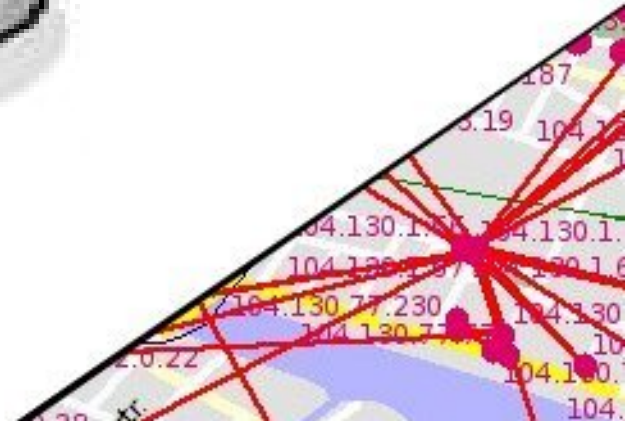
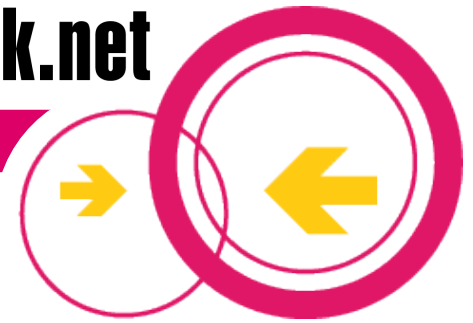


freifunk.net - a successful do-it-yourself approach for building wireless community networks in Germany

Delhi

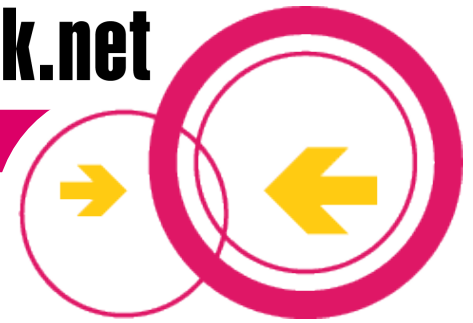
October 2006





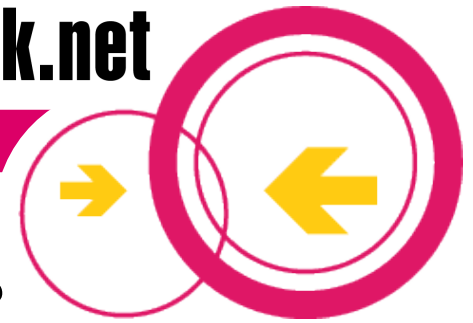
Who is freifunk.net?

- freifunk.net is a non-commercial initiative, started in 2003 and run by a growing number of volunteers. The idea is to spread knowledge about building **free/open** wireless community **networks** in collaboration with existing groups and organisations
- **free/open** means:
 - public accessibility (open for everybody)
 - non-commercial (not part of an enterprise business strategy)
 - community-owned (not owned by a single person/organisation)
 - uncensored
- **Networks** means:
 - communication between humans using digital media (computer, data networks)



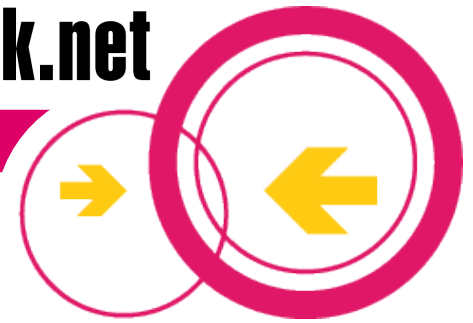
freifunk.net: Project Goals

- Provide technical and general information about free / open wireless networks in german speaking countries
- Promote exchange of knowledge and information between national and international groups
- Help individuals and organisations to build and spread free / open networks
- Raise public consciousness about freedom of information and communication
- Enable people to build and maintain their own networks
- Strengthen existing local structures (social and economical)
- Help to initialize new social communities



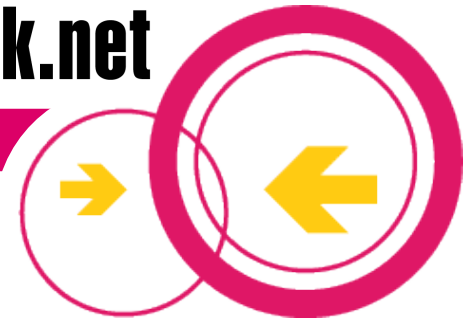
Why use Wireless for Building Free/Open Networks?

- Wireless technology (IEEE 802.11 a/b/g) provides high bandwidth for data transmission (54 Mbit brutto)
- There is plenty of low-cost off-the-shelf equipment and costs of operation are low
- Wireless technology can be provided in areas without existing cable infrastructure and is much cheaper to roll out
- Wireless technology is license exempt and can therefore be used by any individual

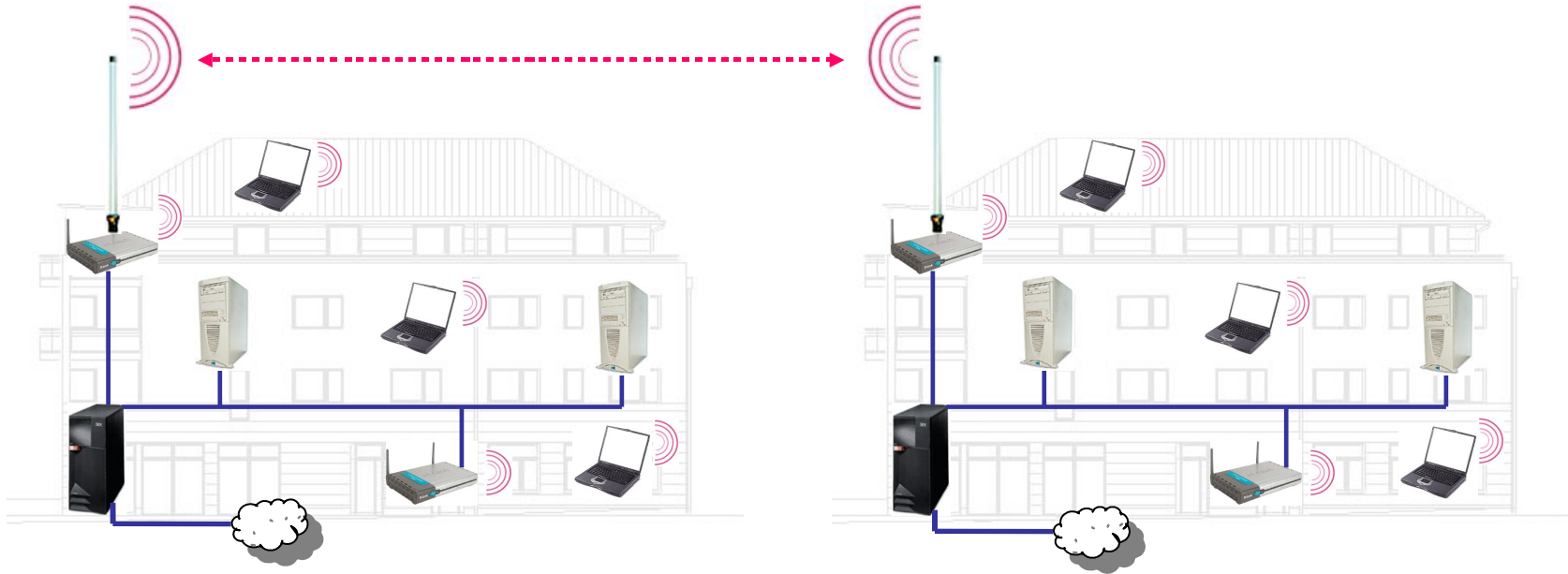


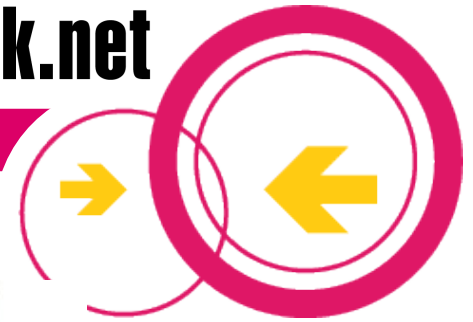
The Vision of freifunk.net

- People shall build their own wireless community networks in their local districts, villages and regions to provide local services such as
 - free data exchange and voice-over-IP-telephone connections without any further costs within the intranet
 - provide streaming audio information like a community-radio
 - provide shared internet gateways (via ISPs) to reduce the individual costs
 - < place your idea here >



Connecting Blocks of Houses

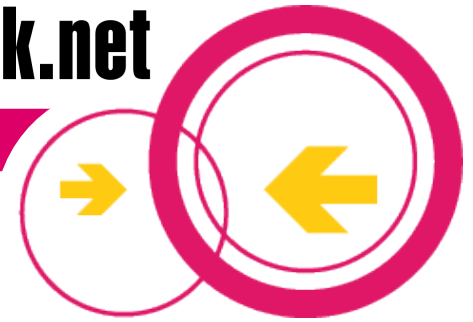




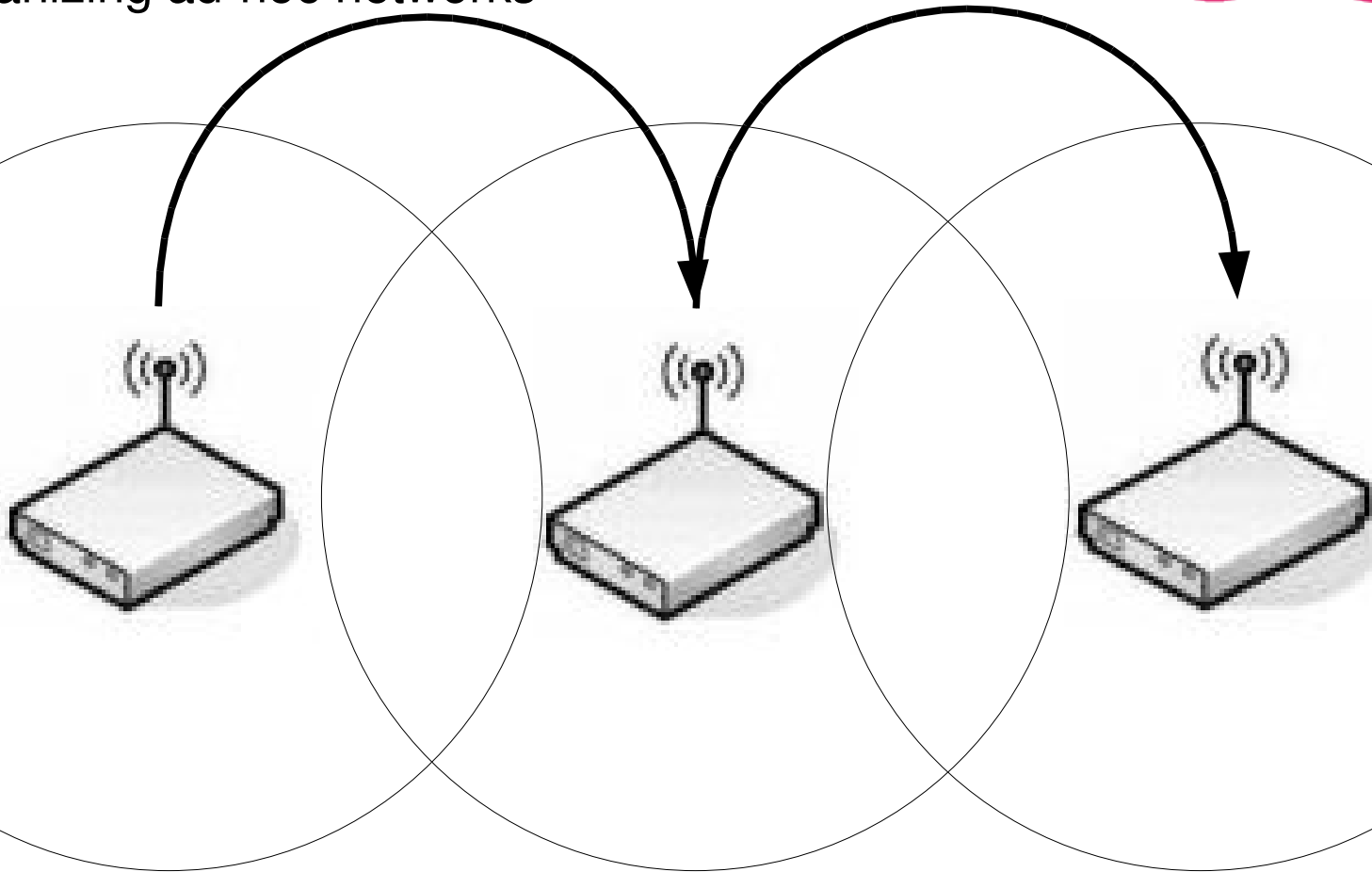
Antennas

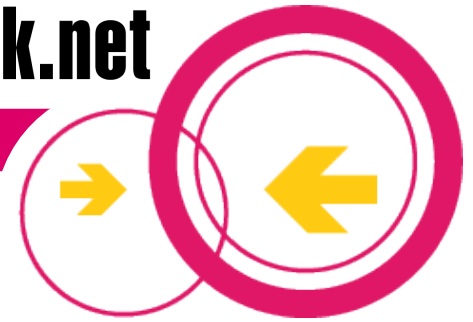
- Using different antennas can increase the range of wireless access points or other wireless devices
- Depending on the use case there are different types of antennas to raise the signal
- Many ways to build cheap antennas are provided on the internet





The Concept of “Meshed Networks” - self organizing ad-hoc networks

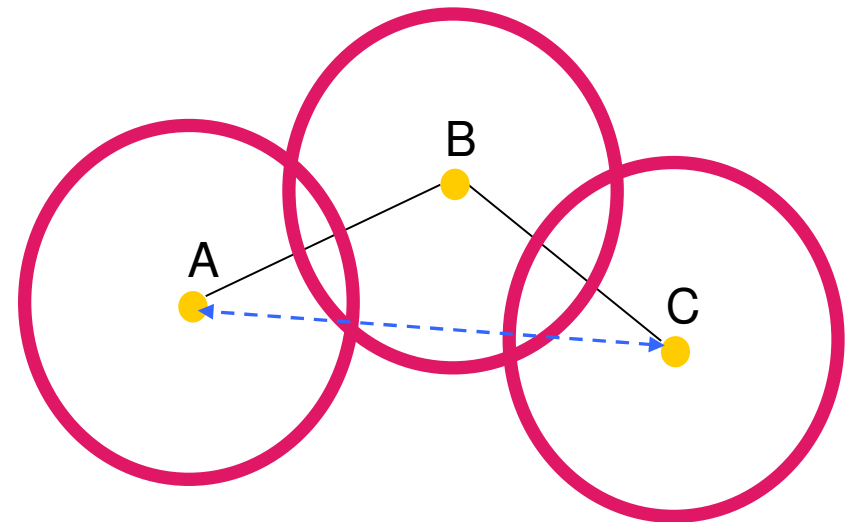


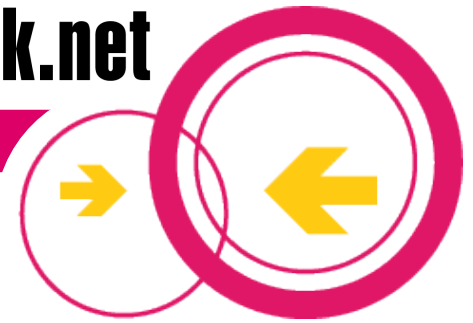


The Concept of “Meshed Networks”

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

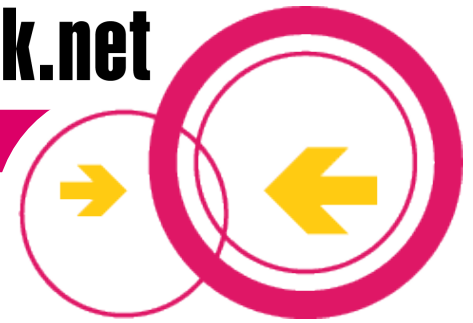
- **A** reaches **B** and **B** reaches **C**
- all nodes exchange routing information via „ad-hoc routing“ protocols
- **A** automatically reaches **C**, if **A** is in contact to **B** and **B** is in contact to **C**





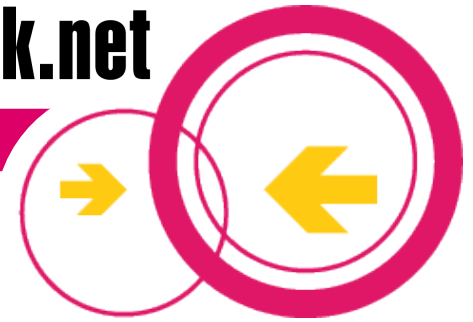
Advantages of „ad-hoc routing“ (meshing)

- 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)
- No specialists are needed to setup the network and run it
- There is no need to spend money for an expensive centralised backhaul infrastructure
- The network can grow dynamically and spontaneously



Picopeering-Agreement as a common social agreement

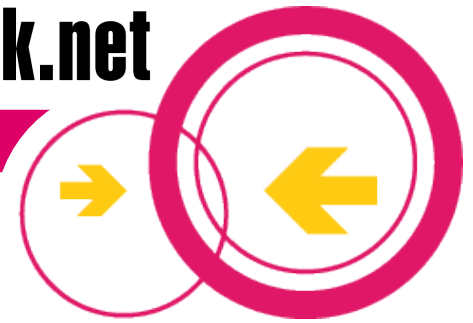
- The concept of meshed networks is based on free data transit on each node and to provide user owned network resources to the common network infrastructure
- This minimal consensus has been documented in the so called **picopeering agreement**, a document developed and maintained by individuals from various international community network groups
- The actual version of the picopeering agreement can be found at <http://picopeer.net>



Practice

- typical hardware: Linksys WRT54GL („WRT“)
- Firmware replacement with the FreifunkFirmware (FFF)
- removable antennas
- devices well known within the developers community
- there are also other possible devices ...

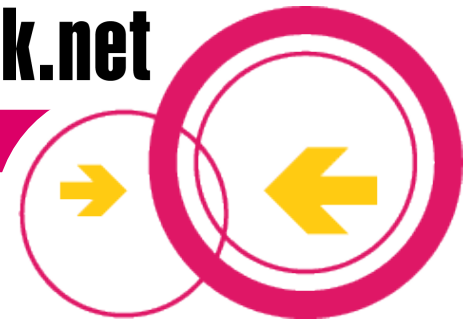




The FreifunkFirmware (FFF)

Mainly developed by Sven-Ola Tücke with support from other community software developers:

- Based on OpenWRT – a free open source Linux operatingsystem for Linksys WRT54GL and similar devices
- ad-hoc routing is based on OLSR (pro-active Optimized Link State Routing Protocol) – developed by Andreas Tønnesen and Thomas Lopatic as free open source software (www.olsr.org)
- OLSR is also available for Windows, LINUX and MAC OS, so that various enduser computer platforms and devices can be integrated to extend the meshed network infrastructure



Properties of the FreifunkFirmware (FFF)

- web based user interface to configure the access point
- extended online help
- translations in other languages (English, Spanish, French)
- enables participation for people with little technical skills
- variety of extensions available: statistics, traffic shaping, internet gateways, ...
- free open source software - can be modified to fit local needs



v1.2.5

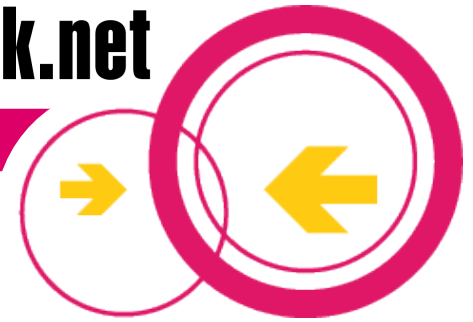
Verwalten

- [Kennwort](#)
- [Kontaktinfos](#)
- [System](#)
- [OLSR](#)
- [Drahtlos](#)
- [LAN](#)
- [WAN](#)
- [Gateway](#)
- [Publizieren](#)
- [Software](#)
- [Firmware](#)
- [Neustart](#)

Verwaltung: Drahtlos

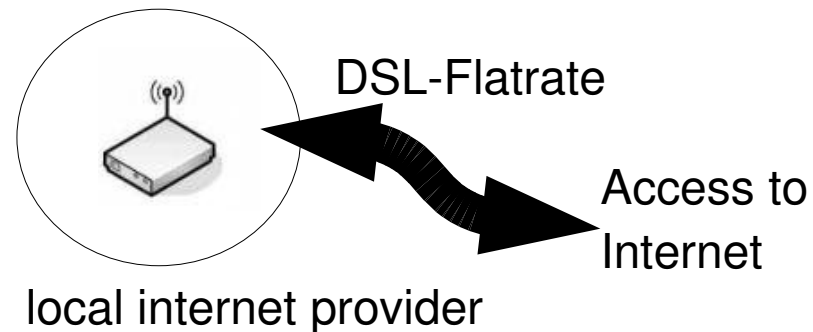
WLAN-Protokoll:	Statisch
WLAN-IP-Adresse:	104.202.25.1
WLAN-Netzmaske:	255.0.0.0
WLAN-Default-Route:	
WLAN-Modus:	Ad-Hoc (Peer zu Peer)
ESSID:	olsr.freifunk.net
BSSID:	02:CA:FF:EE:BA:BE
Kanal:	10
Kartentyp:	<input type="radio"/> 802.11a <input checked="" type="radio"/> 802.11b/g
Empfangsantenne:	<input type="radio"/> Auto <input type="radio"/> Antenne A <input checked="" type="radio"/> Antenne B
Sendeantenne:	<input type="radio"/> Auto <input type="radio"/> Antenne A <input checked="" type="radio"/> Antenne B
Sendeenergie:	60
Entfernung (Meter):	
Funk-Modus:	B-Modus und G-Modus
(E)SSID senden:	<input checked="" type="radio"/> Einschalten <input type="radio"/> Ausschalten
Basisrate:	Rate je nach WLAN-Modus
Übertragungsrate:	Automatisch
CTS-Schutz:	Automatisch
Frame-Burst:	Eingeschaltet
Beacon-Intervall:	100
DTIM-Intervall:	1
Frag.-Schwelle:	
RTS-Schwelle:	
MTU-Wert:	
<input type="button" value="Übernehmen"/> <input type="button" value="Abbruch"/>	

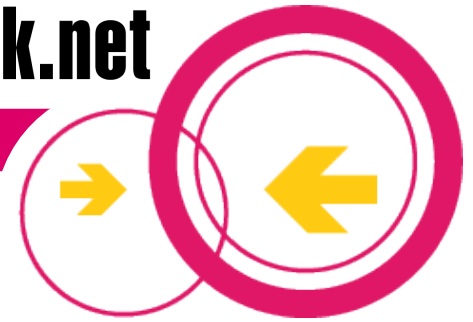
Tipp: Die Einstellung **Antenne A** aktiviert bei vielen Geräten die linke Antenne (von vorne gesehen).



Example: Fürbringerstrasse, Berlin-Kreuzberg

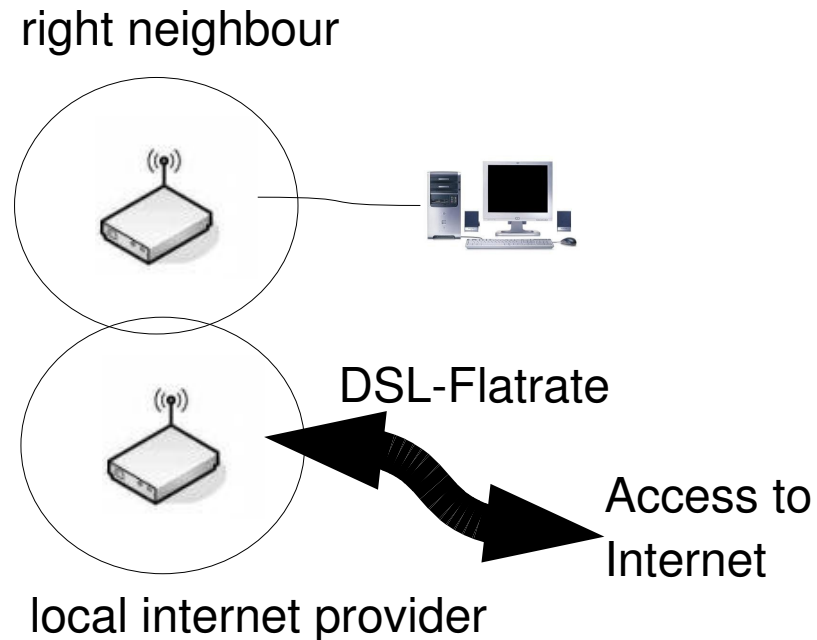
- A single household is connected to the internet and starts running a mesh node (access point)

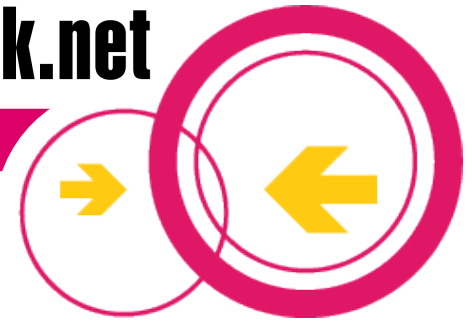




Example: Fürbringerstrasse, Berlin-Kreuzberg

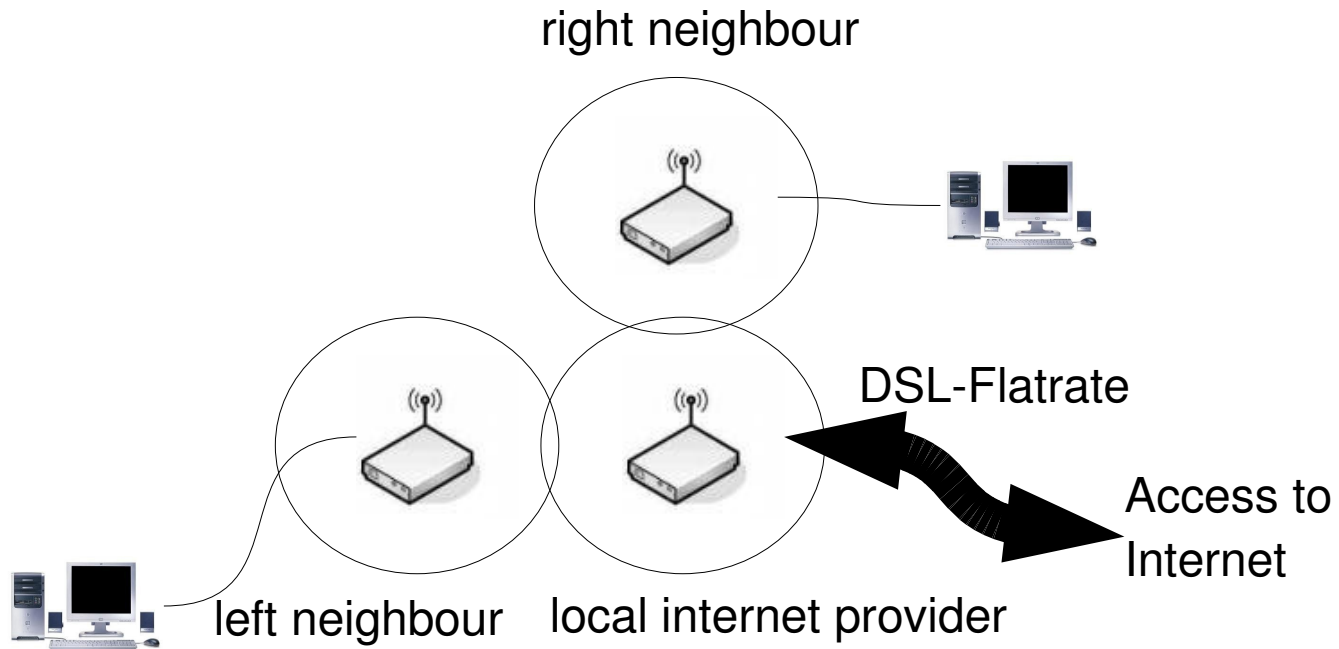
- The neighbour household to the right connects by simply setting up another meshed access point

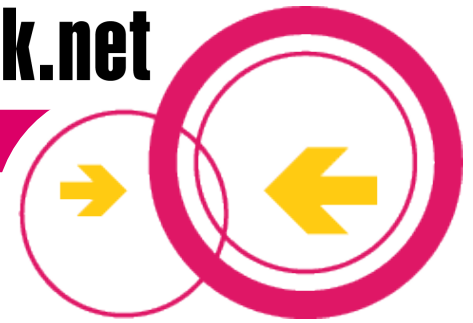




Example: Fürbringerstrasse, Berlin-Kreuzberg

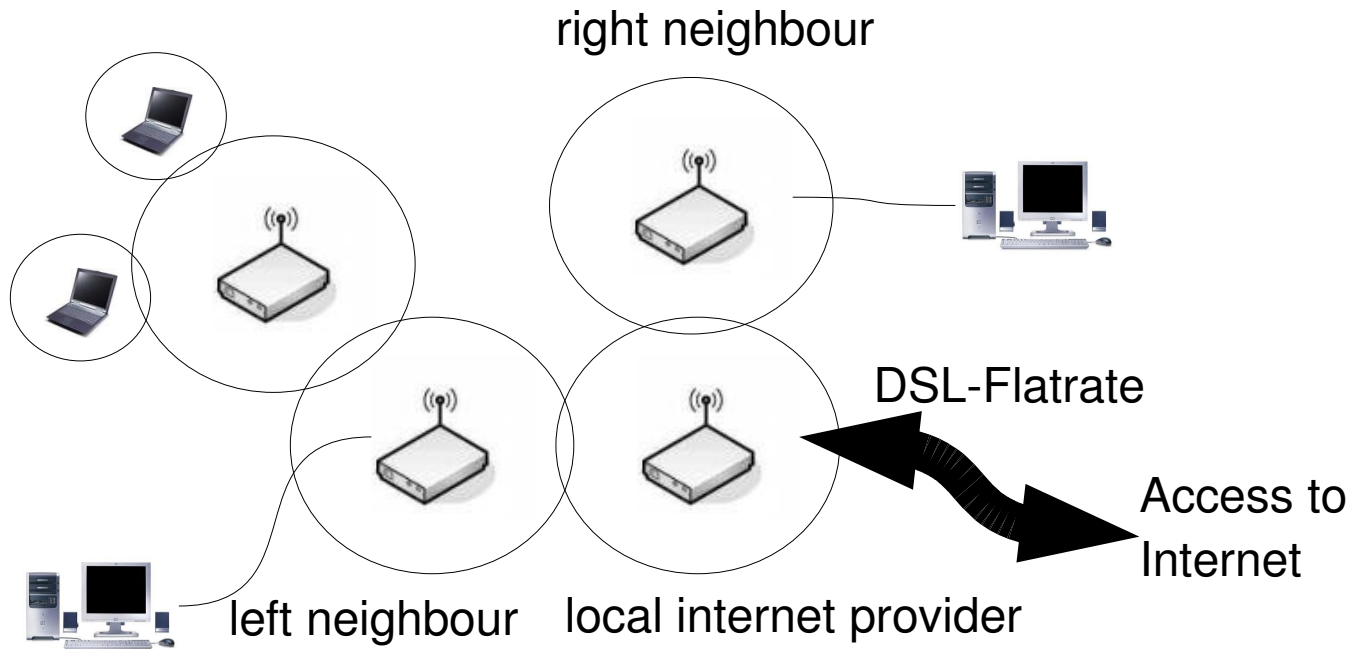
- So does the neighbour to the left

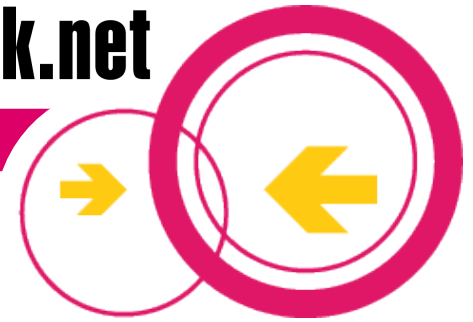




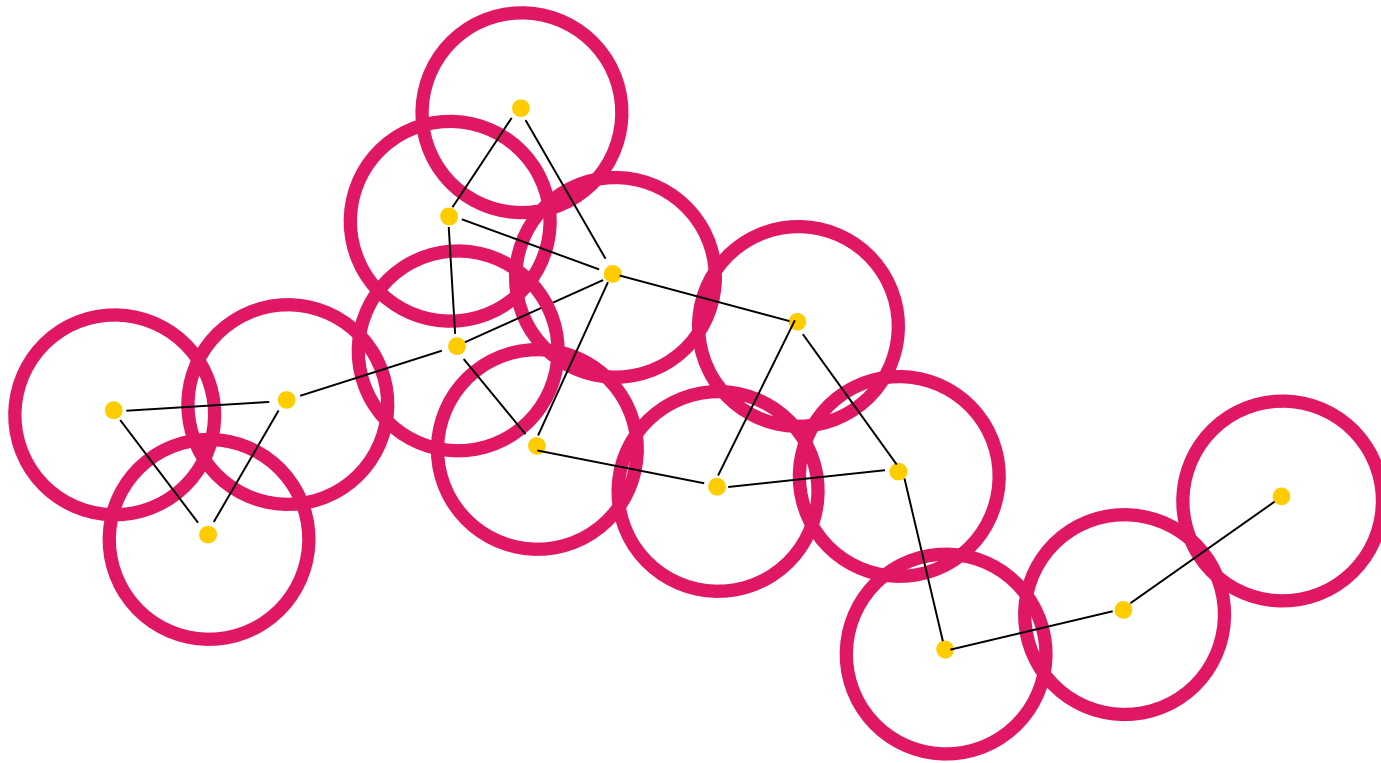
Example: Fürbringerstrasse, Berlin-Kreuzberg

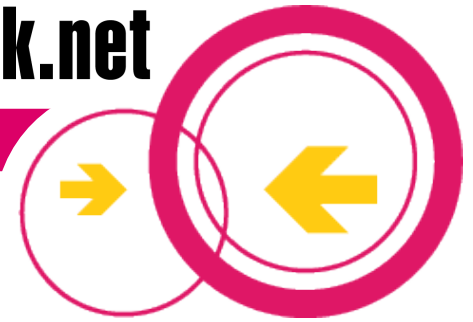
- ... and the neighbour to the left neighbour, and so on and so forth ...



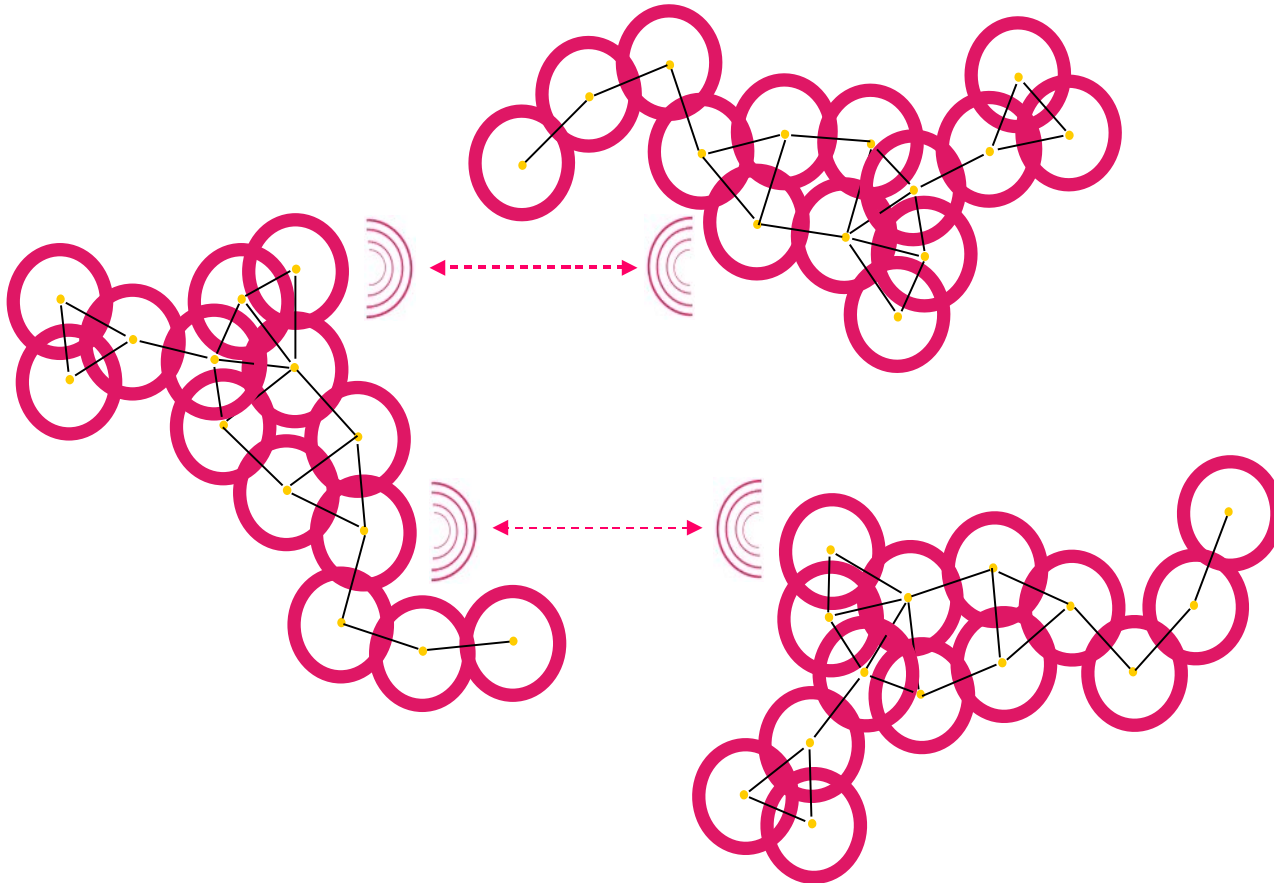


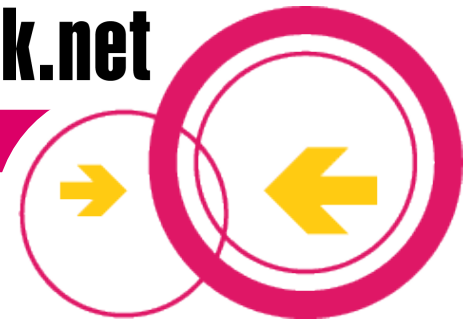
The Network is growing





The various Networks become interconnected

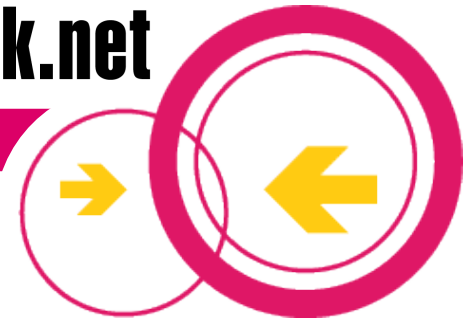




Example: Emmaus-Church as a relais station

- Local christian community supports the freifunk idea and allows to put access points and antennas on top of their church tower
- The equipment (8 access points and antennas) is sponsored by small a local company
- freifunk activists installed the devices on top of the tower
- Because of it's height the tower becomes a central relais station and connects various local communities in its surrounding

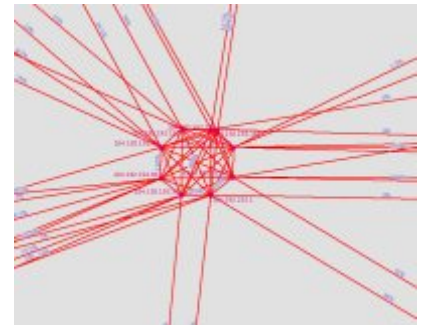


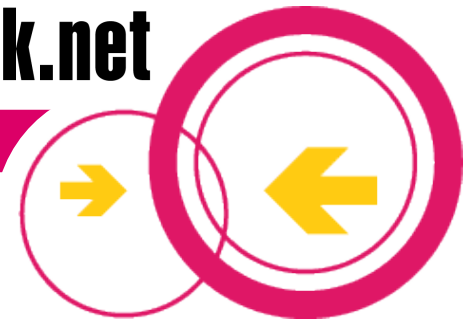


Example: Emmaus-Church



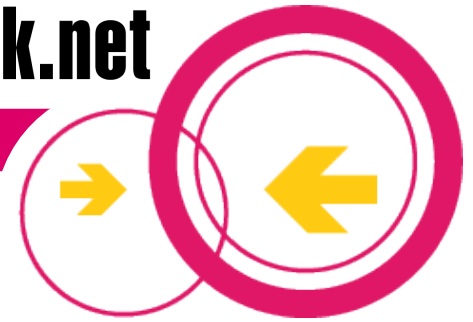
- 8 antennas interconnect the surrounding areas



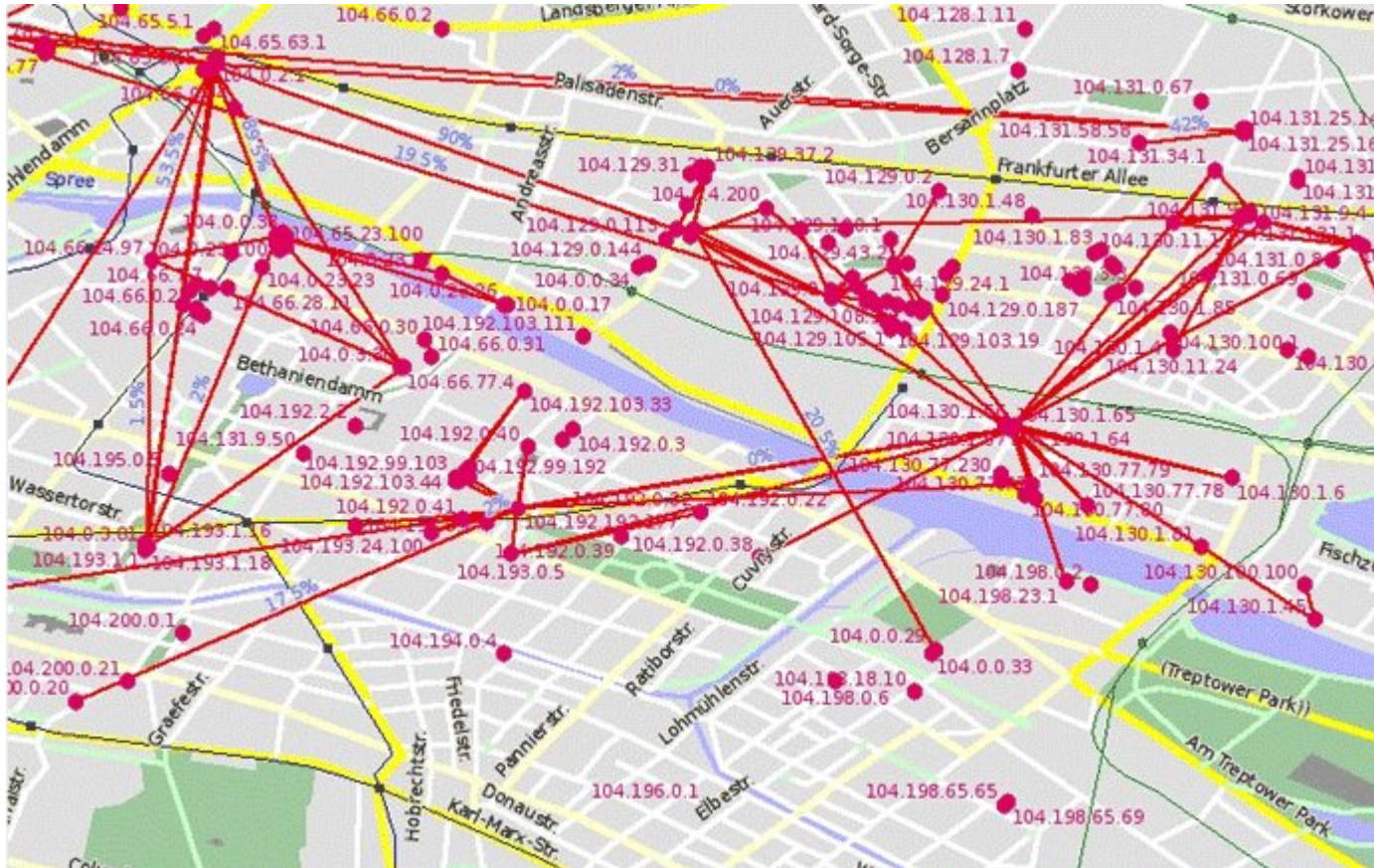


Berlin 2004

- In an early stage freifunk nodes were basically present in areas with only little or no DSL coverage

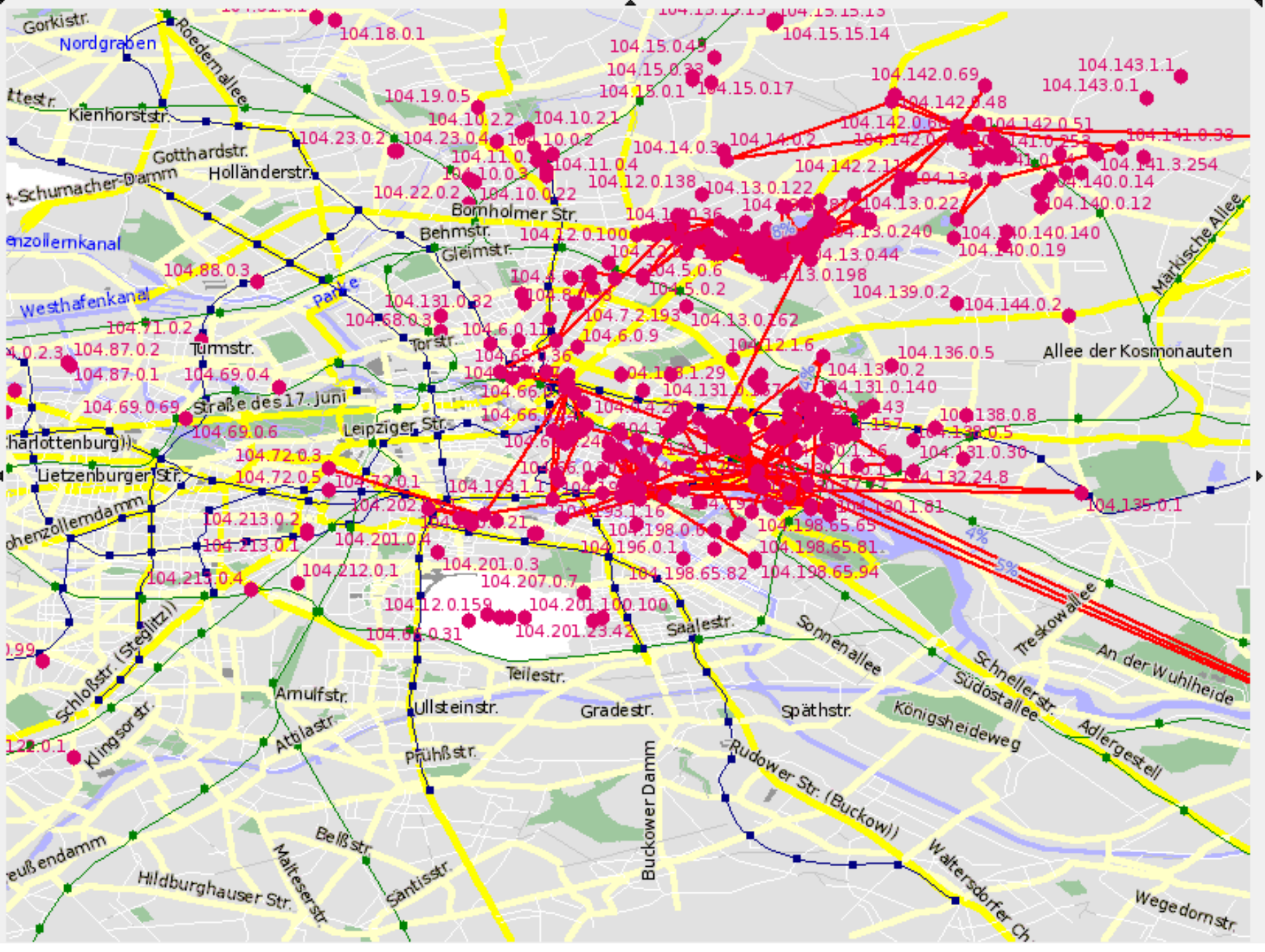


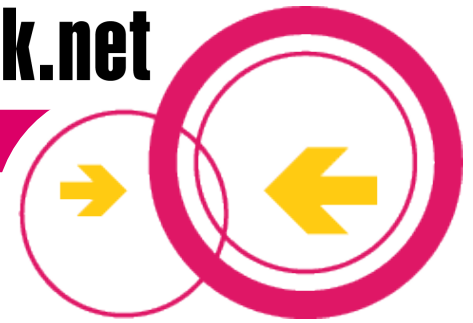
Berlin's OLSR Experiment



Today more than 500 access points are connected to one big meshed network in a growing number of districts all over the city of Berlin.

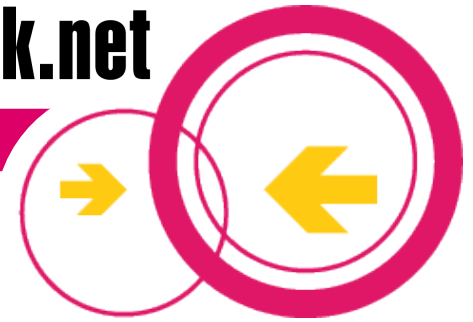
Several thousand users have cheap or free access to the internet.





Successful Expansion

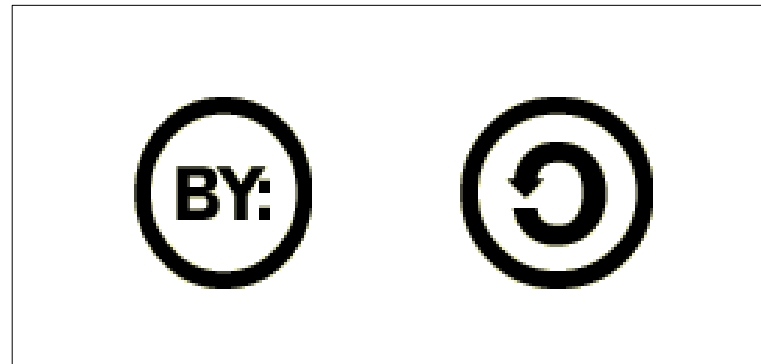
- Due to low technical and social entering barriers the number of participants (= number of nodes) is continuously growing
- Local freifunk initiatives have been founded in almost every german city and in many rural areas, as well as in some areas in Austria and Switzerland
- Berlin's OLSR Experiment (<http://www.olsrexperiment.de>) expands at about 20-30 new nodes per month



Contact and further Information

<http://freifunk.net>

mail@freifunk.net



This work is licensed under the Creative Commons Attribution-ShareAlike License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/2.5/de/> or send a letter to Creative Commons, 559 Nathan Abbott Way, Stanford, California 94305, USA.