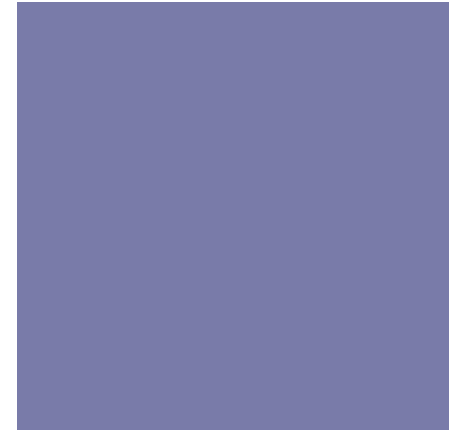




Reassessing Long Distance Wireless for West Africa



Melissa R. Ho School of Information

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Wireless Broadband Access for Communities
and Rural Developing Regions (WIRELESS4D'08)

Karlstad University, Sweden

11-12 December 2008

+ Long Distance WiFi



+



=

long 10-150km

cheap \$1000

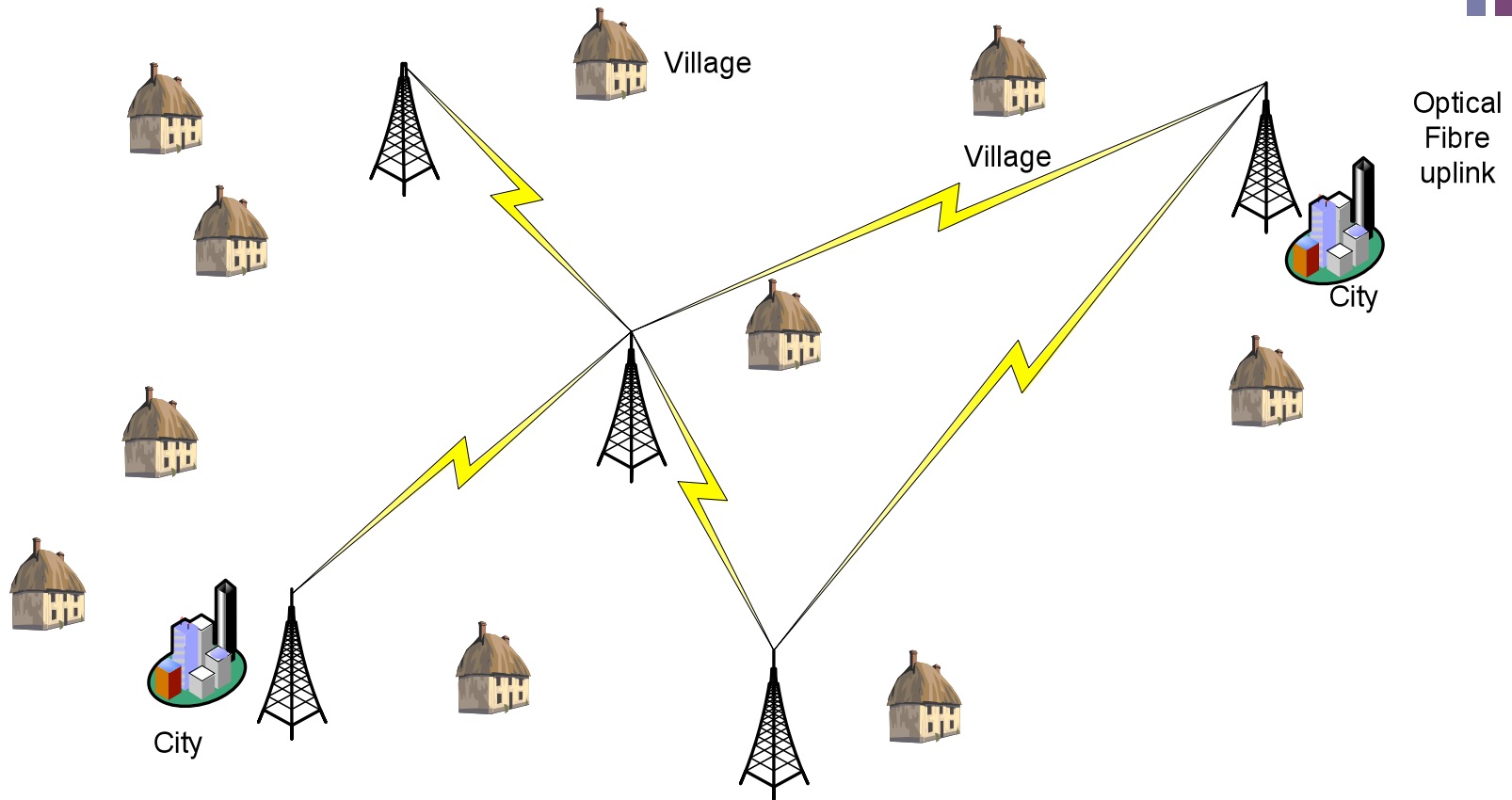
free spectrum

fast up to 20Mbps

wireless links



+ Wi-Fi Long Distance (WiLD)





El Alguila to Platillon – 382 km
6 Mbps with WiLDNet

+ Aravind Theni Telemedicine Network



Real Impact





Guinea-Bissau

Ghana

+ But what happens in other contexts?

Two cases in West Africa: a community radio network in Guinea Bissau, and a inter-university library network and hospital telemedicine network in Ghana



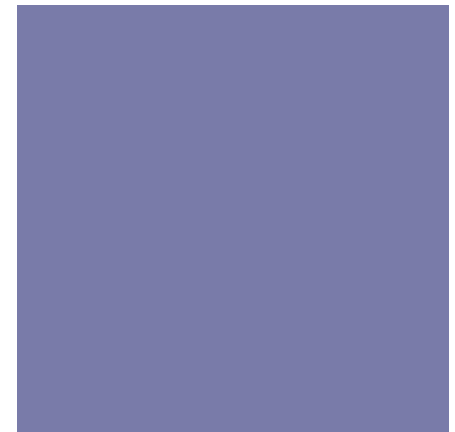
Guinea Bissau: Community Radio Syndication Network

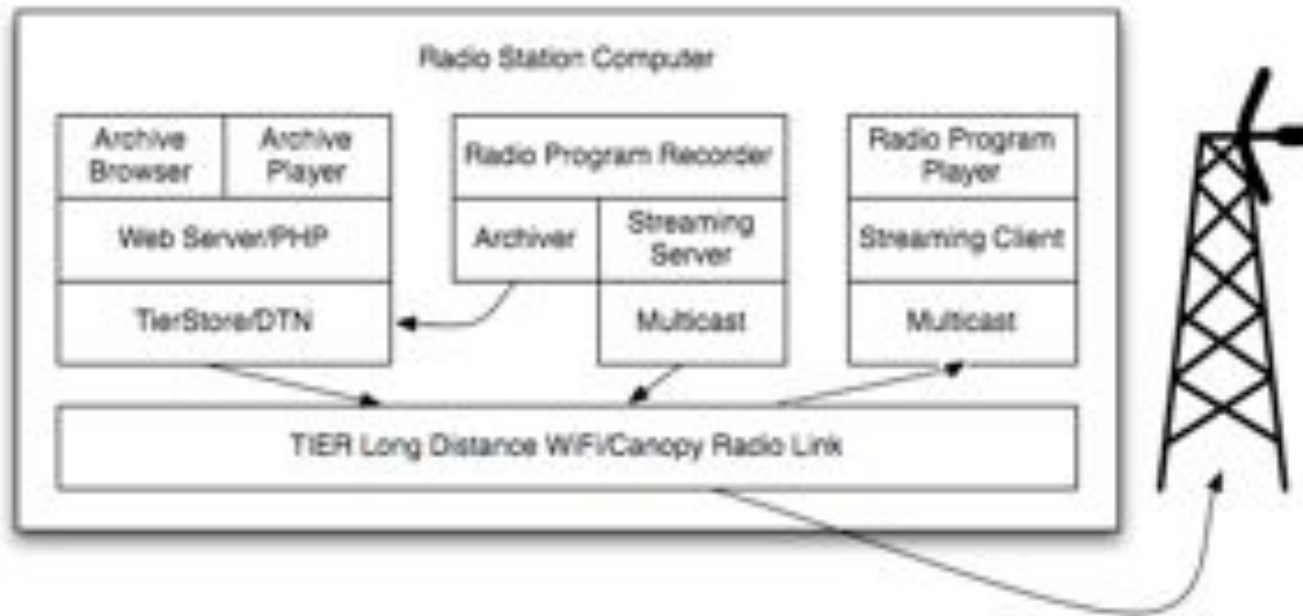
Collaboration with US-AID and Eguitel

Networking 15 community radio stations

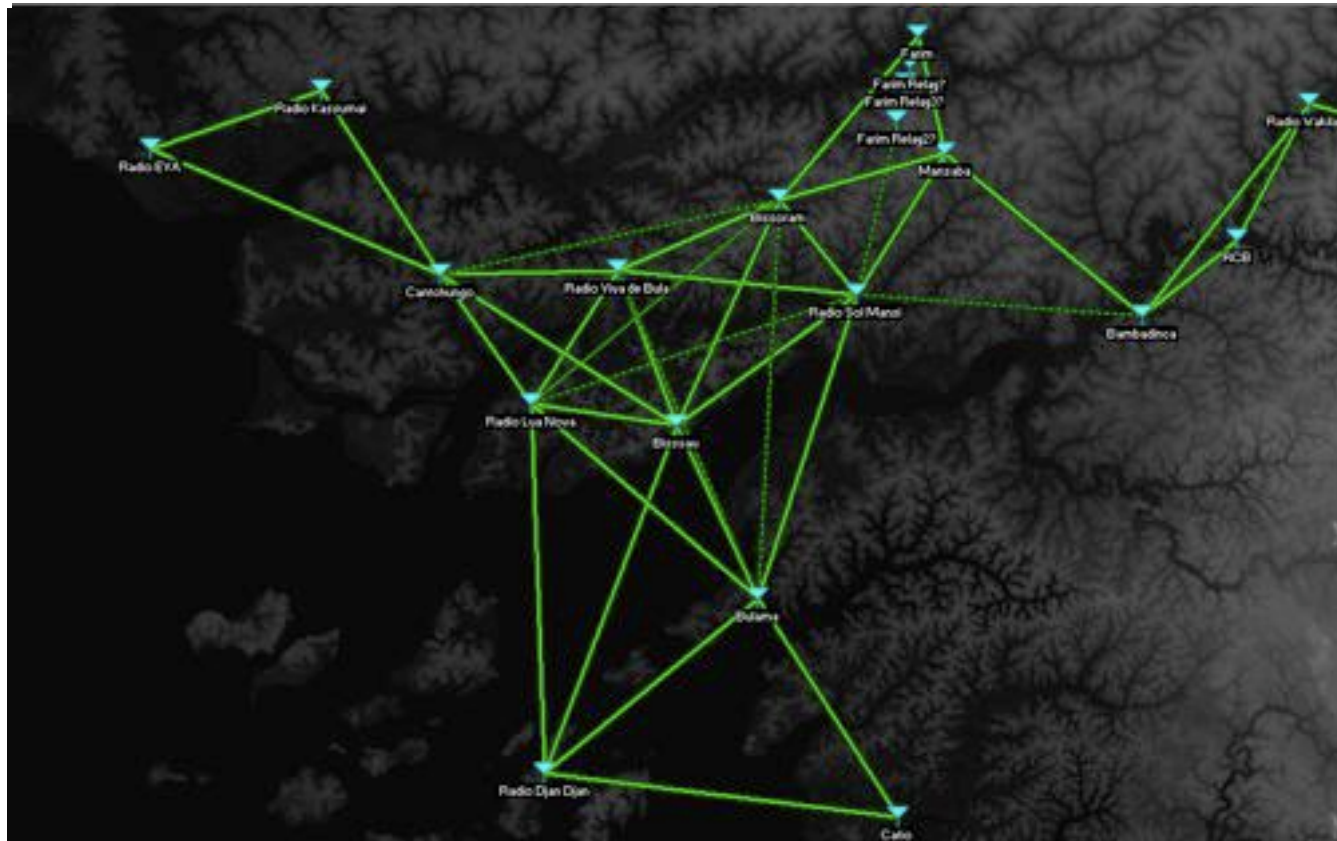
DTN/TierStore overlay enabling content sharing of recorded broadcasts over intermittent network

Wireless network utilizes existing radio station infrastructure: power, mast, and technical expertise





+ Guinea Bissau Software Architecture



+ The Guinea Bissau Network



Ghana Wireless Inter-University Network

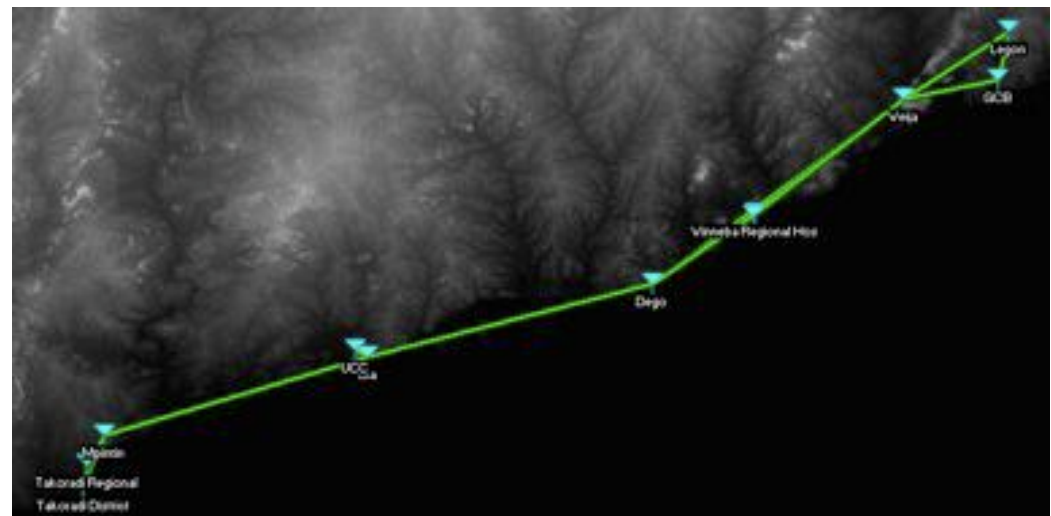
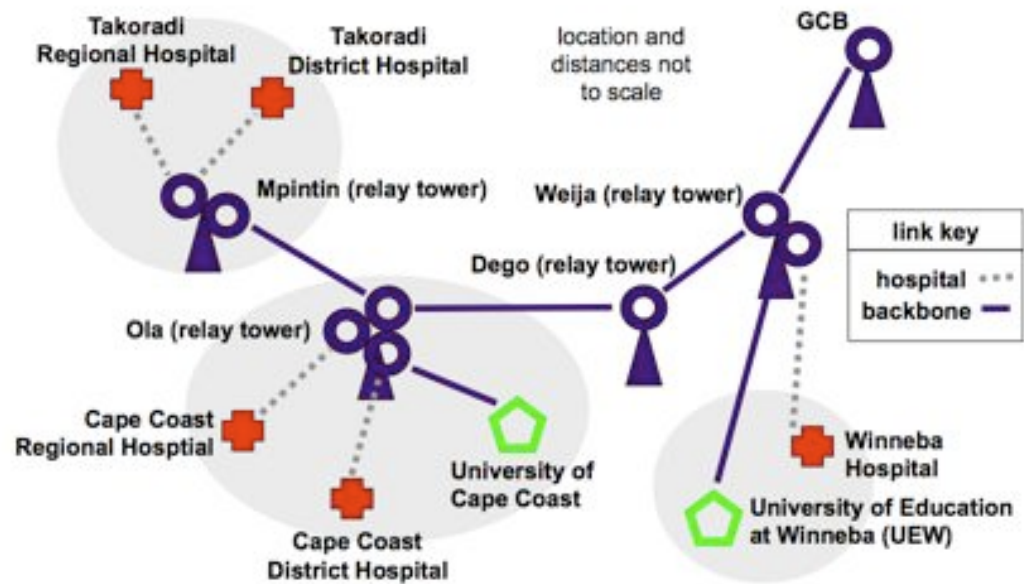
Dedicated wide area network (WAN)

Inter-library communication for card catalog sharing and electronic library resources

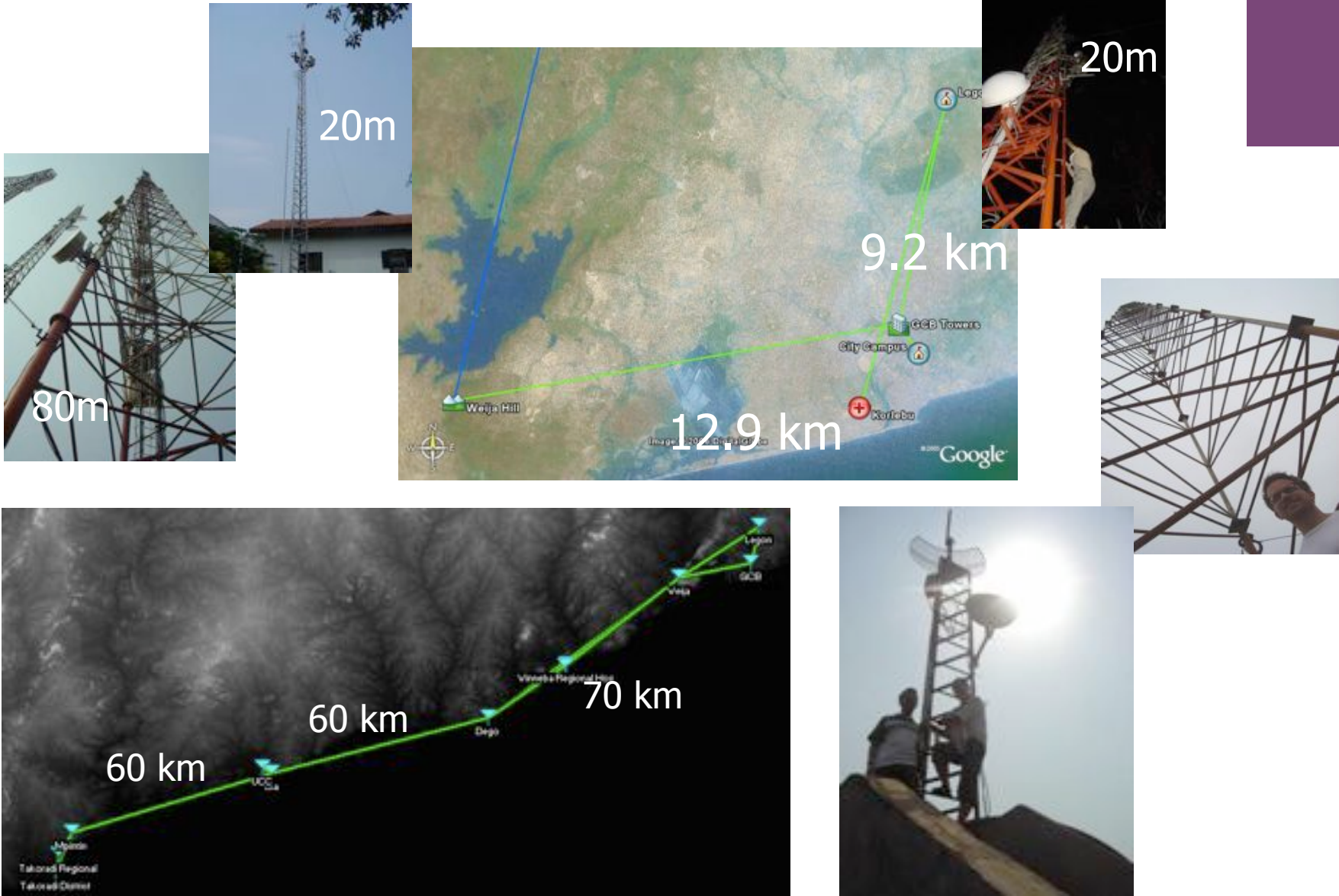
Use of local partner for installation and training

Network maintained by university students and network administration staff

Complementing existing GARNET project

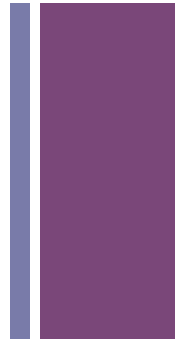


+ Ghana Inter-University Wireless Deployment



+ **Low-cost equipment alone
could not catalyze rural wireless
broadband in these contexts**

- High transportation costs
- Increased labor costs
- Increased infrastructure costs
- Poor power infrastructure
- Local policies: spectrum, customs/import
- Highly regulated/monopolized telecommunications sectors



In Africa

- Concentrated in urban areas
- Mostly Monopolies
- SAT3/WASC/SAFE submarine fiber to Portugal
 - Exclusive rights initially granted to select investors
 - Access is generally overpriced
- Largely served by VSAT
- AfrISPA has established Internet Exchanges in 13 countries



Ghana Remote Relay Station Costs

- Towers are a bulk of the cost for wireless deployments
 - \$200/m up to 30 meters
 - \$300/m over 30 meters
 - 150m tower can cost over \$100,000
 - Annual Maintenance: \$1000
 - In Ghana, material availability is a problem, and towers degrade after a few years

- Spectrum Licensing
 - 2.4 Ghz registration \$500/yr
 - 5.x Ghz license \$5000/yr/channel/site

- Field Engineering
 - Hotel: \$50/night/engineer
 - Daily rate: \$110/day/engineer
 - Transportation:
 - Petrol: \$.50/mile
 - Vehicle: \$.50/mile
 - Total: \$50-\$500 per trip (aka roll)



Technical Challenges

- Roadblock #1:
Load shedding
- Roadblock #2:
Equipment-less
- Roadblock #3:
Tower-less
 - Pricing Installation
 - Commissioned vs.
Dedicated Staff



+ Administrative Challenges

- Rational and affordable spectrum policy
 - In Ghana 2.4 is oversubscribed in urban areas
 - Eguitel has a completely open license – immediate short term gain, but possible long term implications
- Maintenance of an inherently unstable network
 - Compounded by collaboration between several different university units



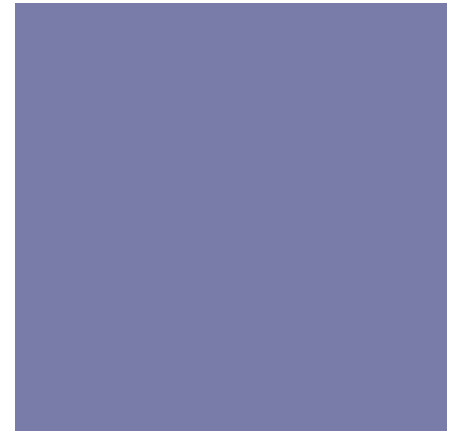


Addressing the Challenges

Often the best solution is to reduce the length of the links and the required height of the mast by introducing **intermediate relay points**

In these cases intermediate relay points *were not available*

- kapok trees as pre-existing mast structures
- electrically steerable antennas
- lightweight, passively cooled equipment
- low power solar/wind powered equipment
- prioritize reliability and robustness to failure rather than “low cost”
- remote monitoring of power systems (e.g. battery health) for preventative maintenance
- design for asynchrony to reduce the cost of the system
- enable trained engineers to work more efficiently or deploy equipment that can be maintained by less-trained staff





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