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Routerlab Worksheet 06

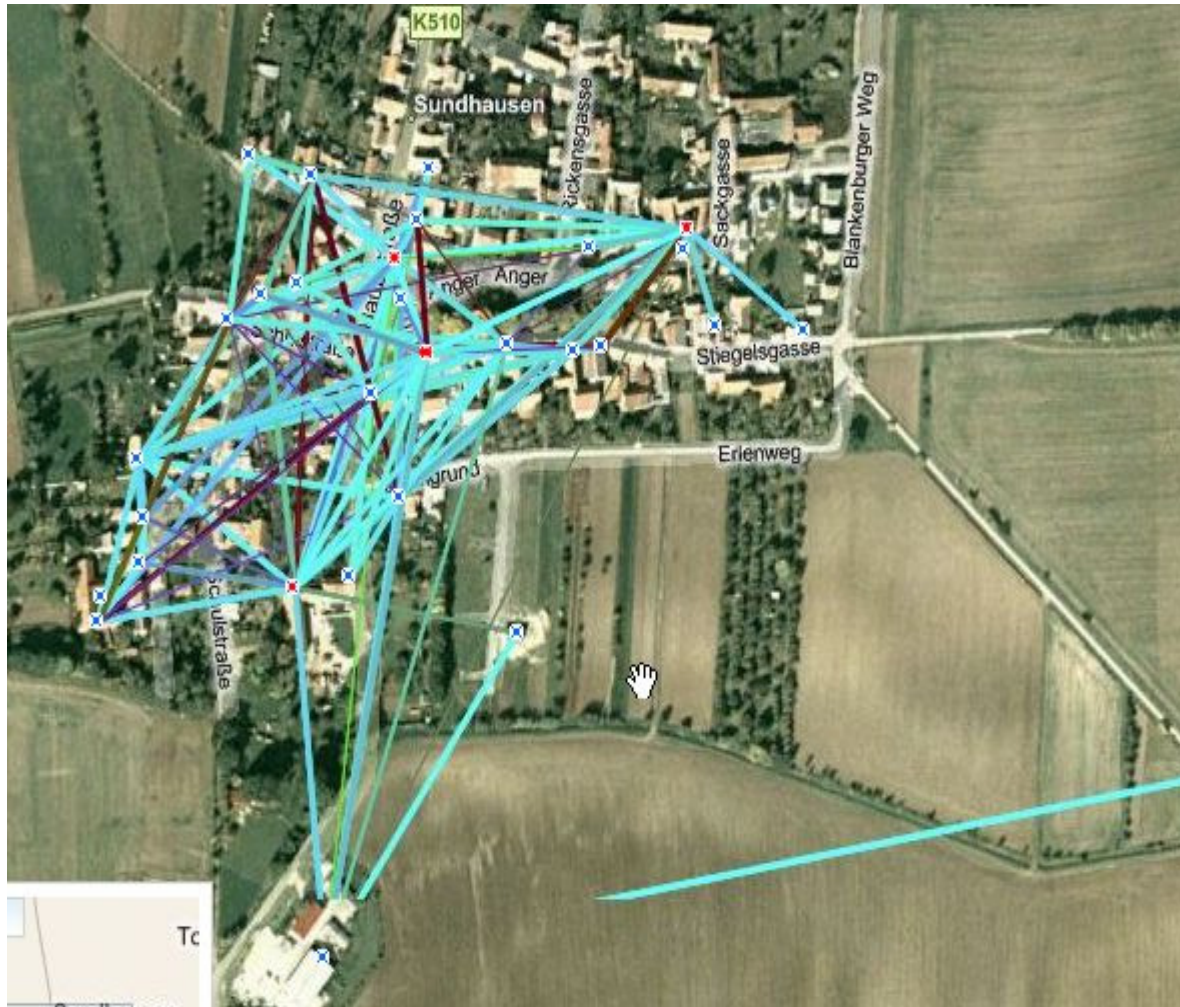
„Mesh your home network“

4. Juni 2009 TU-Berlin, Berlin

Outline

- **Mesh Intro ... why to Mesh ?**
 - **Routing in Meshes (OLSR)**
 - **Worksheets**
-

Real Mesh networks in Sundhausen



Household share the Internet

Routers are based on OpenWRT Linux

Routing algorithm = OLSR

Real Mesh networks

Evaluation	Parameter	Magnets	Freifunk Berlin	Freifunk Weimar
Technical	Deployment	planned	community	planned community
	Architecture	2-tier	1-tier	2-tier
	Mode	802.11super a/g	802.11bg	802.11abg
	Antennas	omni/directional	omni	omni
	Backhaul	directional, freq separated	n.a.	freq separated
	Bandwidth	< 62 Mbps	< 13 Mbps	< 15 Mbps
	Number of nodes	100	800+	150
	Number of gateways	variable (up to 80)	15	15
	Gateway line speed	100 Mbps	1-16 Mbps	1-6 Mbps
	Avg nodes per gateway	1-5	55	15
Economics	Deployment	planned	community	planned community
	Cost per node	> 300 \$	50\$	50\$
Social	Line lease	University	users	community
	AP authentication	list	free	list/trust
	User authentication	802.1x	free	list/trust
	Firmware distribution	central	distributed	central
	Firmware status	homogeneous	heterogeneous	homogeneous
	Services	Internet, IPTV, etc	Internet	Internet

Advantages of meshing

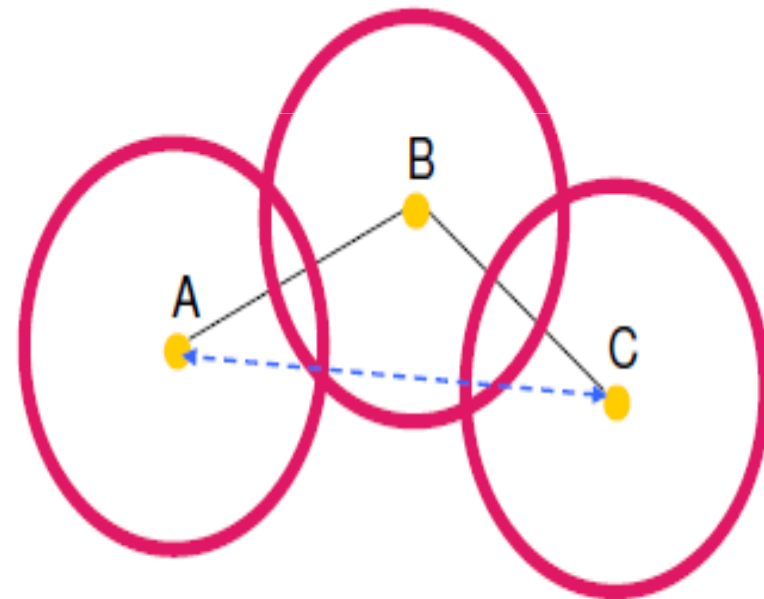
- ❖ Every user can provide his or her own node as part of the commonly owned infrastructure
- ❖ The network does not need a central (human) administration (no hierarchy)
- ❖ There is no need to spend money for an expensive centralised backhaul infrastructure
- ❖ The network can grow dynamically and spontaneously

BUT: There are many things unknown about the theory in relaying messages, laying interactions, and wired results are often not portable to the wireless world.

The Mesh concept

Every accesspoint in a network automatically becomes an active node for others

- **A** reaches **B** and **B** reaches **C**
- all nodes exchange routing information via „ad-hoc routing“ protocols
- **A** automatically reaches **C**, if **A** is in contact to **B** and **B** is in contact to **C**



What should routing do ?

- **Routing protocols take care of ...**

Node discovery

Border discovery

Link metrics

Route calculation

IP address management

Uplink/backhaul management

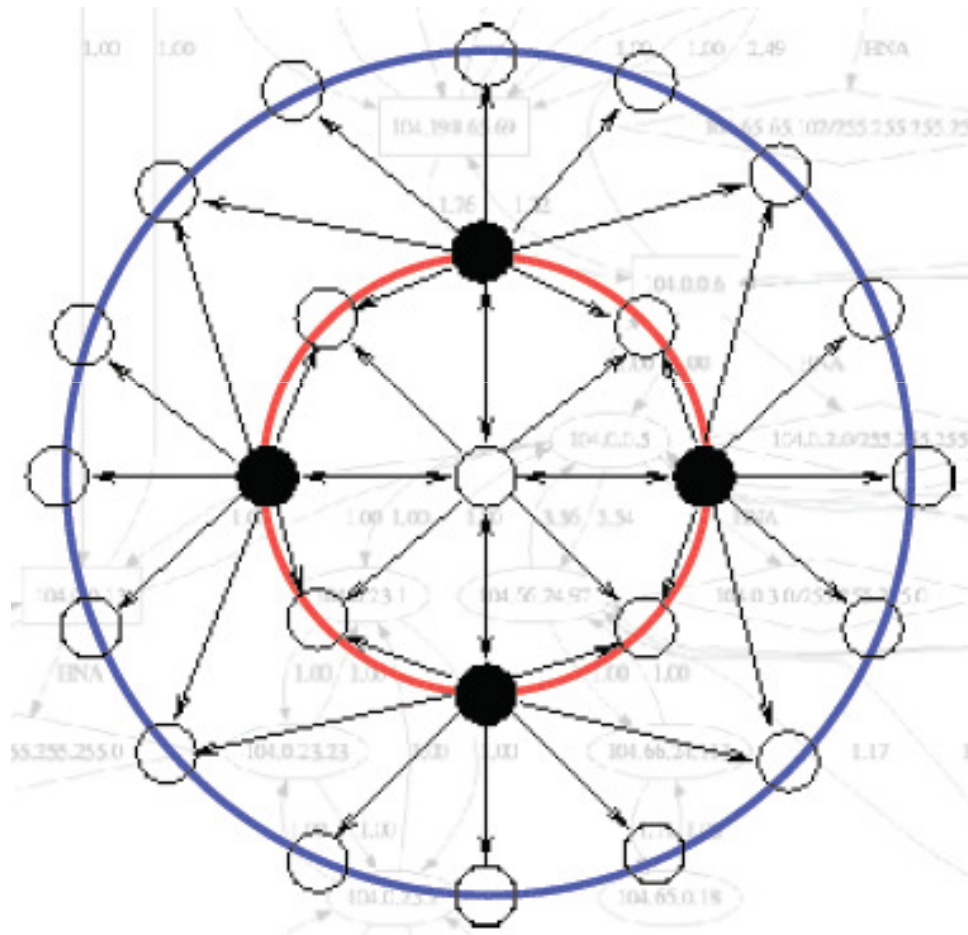
- **Wireless as broadcast medium is challenging**

OLSR Basics

- INRIADraft specified by **RFC 3626**
- Proactive, using **Dijkstra's Algorithm**
- Communication via **UDP broadcasts**
- Multiple OLSR messages per UDP packet
- Validity time in OLSR messages
- Introduced new ideas that were meant to reduce protocol overhead and increase stability:

MultiPointRelays & Hysteresis

RFC3626 Idea: Reducing Overhead



- Only selected neighbors (MultiPoint Relays, MPRs) retransmit messages
- Select MPRs such that they cover all 2hop neighbors
- 2hop neighbors taken from Neighbors' HELLO messages

Reallife results of RFC 3626

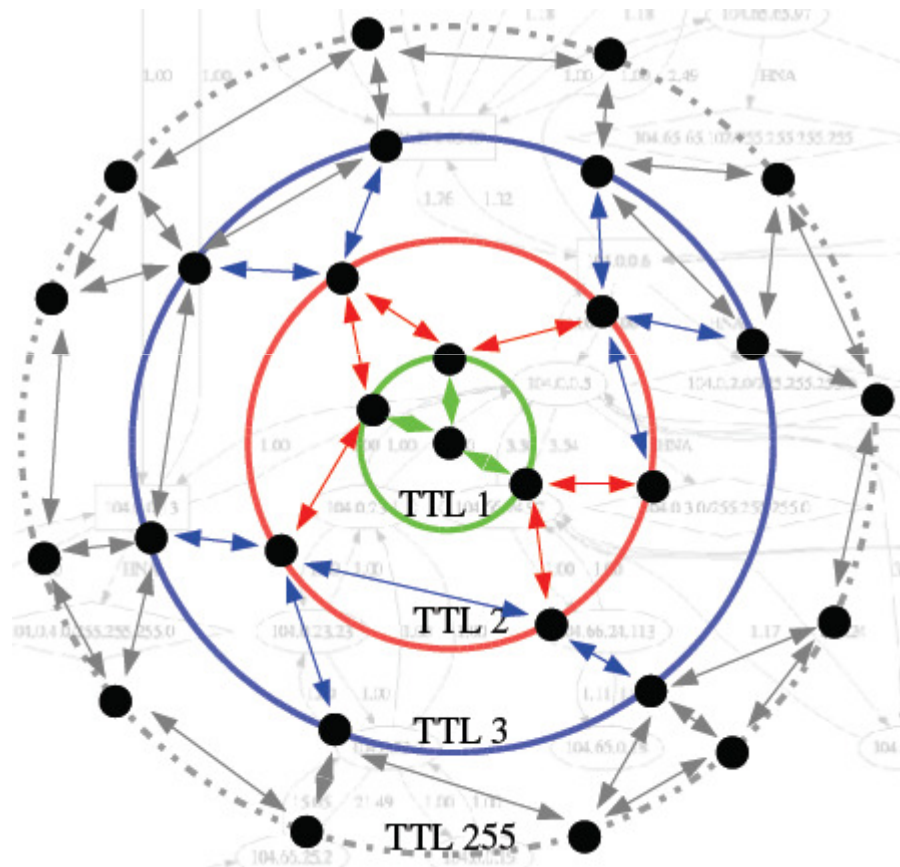


- **Routing table breaks down all the time**
- **Prefers routes with shortest path, low bandwidth and no Stability**
- **Routing loops occur very often**

Addressing the routing-loop issue

- Occurs when topology information is not in sync
- Loops happen amongst adjacent nodes
- Interference causes topology information loss
- Payload traffic causes interference
- Topology information must be redundant and sent often, more often than Hello messages to provide information timely
- MultiPointRelays don't help

Link Quality Fish Eye



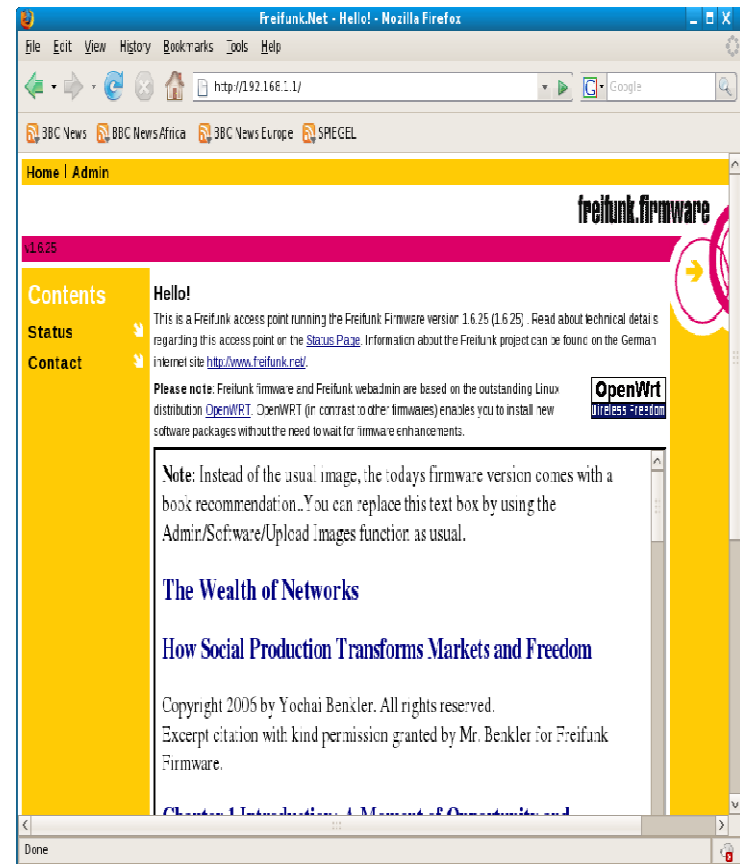
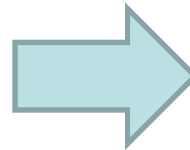
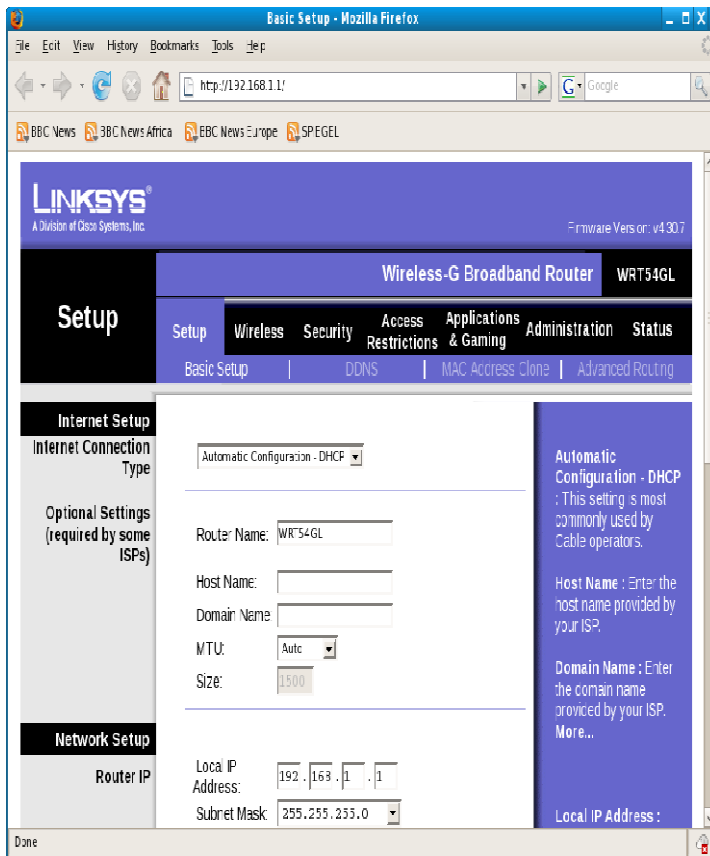
- Broadcast topology messages with **small TTL often**
- Send messages with **large TTL seldom**
- Distant nodes have cloudy view – sufficient to work
- Saving CPU Cycles
- Saving Collisions

Why to mesh ?

How to mesh ?

Worksheets

The right Firmware for your purpose



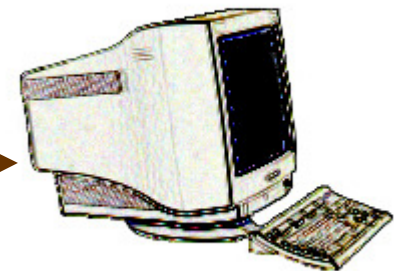
The cabeling



WLAN-IP Router:
10.10.10.x

LAN- IP Router: 192.168.x.1

Home-PC



Home-PC IP: 192.168.x.1+n

Worksheet Topics:

- ❖ How does the flashing of a wireless router work ?
- ❖ Get hands on the widespread OpenWRT Linux derivate
- ❖ How to look at a wireless network ?
(the famouse HORST tool)
- ❖ Routing in wireless, OLSR in real mesh networks

