# Digital World Forum

## Wireless Africa

Kampala

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# “how do we make Community Owned Networks work for the poor?”

- Experiences from FMFI
- Outcomes FMFI
- FMFI Recommendations
- Challenges
  - power
  - technology
  - capacity
  - policy
  - demand
  - pro-poor products & services
  - emerging business models
- Wireless Africa - towards sustainability models for Community Owned Information Networks

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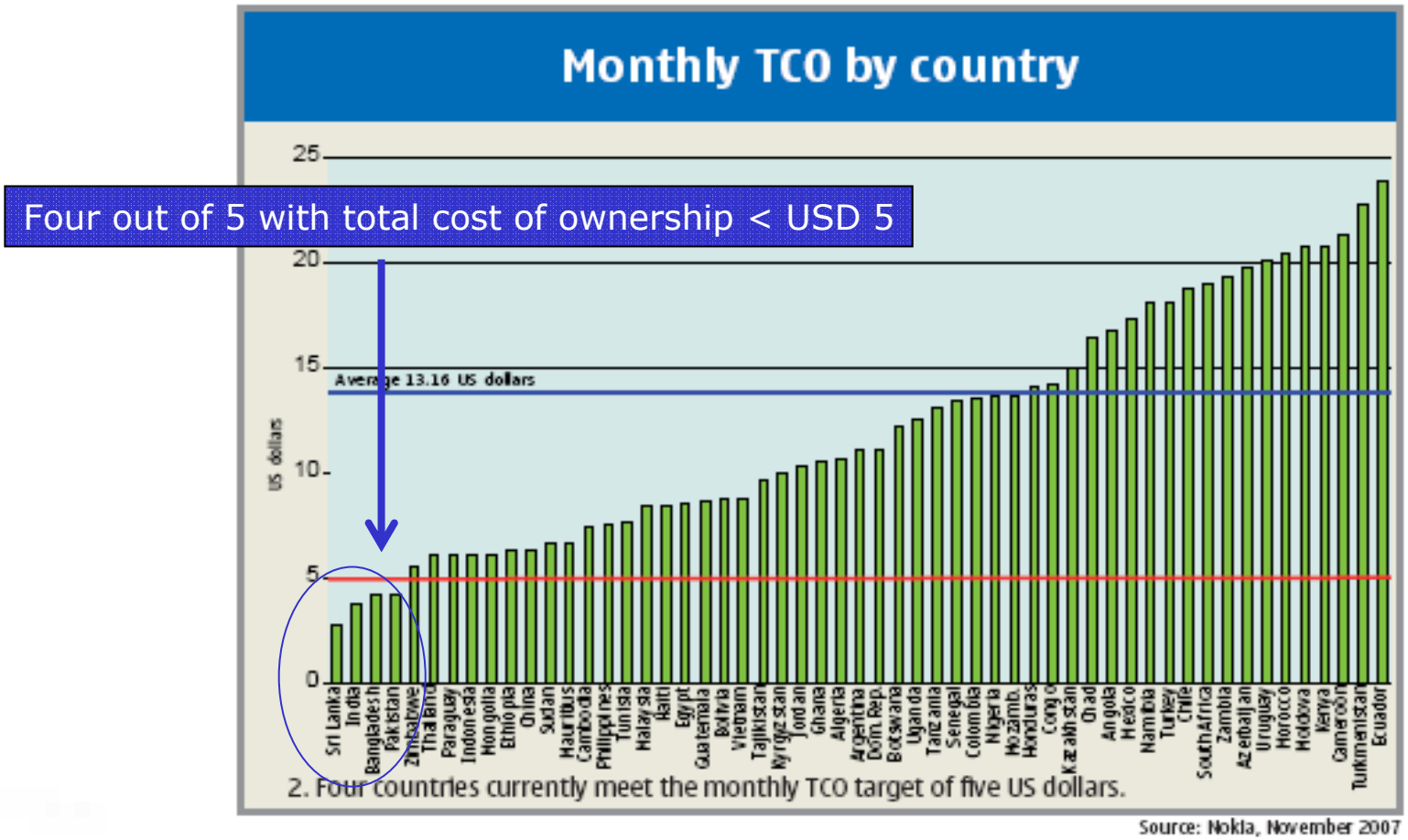
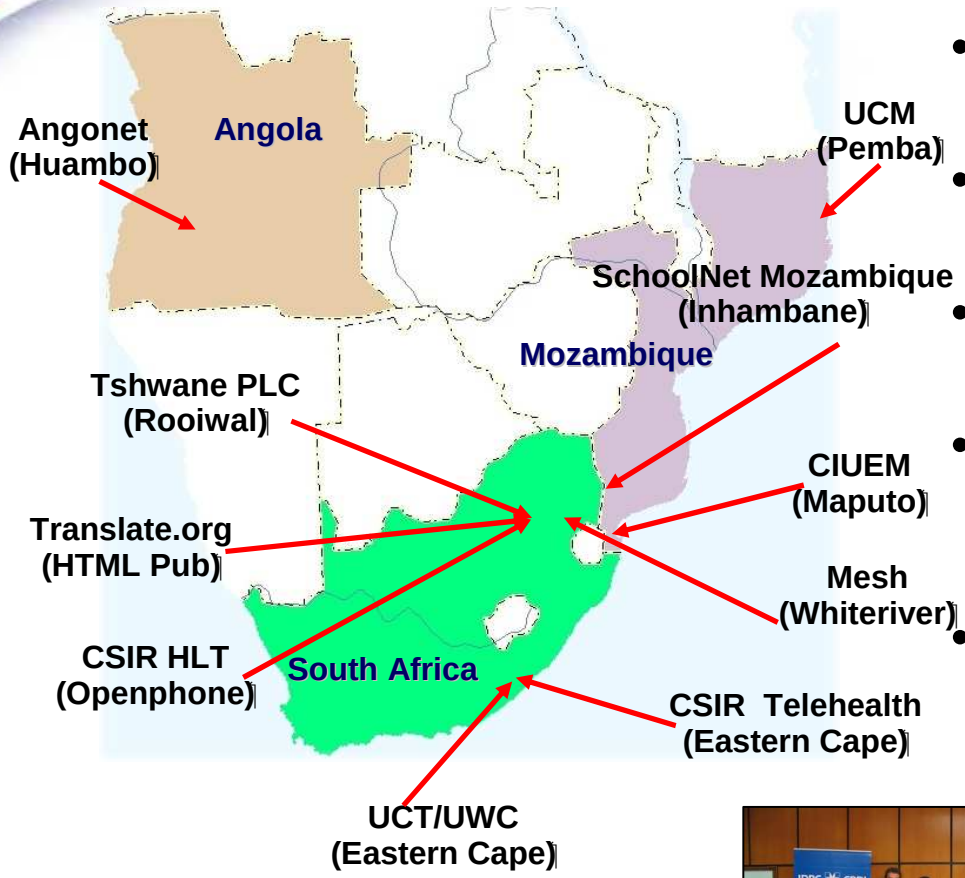
# So, how do you explain this?

- Four South Asian countries + Uzbekistan have the lowest Total Cost of Ownership (TCO), according to Nokia




Source: Nokia, November 2007

# FMFI Projects & Partners




- Paradigm shift from traditional "last mile" & "last inch" thinking
- Nine project partners, Ten implementation sub-projects
- Implementation of innovative first mile technology solutions
- Research of social issues, the user interface and the context of the first inch
- Establishment of a network of regional researchers

IDRC CRDI

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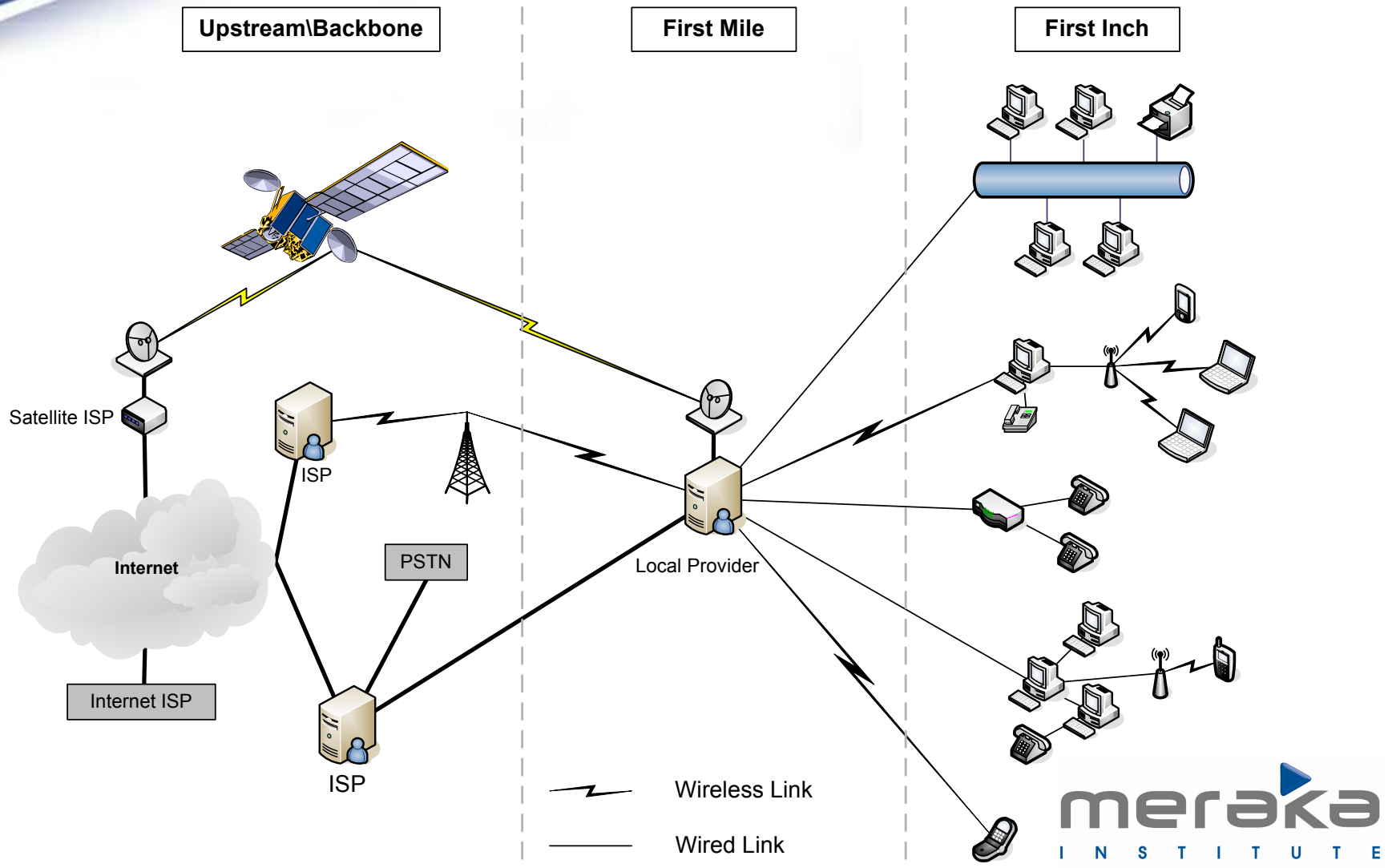
# Definitions: “first mile & first inch”

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# FMFI Projects…cont.

- Improve communication between doctors, health workers and clinic sisters in the Eastern Cape, Tsilitwa and Peebles Valley,Mpumalanga provinces of South Africa

- Improve education in remote parts of Mozambique, Inhambane and Namibia by providing internet access to schools using WiFi technologies, refurbished PCs and open source software

- Use Human Language Technologies to create an authoring environment for a telephone-based information systems at tele-centres (Open Phone).

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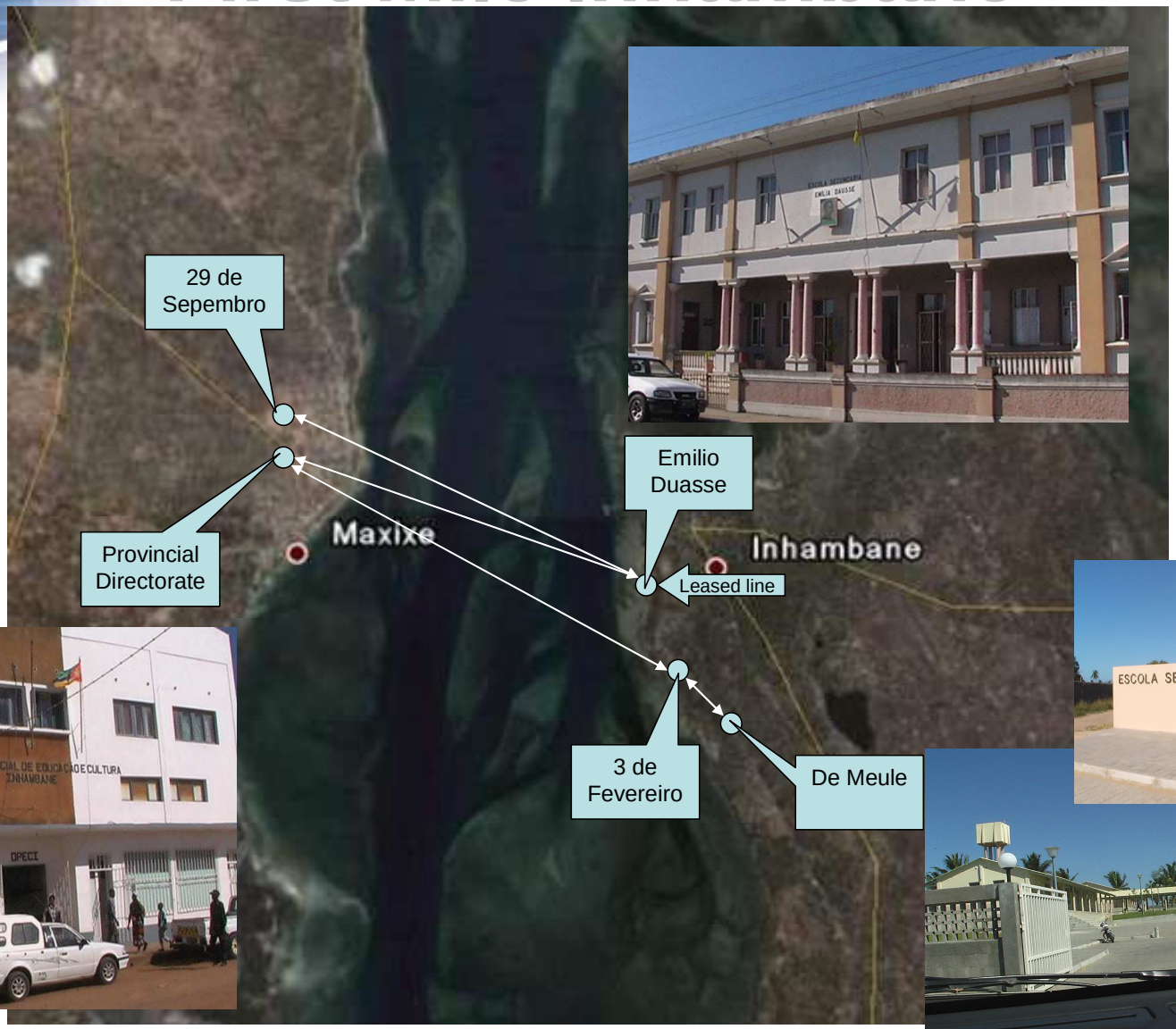
# Outcomes

- Implement innovative, low-cost connectivity solutions
- Changed behaviour in the use of ICTs – how the use of ICTs has changed community life
- Cost and benefits of solutions – to quantify what is meant by low cost connectivity
- Scalability and replicability of technologies – the viability of rolling out the solution
- Influence on policy and regulation – demonstration of project benefits to the regulator

# First Mile Inhambane









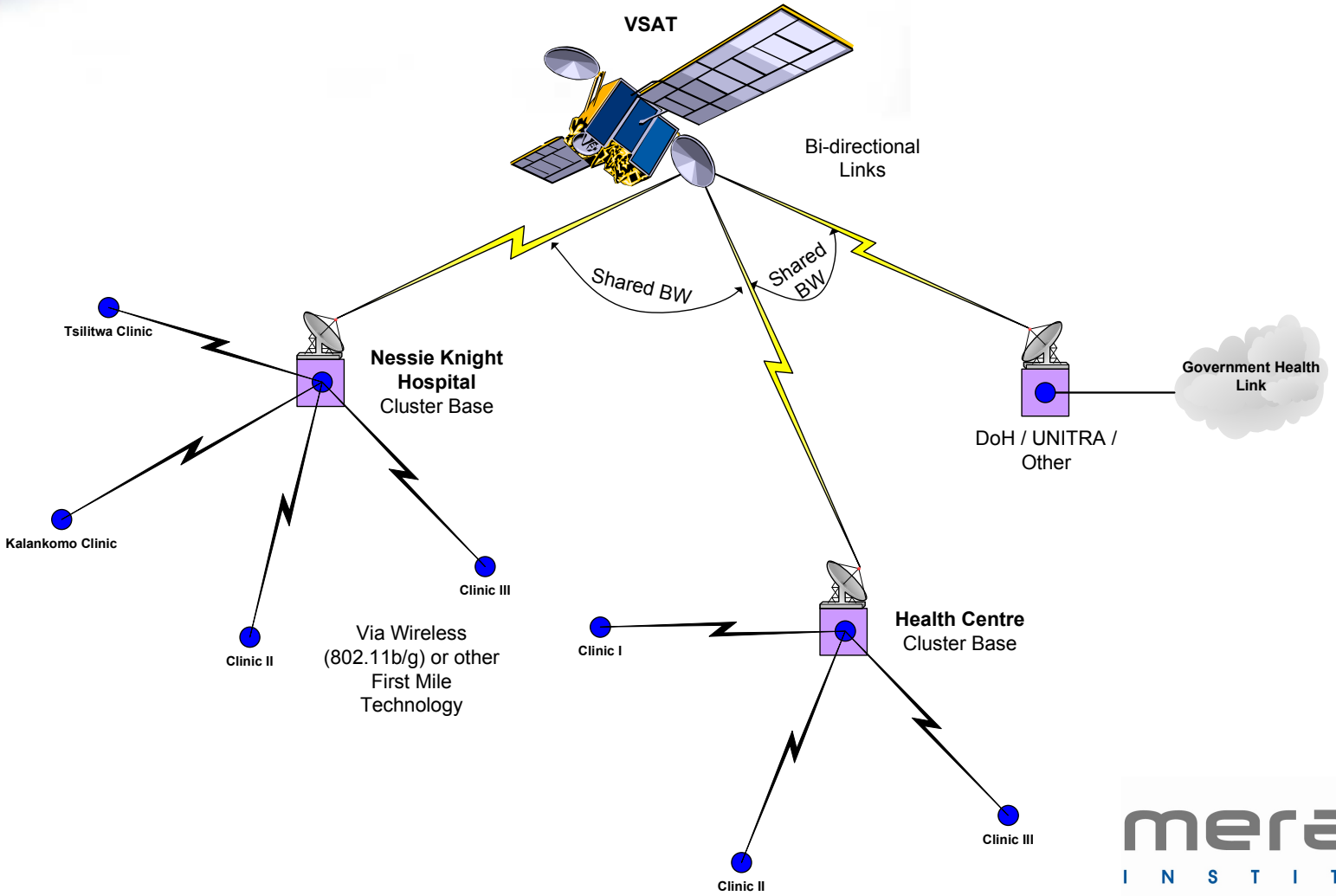
# Schools project Inhambane "the land of the good people"

- Challenges
  - Lack of infrastructure & bibliography at the schools
  - Min Education directly involved in the ICT initiatives
  - connectivity cost burden carried by individual schools
  - mainly limited access (time) to the Internet linked to the cost of dial-up connectivity
- Solution
  - Clustering of schools
  - share the existing leased line at the EPCI telecentre next to the Emilia Duasse School and distribute the connectivity from this point to the nodes in the network through line of sight antennae.

# Inhambane Schools Outcomes

- Policy
  - Ministry of Education subsidises connectivity costs
  - sharing of infrastructure health & education
  - Regulator will grant license exemption for health and education
- Capacity
  - User uptake - ICT's enhance the opportunities for communication, collaboration and sharing of knowledge.
  - Teachers can establish human networks for information dissemination and knowledge sharing and start their own knowledge action groups to develop, discuss and distribute local educational content.
  - a skills development strategy was developed and implemented for teachers & learners
- Scalability
  - using the existing GSM tower infrastructure to mount WiFi antennae to expand mesh networks

# Rural Health Network Concept

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# Boundary Partners Tsilitwa

## Tele-Consultation

Send site

Receive site

## Tele-dermatology


# Telehealth Outcomes

- Capacity
  - Building capacity and understanding of user-uptake issues
  - An effective telehealth solution depends on the commitment of the entire chain of command in the health environment to use it from clinic to specialist.
  - Change management - facilitate individual use by the clinic staff, the hospital doctors and upwards to the district and provincial level personnel.
- Policy
  - Eastern Cape Department of Health Telehealth strategy
- Scalability/Replication
  - Department of Health strategy for 26 clinics

# Challenges and Next Steps

- Community ownership – “bottom-up” approach
- Understanding the benefits of technology
- Sustainability models
- More research in understanding the human/technology interface
- Scalability and replicability, power
- INFLUENCE

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# FMFI Recommendations Technology

- Wireless for rural connectivity – **renewable energy**, low-powered, heat and dust resistant, lightning protected
- First Inch applications should be implemented over existing wireless networks
- Technology development needs to be informed by user needs and demand-side studies
- Technology must be simple to install and maintain
- Mesh equipment with low power, solar panels and built in battery storage, out of the box solutions

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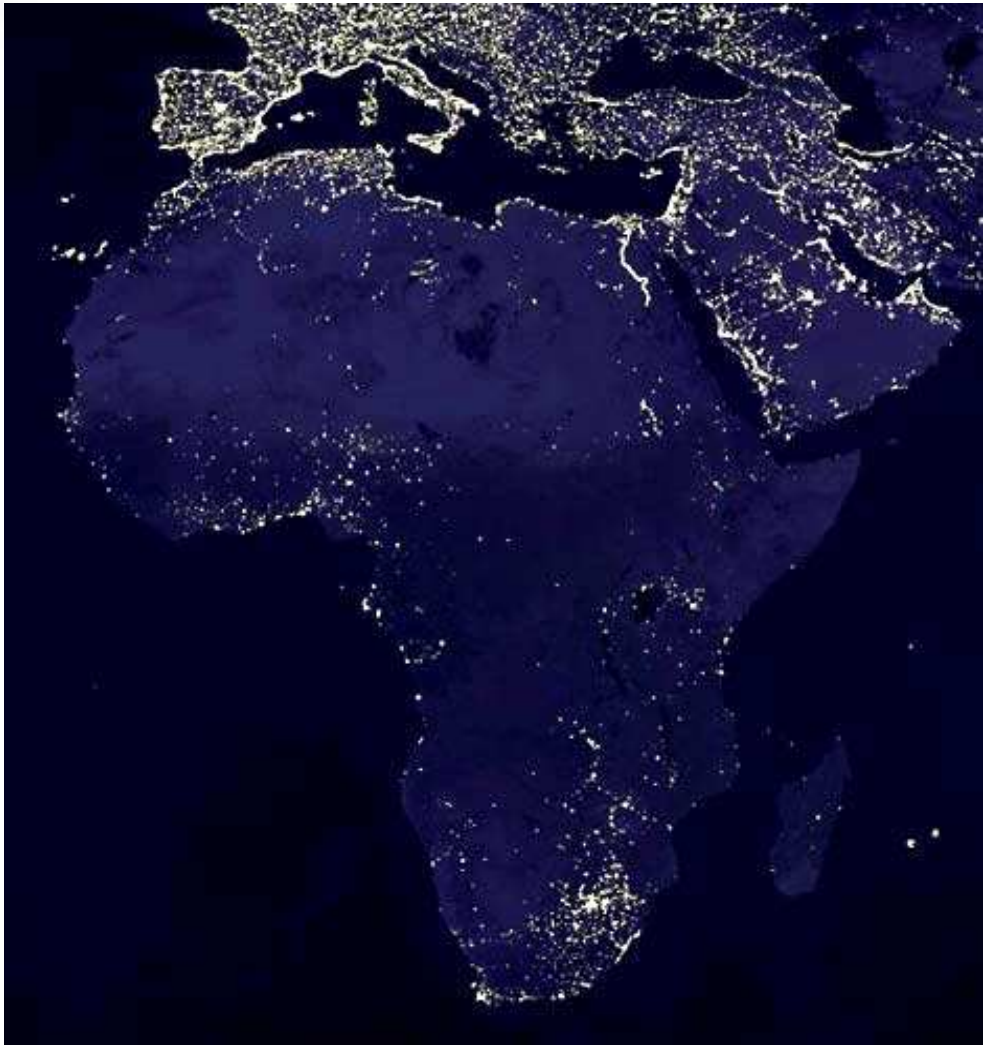
# Deploying ICTs – Power



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# Power

- Solar power is expensive - approximately $5 per Watt (based on the flexible PVL panels we are using) PC 30W

  Solar expensive, therefore reduce power consumption by 90% and save on total project costs by 50% through the use of low powered devices

- Solar panels are an easy theft item and can be easily disposed of. This is somewhat mitigated by using the flexible solar panels we are using for the DD. The panels are glued to the container roof and can not be removed. If you try to remove them, they tear and become useless. They also do not look like solar panels.

- Need a charge regulator to charge the batteries from the solar panels. These come in various forms and efficiencies.

- Need to provide deep cycle batteries to power the equipment. These are also expensive (R900 per battery) and are high risk items for theft.

# Power

- We currently use 5 68W solar panels and 9 105Ah batteries. This gives us about 3 days of no / little sun.

- Factors that influence the number of panels & batteries include: Load (how many amps you require), physical location (because of the different angle of the sun between Pta & Cape Town), how many days you plan to have little or no sun, available roof pitch (ideal pitch is 35 degrees and facing North), etc.

- Currently there are very limited 12Vdc systems available in SA. We currently use a dc to dc supply from *www.mini-itx.com* to power a standard Via based motherboard. This configuration is not very power efficient, but it is more efficient than using an inverter to convert 12Vdc to 220Vac.

# Power

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# Solar power

## Dimensions

depending on final hardware - Work prototype has

**13 W (1 node version)**
**18 W (2 node version)**

**Compromise** between cost and operations margin:

**More power with less power!**

*pictured:*

*prototype of solar powered Meraka mesh node*

# FMFI Recommendations Technology

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# Wireless is easy, ...

## but ...

... we need to

**down**skill **technology,**

**up**skill **people**

in order to
get up to speed and scale

# 2006 @ the London meeting

organized by the Association for Progressive Communications, brings together about 50 people active in wireless networking on the african continent

Janet Haven (OSI) writes:

“Another group looked at software issues: if one were to aggregate **the technology needed to run a WISP - from mesh networking software to billing systems that worked in a world without credit cards - what would it look like?**
Building off the Tactical Technology Collective's popular "in-a-box" idea, everyone around this table agreed to work towards a "**WISP-in-a-box**".

# WISP in a box

## will ...

put together **the best components from the open source / free software world,**

make them **easy to use,**

run them on **low cost, low power hardware**

to create an
**easy wireless ISP box**

and make this product available to
**entrepreneurs, activists, movers of all kinds**

in order to help bringing
**connectivity to underserviced, underprivileged and overcharged communities in Africa**

# VoIP Potating...

## VoIP and Open Hardware for developing regions

Authors: Alberto Escudero-Pascual & David Rowe



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# Free Telephony Project 1

- many people working in open software
- we are working in open hardware
- designs can be copied modified, re-used without restriction
- we encourage cloning of our products

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# IP04

- The IP04 is a low cost phone system that can switch phone calls from analog phones or phone lines over the Internet using VoIP. The IP04 is a professionally designed product that is in volume production today.
- The Free Telephony Project provides free hardware designs for telephone systems. Both the **hardware** and software are open. The hardware for a complete embedded Asterisk IP PBX (including multiple analog ports or a T1/E1) can be built for a few hundred dollars. No PC is required.

# Free Telephony Project 2

- trend: functionality shifting from hardware to (free) software
- trend: total system costs constantly dropping
- falling costs are a good thing for the developing world
- leverage trends using free hardware designs

# Why Free Telephony Project?

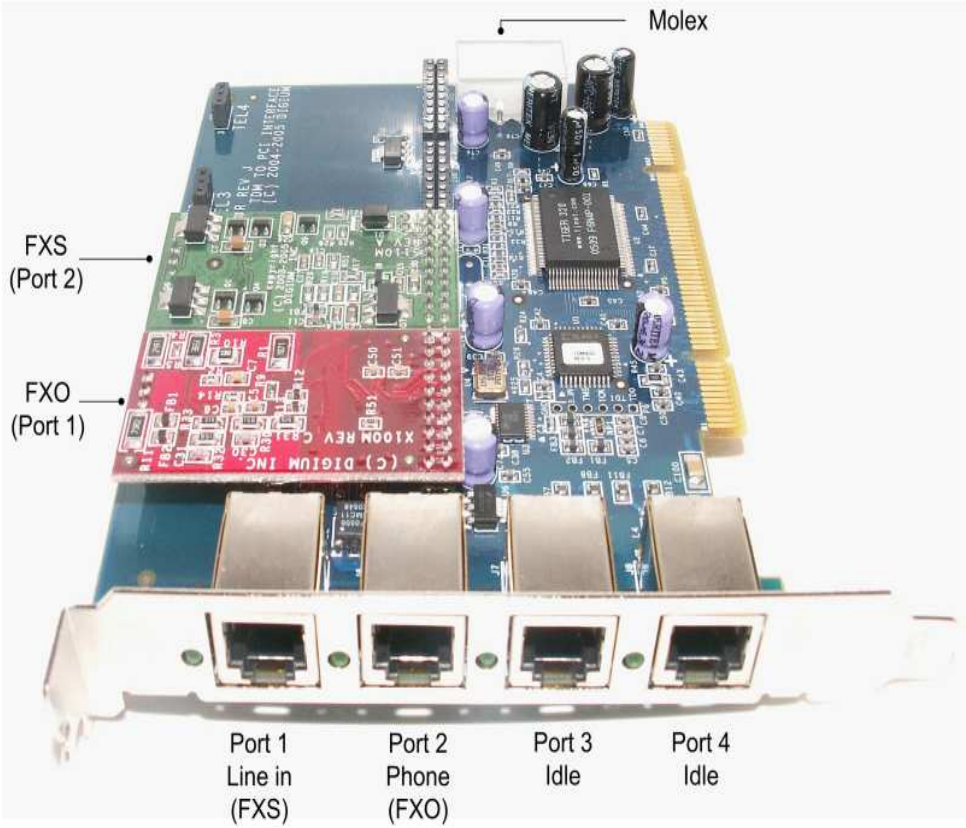
- Hardware designs are free as in speech
- Use FOSS and Open Hardware to drive system costs down
- Lower the cost of telephony for everyone on the planet
- A phone call should be a human right, not a privilege

# Open Hardware

- normal hardware costs include 70% overhead
- exciting new business models, e.g. OLPC
- dramatic price reductions
- local manufacture
- customisation, localisation, e.g. solar, wireless

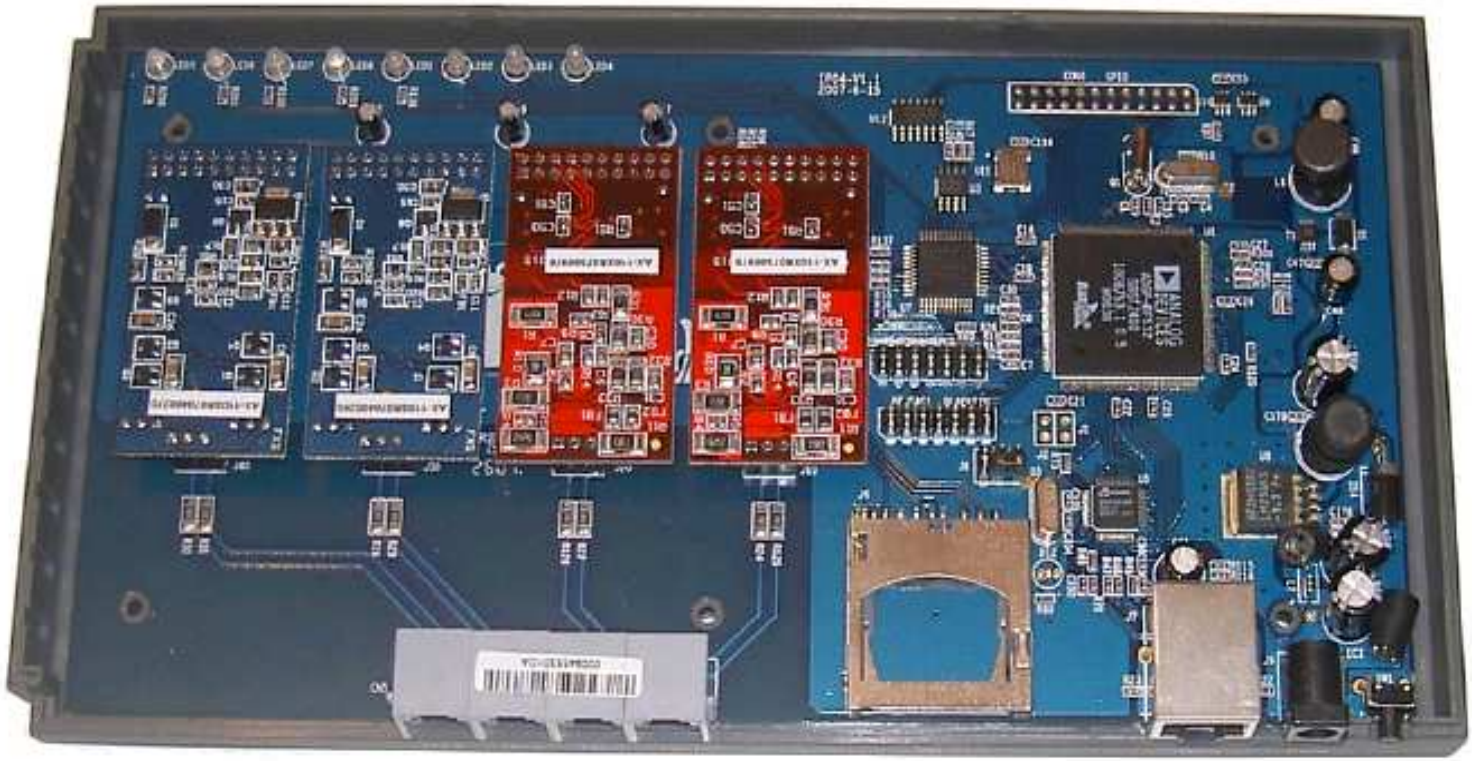
# Asterisk Hardware 1

# Asterisk Hardware 2




TDM400P Wildcard, 1FXO +1 FXS

# IP04 IP-PBX



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# VoIP and GSM

- VoIP can extend GSM/PSTN network at edges, revenue for incumbent telcos.
- IP04 plus WiFi backhauls costs are 5% of GSM deployment (base station)
- free, untimed, community owned networks
- or local business models

# VoIP in a Box

- How easy can we make VoIP over Wifi?
- First Pass – preconfigure Ubiquity NS2 and IP04
- simple training

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# Policy

- A key objective of the FMFI is to use evidence-based research results to influence and inform policy in the telecommunications domain.
- In order to do this, it was necessary to understand the regulatory framework in each country in order to know what the project was trying to influence.
- In light of the limited ICT coverage in rural Africa, rollout of WiFi networks provides great potential to stimulate extended ICT access. This is due to the relatively low costs of WiFi once the backbone connectivity is in place, which enables community-based, or bottom up, deployment.
- All the FMFI partners involved in direct implementation are using some form of WiFi. The current regulatory framework in Southern Africa poses significant challenges to deployment of WiFi community networks.

# South Africa

- In order for community owned networks to be legally pursued, the regulator requires such projects to obtain both a PTN as well as a VANS licence.
- The regulations governing ICT facilities dictates that they must be interconnected with those belonging to Telkom, Sentech, the mobile phone companies or the Second National Operator.
- Under the Electronic Communications Act, a class licence would be needed by FMFI partners for both infrastructure and services, but the use of WiFi would still be hamstrung by the control on power levels and crossing public boundaries.

# FMFI Recommendations Sustainability

- The partners in most of the FMFI projects have taken the responsibility to secure backbone connectivity and distribute this to a range of community and institutional users. All of them have financial and funding constraints and have to ask a fundamental question: “Who is going to pay for (our and their) connectivity?”

- There are some other issues and questions in this regard from an FMFI partner perspective:
  - How do I motivate users who have enjoyed free connectivity up to now, to start paying?
  - How much do I need to charge to recover what it costs me?
  - Will people be prepared to pay for the service I provide?
  - If I start charging, how will I explain this to the regulator?

# FMFI Recommendations Sustainability

- Stimulate demand
- Aggregate the demand
- Business models need to be developed based on demand-side studies for community owned networks
- Billing and management systems need to be developed
- Involve government early
- Needs assessment and local champion
- More capacity building
- Gender

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# FMFI to Wireless Africa

- ***FMFI*** built wireless networks
  - Community Owned Information Networks for business and service delivery models in rural, poor communities

- ***Wireless Africa*** seeks to deploy value added services and business models
  - Towards sustainability models for Community Owned Wireless WISP and VoIP Networks

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# Challenges

- Challenge in rural communities is both to build demand and to aggregate that demand to make sustainable
- Aggregating the demand is the role of Community Owned Networks, build the demand around voice and internet services
- Challenge is to build enough demand to make sustainable – latent demand exists for peer-to-peer communication
- How do we make Community Owned Information Networks, COIN, work for the poor?

# Emerging COIN Business Model

- harness wireless networks, low cost technology and entrepreneurship to create community owned networks with a range of value-added services
- VoIP data traffic, however, travels directly between two peered phones – IMPORTANT because 60% of voice traffic in local networks stays local – within the community – and uses only the local network capacity and save costs
- Establish a series of interconnected wireless nodes, wireless nodes are smart mesh networks

# Vision

***A Wireless Africa built on sustainable Community Owned Networks for Rural Development***

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# Wireless Africa Aims

- aims to overcome failures in addressing the needs of rural communities through promoting innovative, cheap access in various contexts in order to test and to develop business models that support community owned networks whereby the infrastructure is owned and/or operated locally.
- implementing low cost, affordable technologies and applications that result in the high use, potential revenue and or dramatic cost savings for institutions and end users.
- Ultimately, the projects would love to see the expanded use of ICTs in remote African locations.
- lead to replication by identifying and promoting the successful Community Owned Information Network (COIN) business models and eliminating some barriers to seeing more COINs flourish (e.g. removing the technological barriers in setting up VoIP and WISP services).

# Wireless Africa Collaborators

- Morocco
- Tanzania
- Uganda
- Kenya
- Mozambique
- Zimbabwe
- Zambia
- Namibia

- Angola
- South Africa
- Ghana
- Rwanda
- Lesotho
- Nigeria
- Somalia
- Senegal

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# Wireless Africa

- Activities
  - Sharing
  - Benchmarking
  - Procurement – bulk buying
  - Taxes – policy research
  - International bandwidth - lobbying
  - Virtual support
  - Portal – training modules
  - Skills retention – negotiate corporates
  - Skills data base
  - AFNOC training

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# Development through Enterprise

- CK Prahalad [3] argues that capitalism can be the engine to eradicate poverty," if we stop thinking of the poor as victims or as a burden, and start recognising them as resilient and creative entrepreneurs, a whole new world of opportunity will open up".

- "While development aid and political reform are essential components in poverty eradication, equally important are business models that would engage low-income communities as producers and consumers in their own robust economies" [4].

- "Successful business models-inherently versatile, innovative, and driven by the profit motive--can sometimes tackle development challenges more quickly and effectively than government and aid mechanisms" [4].

# Emerging Business Models

- What is emerging is a new model that can harness the expanding power of wireless networks combined with VoIP, WISP and entrepreneurship to create community-owned communication networks and to provide over these networks a range of pro-poor products and services.

# Conclusion

- This paper discusses results from a series of multi-disciplinary projects that research cost and benefit models in the use of ICTs and how community owned networks can be supported through innovative business models in order to address the fundamental question: “how do we make community owned networks work for the poor?”

# Thank You

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