

# Internet in Measurements Africa:

**From Macroscopic to Microscopic view**

*Turing Workshop - Data Science for Connecting the Next One Billion - 16 July 2019*

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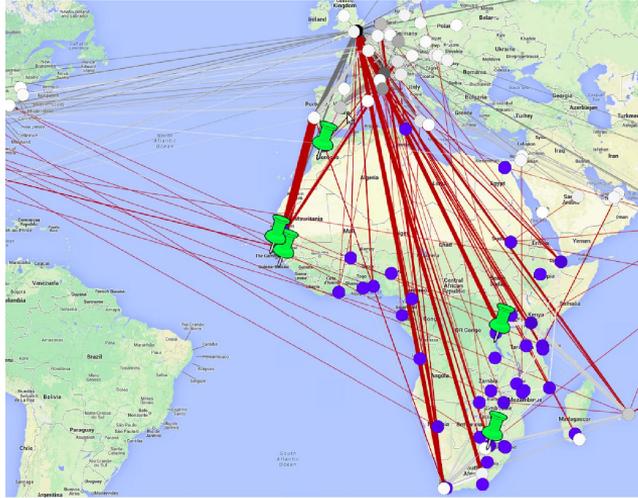


## About Me

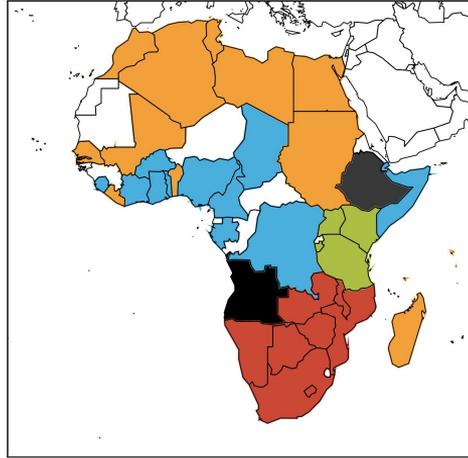
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- Academic at University of Cape Town (previously at *AFRINIC*)
- Teach and research Computer Networks
  - Internet measurements
  - Focus on QoS/QoE in low-resource networks
- Recently been active in measuring properties of the Internet in Africa

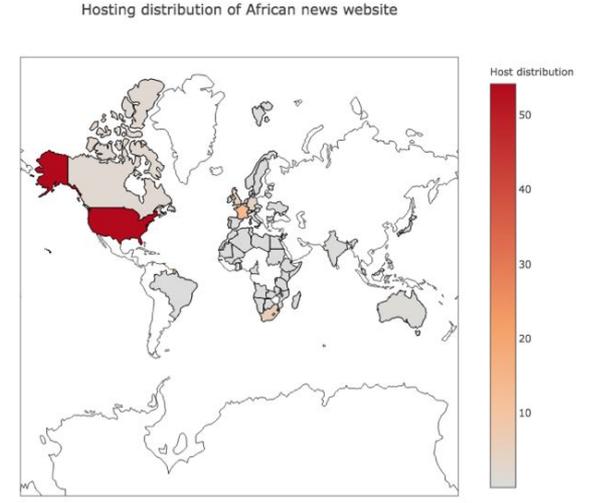
# Africa's Interconnection, Latency and Hosting



**Circuitous Routing**



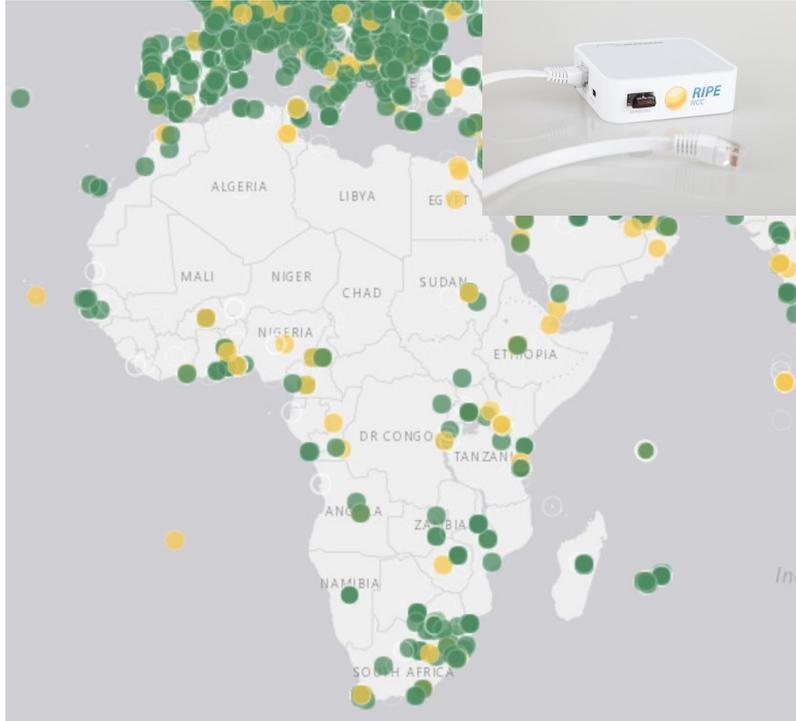
**Latency Clusters**



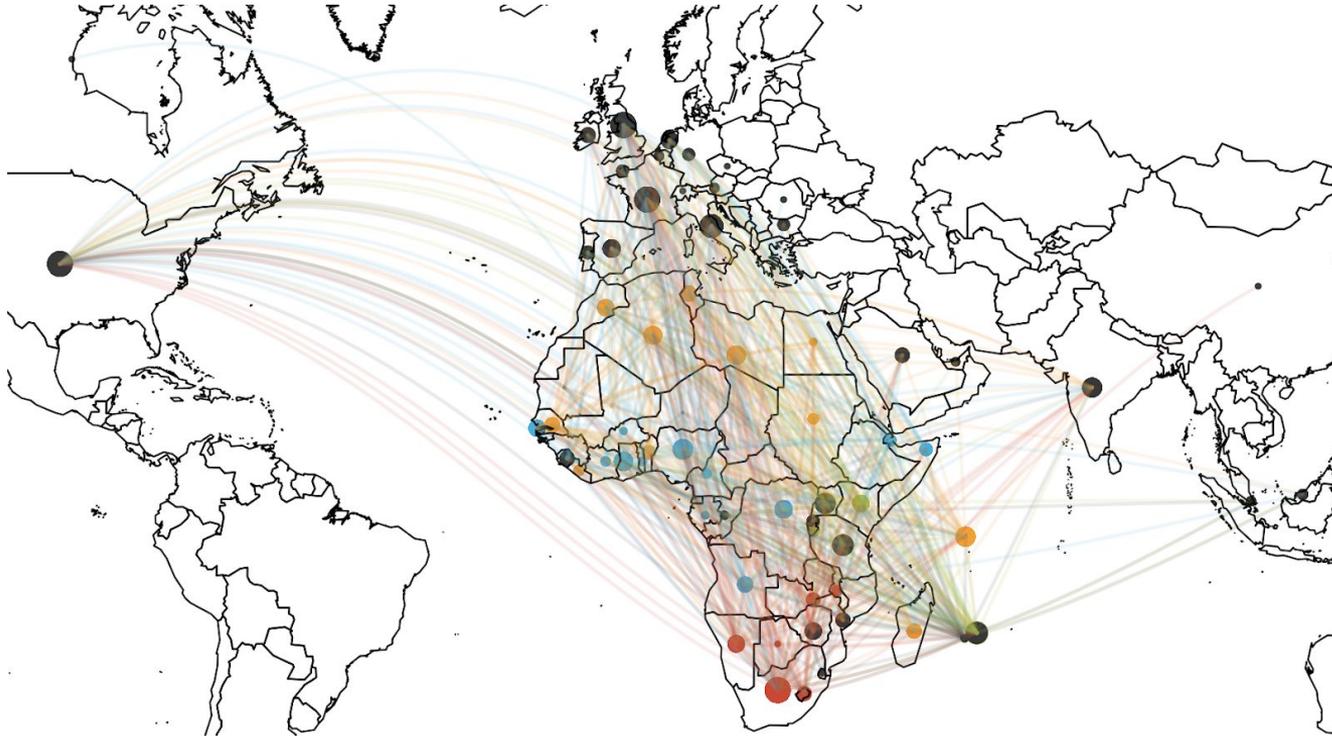
**Remote vs Local Hosting**

# Data Sources and Tools

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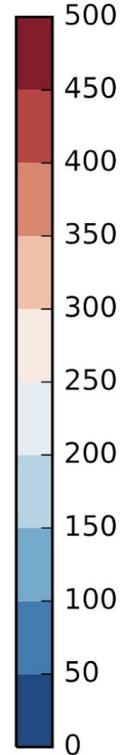
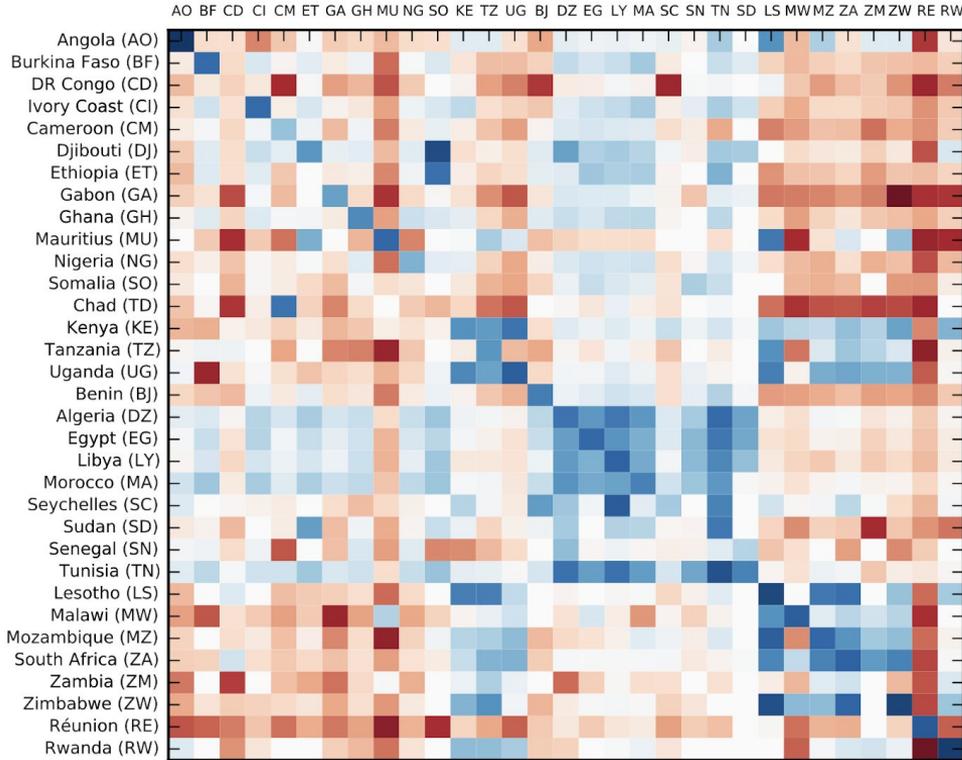


# Upstream Providers



» **37% of Traceroute samples with at least one hop outside Africa**

# Country-level Latencies



**In-country mean:**

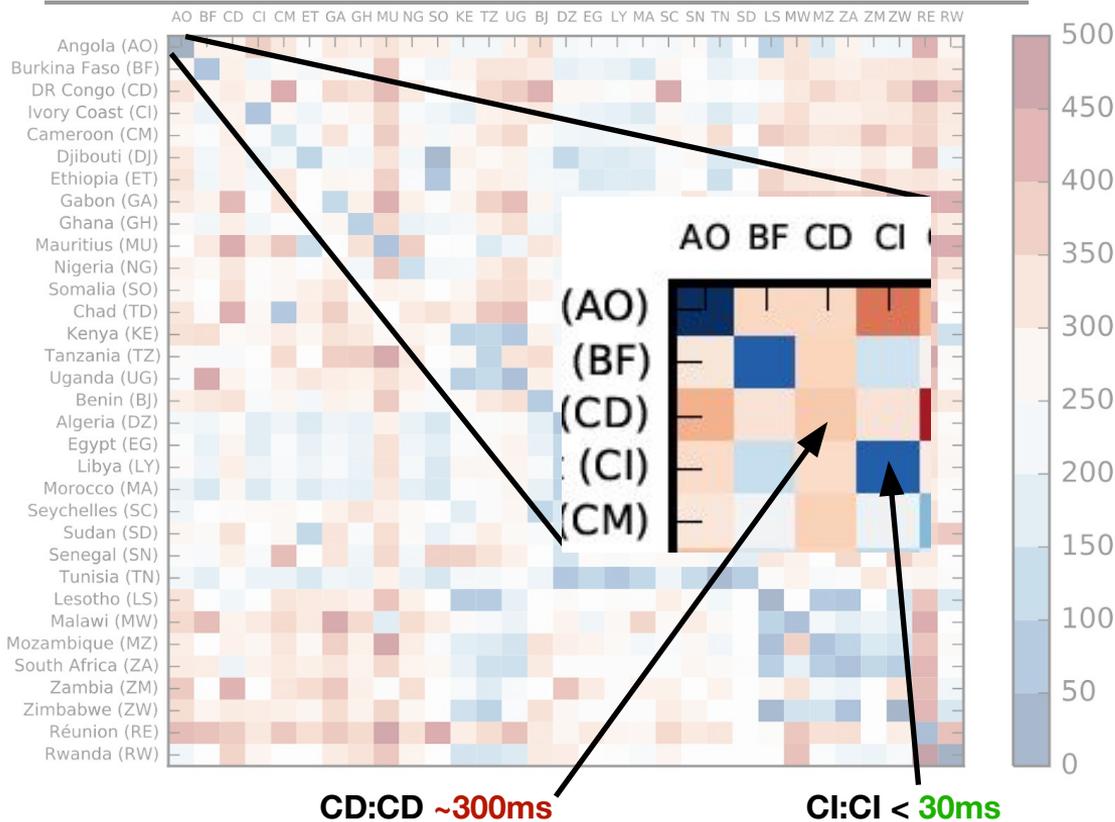
**Africa ~78ms**

**Latin America ~76ms**

**North America ~45ms**

**Europe ~30ms**

# Country-level Latencies



**In-country mean:**

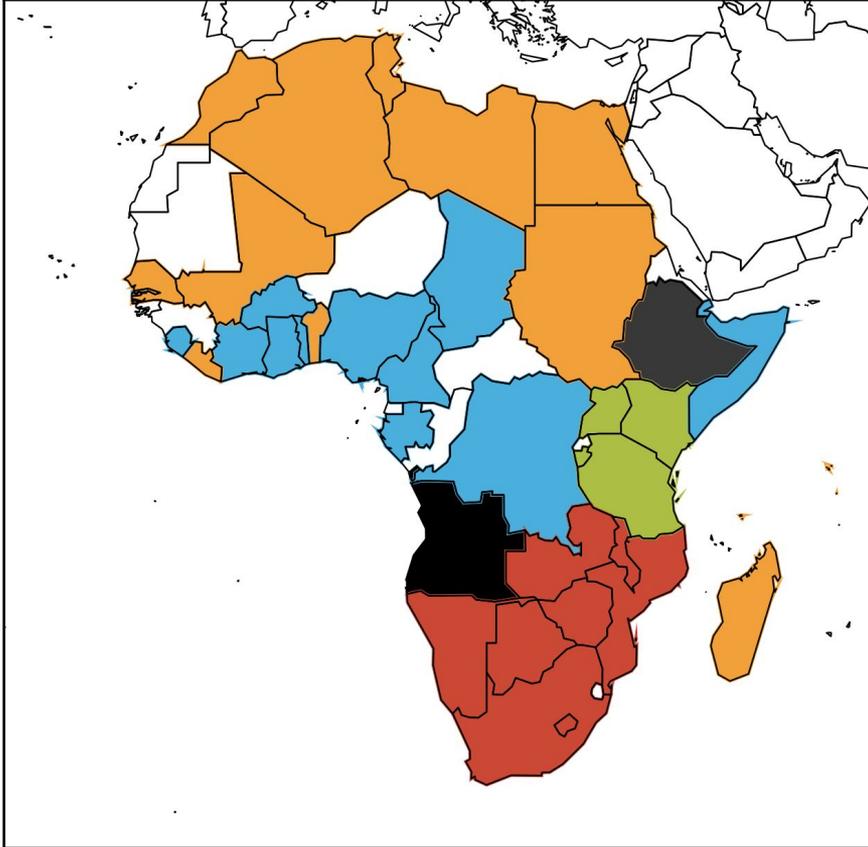
**Africa ~78ms**

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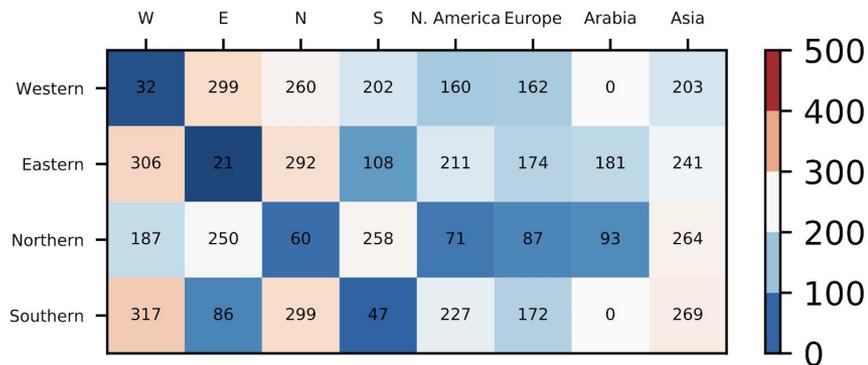
**Europe ~30ms**

# Latency Clusters

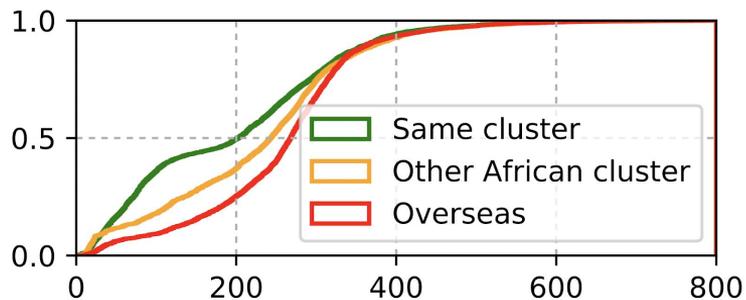


- **Senegal, Liberia and Benin** on the West coast, in Northern cluster
- **Madagascar, Seychelles, islands of the Indian Ocean**, clustered alongside countries in the North
- **Somalia**, on the East coast, is clustered with countries on the West coast.

# Latency to the Upstream



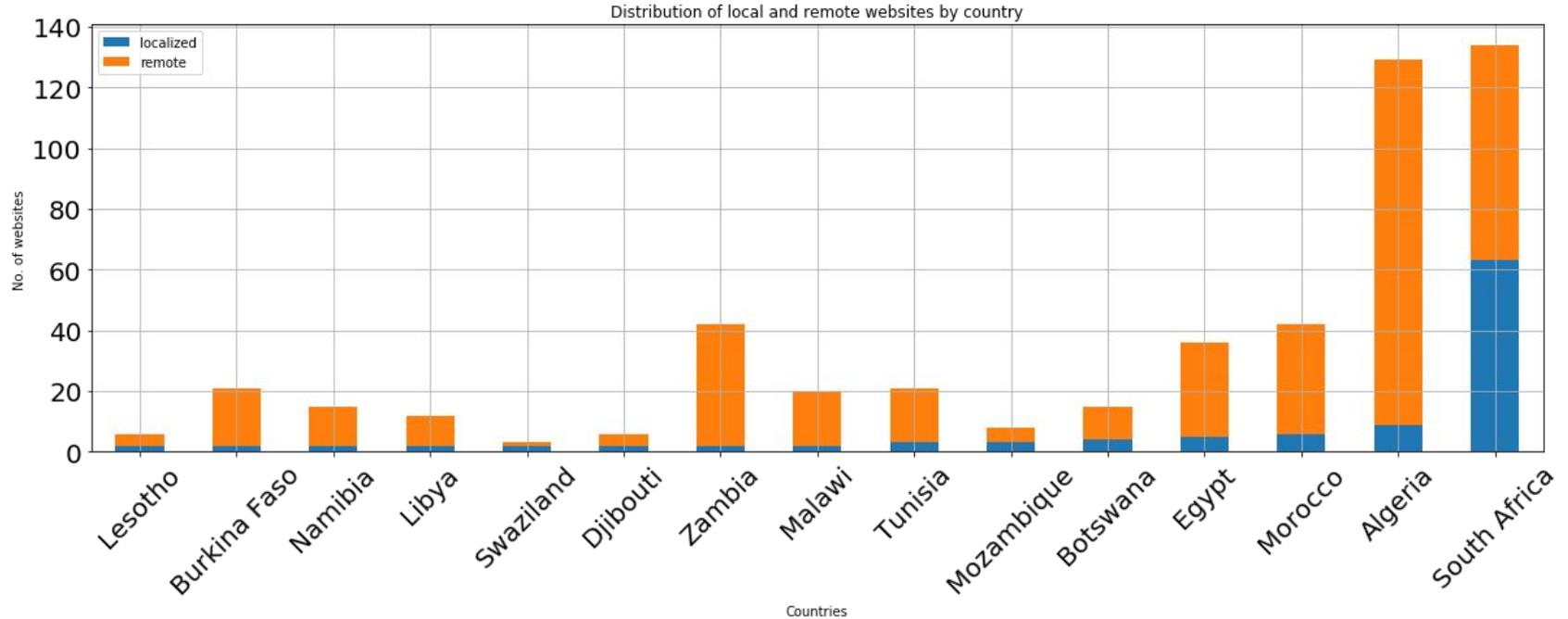
RTT to the first AS hop



RTTs grouped by location of upstream providers

- Northern  $\Rightarrow$  North America **71ms**
- Southern  $\Rightarrow$  North America **227ms**
- Same cluster **203ms**
- Other African Cluster **243ms**
- Overseas **268ms**

# Africa News Hosting (ABYZ News Links)

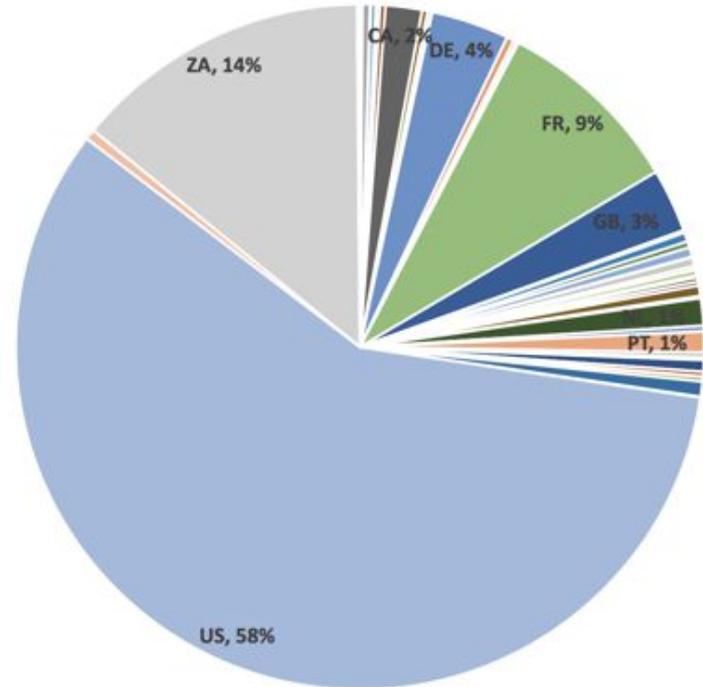


# Geolocation of Africa news hosts

Hosting distribution of African news website



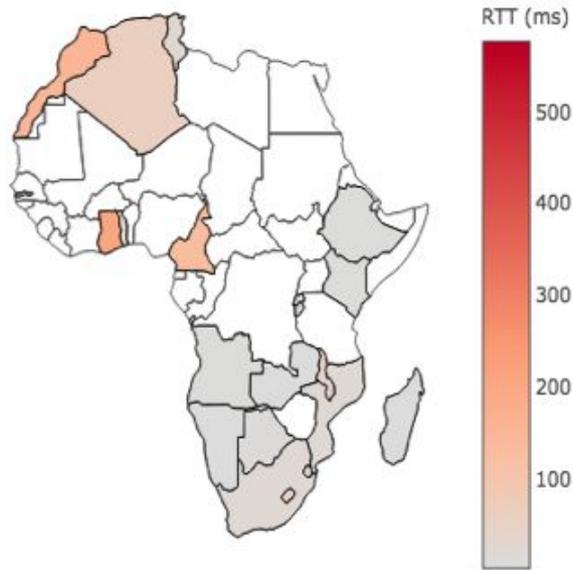
Distribution of remote hosted websites



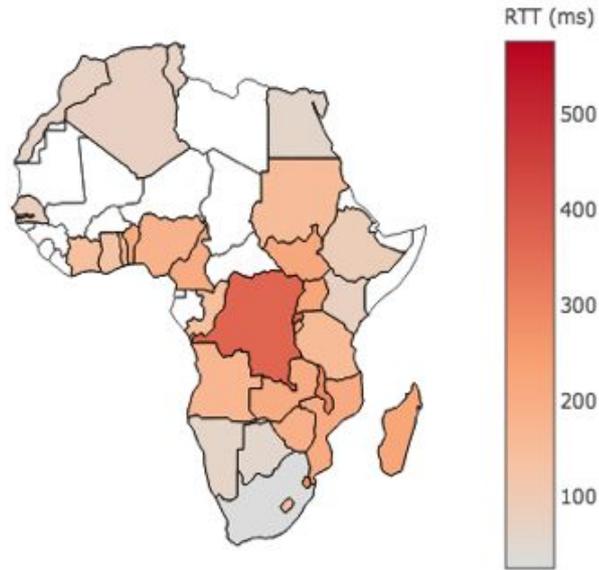
Country-level distribution of remotely hosted African news websites

# RTTs to news websites

RTT to locally hosted news websites



RTT to remotely hosted news websites





# Community Network with Local Services

## South Peninsula iNethi / Ammbr community networks

Providing low cost access with blockchain-based multiradio mesh and localized services



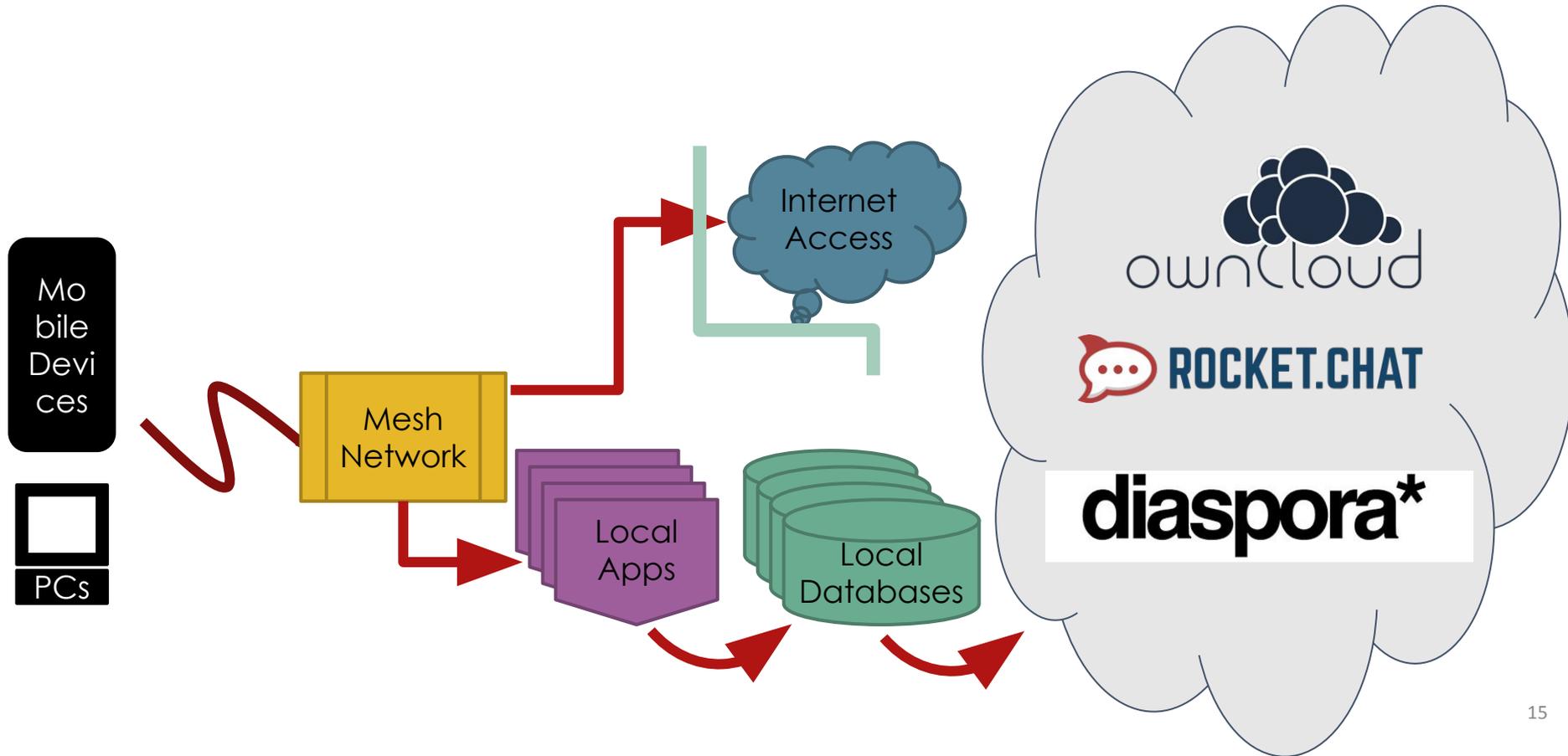


# overview and philosophy



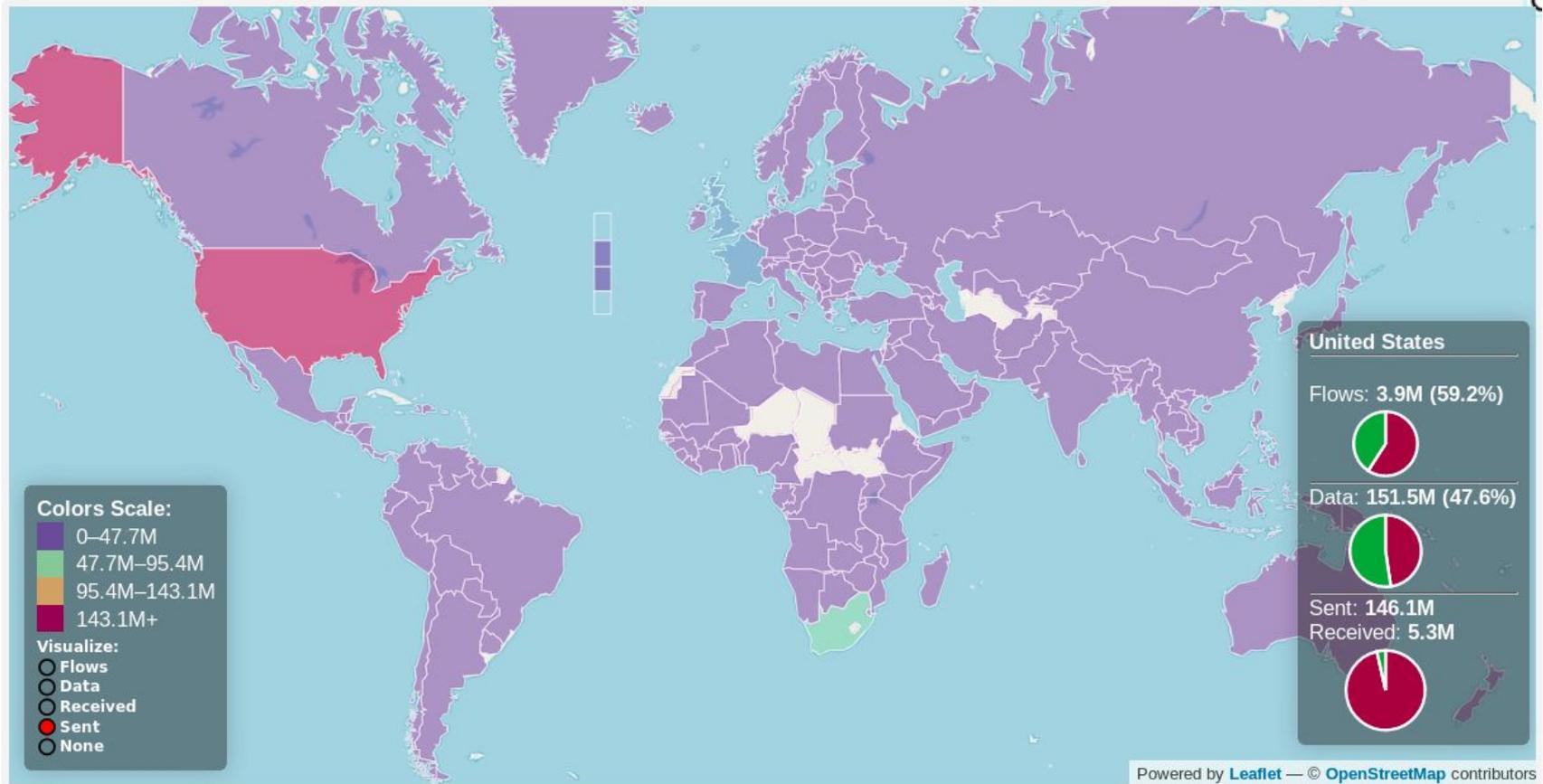
- Uses mesh with TV White Space (TVWS) and WiFi radios
  - Mesh provides simple set-up (self-forming) and repair (self-healing)
  - Mesh routes over TVWS or WiFi or both to provide better coverage, capacity and redundancy
- iNethi Cloudlets for decentralized content distribution
  - Encourage content generation and local innovation
  - Create wiki content, build locally hosted apps, locally hosted services
- iNethi Affordable Internet access
  - Use an easy to use voucher based system
  - Management system to manage quality of service to users
- Community driven design and ownership
  - iNethi seeds cooperative / community owned networks
  - Cloudlet Platform will support new services designed for and by the community

# Inethi: Community Network with Local Services

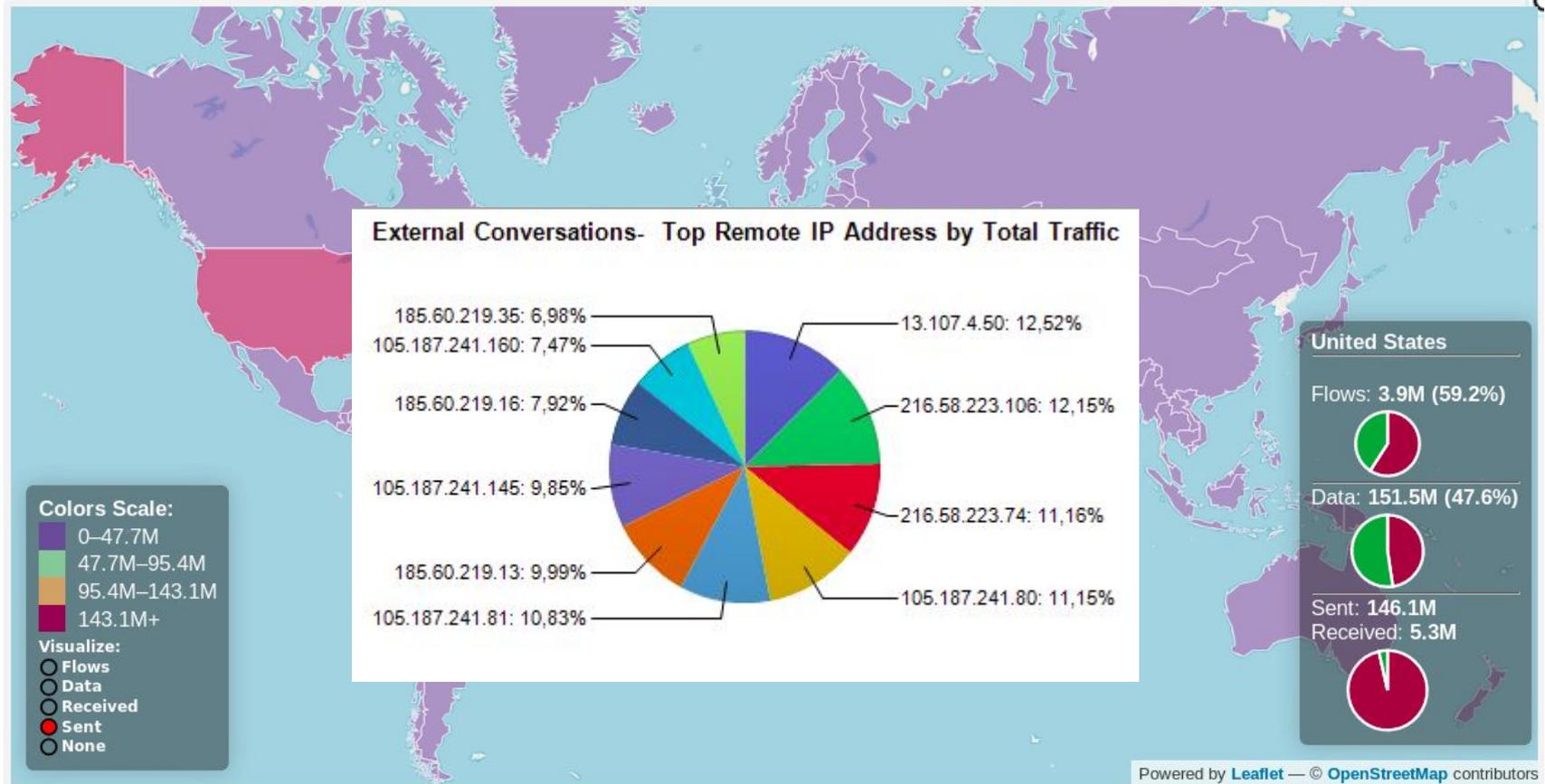




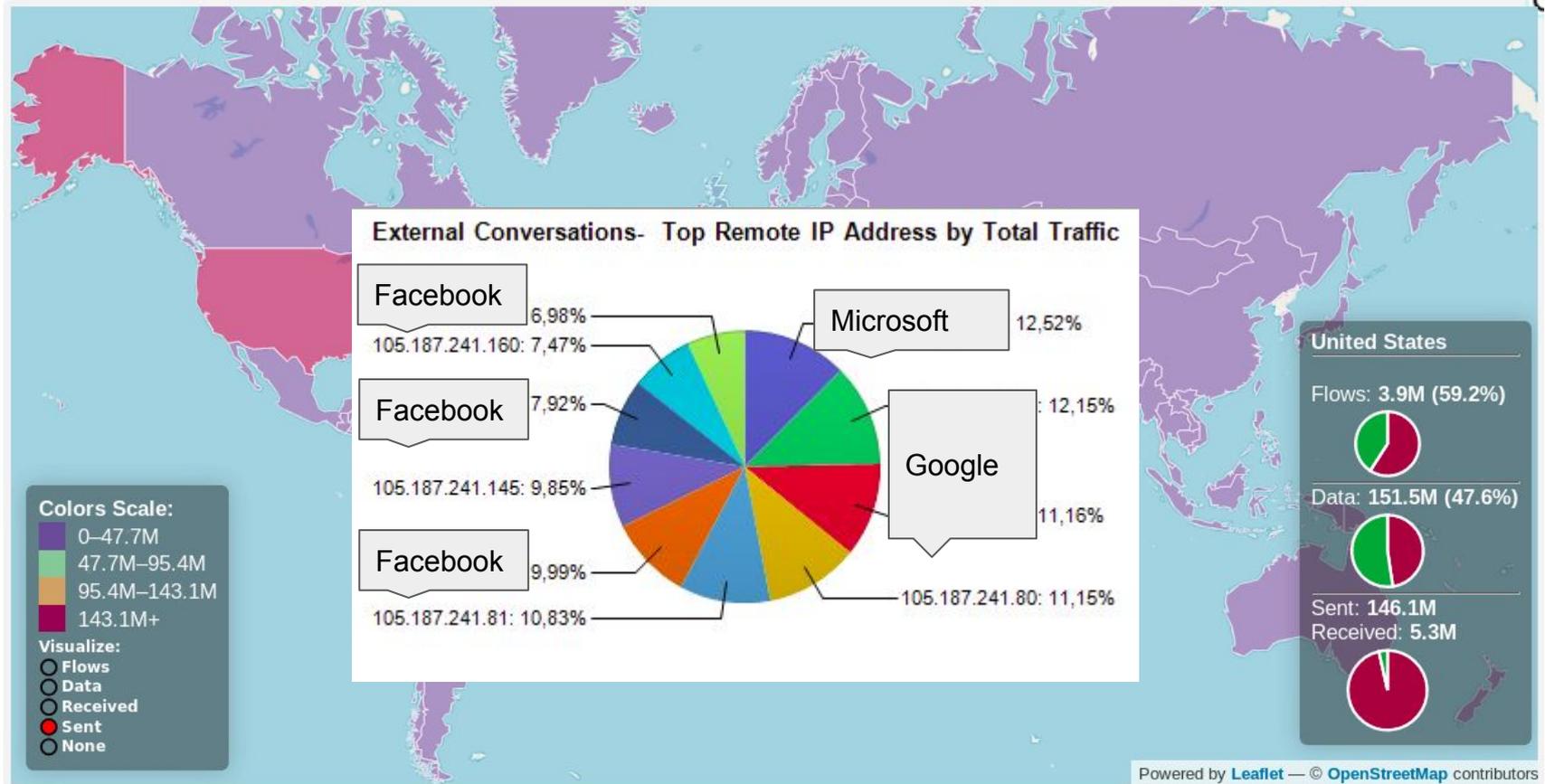
# Community Network with Local Services



# Community Network with Local Services



# Community Network with Local Services





## Next?

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- Connectivity and Bandwidth
- Local services/content
- Localized Measurement Platform
  - User-Centric Quality of Service and Quality of Experience?

# Thank You

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University of Cape Town**

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