

**the fun part of becoming  
a wisp**

**ADDIX**



nils dohse (nido009) - 20.11.2014



# wisp - wireless internet service provider

imagine someone  
takes a network  
engineer from his  
cosy datacenter and  
sends him up this  
ladder - 60 meters



# look the other way - 60m down





# agenda

- whoami
- motivation to do wireless
- legal stuff
- technical stuff
- real world
- recap
- furture
- q&a

# whoami

- 33y old computer-networking loving dad
- from northern germany - kiel
- working at addix internet services
- first ip contact on netware4 server at university of applied science in kiel on 9600bps line in 1995 (pmail for email)





# motivation

- in the beginning there was a 'bet'
- ham radio licensed
- datalinks with breezenet equipment and 10w amps starting 1997
- now affordable equipment on the market
- help of ham ops using their tower to build prototype network
- many spot without bandwidth in SH



# legal stuff 1

focus on german employers

- employer's liability insurance coverage (Berufsgenossenschaft)
  - accident prevention regulation -> PSAgA
  - PSAgA training + G41 examination
  - first aid training for climbers
  - yearly refresh
  - documentation of inspection of PSAgA
- ask your employer's liability insurance



# legal stuff 2 - wireless frequencies

- free usable frequencies at 900 Mhz, 2.4 Ghz, 5Ghz and 24Ghz
- Licensed Radios
- 5.8Ghz for Internet Providers (BFWA)
- obey tx power, dfs and tpc
- work closely with ‘Bundesnetzagentur’



# technical stuff 1

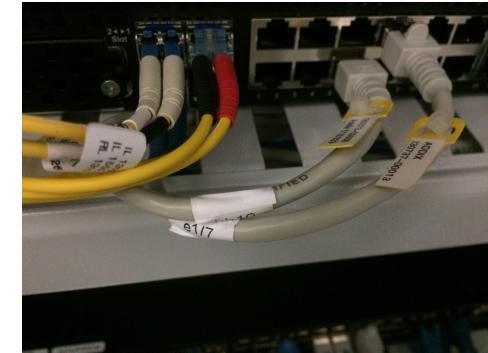


we are an isp

- build an isp wireless network
- we'd like to have a mpls network

hardware

- first try: mikrotik routerboard with wireless cards. Interference and instable
- second try: routerboard does routing, wireless externally. Much better and affordable





## technical stuff 2 - net design

- pppoe dialup by customer
- ‘real’ public ip’s for customers
- public traffic transported in VRF
- management in global routing table

Dialup:

1st try: deploy Cisco’s, do L2TP to LNS (\$\$)

2nd try: mpls vpls (instable)

3rd try: dedicated dialin-boards on towers (no dialin to vrf possible)

# technical stuff 3 - v6 challenges

- ipv6 - no support in 6pe yet
- testing in global routing table
- testing running v6 over vpls
- dhcipv6-pd on dialup works, but radius radius accounting incomplete

## mikrotik downsides

- some routeros-versions unstable
- routeros testing done by customer
- no paid support (look at forum or ask consultants)

# technical stuff 4 - hardware1

mostly ubiquity for wireless links

>1.000 deployed devices

>1.100 km wireless links

in 4 years

running some commercial links on 38,26 and  
18Ghz



# technical stuff 4 - hardware 2



- all equipment at tower top
- starting with custom build integrated boxes  
(not so flexible)
- now migrating to outdoor 19" racks
- custom build dc-power with battery backup

# real world 1

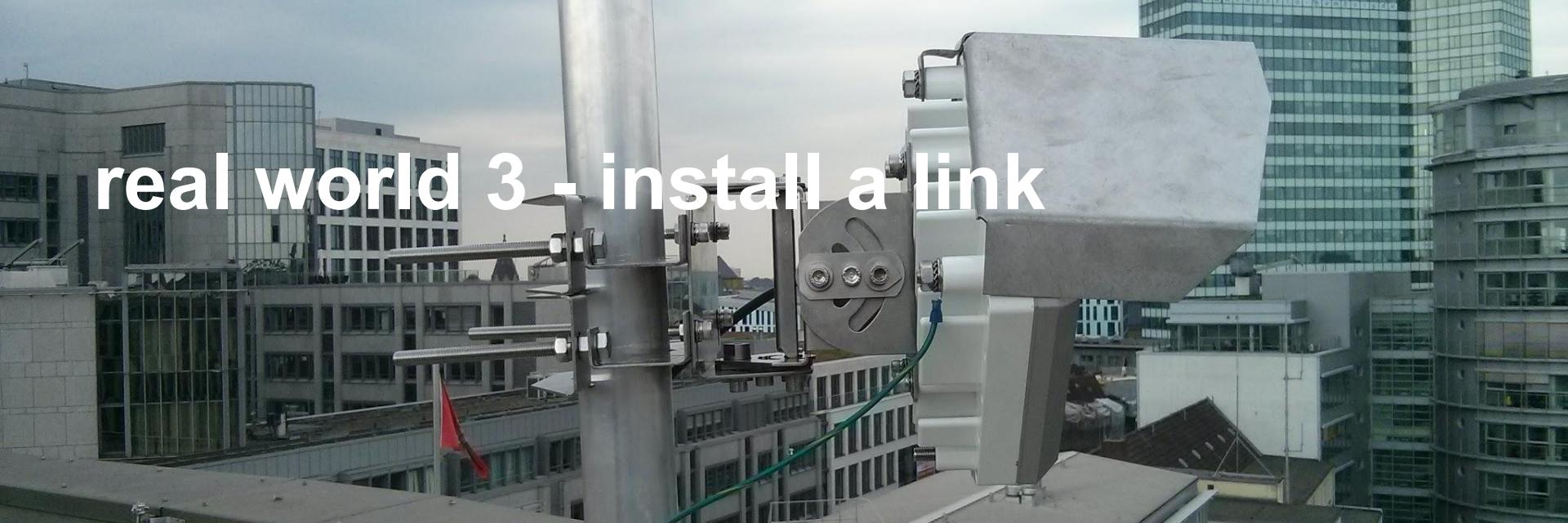
- mobile phone company's pay \$\$\$ to mount antenna's
- do it right or do it twice - you don't want to work outdoor in winter
- always do a LOS-Check (G-Earth lies!)



# real world 2

- need for high places to mount antenna's
- be prepared to deploy towers
- you need at least two teams of two people each
- never trust the weather report





# real world 3 - install a link

- first site visit to find install locations
- view topo data
- line of sight check (multicopter helps - obey legal stuff)
- do a test measurement
- order and install mounts and cabling
- install antenna's, test throughput

# recap

- wisp is fun - it is possible build stable, high bandwidth networks outdoor
- be prepared (tools, cars, equipment)
- real world is never like on google earth
- be your own carrier, solve issues yourself





# future

- wireless to KVZ - then vdsl
  - downside: TAL-rent cost
  - upside: one link, many customers, customers know DSL
- higher bandwidth links in 5Ghz
  - lot of equipment testing (ubnt airfiber, mt netmetal ac)
  - more throughput by
    - higher snr
    - or more rf-bandwidth
- backend systems (excel is not the perfect tool)



# Questions?

Are You Wireless?