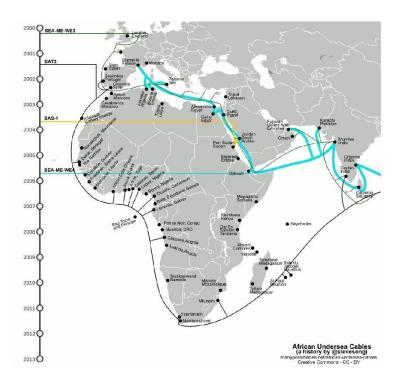


The Road to AfPIF 10



- Only 5.3% of Africans with Internet connection (2008)
  - + But 1000%+ annual growth rate
- + Satellite connections predominant, cost \$3,000 \$5,000 per Mbps
  - + SAT3/SAFE cable, some report paying \$4,500 \$12,000 per Mbps
- + An "Island Continent"
  - + Only ~400,000km of of terrestrial transmission network operational or planned
  - + Limited cross border interconnectivity
- + Policy dialogue focused on imposing telecom-style accounting rate system to the Internet.



African subsea cable infrastructure 2008 (via Steve Song)





## Pre-PIF & Proto-PIF

- + The economic & performance leverage point: Interconnection and traffic exchange
- + Initial focus on creating an IXP association (07/08)
  - + 20+ IXPs in Africa "on paper"
    - Couldn't find managers
    - + Development projects gone fallow
    - Little growth and few networks participating
- + 2008 INET @ AfNOG: "African Interconnection the Value Proposition"
  - + Right mix, right time

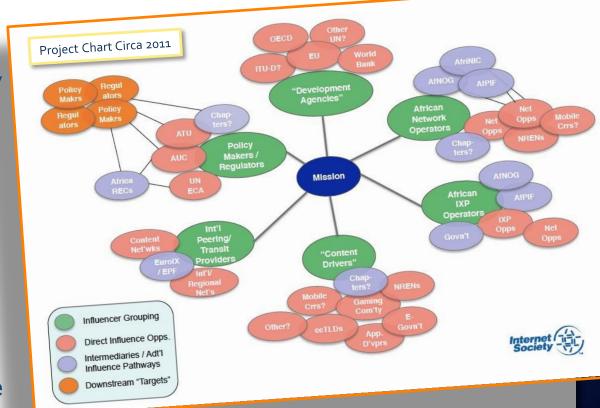




# Taking a Systems Approach to Interconnection in Africa



- A multitude of efforts with partners aimed at priming the pump:
  - Local workshops & capacity building
  - Supporting new IX development
  - Supporting existing IXPs and adding value
  - Advocating in regional & international policy forums
  - Engaging development & funding organizations
  - + Measurement & research
- + AfPIF: The community glue to sustain and build momentum







- + in-fər- mā-shən ( )ā- si-mə-trē
  - + "...occurs when one party to an economic transaction possesses greater material knowledge than the other party."
- + Key Problem: "I manage my network and buy the Internet."
- **+ Key Requirement :** Increase knowledge & relationships necessary to:
  - + Negotiate better deals
  - + Create peering opportunities
  - Create & sustain local and regional traffic exchange
  - + Catalyze growth
  - + Attract new services





# AfPIF-1: 2010 Nairobi, Kenya

- + 2 Days, ~80 Attendees
- + 20 African countries + int. participants
- + Local Host:

### **TESPOK**

+ Sponsors:













# Beyond AfPIF



## Collaborators – Thank you!





























### Map showing ISOC ITE work from 2008 - 2019 (Excluding AXIS Capacity Building Workshops)

**ITE: 2008-2009** 

Blantyre, Malawi

Nairobi, Kenya

Rabat, Morocco

ITE: 2010

Kampala, Uganda

Freetown, Sierra Leone

Sharm el-Sheikh, Egypt

Dar-es-Salaam, Tanzania

Freetown, Sierra Leone

Maputo, Mozambique (P)

Mombasa, Kenya

① ITE: 2011

Maseru, Lesotho

Kampala, Uganda

Blantyre, Malawi

Addis Ababa, Ethiopia

Douala, Cameroon

Accra, Ghana

① ITE: 2012

Kinshasa, DRC

Rabat, Morocco

### Tunisia Morocco Legend Algeria Libya Egypt Western Sahara Technical/Best Practice Workshops New IXP Assistance Cape Verde Technical Assistance/ Mauritania Mali IXP Equipment Niger Chad Eritrea Sudan IXP Meetings Senegal Gambia Guinea Bissau Burkina Faso Djibouti Guinea Nigeria ① ITE: 2018 Sierra Leone Ethiopia Central African South Sudan Zanzibar Liberia Cameroon Togo-Casablanca, Morocco Somalia Côte d'Ivoire Guinea D. R. Congo ① ITE: 2016 Lagos, Nigeria Ghana Gabon Rep. Kenya Harare, Zimbabwe Sao Tome Rwanda-Antananariyo, Madagascar Sevchelles AUC - Vic Falls Burundi Dar es Salaam, Tanzania Zanzibar Angola ① ITE: 2013-2014 Ghana − GIX Tanzania Malawi Commoros Ghana **③ ITE: 2017 ③ ITE: 2019** Angola Lesotho Accra. Ghana **♥** DRC Zambia Ouagadougou, Burkina Faso **O ITE: 2015** Kampla, Uganda (EAPF) V Lome, Togo Tunisia Maputo, Mozambique Kinshasa, DRC Zimbabwe Mauritius Namibia – AXIS Maseru, Lesotho Namibia Mozambique Abuja, Nigeria Kenya – KIXP Burundi – AXIS Bujumbura, Burundi Botswana Harare, Zimbabwe Nigeria – IXPN ■ Gambia – AXIS Chad Lesotho – LIXP Tanzania – TIX Swaziland – AXIS P DRC - KINIX Swaziland P DRC - KINIX Rwanda – RINEX Gabon – AXIS ♥ Uganda – UIXP Kampala, Uganda (EACO) Malawi – MIXP Tunisia Sudan – SIXP South Africa Lesotho



## **African Union AXIS Project**



### **Summary of AXIS Project:**

- ☐ From 2012 2018
- ☐ New partnership with the African Union
- ☐ Trained over 1500 people in 28 Countries
- ☐ Creation of at least 10 New IXPs
- Support of 8 IXPs to grow into Regional IXPs
- ☐ Increased awareness on the value of IXPs
- □ Policy work on crossborder interconnection



# Key Value Builders



- + Africa had the fastest growing Internet market but...
- + ...many global providers had limited understanding of the market, and...
- + ...nearly all content was hosted outside Africa, with few local caches.

Mutual opportunity!

- Big push in early years to explain the African market and bring content & global providers to AfPIF
  - + EPF 5 and 7 critical

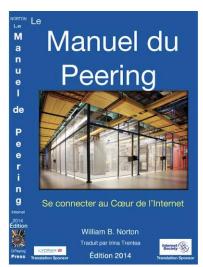
Thanks!



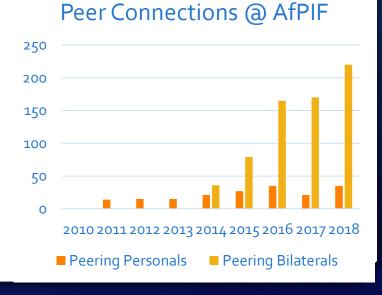


- + The Peering Game @ AfPIF
- Over 600
   peering books
   distributed
- + Peering book translated to French
- PeeringPersonals
- Peering Meeting tool

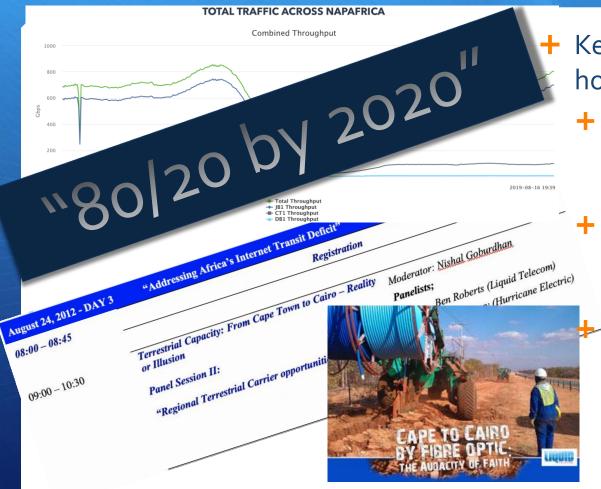








### Vision and Goals



Keep focused on the horizon!

- + Why An Africa that creates & not just a consumes the Internet
- + How A self-sustainable community of practice within 10 years.
- What Community ownership and buy-in



# Infrastructure Development

### IXP Infrastructure

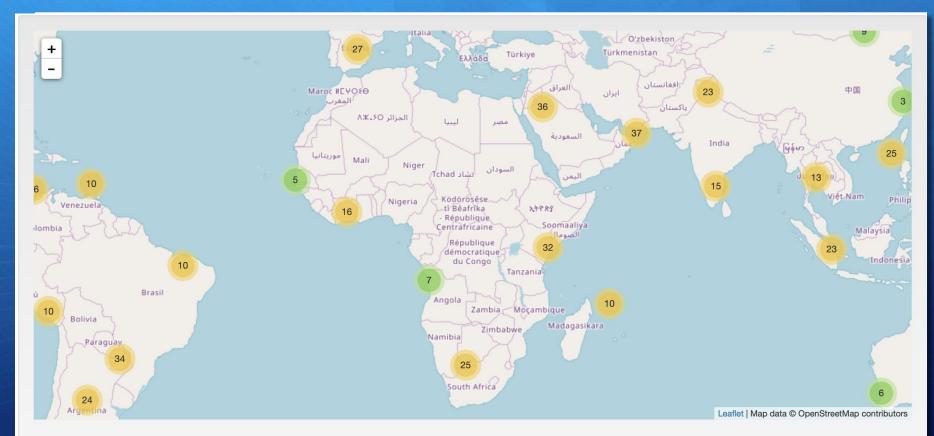


- + 45 IXPs located in 41 cities in 33 countries
- + Over 1000 Networks connected
- More networks connected using fiber
- More IXPs in West, Central Africa and Indian Ocean Islands

Source: https://www.af-ix.net





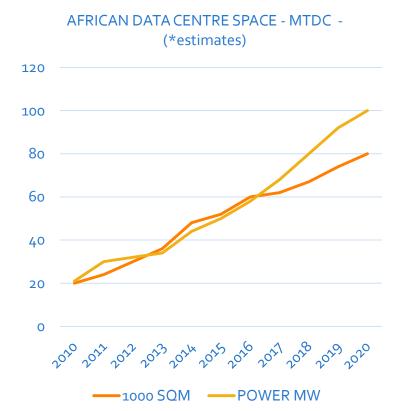


As of 2019-08-17, the root server system consists of 1011 instances operated by the 12 independent root server operators.

Source: https://root-servers.org





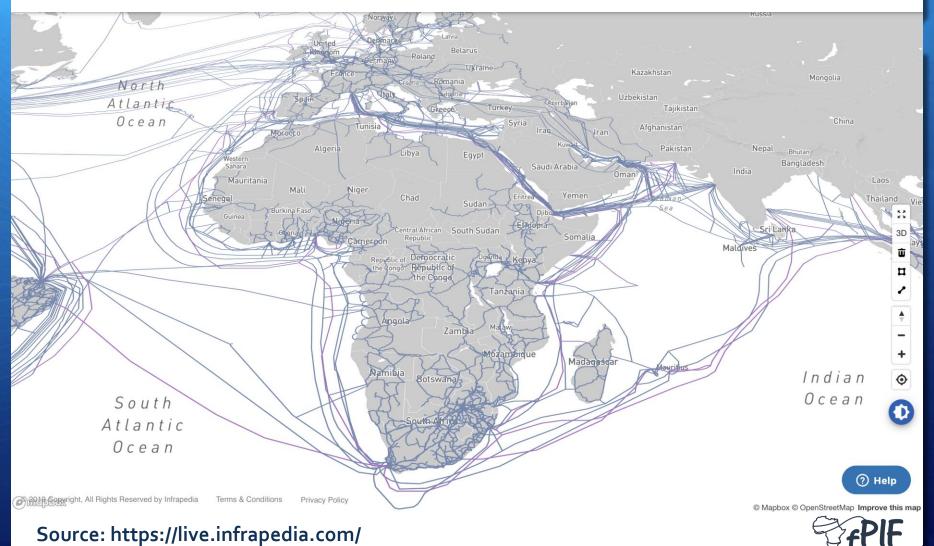


- Africa's Top 5 DC markets (based on number of MTDCs):
  - South Africa
  - 2. Nigeria
  - 3. Egypt
  - 4. Morocco
  - 5. Kenya
- + 30% of Africa's DCs are in South Africa
- + 20% of MTDCs are in West Africa
- + 15% of MTDCs are in North Africa
- 30% of African countries do not have dedicated, commercial colocation facilities
- + Approx.. 55% of DC space is in South Africa

Source: Teraco Data Environments



### Submarine and Terrestrial Infrastructure



# Where are we?

# AfPIF @ 10: Meeting from Cape Town to Casablanca

Nairobi, Kenya 2010 Accra, Ghana 2011 Johannesburg, South Africa 2012 Casablanca, Morocco 2013 Dakar, Senegal 2014 Maputo, Mozambique 2015 Dar es Salaam, Tanzania 2016 Abidjan, Ivory Coast 2017 Cape Town, South Africa 2018 Balaclava, Mauritius 2019



## Program Committee (PC)



- PC is drawn from peering community
- + There are two co-chairs
- + Inaugural PC established in 2016 with 3 year term 12 Members
- + Second PC commenced in 2019 12 Members (5 new)
- + PC charter



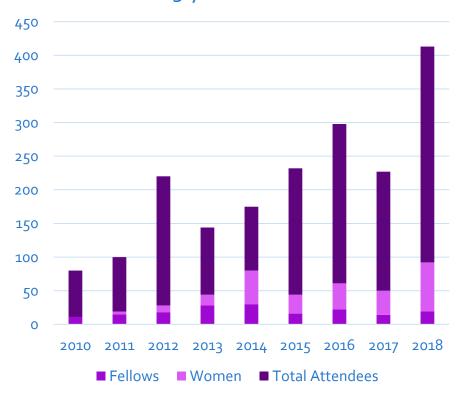


- + Established (informally) in 2012
- + Annual meetings
- + Secretariat established in 2019
- + Co-organizers of AfPIF
- Key to the future of peering Africa





### AfPIF 9 year Attendance



### Women In Tech Fellowship Program







### **Sponsors**

Sponsors



# Impact Beyond AfPIF



### African Route-collectors Data Analyzer

A.R.D.A IXP

IXP view ▼

National view ▼

Regional view -

Towards ARDA 2.0 ▼

**Publications** 

About

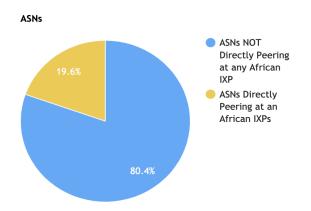
Contact

### PERCENTAGE OF ASNs ASSIGNED TO THE REGION VISIBLE AT ALL IXPs IN AFRICA

This webpage compares over the last month the number of ASNs assigned by Afrinic with respectively the number of peering and origin ASNs visible at all African IXPs. Upon click, the user can download the respective lists of ASNs

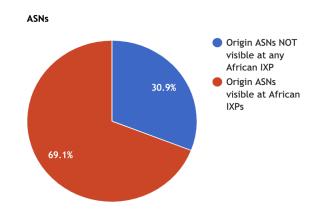
### Percentage of Peering ASNs

Over the last month

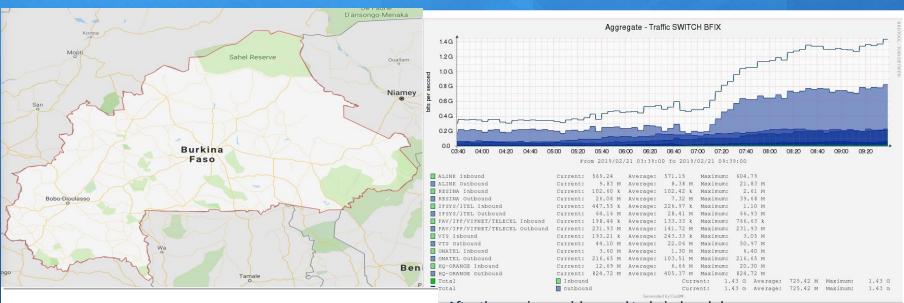


### Percentage of Origin ASNs

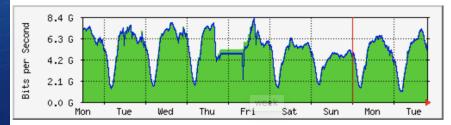
Over the last month







### `Weekly' Graph (30 Minute Average)



Max
In 8129.6 Mb/s (81.3%)
Out 8166.1 Mb/s (81.7%)

Average 5131.3 Mb/s (51.3%) 5085.9 Mb/s (50.9%) **Current** 5814.8 Mb/s (58.1%) 5835.8 Mb/s (58.4%)

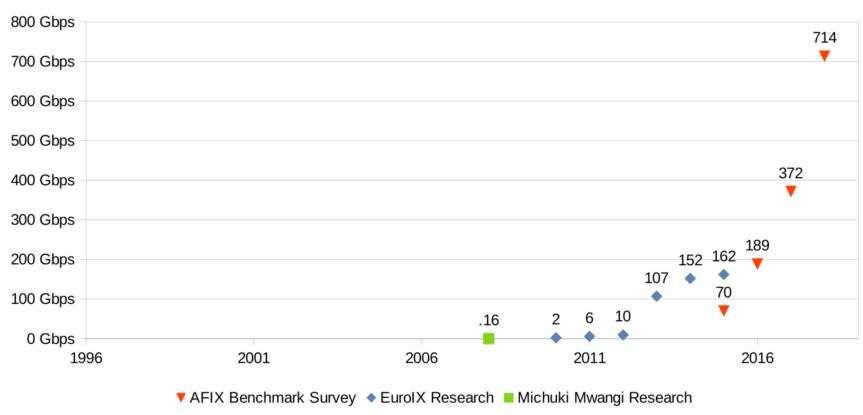
- After the peering roadshow and technical workshop;
  - Community was able to transition from layer 3 to layer 2 IXP in February 2019
- Topology change unlocked penned up traffic from 400 to 1.4Gbps
- Peak traffic is at currently at about 7Gbps
- Saves operators over \$120,000 USD per month
- We have received requests from BFIX on support for;
  - New 10Gbps switch to meet growing demand





### African IXPs: Peak Traffic

Source: African IXP Association (2019)





### **Cross-border Peering of Carriers**

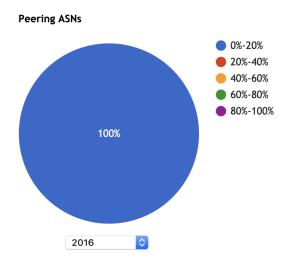


2010 🗘

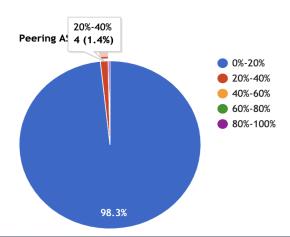
Number of Peering ASNs visible in one or more IXPs In 2010

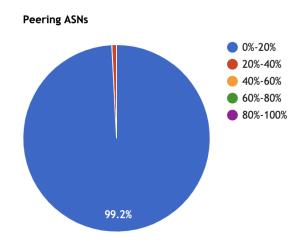


Number of Peering ASNs visible in one or more IXPs In 2014

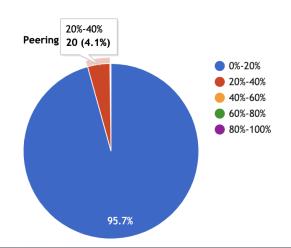


Number of Peering ASNs visible in one or more IXPs In 2016





Number of Peering ASNs visible in one or more IXPs Over the last 12 months



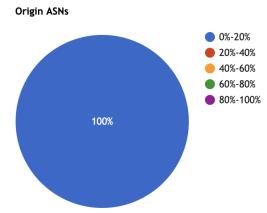


### **Global and Regional Carriers - Open Peering**

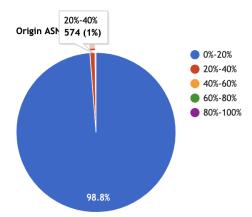
Number of Origin ASNs visible in one or more IXPs In 2010

Number of Origin ASNs visible in one or more IXPs  $\ln 2013$ 

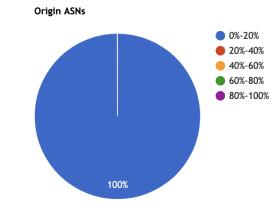




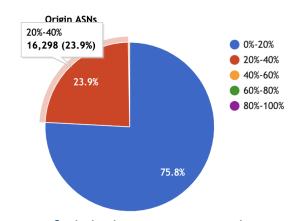
Number of Origin ASNs visible in one or more IXPs  $\ln 2016$ 



 SEACOM announced change of peering peering at AFPIF-2015



Number of Origin ASNs visible in one or more IXPs Over the last 12 months



 Entry of global carriers into the African peering ecosystem



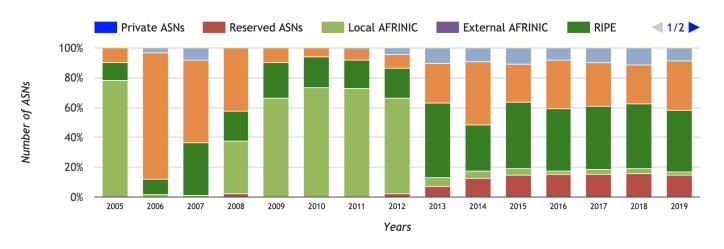


### DISTRIBUTION OF NON-LOCAL ASNs

This view categorizes visible ASNs at an African IXP into Private ASNs, Reserved ASNs, local ASNs, External ASNs in the AFRINIC, RIPE, ARIN, APNIC, and LACNIC region. Upon click, the user can download the list of ASNs and their corresponding groups.

### Distribution of non-local ASNs at all IXPs in Africa

Per year over the historical Data (2005 up to now)





# Looking Forward



- + Progress has been uneven in Africa and participation in AfPIF has also been uneven
  - + Needed goal: To get all countries and African service providers to AfPIF
  - + Education and information sharing efforts still needed
- + Need to get data center space and community to collaborate with AfPIF
  - They are mutually dependent
- + Need to focus on creating a more robust content ecosystem in Africa. (Content, hosting, distribution etc.)
  - + 80/20 by 2020. Still far from a reality for some networks, but not all
- Need to refocus on policy and regulation
  - + Still have cumbersome legal and regulatory environments in many countries
  - + And new developments happening that might setback progress
- Need more data about what is happening in Africa
  - + Better key statistics and peering data
  - + Funding needed for projects to maintain and grow data efforts



# Most importantly ...



The future of AfPIF will depend on the community!







## Thank You!

Michuki Mwangi

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Zynia Digital Karen@zyniadigital.com