

meraka

I N S T I T U T E

African Advanced Institute for Information
& Communications Technology

WISP in a box

**Sebastian Büttrich, wire.less.dk
edit: June 2008 @ Wireless Africa**

Wireless is easy, ... **but ...**

... we need to

downskill technology,

upskill 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 underserved, underprivileged and overcharged communities in Africa

Pillars

- 1. Free Software / Open Source**
- 2. License exempt wireless**
- 3. Local ownership**
- 4. Low power, solar power**
- 5. Low cost**

Work principles

Openness

Cooperation and Inclusion

Reuse of best-of-breed components

No reinventing of wheels

No personal / organizational egoisms

Speed to market – it is NOW

The product

will consist of ...

... Software

preinstalled and on CD/DVD

... Hardware

gateway server, front access node(s)

... Documentation

open and accessible

Starting point

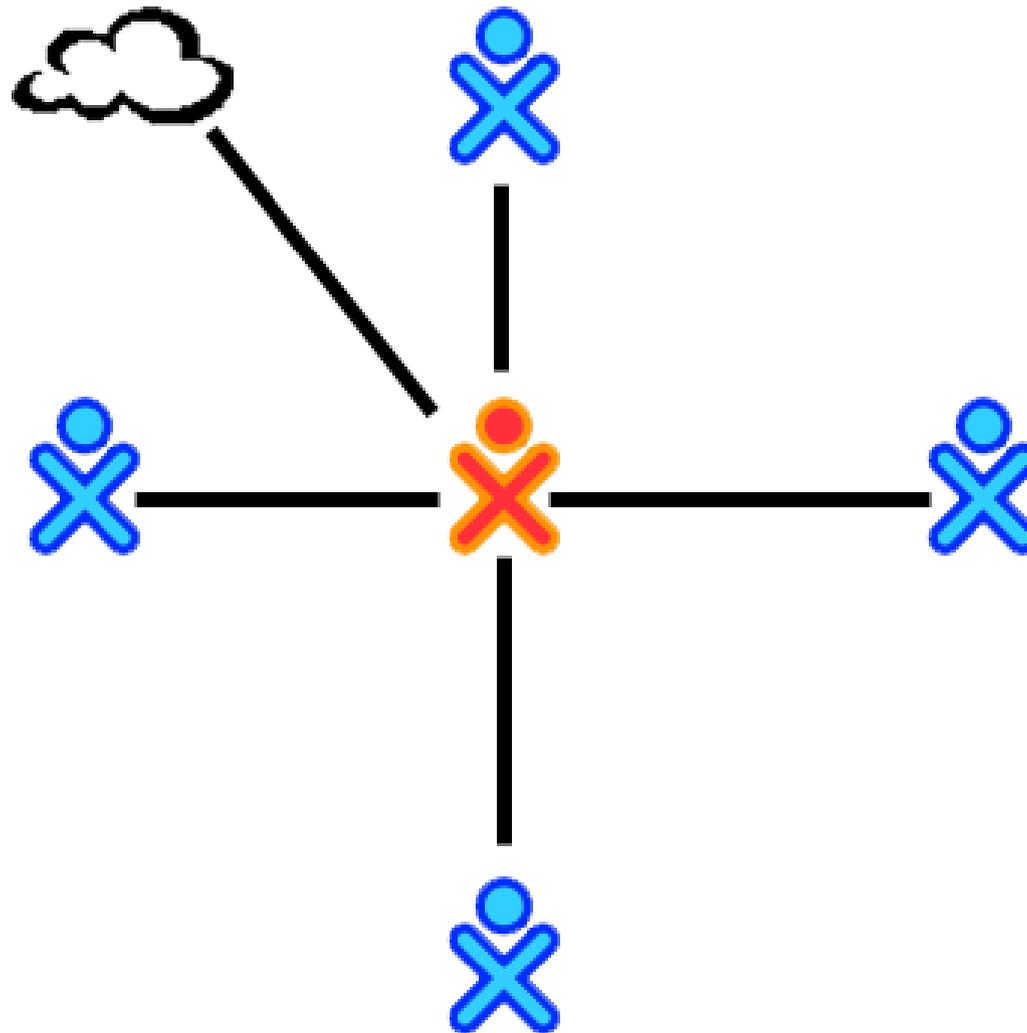
Sustainable business models

Meet the requirements of **for-profit and not-for-profit business models, with and without internet access, like ...**

- Telecentre / Internet Cafe
- The Village Telco
- Freestyle Mesh (Freifunk style)
- Housing Complex / NeighbourNet
- Internet Line Sharing, e.g. VSAT or DSL
- Corporate / Managed Services
- Guesthouse Net
- Content / Media services, e.g. in Education
- Surveillance Nets

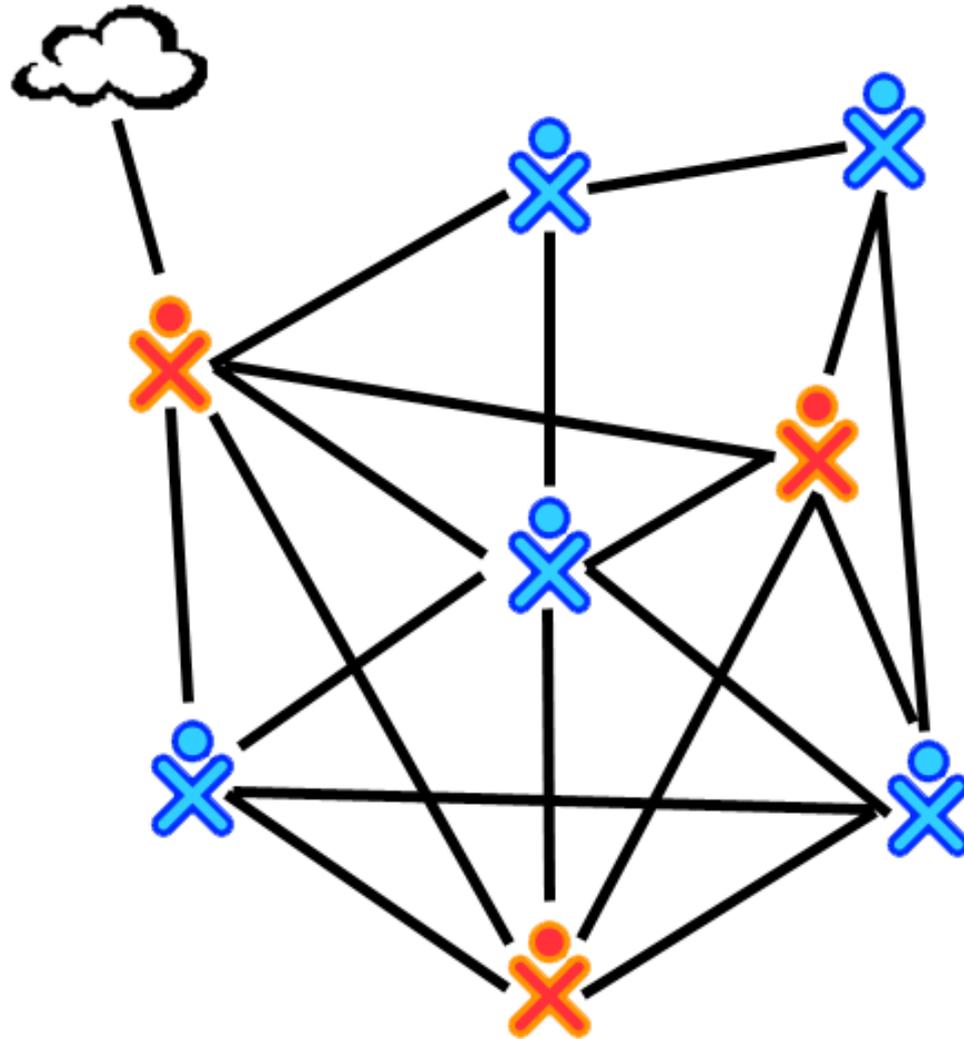
Models

Centralized



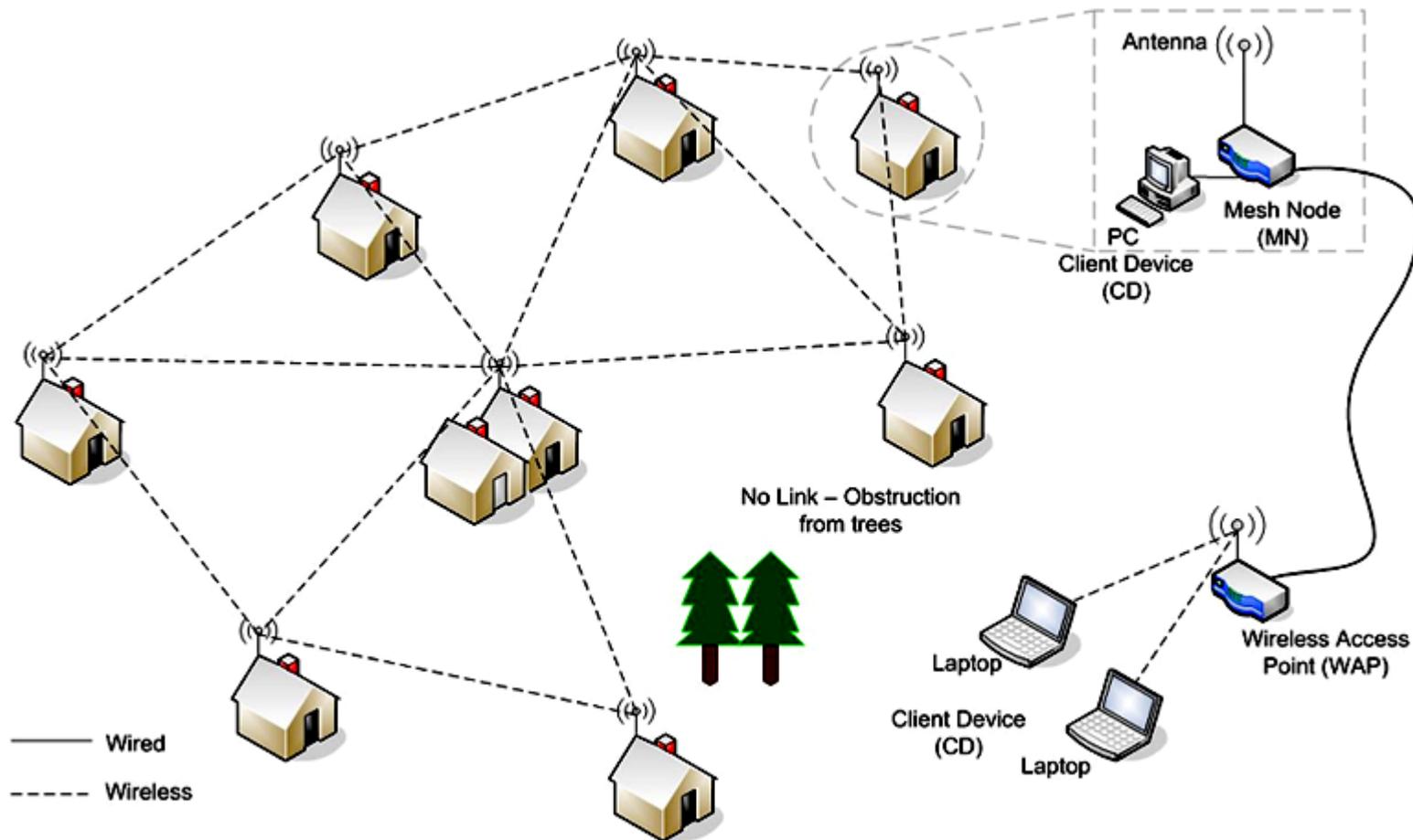
Models

Full mesh



What is a mesh?

Example of a community mesh



Software Platform

Server:

OS: Ubuntu 8.04 server, no X / Inveneo Hub Linux
packages and apps: see detailed list online

Apache, php, MySql, FreeRadius, ispconfig / webmin,
PhpMyPrepaid, Squid, Nagios, Master/WonderShaper,
Asterisk

Front access node(s):

*Firmware: currently working with CoovaAP, but others may
be used (e.g. OpenWRT, RO.B.IN, Open-Mesh FW, ..)*

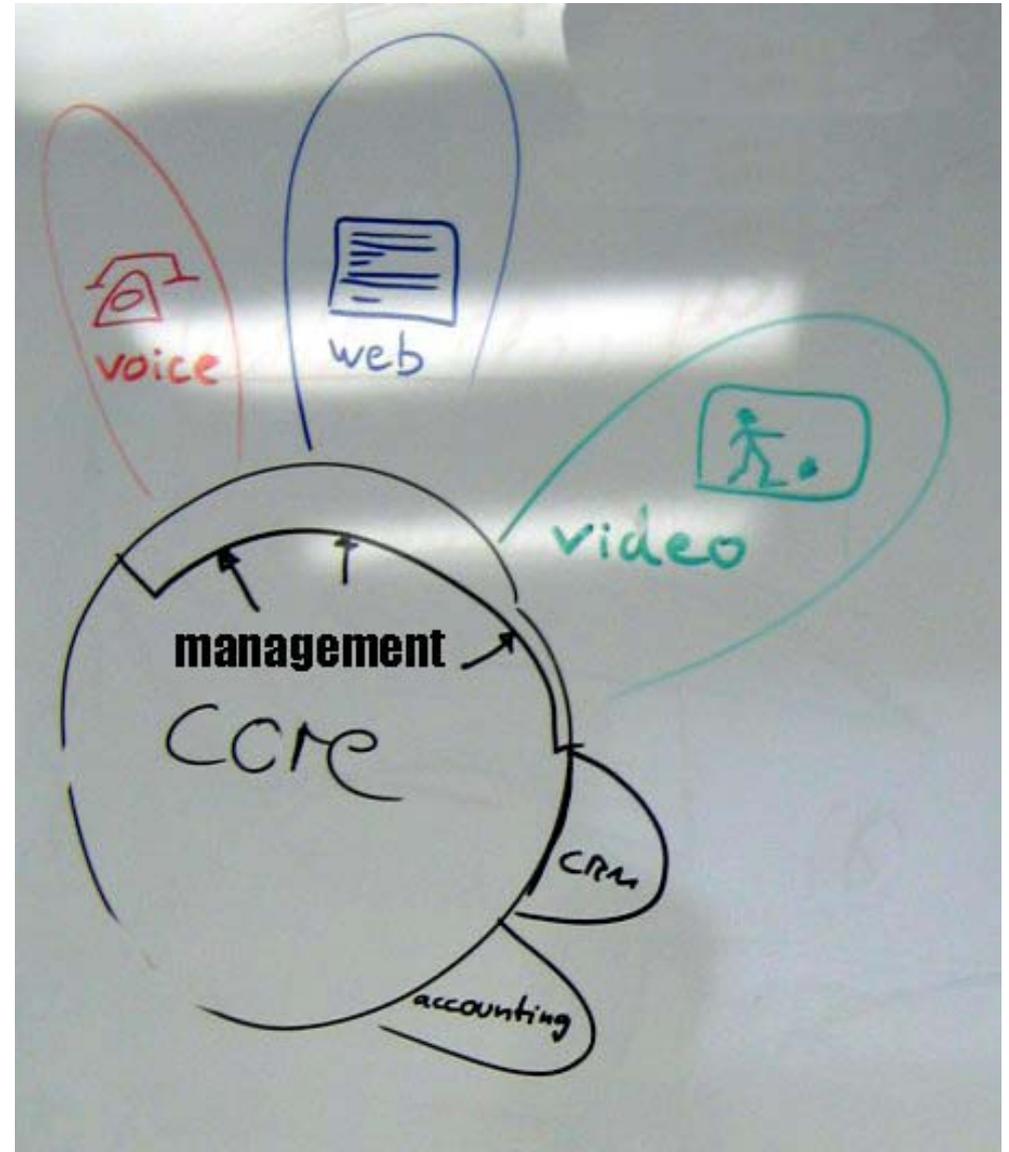
Software Architecture

Core elements
and specific extensions

e.g.
VoIP, Web applications,
Multimedia serving

Focus on
workflow oriented
GUI integration -

the Glue
between things



Software focus

Two main challenges

Network management

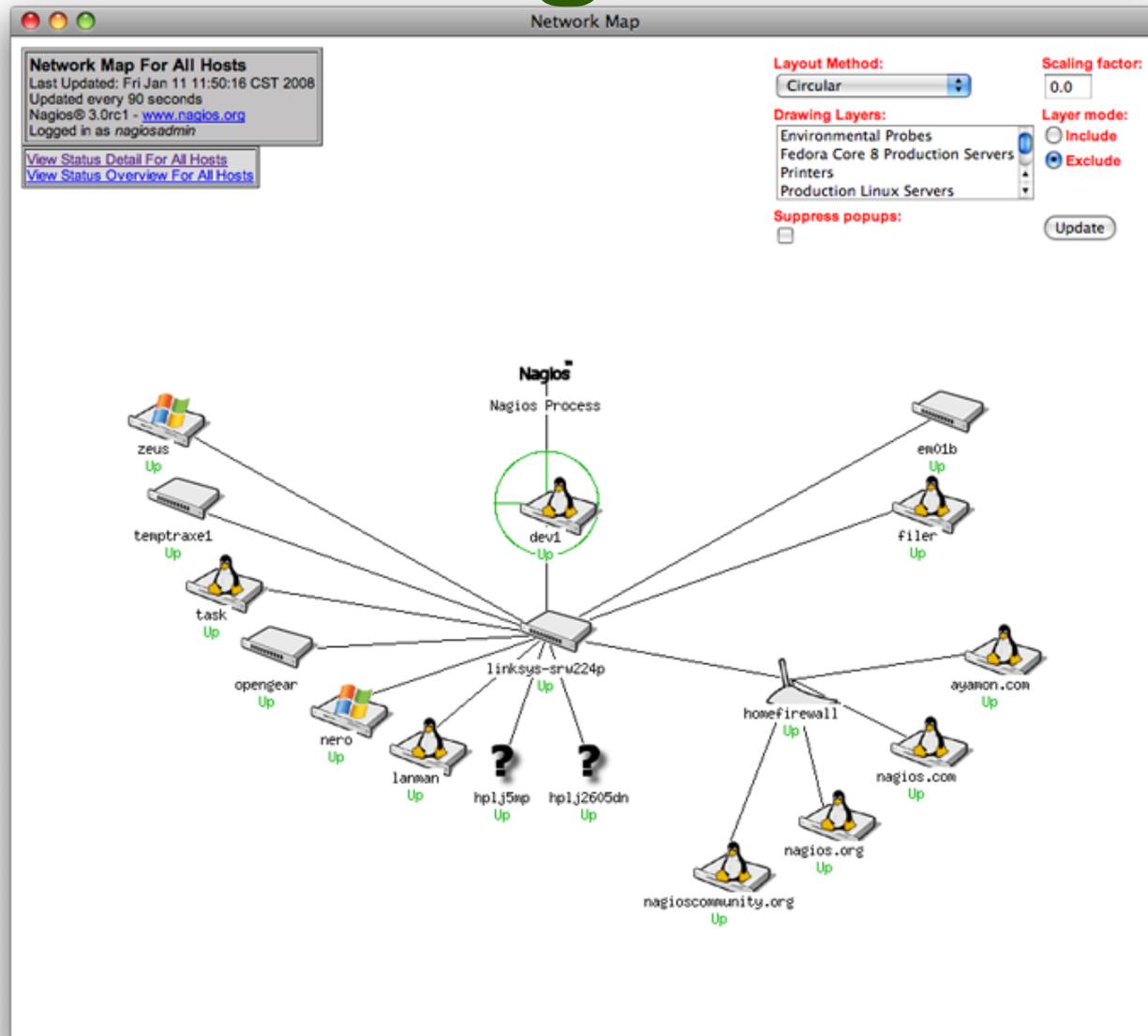
Monitoring, managing, shaping,
maintaining, reporting

Billing

without credit card!
Prepaid is the word!

Software

Network management



Nagios®

Software

Network management

Current Network Status

Last Updated: Fri Jan 11 11:49:43 CST 2008
 Updated every 90 seconds
 Nagios® 3.0rc1 - www.nagios.org
 Logged in as nagiosadmin

[View Service Status Detail For All Host Groups](#)
[View Host Status Detail For All Host Groups](#)
[View Status Overview For All Host Groups](#)
[View Status Grid For All Host Groups](#)

Host Status Totals			
Up	Down	Unreachable	Pending
17	0	0	0
All Problems		All Types	
0		17	

Service Status Totals				
Ok	Warning	Unknown	Critical	Pending
168	4	0	2	0
All Problems		All Types		
6		175		

Status Summary For All Host Groups

Host Group	Host Status Summary	Service Status Summary
Environmental Probes (environmental-probes)	2 UP	5 OK 2 WARNING : 2 Unhandled
Fedora Core 8 Production Servers (fc8-production-servers)	3 UP	112 OK 1 WARNING : 1 Unhandled 2 CRITICAL : 2 Unhandled
Printers (printers)	2 UP	4 OK
Production Linux Servers (production-linux-servers)	4 UP	115 OK 1 WARNING : 1 Unhandled 2 CRITICAL : 2 Unhandled
Production Websites (production-websites)	4 UP	24 OK
Switches (switches)	1 UP	1 OK
Windows Desktops (windows-desktops)	1 UP	17 OK 1 WARNING : 1 Unhandled

Software Billing



Software Billing

Prepaid, voucher

Time based

Calendar time
Usage time

Consumption/Data based

Different services
(web, mail, local content, voice)



Software Billing

The screenshot shows a web browser window titled "PhpMyPrepaid ticket management - Mozilla Firefox". The address bar displays "http://localhost/phpmyprepaid0.4/www/phpmyprepaid.php". The page features a navigation menu on the left with options like "Show Locations", "Create Accounts", "View Accounts", "Timed Accounts", "Octets Accounts", "Subscribers times", "Subscribers octets", "Subscribers Expiration", "Unused Account", "Partially Used Account", "Connected Now", "Today", "This Week", "This Month", "Billing Plan", "User management", "Statistics", and "Configuration". The main content area displays a table of users with columns for Username, Billing Plan, Value, Used, and Activate Date. Below the table, it indicates "Showing results 1 to 10 of 64" and provides two "Print Users list" links. The system tray at the bottom shows the time as 19:52 on 2007-03-08 and the user as root@caran.

Username	Billing Plan	Value	Used	Activate Date
abra02	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
ajlg56	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
anf33	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
aywb7	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
bex03	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
bnnf48	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
cps62	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
cwlb26	1 hours	1 hours	0 seconds	0000-00-00 00:00:00
dcuz92	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00
dilm19	15 minutes	15 minutes	0 seconds	0000-00-00 00:00:00

Hardware

Current reference platform

Server

inexpensive low power
mini-ITX board
(AMD GEODE 500 MHz)



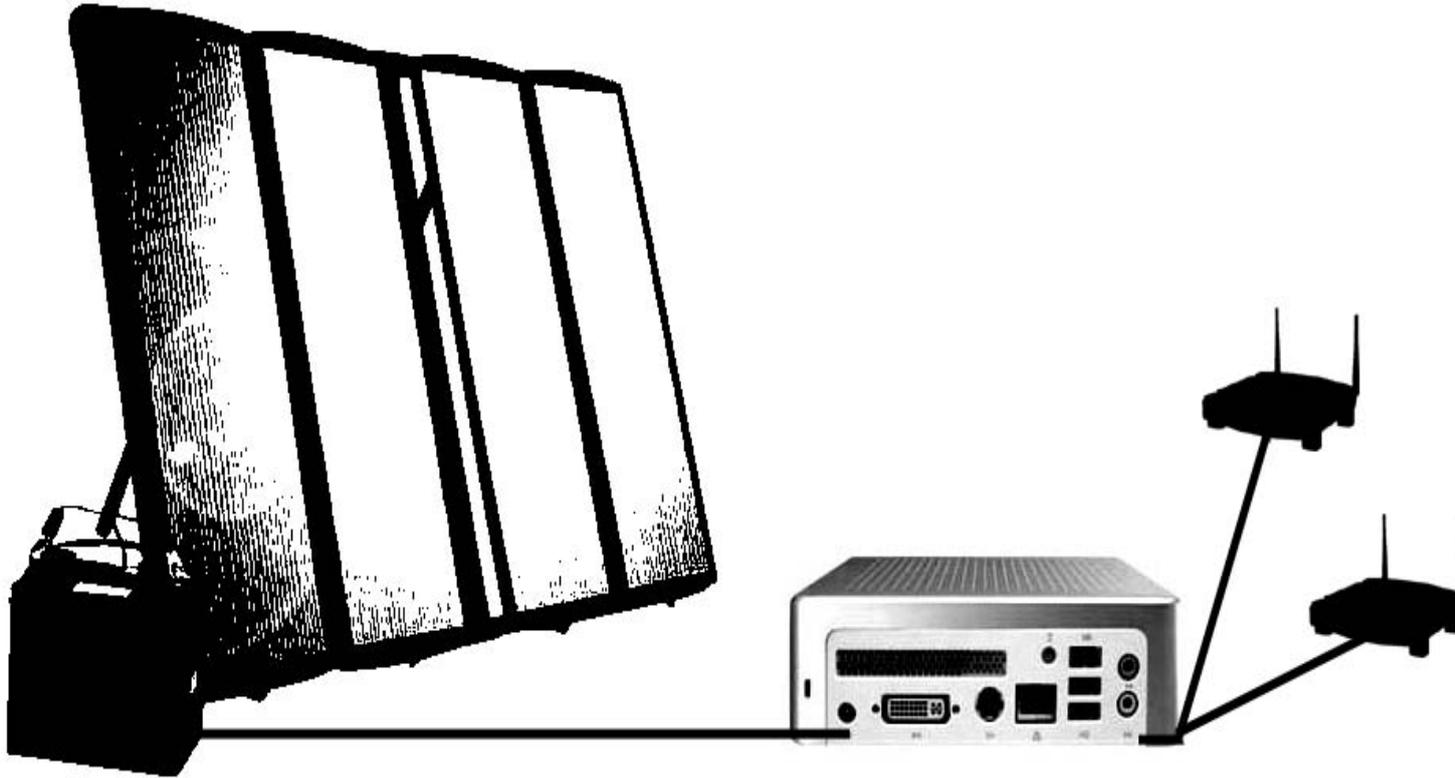
Access Node

Linksys WRT54GL
or: Ubiquiti NS,
Open-mesh/Accton



Hardware

The product



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:

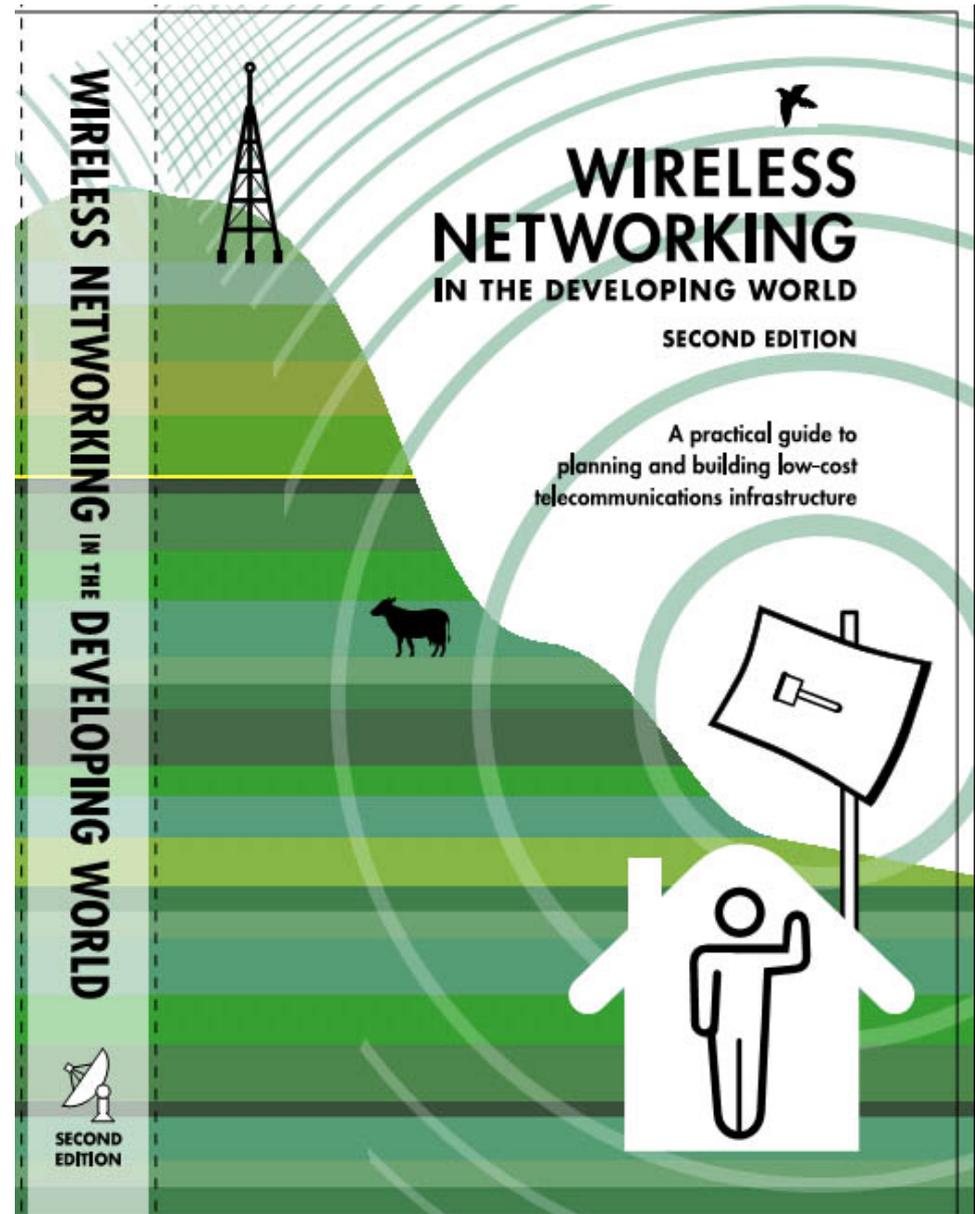
*prototype of solar powered
Meraka mesh node*



Documentation

Openness

We have
seen it working!



Work status

Where are we?

Existing Technology Research: completed

Software components: shortlist completed

Hardware platform: choice completed

Resources / subprojects assigned

Software Test/Integration work started

Prototype delivery: October 2008 (?)

**We are not there yet,
but ..**

... we are many!

Wireless Africa Alliance

WISPiab

Village Telco

VolPiab

Open Hardware movement

Freifunk

Inveneo

Open-Mesh

WirelessU

Digital Doorway

& ... & ... & ... & ... & ... & ... & ... :)

**That was it ...
Thank you!**

sebastian@less.dk



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WISP in a box / wiki:

<http://wirelessafrica.meraka.org.za>

Business models

Telecentre/Internet Cafe

Economics: Free or paid by users / advertisers / cafe business

Billing models: typically Prepaid (Time based):

Applications: typically Browser / Mail / Office / Games

Network / Topology: wired LAN

Internet uplink: model works with and without uplink, but typically yes

User Devices / Locations: Users on business owned PC

Legal & Regulatory: legal in most countries

Business models

VSAT / Line sharing

Economics: Typically paid by users, in split scheme (e.g. cost per user = (line cost / # of users)*(marginfactor))

Billing models: Prepaid monthly

Applications: All PC apps

Network / Topology: centralized or mesh

Internet uplink: yes

User Devices / Locations: PCs and other, local at office or homes

Startup Strategy: bottom up, organic

Legal & Regulatory: potential issues with DSL or line resell (?), power limits for wireless part

Business models

Organic mesh

Economics: Typically completely user paid, informal, but might implement business scheme similar to line sharing ((e.g. cost per user = (central uplink cost / # of users)*(marginfactor))

Billing models: e.g. Prepaid monthly

Applications: All incl telephony

Network / Topology: full mesh / inframesh

Internet uplink: typically yes, but local net relevant

User Devices / Locations: all types of devices, at user homes / office / businesses, roaming users

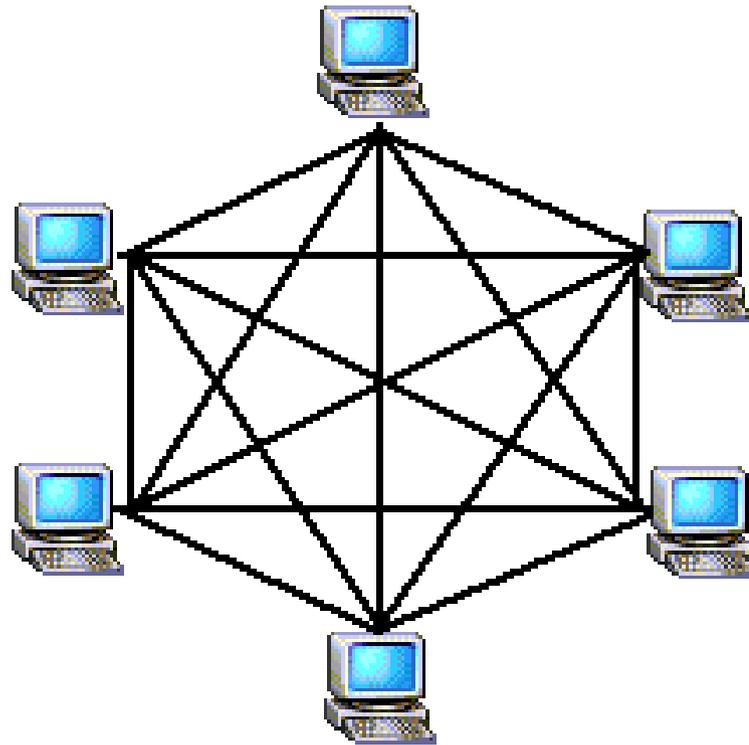
Legal & Regulatory: potential issues with power limits, collision with other networks, DSL reuse / resell

What is a mesh?

- A mesh network is a network that employs one of two connection arrangements:
full mesh topology or partial mesh topology.
- In the **full mesh topology**, each node is connected **directly to each of the others.**
In the **partial mesh topology**, nodes are **connected to only some**, not all, of the other nodes."

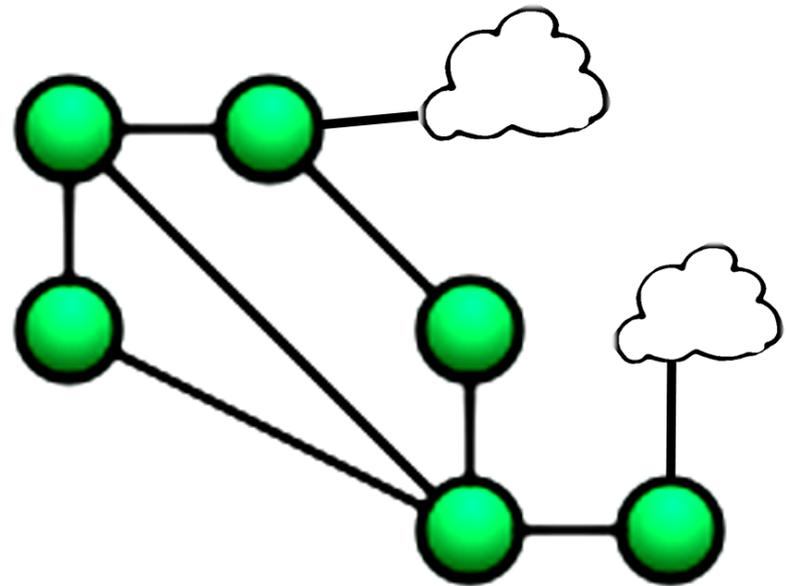
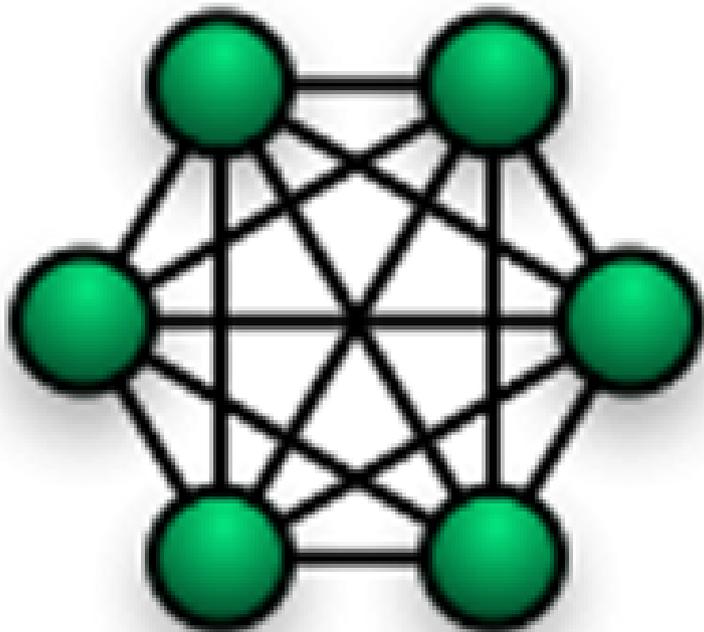
What is a mesh?

A full mesh



What is a mesh?

Full and partial meshes



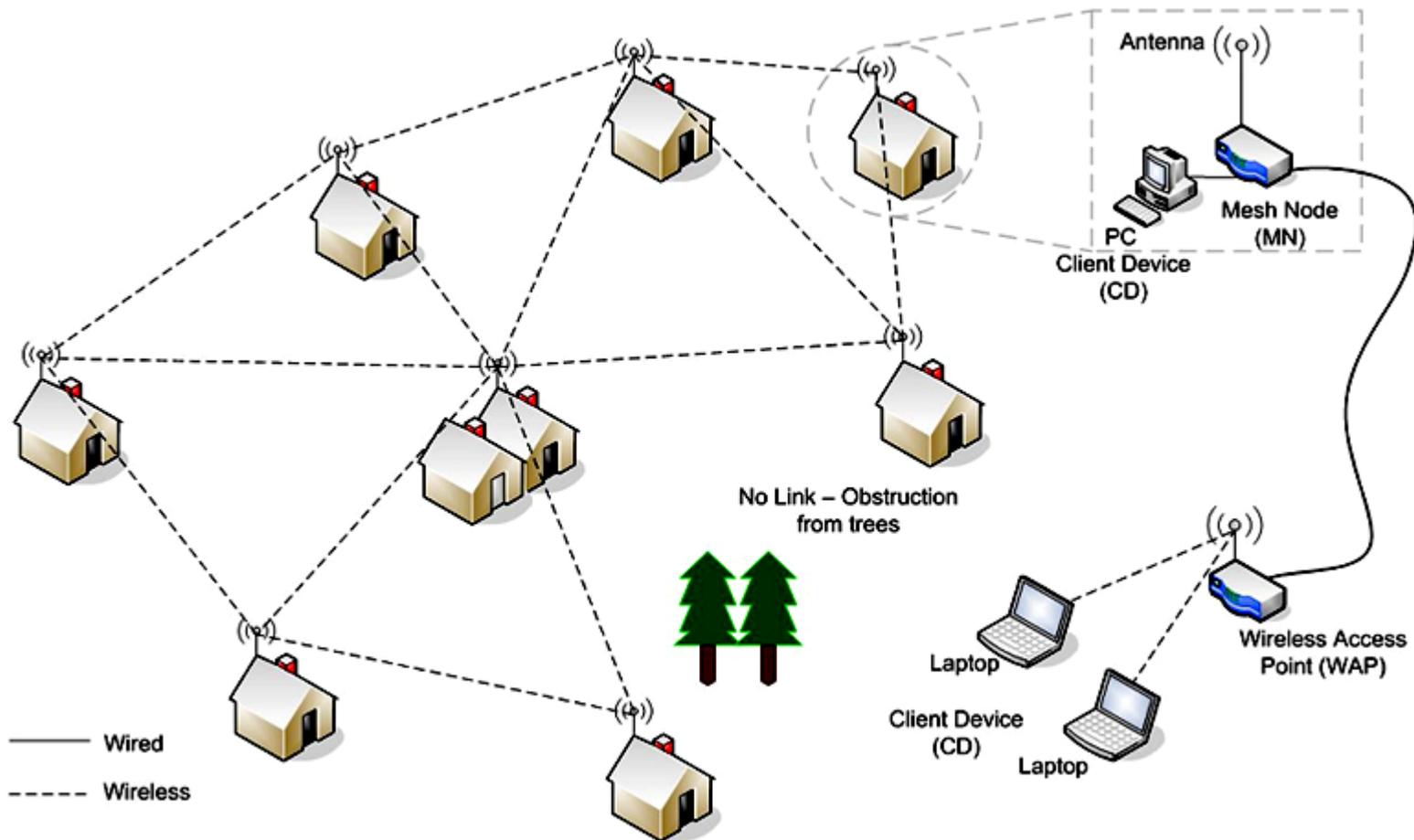
What is a mesh?

A common understanding

- A network that handles many-to-many connections and is capable of dynamically updating and optimizing these connections
- In a wireless mesh network, all wireless cards are in *ad-hoc* mode (not *infrastructure*)
- Note: A mesh does not have to be (very) dynamic!
- Often, you will meet the term *Mobile ad-hoc network (MANET)*

What is a mesh?

Example of a community mesh

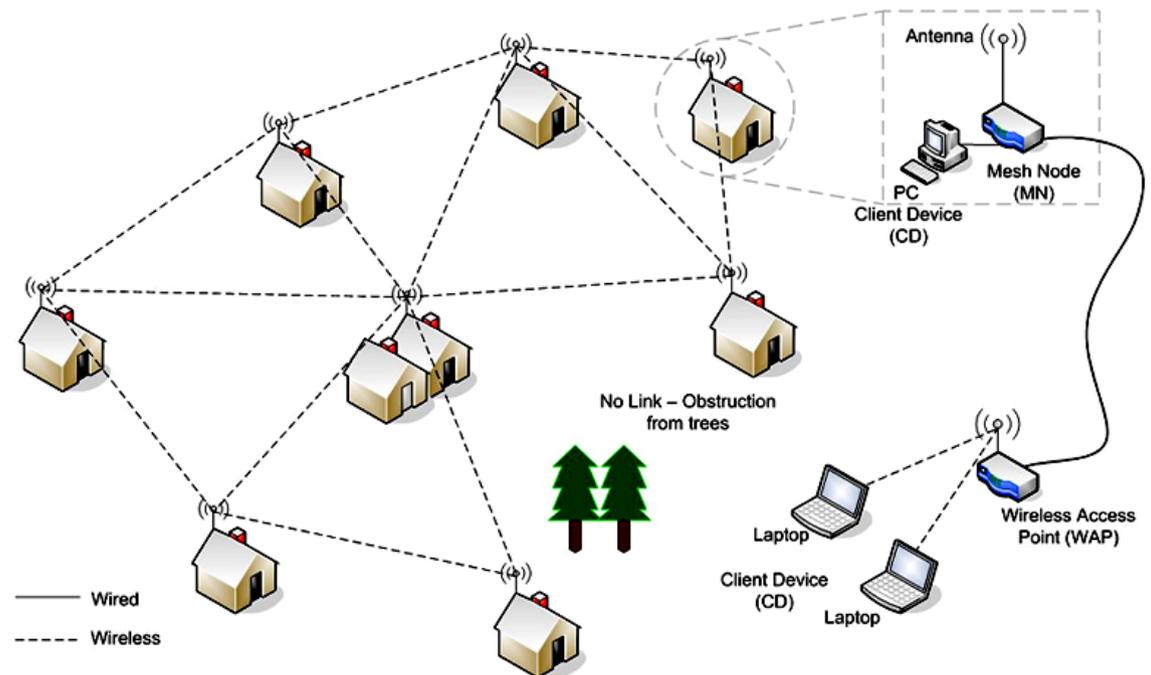


Why mesh?

- Meshing allows for

robust
dynamic
self healing
long distance

wireless networks



Why mesh?

Mesh networking ...

- Makes good use of community resources through sharing
- Lends itself nicely to favourable social models: sharing models, distributed responsibility models, where *personal interest = shared interest*
- Is often called *self-configuring and easy to set up*

well ... that may be argued :) ... we will see in the Lab

