

Internet in Measurements Africa:

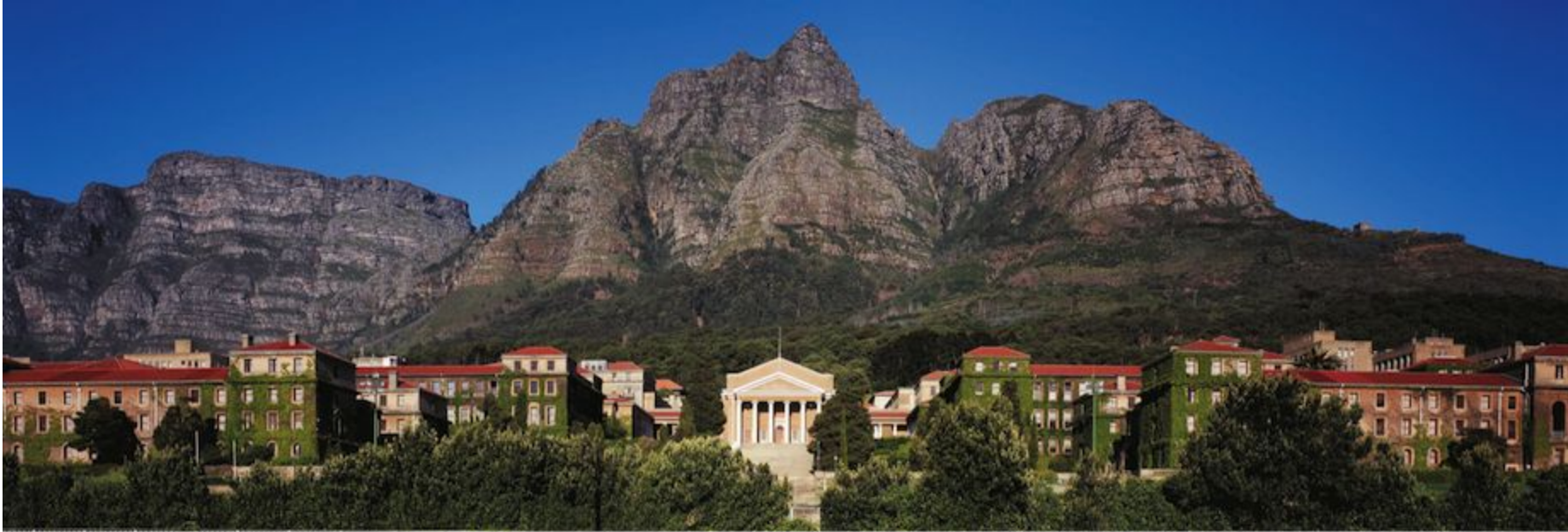
From Macroscopic to Microscopic view

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

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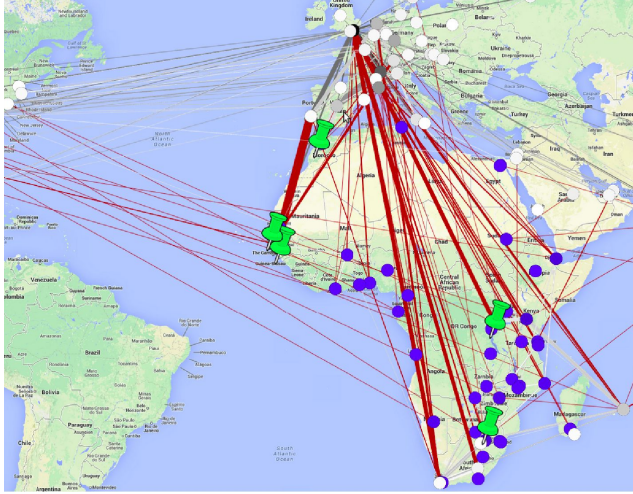




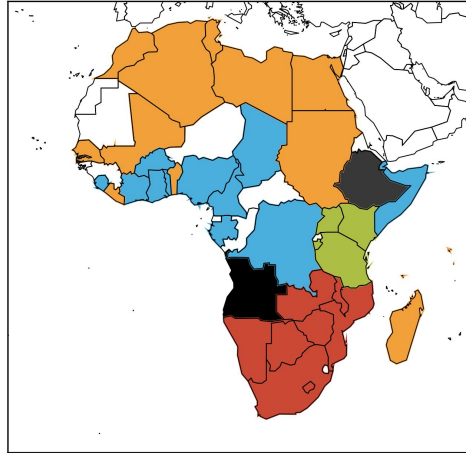
About Me

- 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

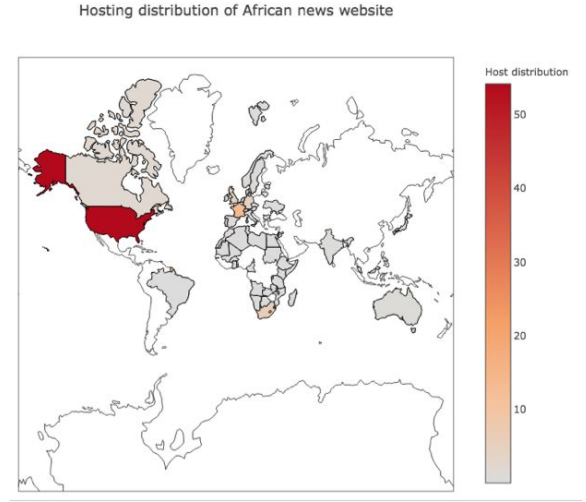
Africa's Interconnection, Latency and Hosting



Circuitous Routing

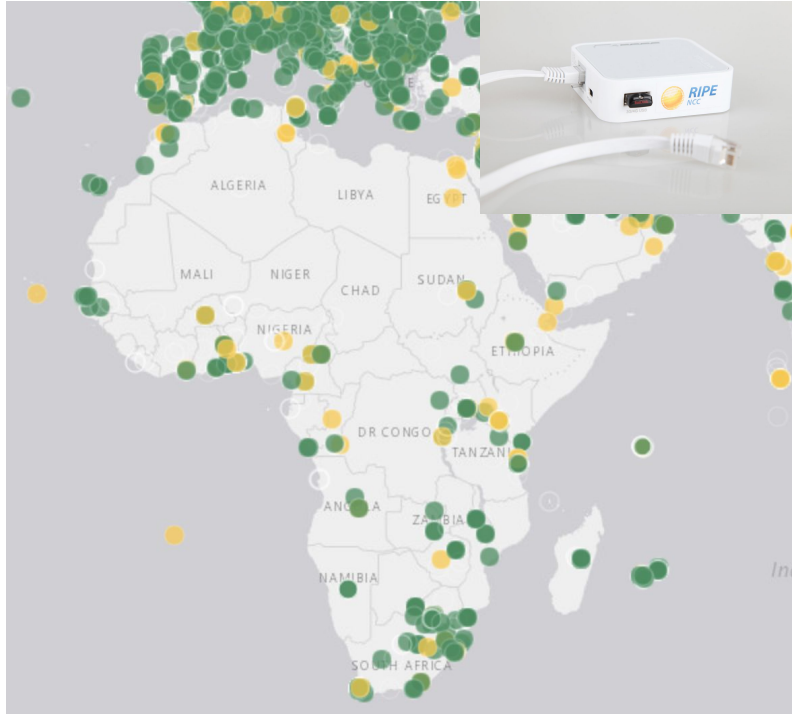


Latency Clusters

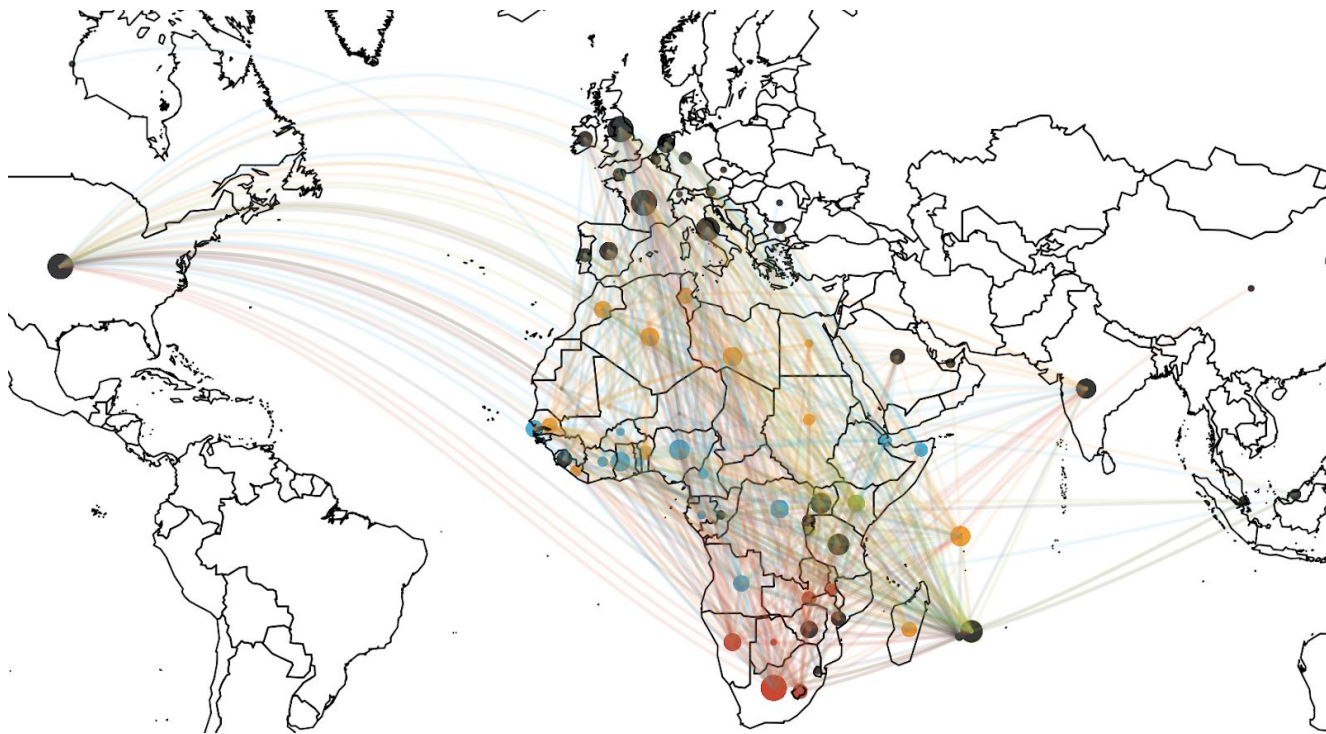


Remote vs Local Hosting

Data Sources and Tools

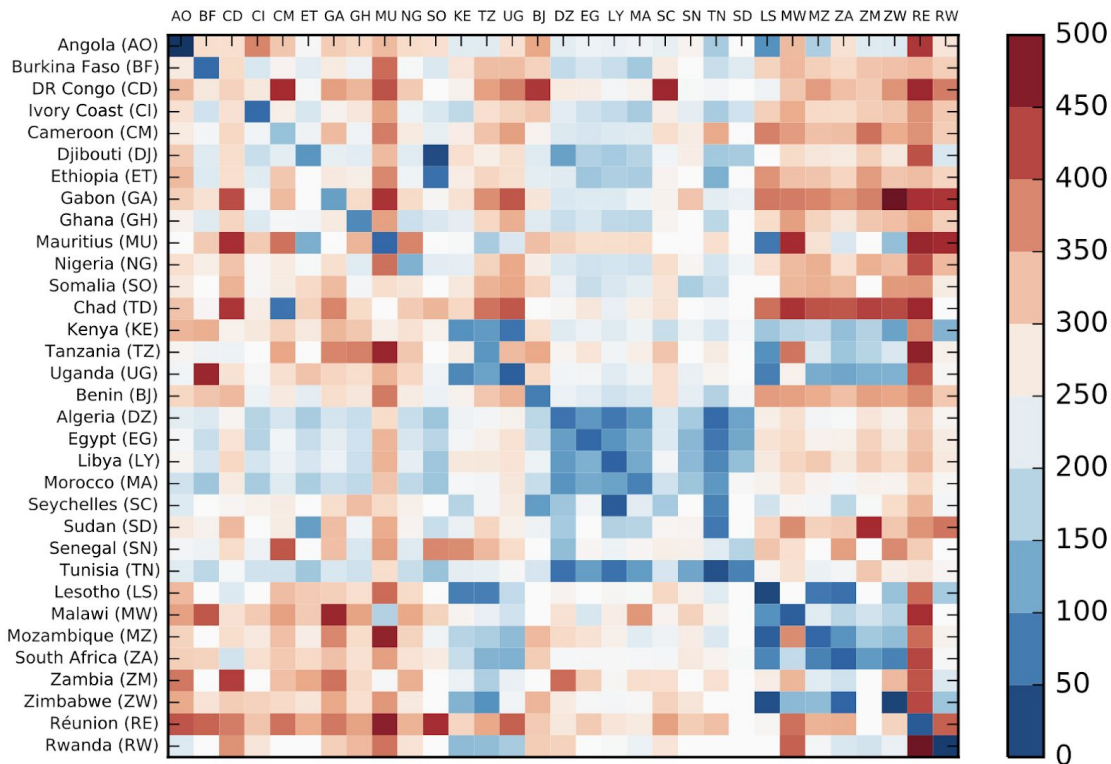


Upstream Providers



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

Country-level Latencies



In-country mean:

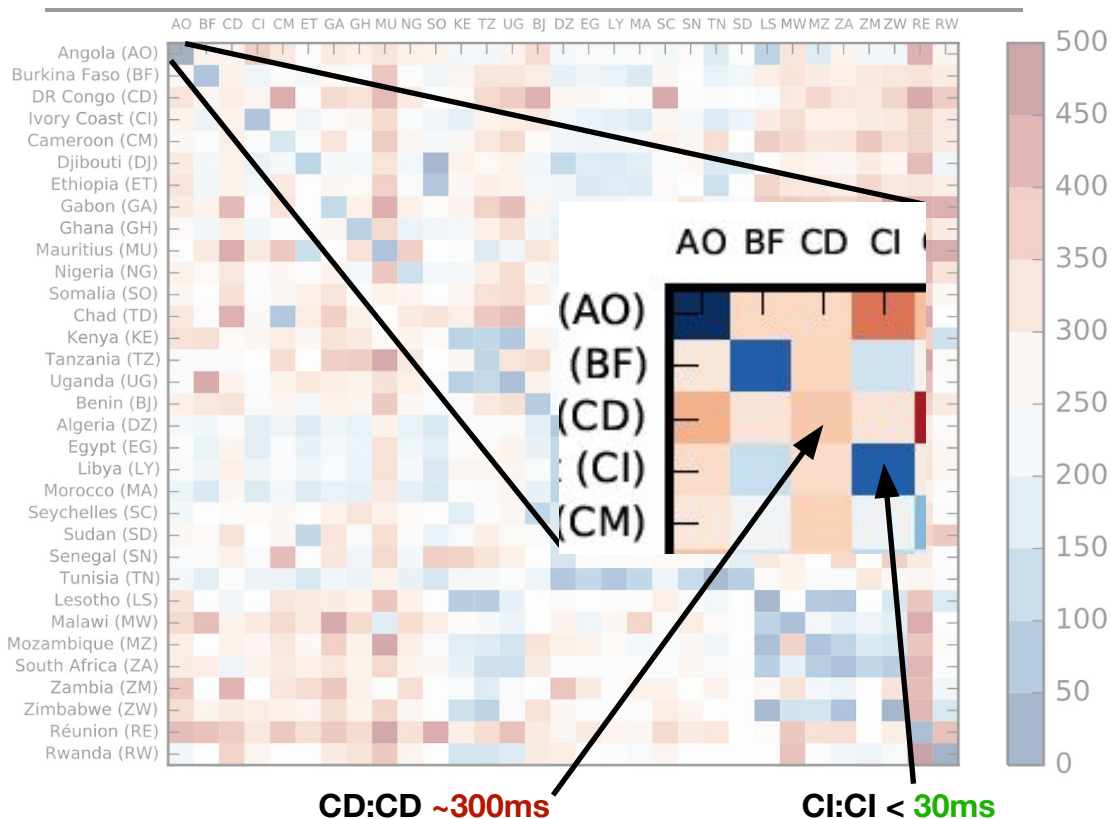
Africa ~78ms

Latin America ~76ms

North America ~45ms

Europe ~30ms

Country-level Latencies



In-country mean:

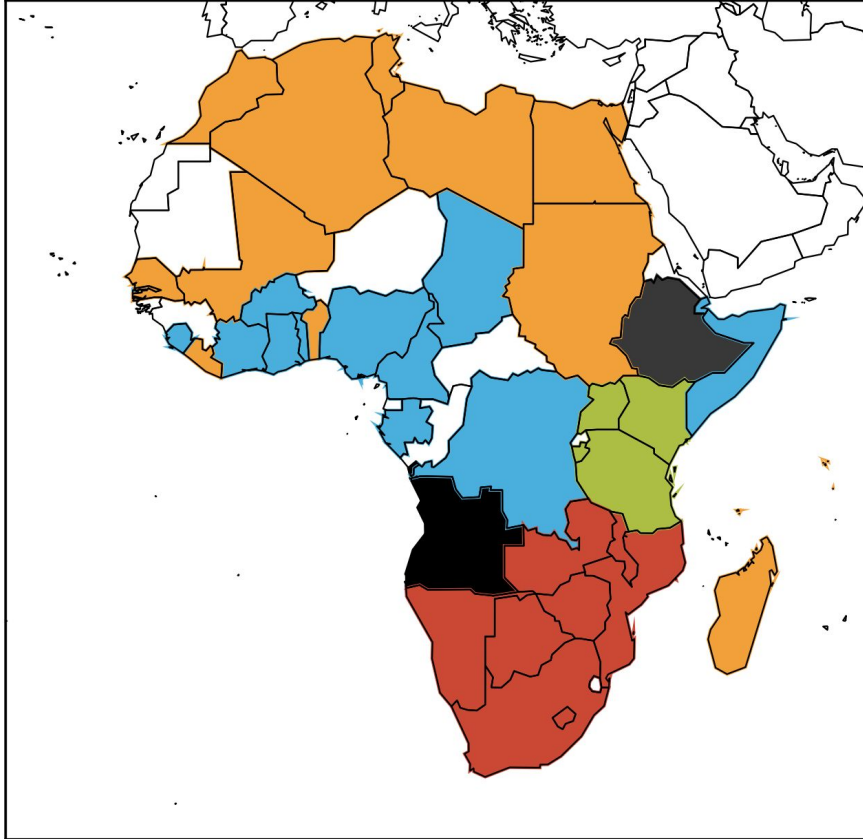
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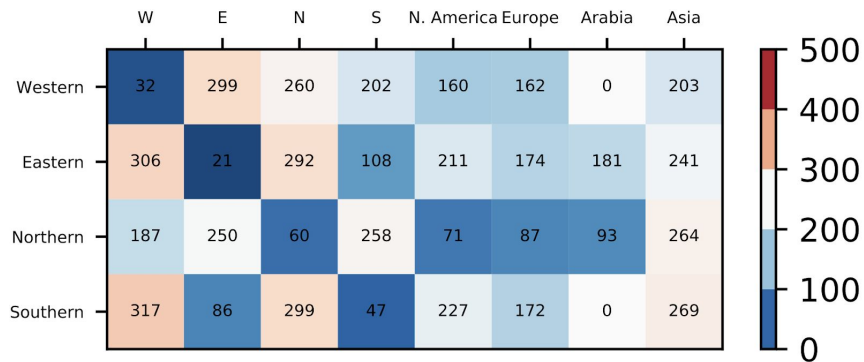
Europe ~30ms

Latency Clusters

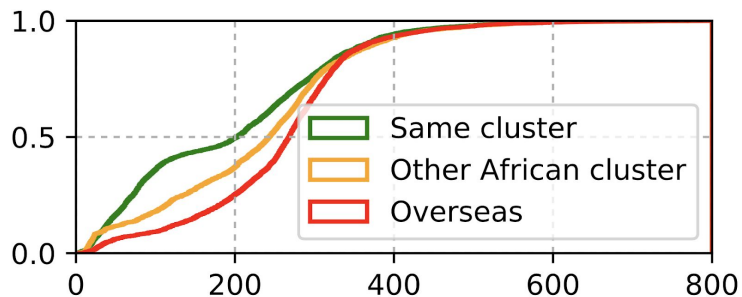


- **Senegal, Liberia and Benin** on the West coast, in Northern cluster
- **Madagascar, Seychelles, islands of the Indian Ocean**, clustered alongside countries in the North
- **Somalia**, on the East coast, is clustered with countries on the West coast.

Latency to the Upstream



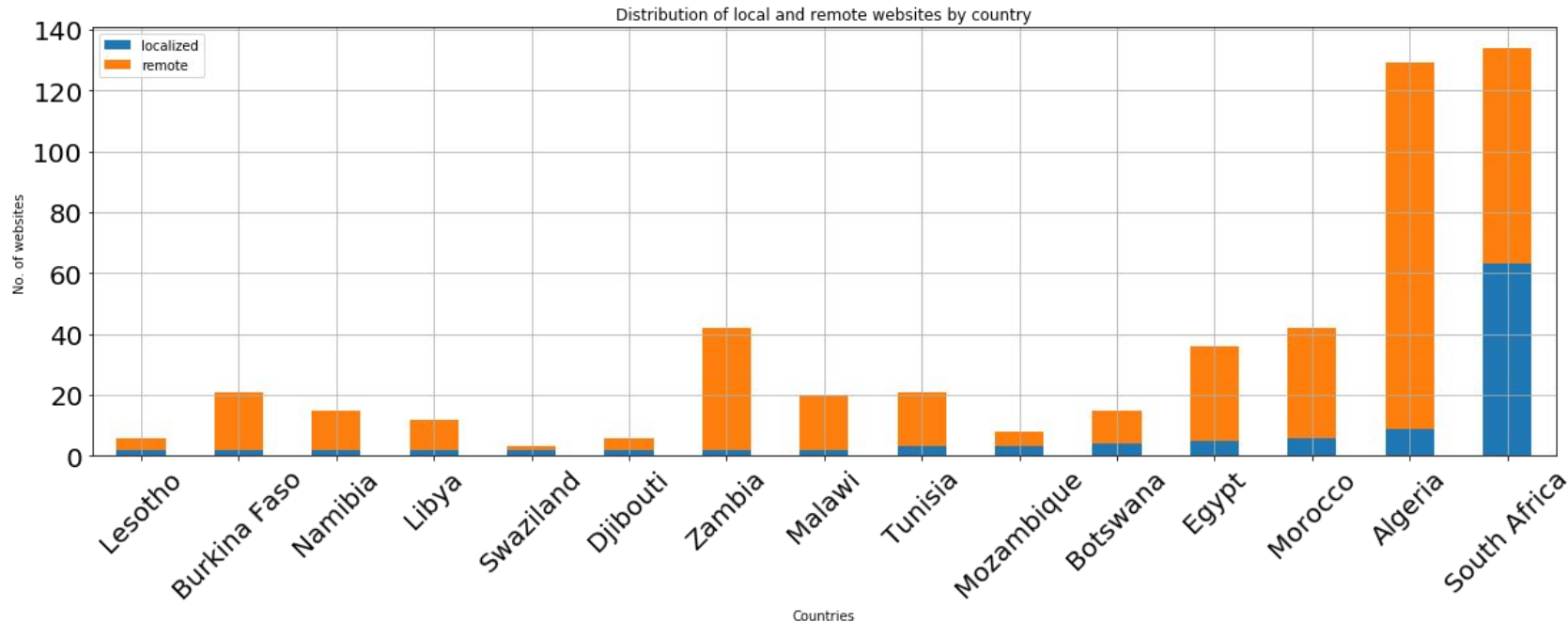
RTT to the first AS hop



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)

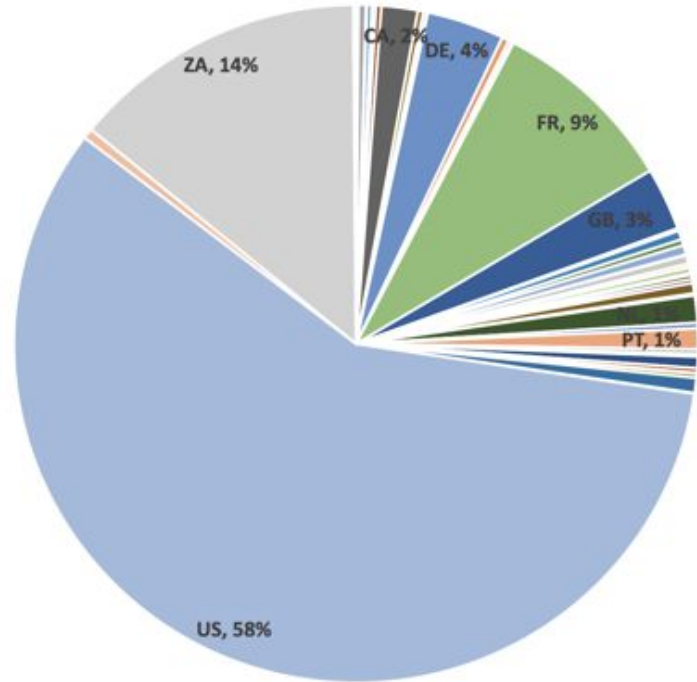


Geolocation of Africa news hosts

Hosting distribution of African news website



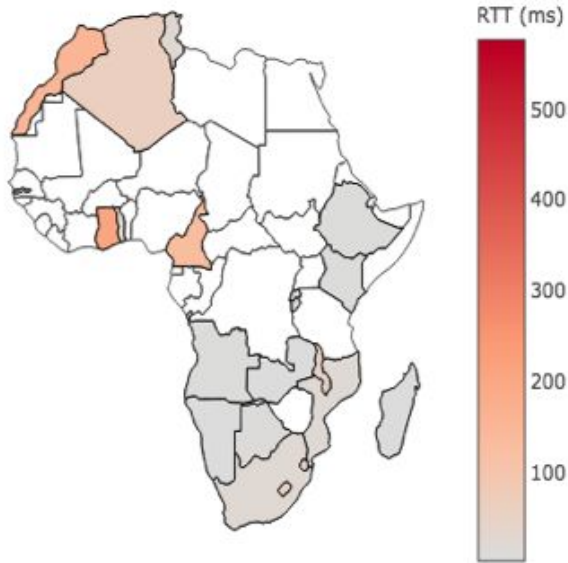
Distribution of remote hosted websites



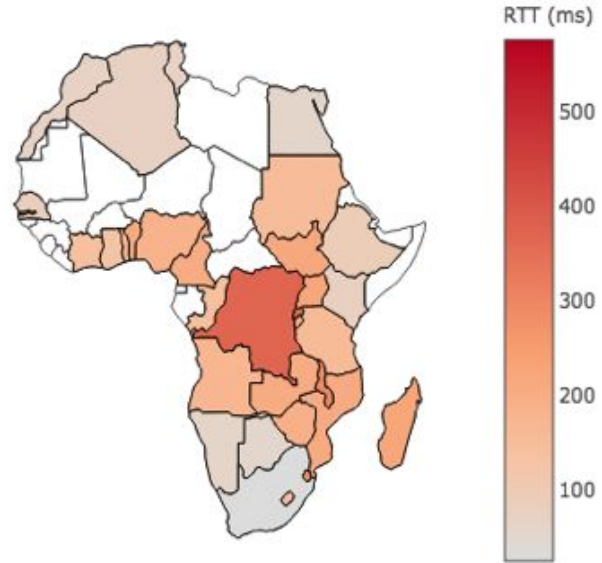
Country-level distribution of remotely hosted African news websites

RTTs to news websites

RTT to locally hosted news websites

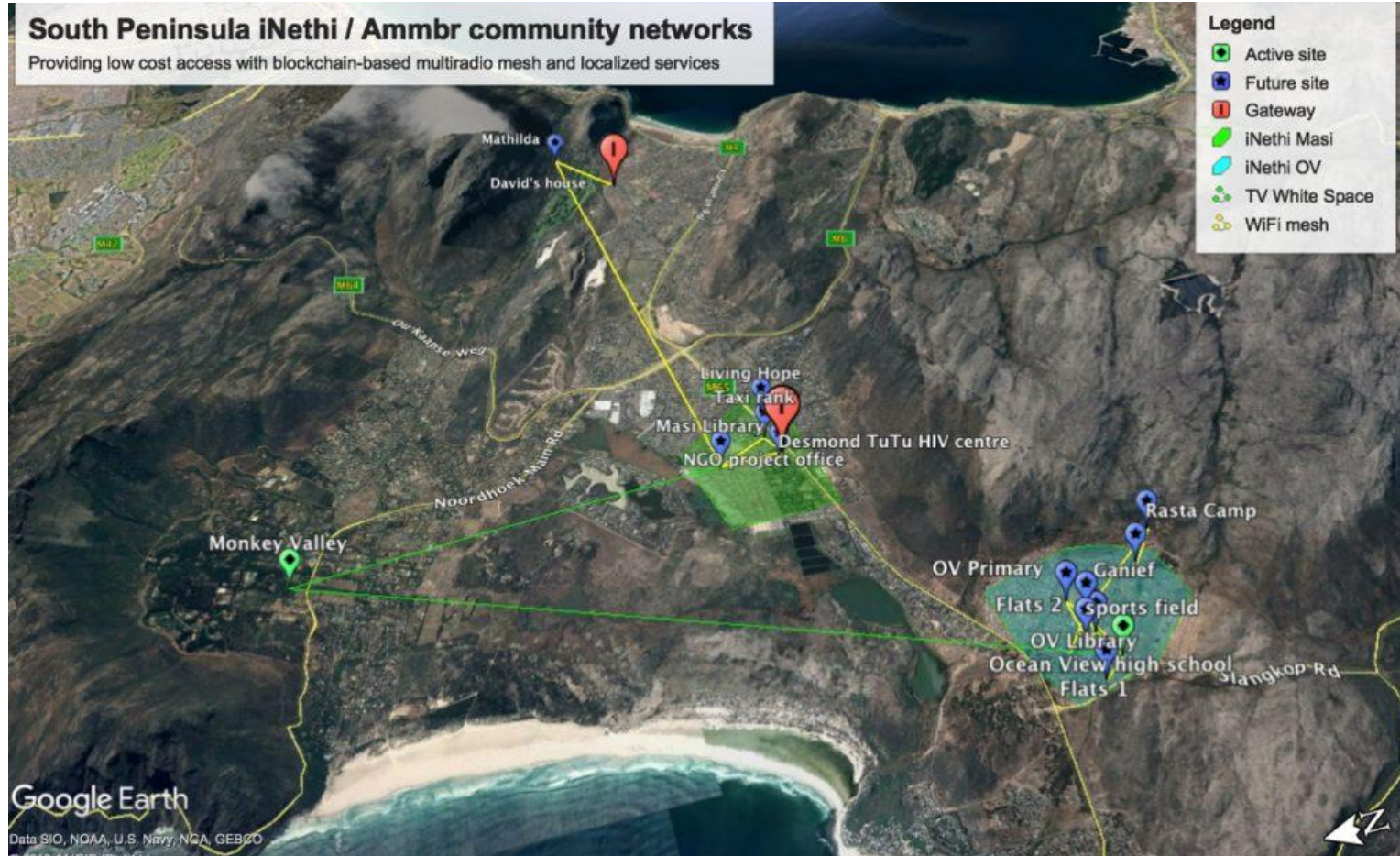


RTT to remotely hosted news websites





Community Network with Local Services



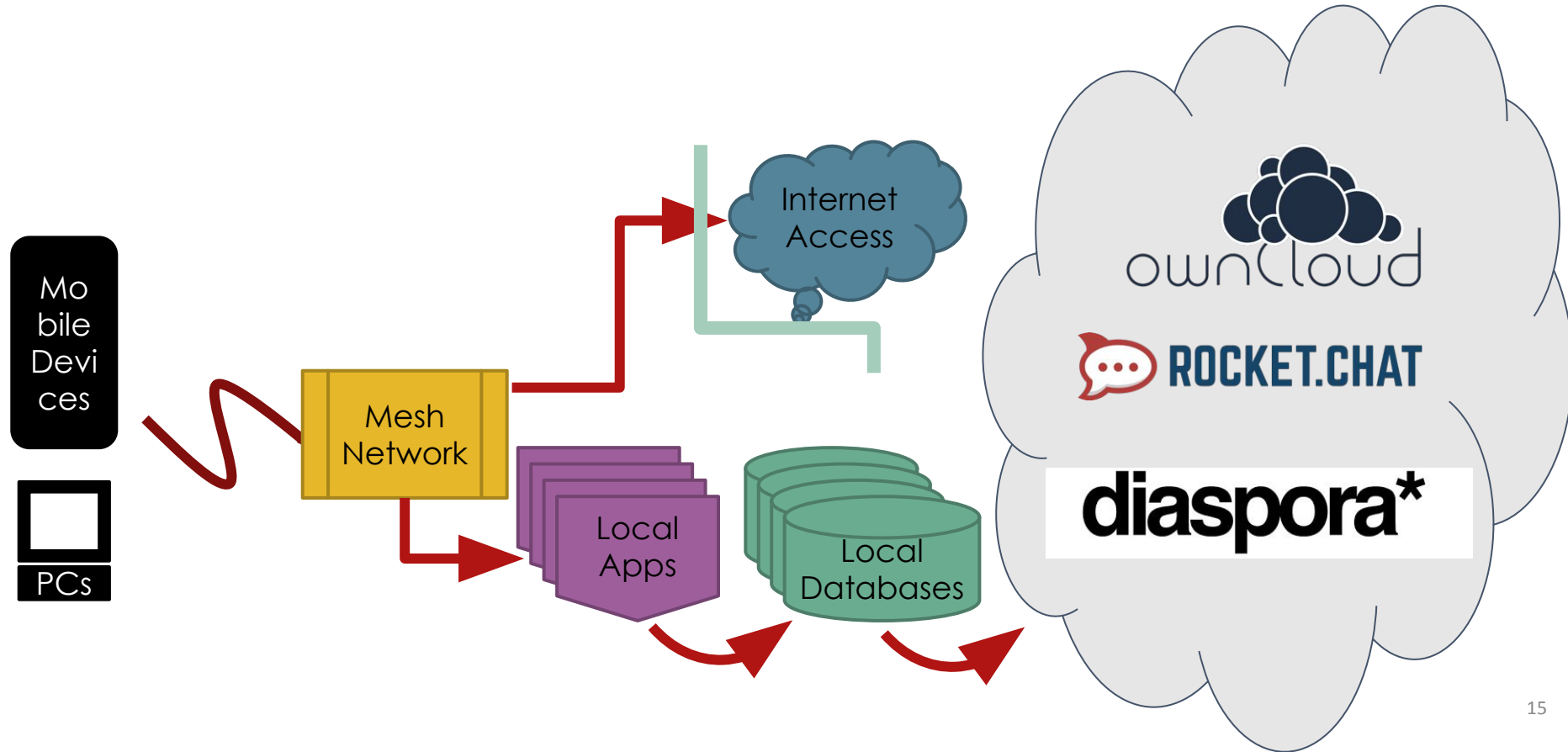


overview and philosophy



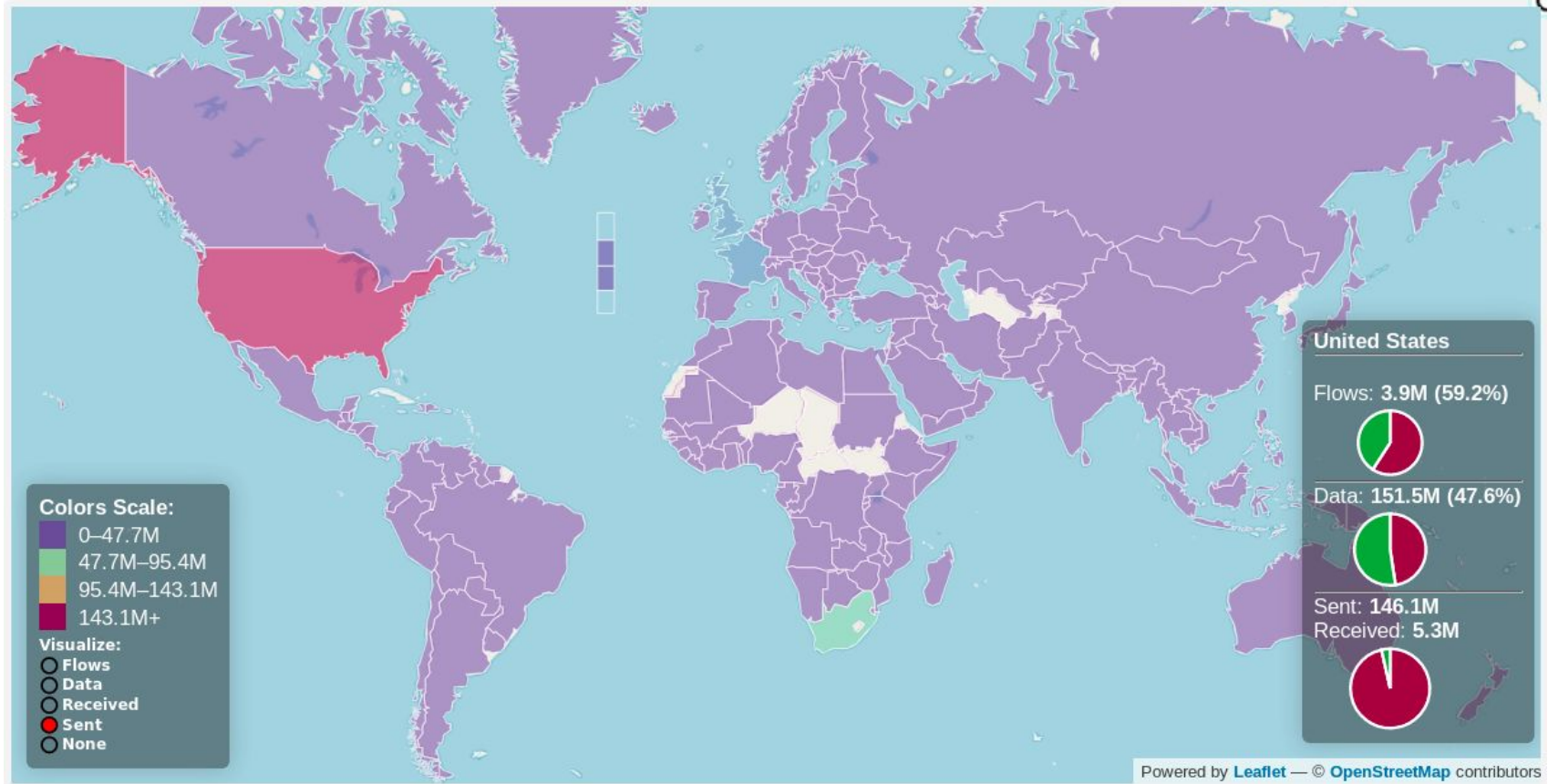
- Uses mesh with TV White Space (TVWS) and WiFi radios
 - Mesh provides simple set-up (self-forming) and repair (self-healing)
 - Mesh routes over TVWS or WiFi or both to provide better coverage, capacity and redundancy
- iNethi Cloudlets for decentralized content distribution
 - Encourage content generation 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

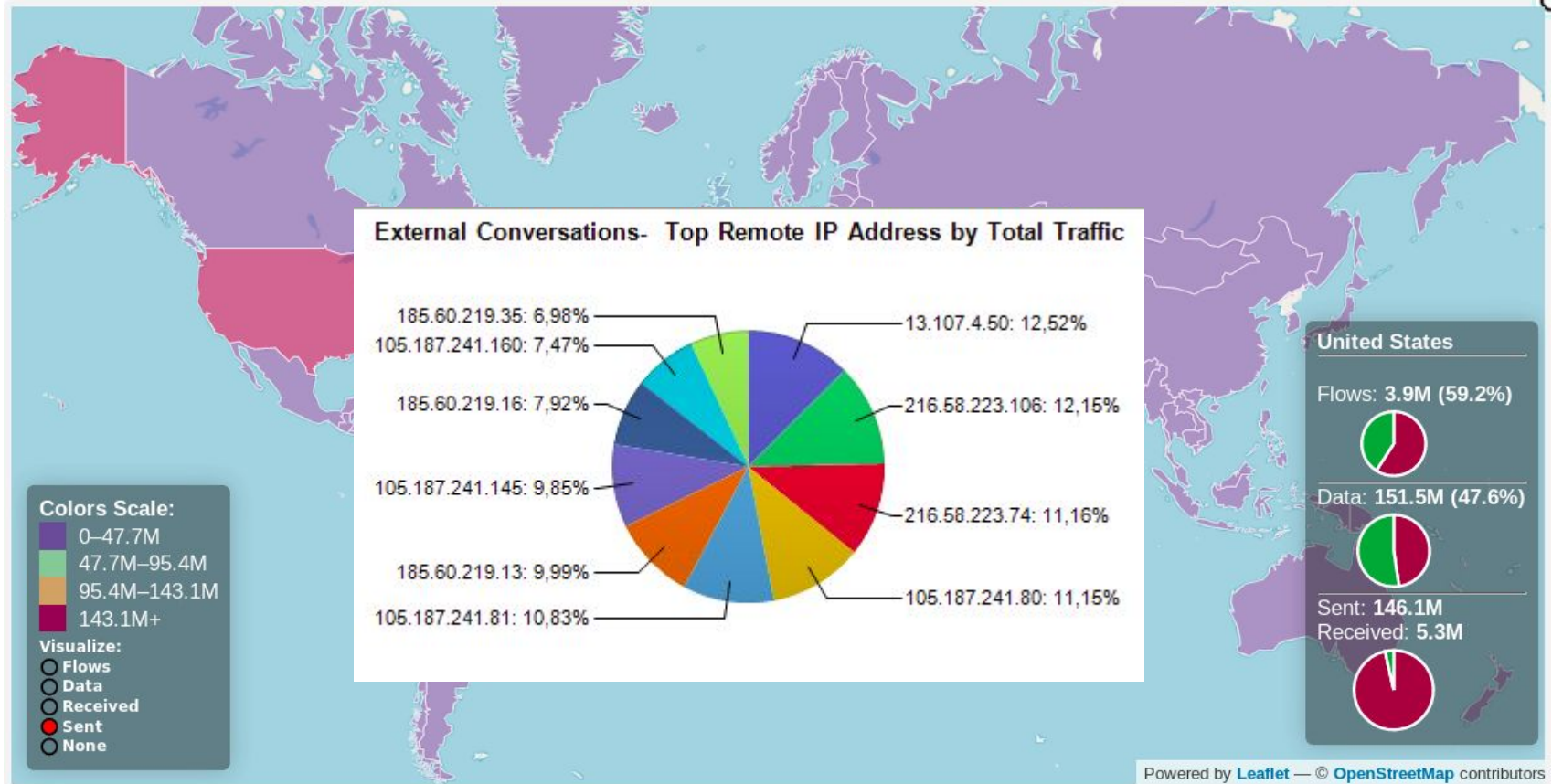




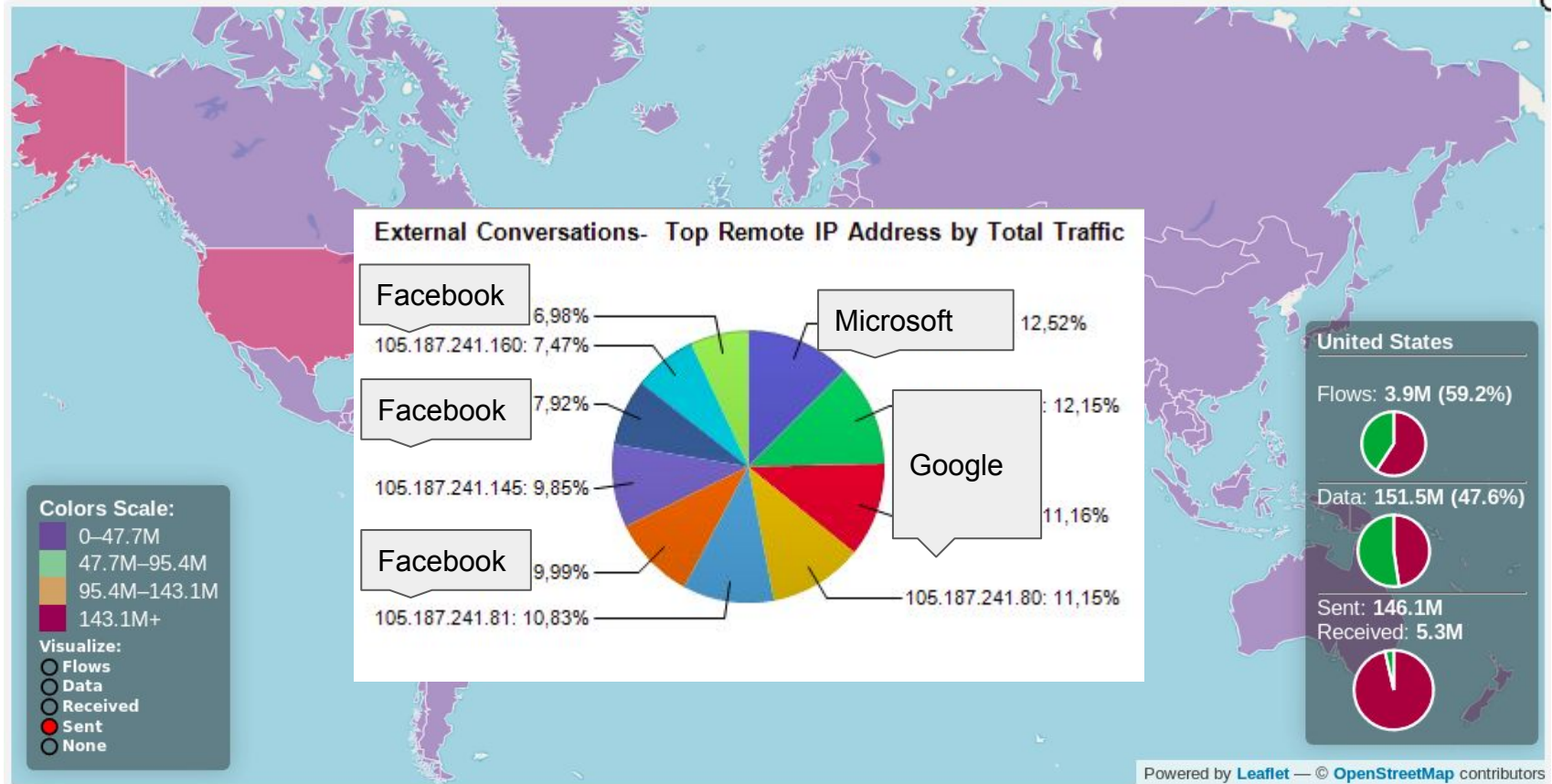
Community Network with Local Services



Community Network with Local Services



Community Network with Local Services





Next?

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

Thank You

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