

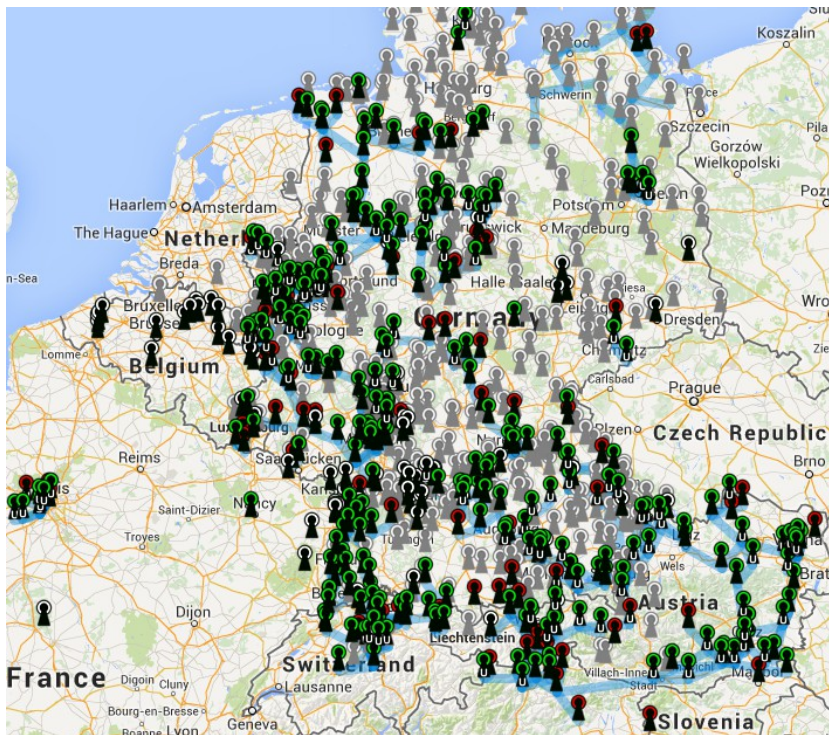
The European HAMNET

A large scale high speed radio network

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<http://hamnetdb.net> → Map



User access

Interlinks

db0fhn:~\$ whois dg8ngn

- VHF/UHF/Microwave Manager DARC e.V.
- Active in Frequency Management DARC e.V.
- 44Net IP-Coordination Team, Germany
(Thomas, DL9SAU / Egbert, DD9QP / Jann, DG8NGN)
- One of the founders of the D-Star ircDDB network
(Hans-Jürgen, DL5DI / Michael, DL1BFF / Jann, DG8NGN)
- Profession: System Engineer for Spectrum Monitoring Systems at Rohde & Schwarz Munich

Abstract

The HAMNET is a **high speed amateur radio multimedia network** based on commercial wireless devices using mainly the **6cm band**.

It covers mostly the German speaking region in Europe and is about to grow over the language border.

It is using the international coordinated **IP-address space of the AMPRNet (44.0.0.0/8)** and AS numbers out of the 16-bit and 32-bit **private AS number space** to interconnect active regions by external **BGP routing**.

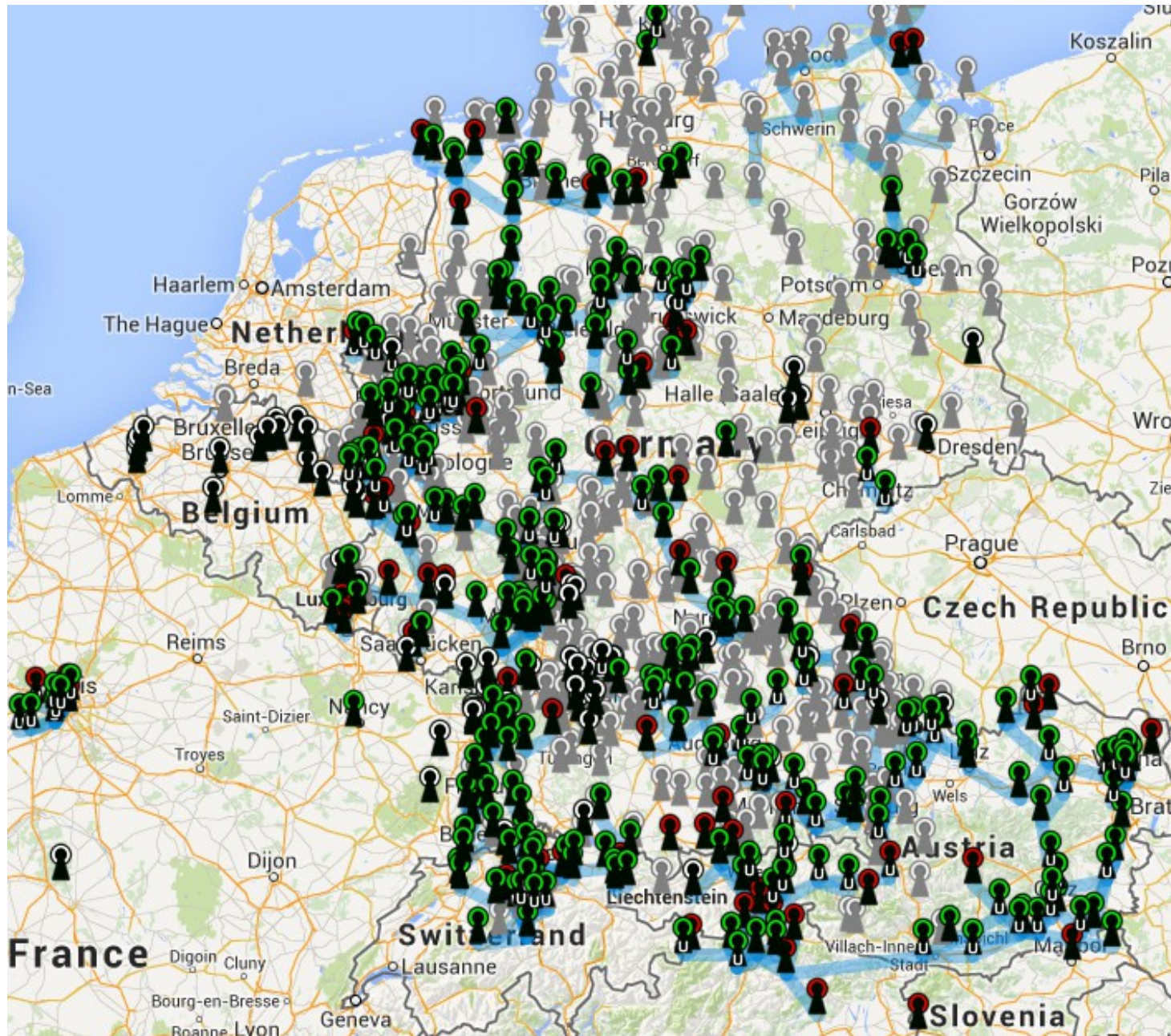
This paper documents how this network has been deployed and how it is **interconnected** with the international **AMPRNet** and the **Packet Radio World**.

It will show which **tools** have been developed and customized for **link planning, spectrum and network management**.

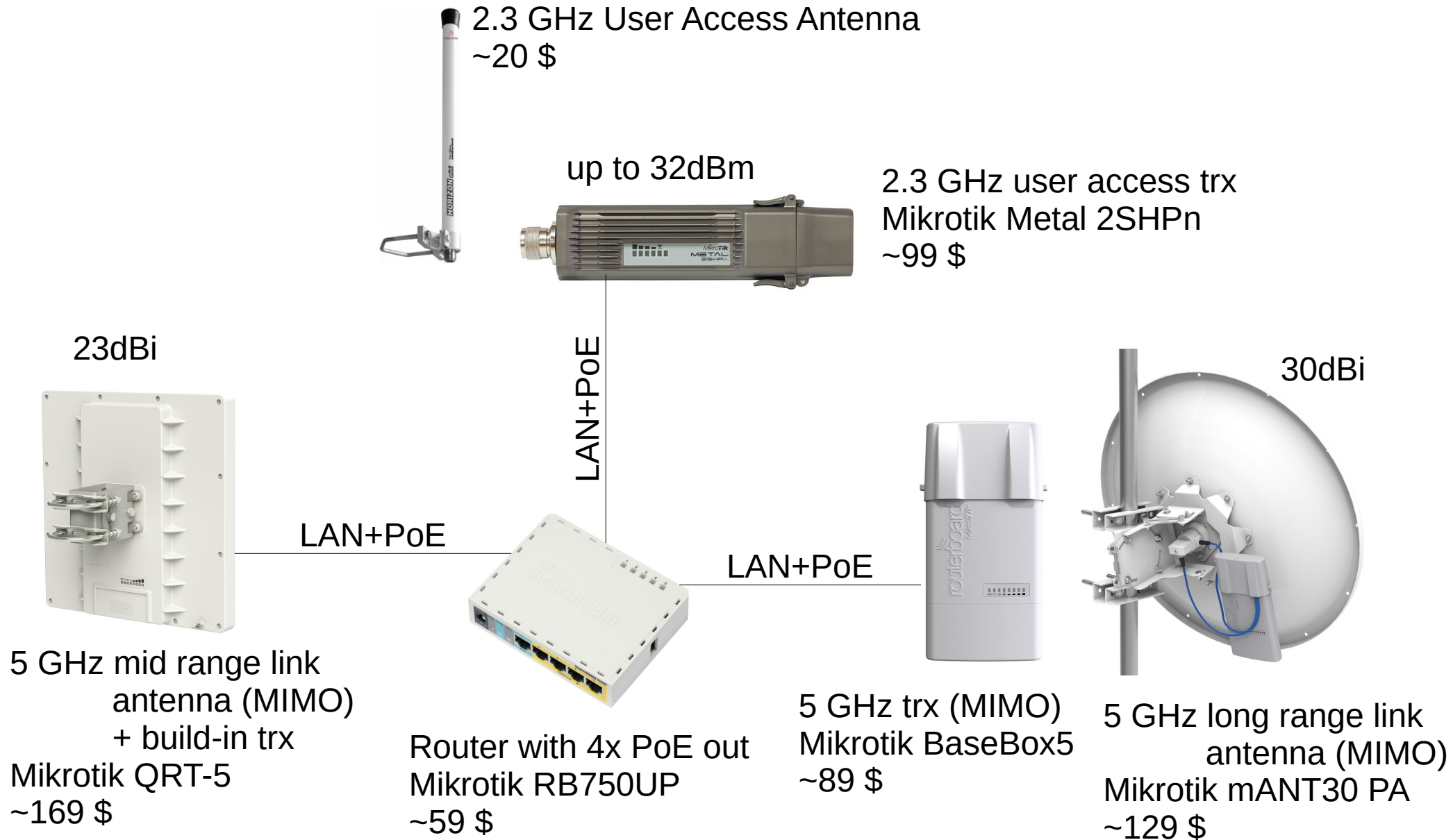
Moreover it will show the **challenges** we meet with **authentication, spectrum regulatory questions and non-line-of-sight wireless user access**.

Finally the vision of a huge **intranet for radio amateurs** with **end-to-end communication** capabilities will be presented.

The network

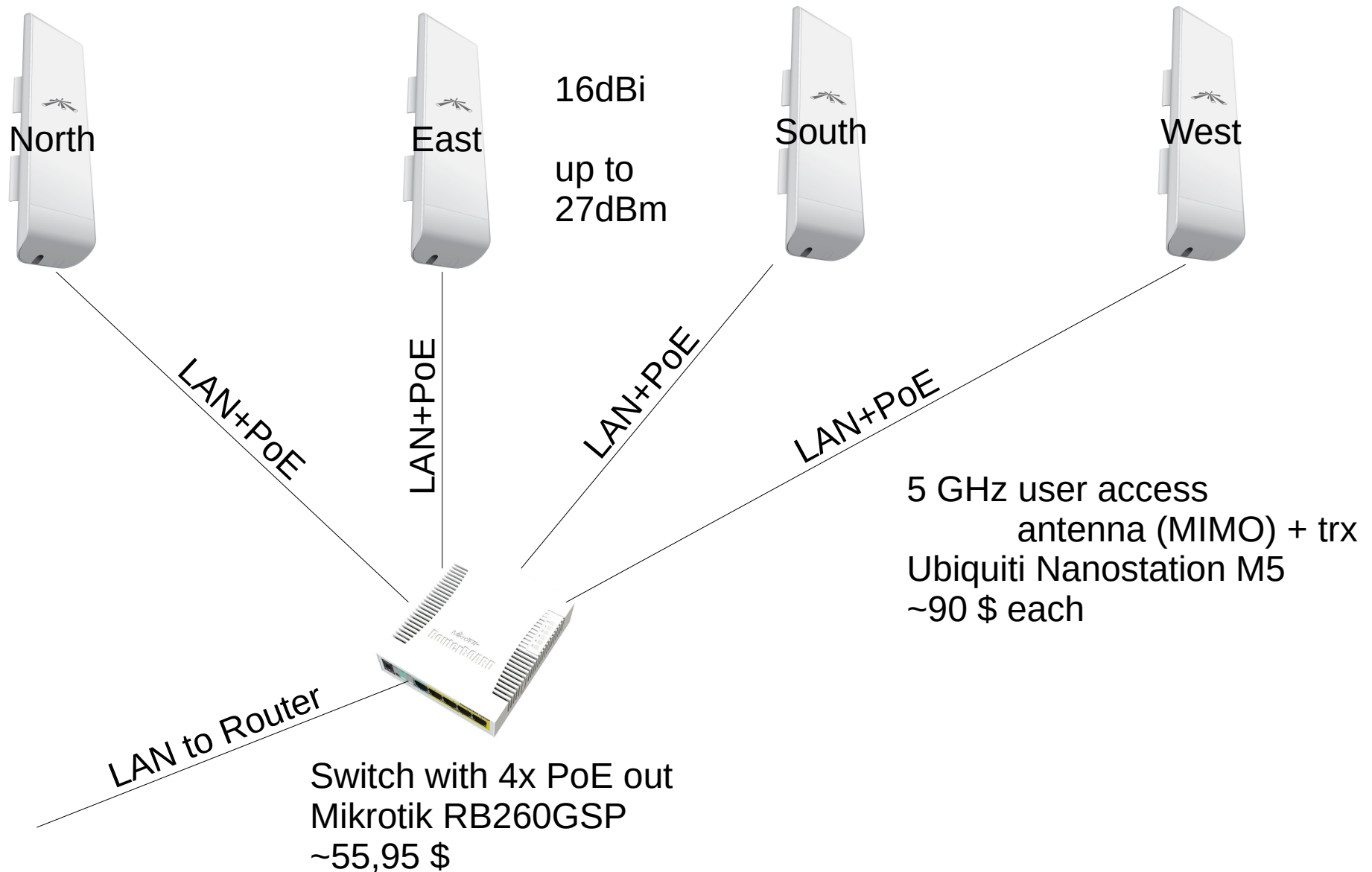


Standard Deployment Example Mikrotik



Standard Deployment Example

Ubiquiti User Access



Network Management – Principles & IP Allocations

- Keeping the experimental nature of amateur radio
 - Regional network management
 - Active regions will get enough resources (**IP-addresses, AS-numbers**)
 - Active regions will „speak“ **eBGP** to neighbors
- IP numbers for German regions will be provided by the German IP coordination team

Network	Country	Co-Ordinator
44.0.0.0/8	Global	WB6CYT [Brian Kantor]
44.130.0.0/16	GERMANY	DG8NGN [Jann Traschewski]
44.224.0.0/15	GERMANY	DG8NGN [Jann Traschewski]

<https://portal.ampr.org/networks.php>

Network Management – ASN allocations (16 bit)

- The HAMNET is using the private AS space as noted in RFC 1930 (AS64512 to AS65535)

[RFC 1930](#)

Guidelines for creation of an AS

March 1996

10. Reserved AS Numbers

The Internet Assigned Numbers Authority (IANA) has reserved the following block of AS numbers for private use (not to be advertised on the global Internet):

64512 through 65535

Network Management – ASN allocations (16 bit)

- The allocation to different countries is not yet coordinated in a global way, thus we try to synchronize our wikis with recent changes:

DL: <http://www.de.ampr.org/dokumentation/as-nummern>

OE: http://wiki.oevsv.at/index.php?title=Routing_-_AS-Nummern

This is the central documentation place for the allocation of AS numbers used within the AMPRNet.

Country	ASN Block	local documentation
OE Austria	64512-64599	Wiki
I Italy	64600-64619	Wiki
DL Germany	64620-64683	List or WHOIS-Search
LX Luxemburg	64684-64685	Wiki
CR Croatia	64686-64690	Wiki
PA Netherlands	64691-64694	Wiki
S5 Slovenia	64695-64704	Wiki
HA Hungary	64705-64707	Wiki
EA Spain	64708-64719	Wiki
HB Switzerland	64720-64739	Wiki
HB0 Liechtenstein	64740-64741	Wiki
F France	64742-64777	Wiki
ON Belgium	64778-64788	Wiki
TA Turkey	64789-64799	Wiki
SP Poland	64800-64839	Wiki
YO Romania	64840-64849	Wiki
* Test and BGP-Confederations		65510-65534 Wiki

Network Management – ASN allocations (32 bit)

- The amateur radio community requested a private AS number block within the 32 bit range
- RFC 6996 reflects the new private AS number block 4200000000 to 4294967294
- No coordination – just experiments and thoughts how to coordinate

RFC 6996

Private Use AS Reservation

July 2013

5. IANA Considerations

IANA has reserved, for Private Use, a contiguous block of 1023 Autonomous System numbers from the "16-bit Autonomous System Numbers" registry, namely 64512 - 65534 inclusive.

IANA has also reserved, for Private Use, a contiguous block of 94,967,295 Autonomous System numbers from the "32-bit Autonomous System Numbers" registry, namely 4200000000 - 4294967294 inclusive.

These reservations have been documented in the IANA "Autonomous System (AS) Numbers" registry [[IANA.AS](#)].

Routing within a region

- Each region is free to use its favorite routing protocol (e.g. OLSR, B.A.T.M.A.N., OSPF, internal BGP)
- Internal BGP is often used
 - Full Mesh: Each node needs to talk to each other node (more traffic, does not scale → $n(n-1)/2$ BGP links necessary)
 - Route Reflector: Each node needs to talk to the route reflector (Single point of failure)
 - BGP Confederation: ASN block 65510 to 65534 is used as internal AS numbers

Deployment - Sites

- Get in touch with anybody on this site:
<http://hamnetdb.net/?m=util&func=maintainer>

Maintainers with write-access in this database:

Callsign	Full Name	Comment	Edited
db1hdn	Dennis	Admin DB0ROW, DB0RTN	364d dh6bb
db5jl	Detlev	C21	536d dg8ngn
db7mj	Peter	Sysop DB0ESS	477d dl8mbt
db7yi	Michael	Sysop DB0PM	595d dg8ngn
db8zp	Peter	Sysop DB0TAN	403d dg8ngn
dc1dmr	Matti		92d dh3wr
dc1nf	Dieter	Sysop DB0ADS	303d dg8ngn
dc1paa	Michael	Sysop DB0ALU	557d dg8ngn
dc1rd	Rainer	Sysop DB0SL	423d dg8ngn
dc2ve	Frank	Verwaltung AS64650	538d dg8ngn
dc4ah	Andreas	Sysop DB0DLX	293d dk2ern

- They can create an account for you to edit the database
- Or ask me (dg8ngn@darcd.de) to get you an account

Deployment - Sites

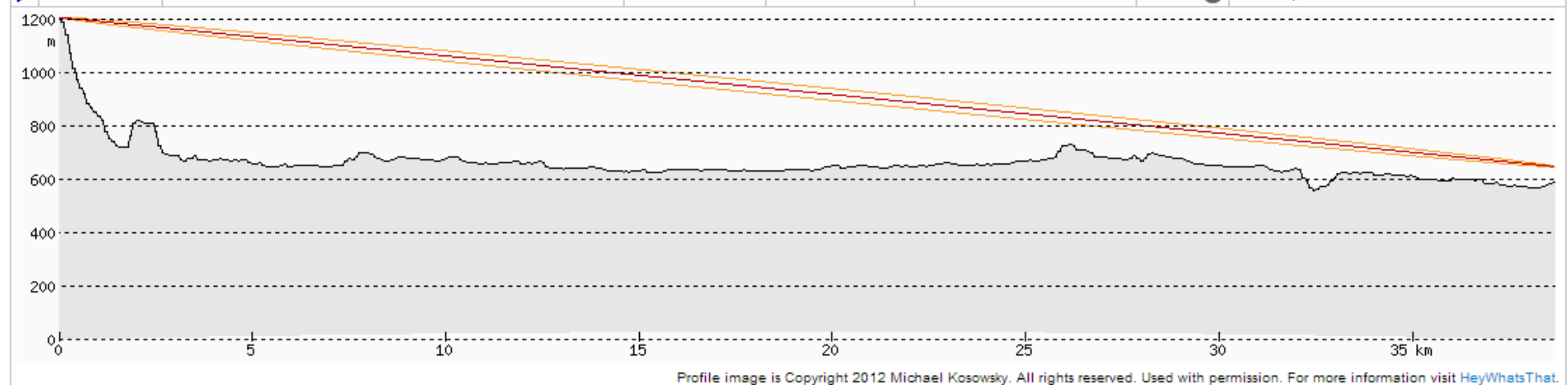
- Login to <http://hamnetdb.net>
- Click on „Sites“
- Press „New Site“
- Fill the following data into the form:
 - Call sign
 - Descriptive Name
 - Latitude, Longitude and meters above **ground**
 - Comma separated list of maintainers

Deployment - Sites

- Click onto your site and scroll down the list
- Have a look for nearby sites and check the link profile by clicking „Profile“

Other sites near db0isw:

Site	Name	Distance	Direction	Above ground	Edge	
No Call	Herzogstand	19.6 km	223.6°	20 m		Profile Show in linktool
db0pme	Hintereck / Gmund am Tegernsee	21.2 km	84.5°	5 m	+	Profile Show in linktool
db0pm	Brenten / Hausham	26.7 km	85.2°	9 m	+	Profile Show in linktool
db0abx	Laber	33.9 km	240.8°	5 m		Profile Show in linktool
No Call	Raisting EMC-Turm	34.3 km	304.3°	35 m		Profile Show in linktool
dl0igi	Hohenpeissenberg	36.1 km	281.9°	50 m		Profile Show in linktool
dm0gap	Wank / Garmisch-Partenkirchen	36.6 km	226.7°	8 m	+	Profile Show in linktool
db0ona	Hohenpeissenberg	36.8 km	281.5°	4 m	+	Profile Show in linktool
db0dba	München DEBA-Hochhaus	38.6 km	0.6°	61 m	+	Profile Show in linktool



- Check for line of sight (5 GHz) and get in touch with the operator

Deployment – Link Budget

- You might want to calculate your link budget to estimate the data rate you could achieve
- Check your data sheet of your TRX (e.g. Mikrotik QRT 5)
 - Gain is 23 +/- 1dBi

	TX power / RX sensitivity
TX/RX at MCS0	30dBm / -96dBm
TX/RX at MCS7	24dBm / -78dBm
TX/RX at 6Mbit	30dBm / -96dBm
TX/RX at 54Mbit	27dBm / -80dBm
Frequency range	4900-5920MHz

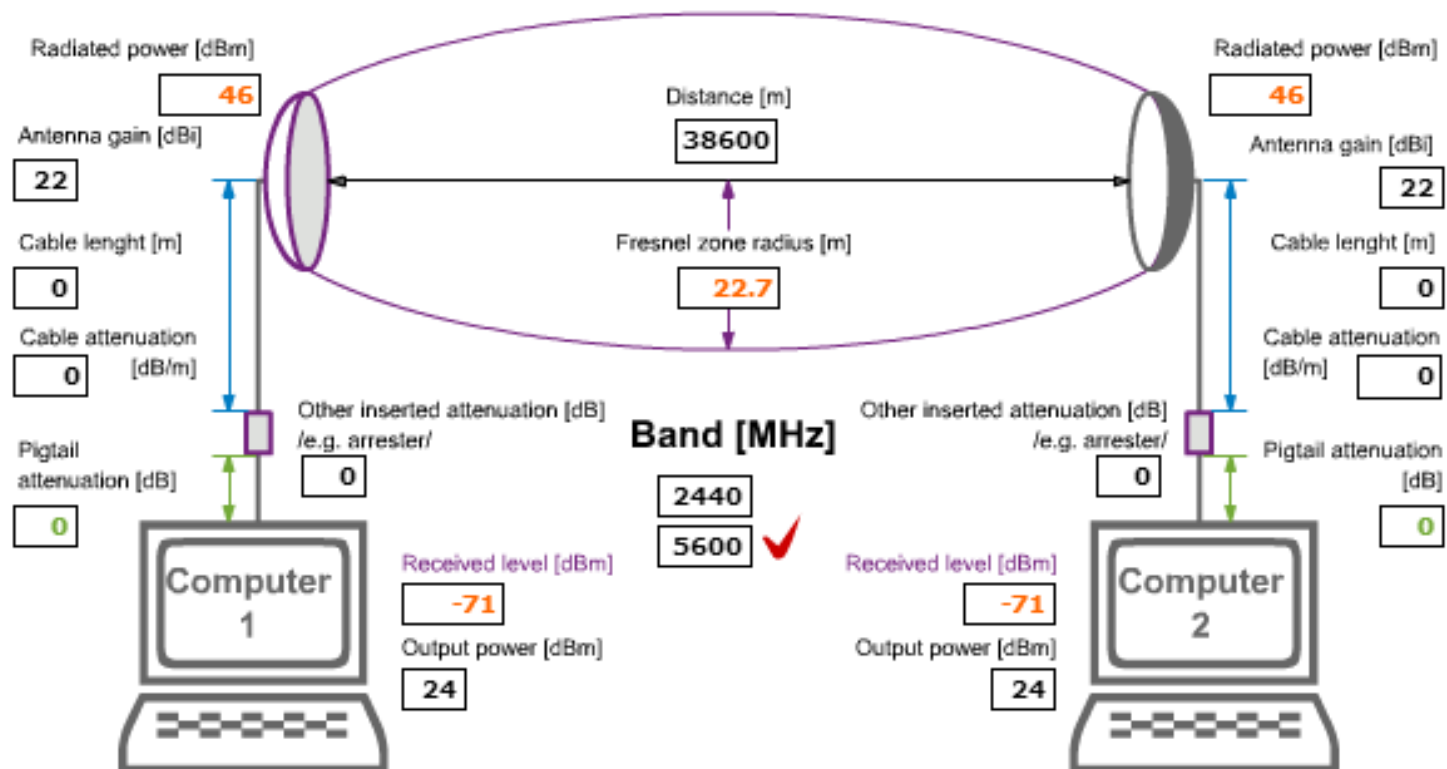
- TX level at MCS7 (Modulation and Coding Scheme: 64-QAM with Coding rate 5/6) will be 24dBm
 - RX at MCS7 needs -78dBm of receiving power level
- Check additional losses of antenna gain by looking into chart „gain vs. frequency“ (if provided by manufacturer)

Deployment – Link Budget

- There are many link budget calculation tools on the web
- Pick one and put the worst case values in (e.g. <http://en.jirous.com/calculation-wifi>):

Fresnel zone

Fresnel zone is an area where most of the power between antennas is transmitted, it is cigar shaped. If there is a barrier in this area, the transmission attenuation increases. Calculated radius is in the middle of the link and at the end it decreases.



Deployment – Link Budget

- Estimated receiving level is -71dBm, so we have 7dB left for inaccuracy (e.g. unknown frequency/gain behavior)
- Keep in mind that changing bandwidth from 20 MHz down to 10 MHz will give you 3dB more gain (respectively 6dB by narrowing down to 5 MHz) but the throughput will suffer from the same factor (divided by 2 respectively 4)
- Running 2 spatial streams (horizontal and vertical polarization) at the same time will give us 130 Mbit/s:

MCS index	Spatial streams	Modulation type	Coding rate	Data rate (Mbit/s)			
				20 MHz channel		40 MHz channel	
				800 ns GI	400 ns GI	800 ns GI	400 ns GI
7	1	64-QAM	5/6	65.00	72.20	135.00	150.00
15	2	64-QAM	5/6	130.00	144.40	270.00	300.00

Deployment – Spectrum Regulatory

- Before deploying a radio link you need to check the rules which apply for your country
- Germany
 - Automatic radio stations need a special license (they get a special call sign e.g. „db0xyz“) from the regulation authority „BNetzA“ (200,- € per call sign)
 - Different rules will apply per band or even frequency ranges (e.g. max. 15W ERP >30 MHz and 10 MHz bandwidth maximum) by law

Deployment – Spectrum Allocation Status

- On the most GHz bands we do only have secondary status and need to take care that the primary user will not be disturbed
- Germany
 - If applying for a license the regulatory authority will send a request to the primary user
 - If the primary user is fine with the planned frequency usage a permission will be given by the regulatory authority (takes currently around 4 to 5 month)

Deployment – Spectrum Sharing

- Sharing with Wifi (Germany)

Amateur	Wifi
Max. 15W ERP	Max. 1W ERP (if DFS „Dynamic Frequency Selection“ and TPC „Transmit Power Control“ is used)
Need special License	No license necessary
Bandwidth limited	40 MHz and more
Further Restrictions and Rules (need to identify, no encryption, limited content)	Radar Detection must be implemented in the upper 5 GHz band

Question: Is it all worth just for 12dB more gain considering that most of the wifi networks doesn't take care on DFS, TPC and Radar Detection?

Deployment – Spectrum Sharing

- Sharing with Radars is possible due to spectrum management (license for radio links only if primary user has agreed)



Wifi emissions without radar detection disturbing weather radars...

Rain: Romania

Wifi: Slovakia and Poland

Deployment – Spectrum Sharing

- Sharing with other Amateur Radio Applications
 - Have a look into the IARU Band plan
 - Have a look into your national Band plan
- Germany
 - We are running different kind of digital links (Digital ATV, Packet Radio, HAMNET)
 - The Band plan should specify „bandwidth“ for certain frequencies rather than „application types“ to be able to consolidate the applications
 - e.g. DATV-links can carry TCP/IP, HAMNET can carry IPTV and Packet Radio → Build a large backbone for any kind of amateur application

Deployment - Identification

- Radio amateurs need to identify in regular intervals
 - ESSID (e.g. HAMNET-DB0ABC-DB0XYZ)
 - But is a transmission coming from DB0ABC or DB0XYZ?
 - Only valid with fixed convention (e.g. AP-Mode = first call sign and Station-Mode = second call sign)
 - How to handle Point-to-Multipoint Links?

Deployment - Identification

- Using locally administered MAC-addresses
 - Encoding of call sign into the free bits in a MAC-address

```
Byte 6   Byte 5   Byte 4   Byte 3   Byte 2   Byte 1
RRRRRRXX RRRRRRNN RRRRRRSS RRRRRRSS RRRRRRSS RRRRRRSS
8 Bit   1 8 Bit   1 8 Bit   1 8 Bit   1 8 Bit   1 8 Bit   1
```

R = Bits for coding the call sign

S = Bits for the station identifier (SSID)

N = reserved for future applications

X = Standardbits according to IEEE 802

Bit 1: 0 = unicast / 1 = multicast

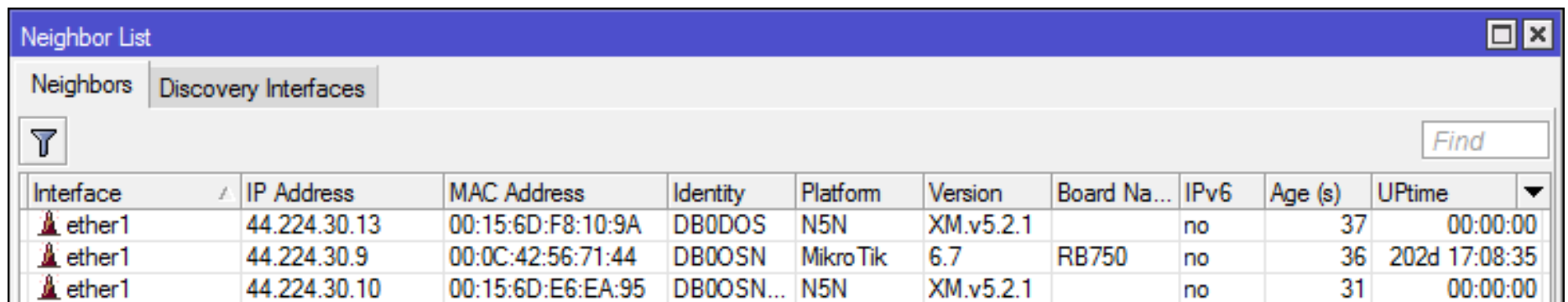
Bit 2: 0 = globally unique / 1 = locally administered

Details and Tools/Scripts available (in German) on:

<http://db0fhn.efi.fh-nuernberg.de/doku.php?id=projects:wlan:proposal>

Deployment - Identification

- Neighbor Discovery Protocols
 - There are plenty of neighbor discovery protocols in the wild (CDP, LLDP, MNDP, ...)
 - Just set the „Identity“ to your call sign and you're fine



The screenshot shows a window titled "Neighbor List" with two tabs: "Neighbors" and "Discovery Interfaces". Below the tabs is a search bar with a filter icon and a "Find" button. The main area contains a table with the following columns: Interface, IP Address, MAC Address, Identity, Platform, Version, Board Na..., IPv6, Age (s), and Uptime. The table lists three neighbors, all connected via the "ether1" interface.

Interface	IP Address	MAC Address	Identity	Platform	Version	Board Na...	IPv6	Age (s)	Uptime
ether1	44.224.30.13	00:15:6D:F8:10:9A	DB0DOS	N5N	XM.v5.2.1		no	37	00:00:00
ether1	44.224.30.9	00:0C:42:56:71:44	DB0OSN	MikroTik	6.7	RB750	no	36	202d 17:08:35
ether1	44.224.30.10	00:15:6D:E6:EA:95	DB0OSN...	N5N	XM.v5.2.1		no	31	00:00:00

Neighbor List of HAMNET Station „DB0DOS“
(Mikrotik and Ubiquiti Devices)

Deployment – AS/IP-Subnet-Allocation

- Regions need to get an AS- and IP-Allocation
 - The German IP Coordination is taking care

```
# -----  
# HAMNET-DL  
# -----  
# AS-      AS-      NETWORKS      NETWORKS      NETWORKS  
# NO      NAME      BACKBONE      USER/SERVICES  PACKET-RADIO  
  
*                               44.225.254.0/23 # Anycast  
64625     DISTRIKT-C-625-AS  44.224.10.0/23  44.225.20.0/22  44.130.56.0/24  
64626     DISTRIKT-B-626-AS  44.224.12.0/23  44.225.24.0/22  44.130.60.0/24  
                                                44.130.99.0/24  
  
64627     DISTRIKT-L-627-AS  44.224.14.0/23  44.225.28.0/22  44.130.146.0/24  
64628     DISTRIKT-S-628-AS  44.224.16.0/23  44.225.32.0/22  
64629     DISTRIKT-D-629-AS  44.224.18.0/23  44.225.36.0/22  
64630     DISTRIKT-U-630-AS  44.224.20.0/23  44.225.40.0/22  44.130.59.0/24  
64631     DISTRIKT-T-631-AS  44.224.22.0/23  44.225.44.0/22  44.130.53.0/24  
                                                44.130.61.0/24
```

Deployment – AS-Allocation

- Information is reflected in the HAMNETDB

The Hamnet-Database Show: [Map](#) [Fullscreen Map](#) OSM

	AS	Name	Maintainer	Comment	Edited
	AS64625	DISTRIKT-C-625-AS	dl3mbg,dg8ngn	Oberbayern	567d dl8mbt
	AS64626	DISTRIKT-B-626-AS	dg8ngn	Franken	598d dg8ngn
	AS64627	DISTRIKT-L-627-AS	dd9qp	Niederrhein - WES, KLE	162d dd9qp
	AS64628	DISTRIKT-S-628-AS	dg1cpa	Distrikt Sachsen	510d dd9qp
	AS64629	DISTRIKT-D-629-AS	dl7uaz	Berlin	594d dg8ngn
	AS64630	DISTRIKT-U-630-AS	dl8rds,dg8ngn	Ostbayern	594d dg8ngn
	AS64631	DISTRIKT-T-631-AS	dg8ngn	Schwaben	595d dg8ngn

<http://hamnetdb.net/?m=as>

Deployment – IP-Subnet-Allocation

- Information is reflected in the HAMNETDB

	Subnet-IP	Type	Own AS	Parent	Radio parameters / Comment	Edited
/	44.130.53.0/24	AS-Packet-Radio	-	AS64631		393d dg8ngn
/	44.130.56.0/24	AS-Packet-Radio	-	AS64625		393d dg8ngn
/	44.130.59.0/24	AS-Packet-Radio	-	AS64630		393d dg8ngn
/	44.130.60.0/24	AS-Packet-Radio	-	AS64626		399d dg8ngn
/	44.130.61.0/24	AS-Packet-Radio	-	AS64631		393d dg8ngn
/	44.130.99.0/24	AS-Packet-Radio	-	AS64626		186d dg8ngn
/	44.130.146.0/24	AS-Packet-Radio	-	AS64627	Distrikt-L Packet-Radio Netz	162d dd9qp
/	44.224.10.0/23	AS-Backbone	-	AS64625		665d dg8ngn
/	44.224.12.0/23	AS-Backbone	-	AS64626		594d dg8ngn
/	44.224.14.0/23	AS-Backbone	-	AS64627	Distrikt-L Backbone Netz	579d dg8ngn
/	44.224.16.0/23	AS-Backbone	-	AS64628		594d dg8ngn
/	44.224.18.0/23	AS-Backbone	-	AS64629	Berlin Backbone Netz	585d dl7uaz
/	44.224.20.0/23	AS-Backbone	-	AS64630		594d dg8ngn
/	44.224.22.0/23	AS-Backbone	-	AS64631		594d dg8ngn
/	44.225.20.0/22	AS-User/Services	-	AS64625		689d dl8mbt
/	44.225.24.0/22	AS-User/Services	-	AS64626		594d dg8ngn
/	44.225.28.0/22	AS-User/Services	-	AS64627	Distrikt-L User/Services Netz	579d dd9qp
/	44.225.32.0/22	AS-User/Services	-	AS64628		594d dg8ngn
/	44.225.36.0/22	AS-User/Services	-	AS64629	Berlin User-Service Netz	458d dl9sau
/	44.225.40.0/22	AS-User/Services	-	AS64630		688d dl8mbt
/	44.225.44.0/22	AS-User/Services	-	AS64631		688d dl8mbt

<http://hamnetdb.net/?m=subnet>

Deployment – „IP-Subnetting“

- Each region gets a /23 for the backbone (transfernetworks) and a /24 for user-/services (sitenetworks)
- Best practice:
 - Each site has a single router
 - Each site gets a /27 network from the maintainer (leave the next /27 free in case a network needs to be increased)
 - The sitenetwork will be announced by the router to the network
 - The sitenetwork can be splitted „internally“ at the site into several networks (e.g. /28 for users and /28 for services) → easy firewalling
 - Each site uses a /29 transfer network to interconnect to another site

Deployment – Network Documentation

- The HAMNETDB provides network management capabilities
- Data structure (AS, Hosts, Subnets, Sites):
 - Hosts belong to sites (user defined)
 - Hosts belong to subnets (by nature)
 - Subnets belong to AS (user defined)
- The HAMNETDB is able to visualize data

Deployment – Network Documentation Example

Site db0zm (München-Freimann Studentenstadt)

Show:

[Map](#)

[Fullscreen Map](#)

OSM

Coordinates: 48.184086,11.611249 - 48°11.05' N 11°36.67' E - 48°11'02" N 11°36'40" E
Elevation: 65 m above ground

Maintainer: **dl8rds,dg8ngn,dl8mbt,dd5ki**

Am Standort ist auch

- 2m FM Relais DB0ZM 145.750
- 70cm FM-Relais DB0NJ 438.775
- 70cm DMR-Relais DB0NJ 439.4375
- 2 Kameras von <http://www.foto-webcam.eu>

Site configuration: <https://www.dropbox.com/s/0sd219kow4lb23f/DB0ZM.gif>

Last edited 2013-12-07 by **dl8mbt**

db0zm (München-Freimann Studentenstadt)
bb-db0tvm.db0zm
[44.224.10.49](#)
Station WDS (NStreme)
000c423a644c

Backbone-Network
[44.224.10.48/29](#)
5685MHz, 10Mhz, horizontal

db0tvm (München Olympiaturm)
bb-db0zm.db0tvm
[44.224.10.54](#)
AP Bridge (NStreme)
000b6b234bca
4.4km - 256.2° - [Show in Linktool](#)

db0zm (München-Freimann Studentenstadt)
bb-db0wai.db0zm
[44.224.10.46](#)
Station WDS (NStreme)
000c4260e61f

Backbone-Network
[44.224.10.40/29](#)
5825MHz, 10Mhz, horizontal


db0wai (München Thalkirchen)
bb-db0zm.db0wai
[44.224.10.41](#)
AP Bridge (NStreme)
000c4260f560
8.6km - 207.5° - [Show in Linktool](#)

































db0zm (München-Freimann Studentenstadt)
bb-db0ebe.db0zm
[44.224.10.73](#)
Station WDS (NStreme)
000c436fb3f2

Backbone-Network
[44.224.10.72/29](#)
5795MHz, 10Mhz, vertikal

db0ebe (Ebersberg Aussichtsturm)
bb-db0zm.db0ebe
[44.224.10.78](#)
AP Bridge (NStreme), 23dBi
000c426fb3f2
28.0km - 111.8° - [Show in Linktool](#)

Deployment – Network Documentation Example







Contains the following hosts :

	Host-IP	M	Hostname	Type	Site	Radio parameters / Comment	Edited
	44.224.10.46		bb-db0wai.db0zm	Routing-Radio	db0zm	Station WDS (NStreme)	584d dg8ngn
	44.224.10.49		bb-db0tvm.db0zm	Routing-Radio	db0zm	Station WDS (NStreme)	584d dg8ngn
	44.224.10.73		bb-db0ebe.db0zm	Routing-Radio	db0zm	Station WDS (NStreme)	378d dg8ngn
	44.224.10.74		Ink-db0ebe.db0zm	Service	db0zm		584d dg8ngn
	44.225.20.193		router.db0zm	Service	db0zm	Routerboard RB433AH (WAI, TVM)	584d dg8ngn
	44.225.20.194		allstarlink.db0zm	Service	db0zm	2m FM-Relais DB0ZM	667d dg8ngn
	44.225.20.195		eoip.db0zm	Service	db0zm	Routerboard RB411AH (EBE)	667d dg8ngn
	44.225.20.196		hamnetdb.db0zm	Service	db0zm	Raspberry PI mit Debian - ProxyPa..	506d dl8mbt
	44.225.20.197		webcam-nord.db0zm	Service	db0zm	Kamerarechner WL500GP OpenWRT - h..	589d dl8mbt
	44.225.20.198		webcam-sued.db0zm	Service	db0zm	Kamerarechner WL500GP OpenWRT - h..	589d dl8mbt
	44.225.20.199		dmr.db0zm	Service	db0zm	db0nj 439.4375 MHz, Motorola DR30..	269d dl8mbt
	44.225.20.200		proxmox.db0zm	Service	db0zm	Server for Virtual Machines	7m dg8ngn
	44.225.20.201		ipmi.db0zm	Service	db0zm	Remote Console	7m dg8ngn
	44.225.20.202		winxp.db0zm	Service	db0zm	Windows VM	6m dg8ngn
	44.225.20.203		dhcp-44-225-20-203.db0zm	DHCP-Range	db0zm	assigned dynamically	0s system
	44.225.20.204		dhcp-44-225-20-204.db0zm	DHCP-Range	db0zm	assigned dynamically	0s system
	44.225.20.205		wetter.db0zm	Service	db0zm	Wetterstation Davis Vantage Vue -..	102d dl8mbt
	44.225.20.206		netio.db0zm	Service	db0zm	Schaltsteckdose - 1: DMR-Relais D..	269d dl8mbt

18 entries.


Deployment – Network Documentation Example

Surrounding subnets +:

	Subnet-IP	Type	Own AS	Parent	Radio parameters / Comment	Edited
	44.224.10.0/23	AS-Backbone	-	AS64625		665d dg8ngn
	44.224.10.40/29	Backbone-Network	-	AS64625	db0zm , db0wai - 5825MHz, 10MHz, horizontal	691d dl8mbt
	44.224.10.48/29	Backbone-Network	-	AS64625	db0tvm , db0zm - 5685MHz, 10MHz, horizontal	691d dl8mbt
	44.224.10.72/29	Backbone-Network	-	AS64625	db0zm , db0ebe - 5795MHz, 10MHz, vertikal	691d dl8mbt
	44.225.20.0/22	AS-User/Services	-	AS64625		689d dl8mbt
	44.225.20.192/28	Site-Network	AS65530	AS64625	db0zm	264d dg8ngn



6 entries.

Surrounding AS:

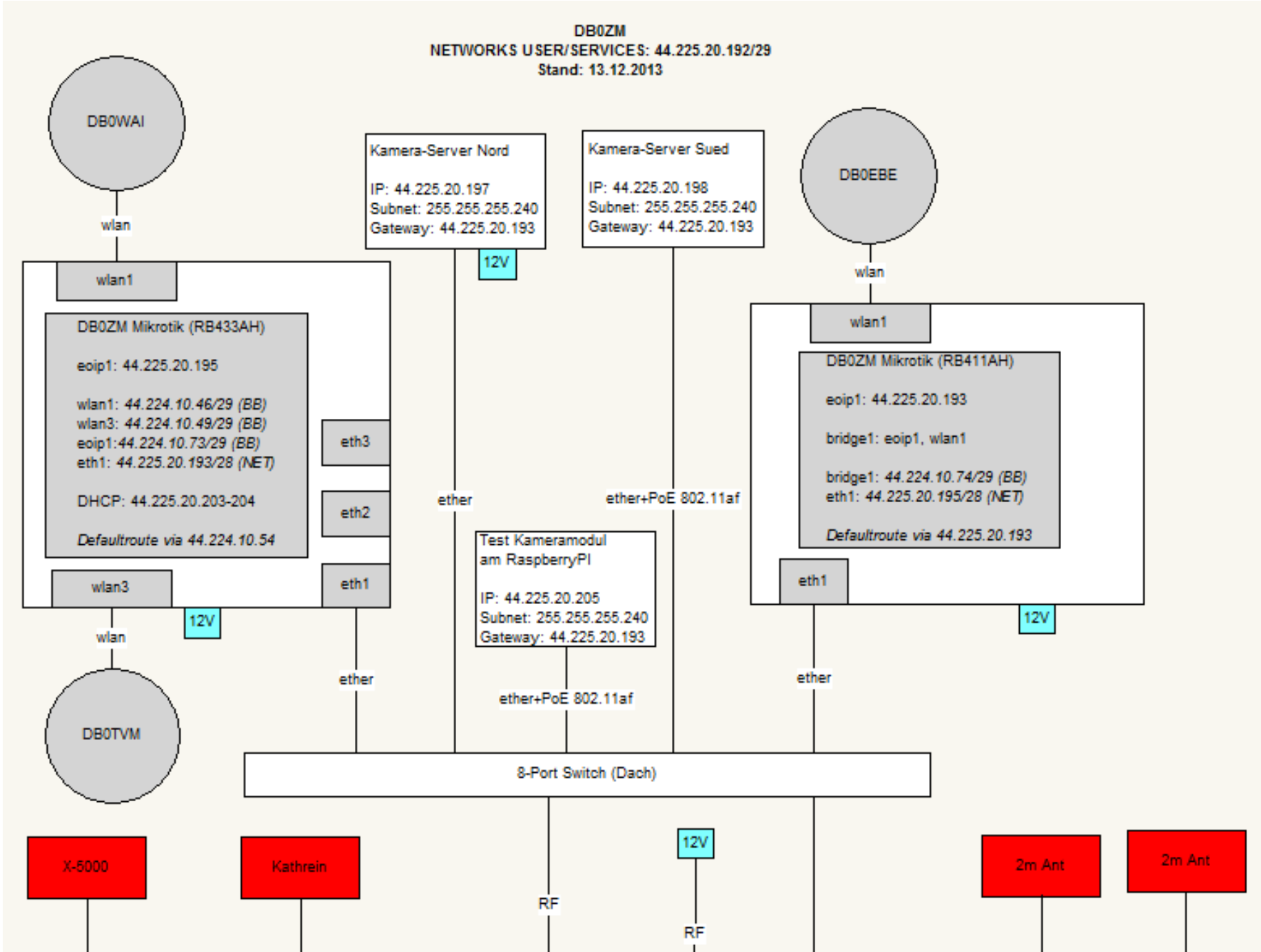
	AS	Name	Maintainer	Comment	Edited
	AS64625	DISTRIKT-C-625-AS	dl3mbg, dg8ngn	Oberbayern	567d dl8mbt

1 entry.

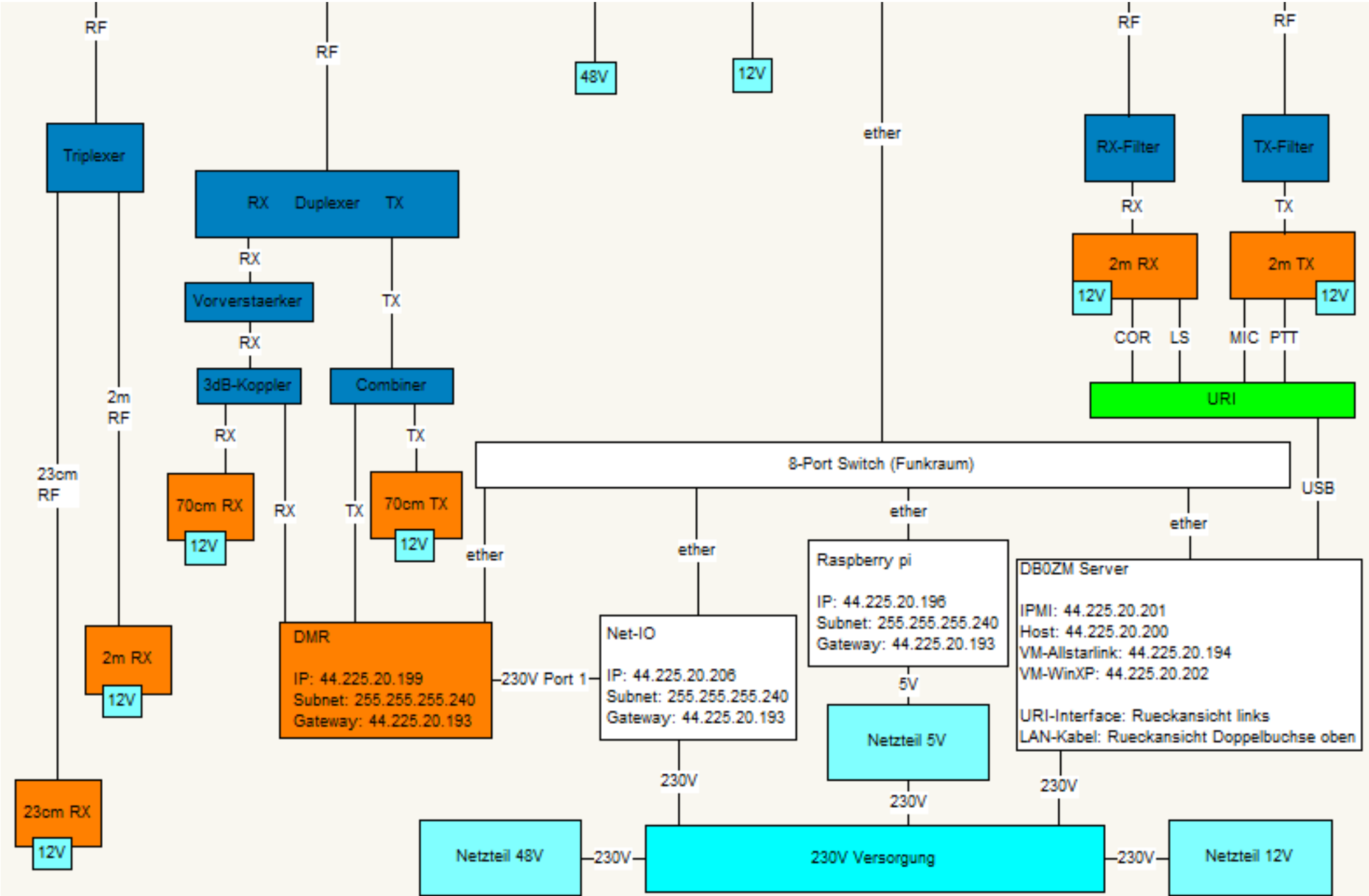
Other sites near db0zm:

	Site	Name	Distance	Direction	Above ground	Edge	
	db0tvm	München Olympiaturm	4.4 km	256.2°	200 m		Profile Show in linktool
	dl0muc	Clubstation Chaos Computer C..	5.0 km	228.0°	30 m		Profile Show in linktool

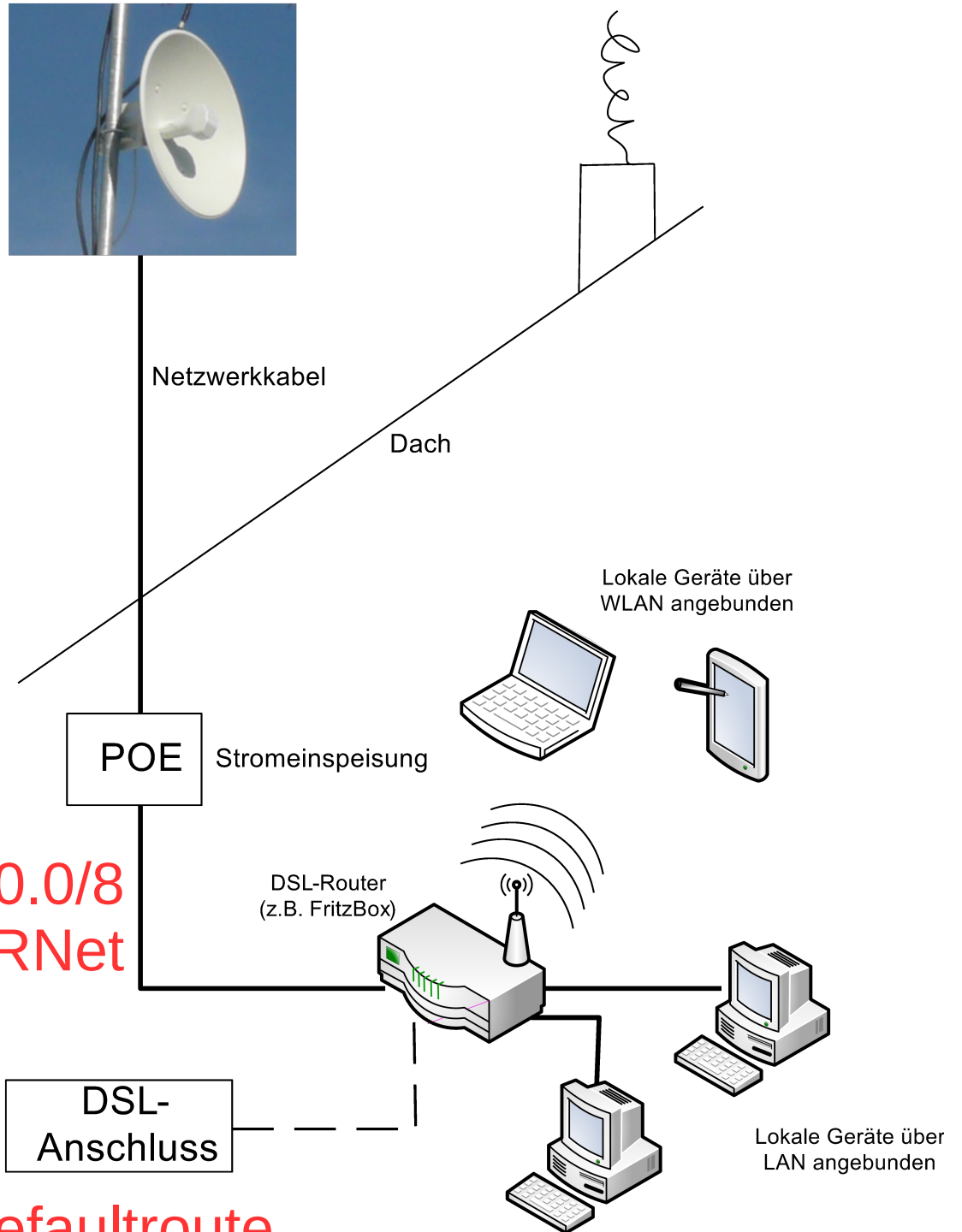
Deployment – Network Documentation Example



Deployment – Network Documentation Example



Deployment - Typical User Setup



Keep 44.0.0.0/8 for radio amateurs only !

Deployment – DNS

- Each region can run its own DNS Server
- In Germany there is a national DNS concept in place running under „de.ampr.org“
- The HAMNETDB can generate DNS zone files for downloading

Generate DNS zone files

Generate sub-domains for each AS (CGI-parameter: **by_as**) Limit to AS (**only_as**)

SOA-NS (**ns**)

SOA-Mail (**mail**)

SOA-Serial (**serial**)

(Inserted literally, 'unix' > seconds since epoch, default yymmddHHMM)

Domain-suffix for all entries (**suffix**)

Country (**country**)

Automated update (Debian file system layout):

```
cd /var/cache/bind && \
  wget -qO- 'http://hamnetdb.net/dnszone.cgi?by_as=0&suffix=de.ampr.org' | \
  tar zxvf - && /etc/init.d/bind9 reload
```

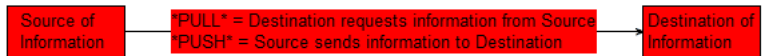
First setup: Add **include "named.conf.hamnetdb";** to /etc/bind/named.conf.local

Deployment – DNS

- Running a DNS Server is quite some work, so we offer a service to host „HAMNETDB-synchronized“ zones at DB0FHN
- DB0FHN is a DNS-Hub in Germany and will exchange with our other two DNS-Hubs DB0RES and DB0TUD
- At DB0TUD there is a script which synchronizes the *.de.ampr.org information to the flat ampr.org zone
- There is a dataflow diagram of the international distribution of hostname information available

AMPRNet: Distribution of Routing- and Hostname-Information

AMPRNet IP address coordinators
and / or
Automatic/Semi-automatic update scripts
(e.g. in Germany a semi-automatic update
script extracts information from the
national DNS project which itself is partly
synced by <http://hamnetdb.net>)



Everybody can review current zonefile
information using these files:
44.rev
ampr.org
ampr.tar.gz
amprhosts

Brian, WB6CYT:
ARIN does not update it at all except to handle
changes to our nameserver constellation. We do
not currently further delegate the in-addr domain.

Secondary DNS-Servers:

* hamradio.ucsd.edu
* ns0.comgw.net
* munnari.OZ.AU
* ampr-dns.in-berlin.de
* ns2.threshinc.com
* ns1.defaultroute.net

Brian, WB6CYT:
The time that it takes an end user to notice
the changes depends upon his cache
settings. The default TTL on AMPR.ORG
DNS records is 1 hour.

ADD/DEL records to/from
"ampr.org" Zonefile:
A-record
CNAME-record
MX-record

PUSH - E-Mail to AMPRNet
Robot from "registered E-Mail
addresses"

(will be confirmed by Robot with
Subject: "AMPRNet address
update received")

PULL - FTP
<ftp://hamradio.ucsd.edu/pub>

PUSH - Send Notify whenever the master
zones are updated.

PULL - AXFR after zone transfer notification received
PULL - AXFR after hourly check of the master
zone showed incremented serial number
(to cover the situation that the slave server
has missed a zone transfer notification)

Brian, WB6CYT:
New DNS records will be loaded
into the master zonefiles
"ampr.org" and "44.in-addr" once
an hour, at one minute past the
hour. ie, **:01:00

AMPRGW

169.228.66.251 (amprgw.sysnet.ucsd.edu)
44.0.0.1 (gw.ampr.org, ampr.org)

University of California at San Diego / USA

Primary DNS-Server for "ampr.org" and "44.in-addr":
TTL: 1 hour
SOA-record: 3600 = Refresh, 900 = Retry, 720000 = Expire,
86400 = Minimum

PUSH - Gateway Database by RIPv2
169.228.66.251 UDP 520 -> <gateway IP addresses> UDP 520

Brian, WB6CYT:
Every 5 minutes a pseudo-RIP transmission sends the
current loaded data to the connected gateways.

Brian, WB6CYT:
Every 15 minutes the 'ipipd' daemon
reloads a fresh copy of the routes from
the database. Routes are loaded by IP
address; 'amprgw' does NOT resolve
hostnames.

PUSH - Gateway Database by RIPv2
(Encapsulated using protocol number 4 --> see /etc/protocols) -->
44.0.0.1 UDP 520 -> 224.0.0.9 UDP 520

Brian, WB6CYT:
It's a mysql database and the portal is
the master. Amprgw has an always-
open ssl connection to the portal and
tracks the mysql transaction log,
replicating the transaction on the local
copy. Standard mysql replication.

Realtime Replication of
the Gateway Database
(hostnames resolved by portal)

Jann, DG8NGN:
Older gateways will pull once a day (some once a month or manually)

PULL - Gateway Database by FTP
ftp://gateways:*****@portal.ampr.org/encap.txt

Gateways

e.g. Linux:
* ftp-script + munge.pl
* email-merge + munge.pl
* rip44d (<http://wiki.ampr.org/index.php/Rip44d>)
* ampr-ripd/amprd (<http://www.yo2loj.ro/hamprojects>)

Jann, DG8NGN:
munge.pl scripts
defaults to minimum
netmask of /16,
however there are
some gateways
serving /15 or even
less.

Gateway
Operators

PUSH - Gateway Information by E-Mail to: -->
"gateways@ampr.org"

PUSH - Gateway Information by HTTP -->
<http://portal.ampr.org>

PORTAL

Portal AMPR.ORG
195.66.149.110 (portal.ampr.org)

London / UK

Gateway Database
44.x.x.x/x via <ip address>
44.x.x.x/x via <hostname>
....

Chris, G1FEF:
For the FTP site, a cronjob runs once every 5 minutes and checks the current
version of the encap.txt file against what the script saw the last time it ran. If it is
the same it exits without doing anything. If the versions differ, the script re-creates
the encap.txt file, it also resolves any gateways that have the "hostname" field
populated. So worst case, the FTP site is 5 minutes behind the database.

PUSH - E-Mail Robot sends Gateway Database
Timing options:
- daily / weekly / monthly
- immediately after gateway database changes

PULL - Download from the Web Portal
<http://portal.ampr.org>

Marius, YO2LOJ:
Both the ampr-ripd and amprd expire the
routes after 15 minutes, only, and only if
they get RIP updates via the tunnel. If no
RIP messages are arriving, the routes are
persistent, including a restart of the
daemons, behaving as if you have a static
encap file.

Brian, WB6CYT:
the hostname is resolved
to an address by the
portal so that the IP
address in the encap file
is up to date too. It does
this periodically (every 5
minutes).

Chris, G1FEF:
If you download the encap.txt file from the web portal, it re-creates it for you
in realtime from the database, any gateways that have the "hostname" field
populated will cause the gateways IP address to be resolved at the time
you download it. So this is the "freshest" version you can get.

Jann Traschewski, DG8NGN
08.01.2014



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Interconnection with the AMPRNet

- Single Point of Failure: DB0FHN (University of applied sciences Nuremberg)
- Import of IPIP-Routes into the HAMNET
- Registered as a gateway on portal.ampr.org for several subnets

Details of gateway	
Title	141.75.245.225
Hostname	
Gateway IP	141.75.245.225
Originally added	2012-06-22 13:39:06
Last modified	2014-01-08 07:54:16
Status	Active
Subnet	44.130.0.0 / 16
Subnet	44.133.128.0 / 17
Subnet	44.134.189.0 / 24
Subnet	44.134.190.0 / 23
Subnet	44.142.0.0 / 15
Subnet	44.144.0.0 / 16
Subnet	44.161.0.0 / 16
Subnet	44.224.0.0 / 15
Notes	gateway area: Germany, Austria, Switzerland, Luxembourg, Italy (South Tyrol), Spain, Belgium maintained by: Jann Traschewski, DG8NGN (jann@gmx.de) notes: Gateway between IPIP-Net, IP-over-AX.25-Net, HAMNET services: VPN-Access to AMPRNet and AX.25 via AXUDP, OpenBCM Mailbox, Convers web: http://db0fhn.efi.fh-nuernberg.de

Extracted from <https://portal.ampr.org>

- There is even a dataflow diagram of the IP Routing available

AMPRNet: IP-Routing and Data Flow

Brian, WB6CYT:
Here's a current list of
the authorized BGP-
announced 44/8
subnets.

13.12.2013:
44.16.15.0/24
44.24.192.0/24
44.24.240.0/20
44.74.128.0/24
44.98.254.0/24
44.127.128.0/24
44.130.99.0/24
44.135.120.0/24
44.135.216.0/23
44.136.138.0/23
44.136.150.0/23
44.136.158.0/23
44.136.224.0/24
44.136.227.0/24
44.139.0.0/16
44.140.0.0/16
44.144.0.0/16
44.161.252.0/22
44.169.48.0/20
44.208.0.0/16



44.0.0.0/8

AMPRGW

169.228.66.251 (amprgw.sysnet.ucsd.edu)
44.0.0.1 (gw.ampr.org, ampr.org)

University of California at San Diego / USA

Gateway-Database (44.x.x.x/x via <public ip address>)
DNS-Database (see "AMPRNet Routing Information.png")

Direct Connected Gateways

(will announce their 44net block
directly to the Internet using BGPv4)
-> <http://www.ampr.org/tos.txt> (7b)

44.0.0.0/8

Communication only possible if the Direct Connected Gateways take part in the Mesh-Network

Traffic from Internet to AMPRNet
Mesh-Network encapsulated using
protocol number 4 --> see /etc/protocols

(forwarded if destination IP address
has A-record in "ampr.org" zonefile)

Traffic from AMPRNet to Internet
Mesh-Network encapsulated using
protocol number 4 --> see /etc/protocols

Implementation on Linux using "ip rule"

(Traffic from AMPRNet to
AMPRNet will be dropped!)

Mesh-Network using "ipencap" for Peer-to-Peer Traffic
(see "AMPRNet Routing Information.png" to understand the
distribution of the Gateway-Database)

Hack:

Special Gateway which is
not source-route filtered

(avoid routing loops at local
gateway using "ip route
throw" or "ip route
blackhole" of own prefixes)

44.0.0.0/8

IP-over-AX.25 Networks

Wireless Networks

VPN to Endusers

Jann Traschewski, DG8NGN
06.01.2014



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Interconnection with the Packet Radio Network

- DB0FHN connects to the Packet Radio Node „IGATE“ (available in the Flexnet based land)

■ DG8NGN: Verbunden mit DB0FHN

```
(X)NET/LINUX V1.39 Digipeater Nuremberg Institut of Technology. Loc: JN59NK.  
Shortcuts: "help", "info", "mailbox", "shell", "admin"
```

```
=>c igate
```

```
link setup (6)...
```

```
*** connected to IGATE
```

```
This is IGATE. Internetgatewaysystem for the Packet Radio Network.
```

```
Please type "einfo" (english).
```

```
Bitte "info" (deutsch) eingeben.
```

```
Please type "czinfo" (czech).
```

```
Please type "plinfo" (polish).
```

```
=>arp
```

IP	Iface	Hardware	Min.	Used
44.130.60.100	AX25	DB0FHN-10	0	10829
44.130.90.100	AX25	DB0TUD-10	0	17615
44.130.254.1	AX25	DG8NGN-10	0	307
44.130.254.254	AX25	IGATE	0	0

```
=>ipr
```

```
IP-Routes of 44.130.254.254:
```

IP-Net	M	Iface	via IP	use
44.130.254.0	24	AX25		739
44.130.90.0	24	AX25	44.130.90.100	20979
	0	AX25	44.130.60.100	41417

```
=>_
```

Interconnection with the Packet Radio Network

- The allocation for IGATE is 44.130.254.0/24 and is splitted into fixed addresses 44.130.254.1 to 44.130.254.127 (e.g. DG8NGN = 44.130.254.1) and dynamic addresses 44.130.254.128 to 44.130.254.253
- Connect with a Packet Radio Terminal to IGATE via your access digipeater and type „GETIP“

```
■ DL4MF0: Verbunden mit DBOFHN
(X)NET/LINUX V1.39 Digipeater Nuremberg Institut of Technology. Loc: JN59NK.
Shortcuts: "help", "info", "mailbox", "shell", "admin"
=>c igate

link setup (6)...
*** connected to IGATE
This is IGATE. Internetgatewaysystem for the Packet Radio Network.

Please type "einfo" (english).
Bitte "info" (deutsch) eingeben.
Please type "czinfo" (czech).
Please type "plinfo" (polish).
=>getip

Your_Ipaddress: 44.130.254.129

=>
=>arp

IP                Iface   Hardware           Min.  Used
44.130.60.100     AX25    DBOFHN-10         0    11028
44.130.90.100     AX25    DBOTUD-10         0    17677
44.130.254.1      AX25    DG8NGN-10         0     315
44.130.254.129   AX25    DL4MF0             57596  0
44.130.254.254   AX25    IGATE              0     0
=>_
```

Interconnection with the Packet Radio Network

- Insert the new IP address in your IP stack and try a ping

```
C:\WINDOWS\system32\cmd.exe
C:\Documents and Settings\Testuser>ping 44.24.255.5

Pinging 44.24.255.5 with 32 bytes of data:

Reply from 44.24.255.5: bytes=32 time=1025ms TTL=59
Reply from 44.24.255.5: bytes=32 time=353ms TTL=59
Reply from 44.24.255.5: bytes=32 time=381ms TTL=59
Reply from 44.24.255.5: bytes=32 time=358ms TTL=59

Ping statistics for 44.24.255.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 353ms, Maximum = 1025ms, Average = 529ms

C:\Documents and Settings\Testuser>
```

```
FlexNet Trace - suspended
Filter Copy Scroll Help
<TO DL4MFO-10>IGATE v DBOFHN (13) SABM+>
<RO IGATE>DL4MFO-10 v DBOFHN* (13) UA->
<RO IGATE>DL4MFO-10 v DBOFHN* (13) I00^>
This is IGATE. Internetgatewaysystem for the Packet Radio Network.
|
Please type "einfo" (english).|
Bitte "info" (deutsch) eingeben.|
Please type "czinfo" (czech).|
Please type "plinfo" (polish).|
=>
<TO DL4MFO-10>IGATE v DBOFHN (13) RR1v>
<TO DL4MFO-10>IGATE v DBOFHN (13) I10^ $CC>
IP: len 60 44.130.254.129->44.24.255.5 ihl 20 ttl 128 prot ICMP
ICMP: type Echo Request id 512 seq 2304
abcdefghijklmnopqrstuvwabcdefghi
<RO IGATE>DL4MFO-10 v DBOFHN* (13) RR1v>
<RO IGATE>DL4MFO-10 v DBOFHN* (13) I11^ $CC>
IP: len 60 44.24.255.5->44.130.254.129 ihl 20 ttl 59 prot ICMP
ICMP: type Echo Reply id 512 seq 2304
abcdefghijklmnopqrstuvwabcdefghi
<TO DL4MFO-10>IGATE v DBOFHN (13) RR2v>
<TO DL4MFO-10>IGATE v DBOFHN (13) I21^ $CC>
IP: len 60 44.130.254.129->44.24.255.5 ihl 20 ttl 128 prot ICMP
ICMP: type Echo Request id 512 seq 2560
abcdefghijklmnopqrstuvwabcdefghi
<RO IGATE>DL4MFO-10 v DBOFHN* (13) RR2v>
<RO IGATE>DL4MFO-10 v DBOFHN* (13) I22^ $CC>
IP: len 60 44.24.255.5->44.130.254.129 ihl 20 ttl 59 prot ICMP
ICMP: type Echo Reply id 512 seq 2560
abcdefghijklmnopqrstuvwabcdefghi
```

- Instructions how to interconnect Packet Radio Nodes (XNet) to the HAMNET or AMPRNet are available

Motivation or „why?“

- The easy answer: „Why not?“
 - „Why?“ is not a valid question in a hobby
- Seriously:
 - Most administrators just want to attach repeaters to the internet. So why not deploying the local network with net44 addresses rather than RFC1918 addresses (10.0.0.0/8, 172.16.0.0/12 and 192.168.0.0/16)?

It doesn't hurt. Just apply for an IP range and use it (even if not interconnected to the AMPRNet, **yet**).

Motivation – Connection to net44

- Provide and use services on net44
- Trusted network
 - Packets from net44 are supposed to come from an amateur radio operator
 - Providing gateways to RF is OK without further authentication of the individual amateur (e.g. access to the Packet Radio Network, access to shared Remote Transceivers, ...)
- End-to-End communication
 - NAT is evil...
 - No need to struggle around with portforwarding

Motivation – Building a RF backbone

- Backbone for services (cf. Packet Radio Network – BBS, Convers, ...)

Transport of:

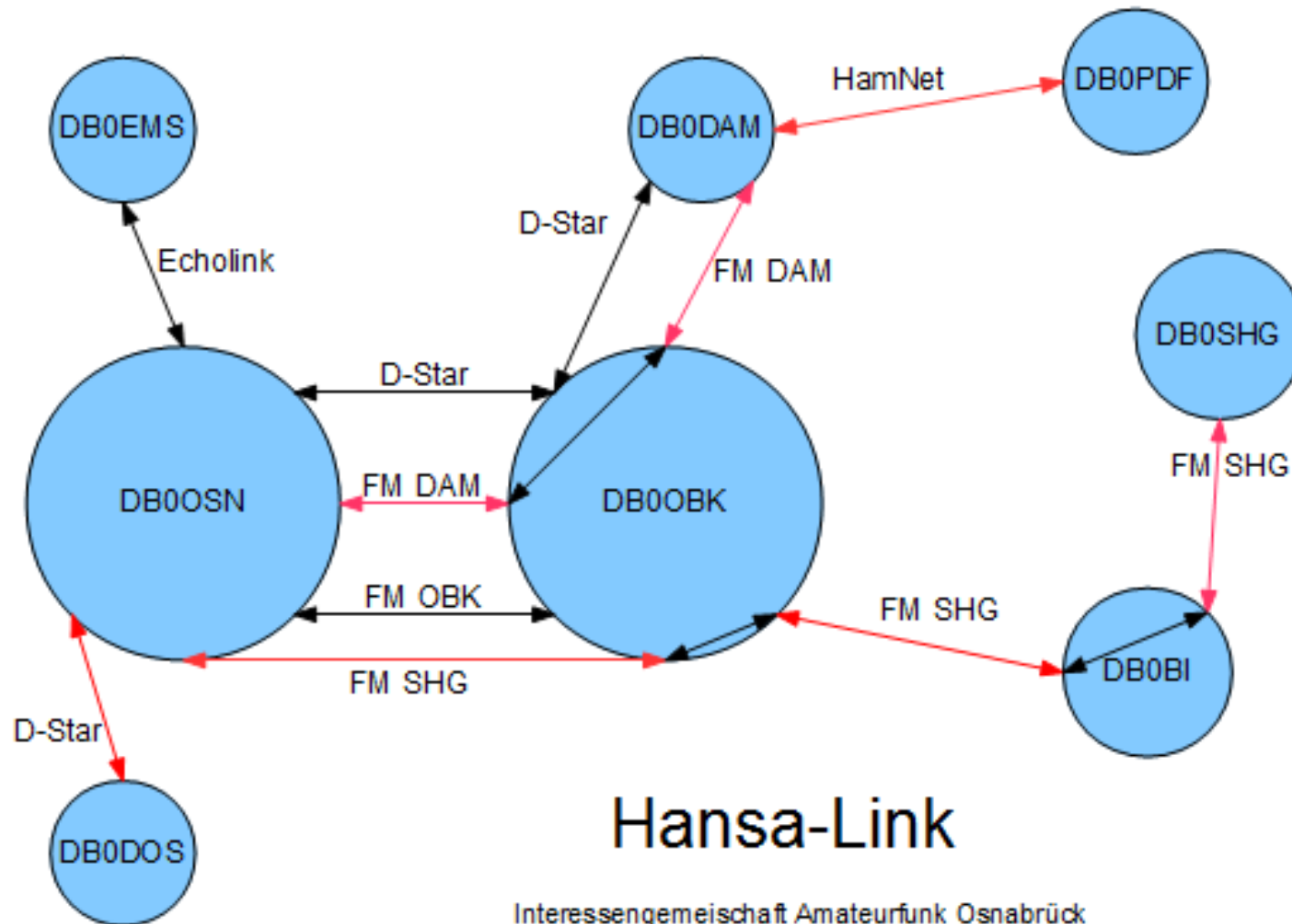
- DATV, VoIP (DMR, D-Star, Echolink), Packet Radio
 - whatever you can transport on TCP/IP...
- Build an independent network for emergency communication (where the funding could come from...)
 - It is cool - „Because we can...“

Motivation – Learning & Experimentation

- Building your own Internet
 - Technology you usually don't get in touch with (Routing protocols, Server-to-Server VPNs, DNS-Hosting, ...)
 - Peering with other groups around the world
- Building your own backhaul
 - GHz wave propagation
 - System Integration of backhaul technology

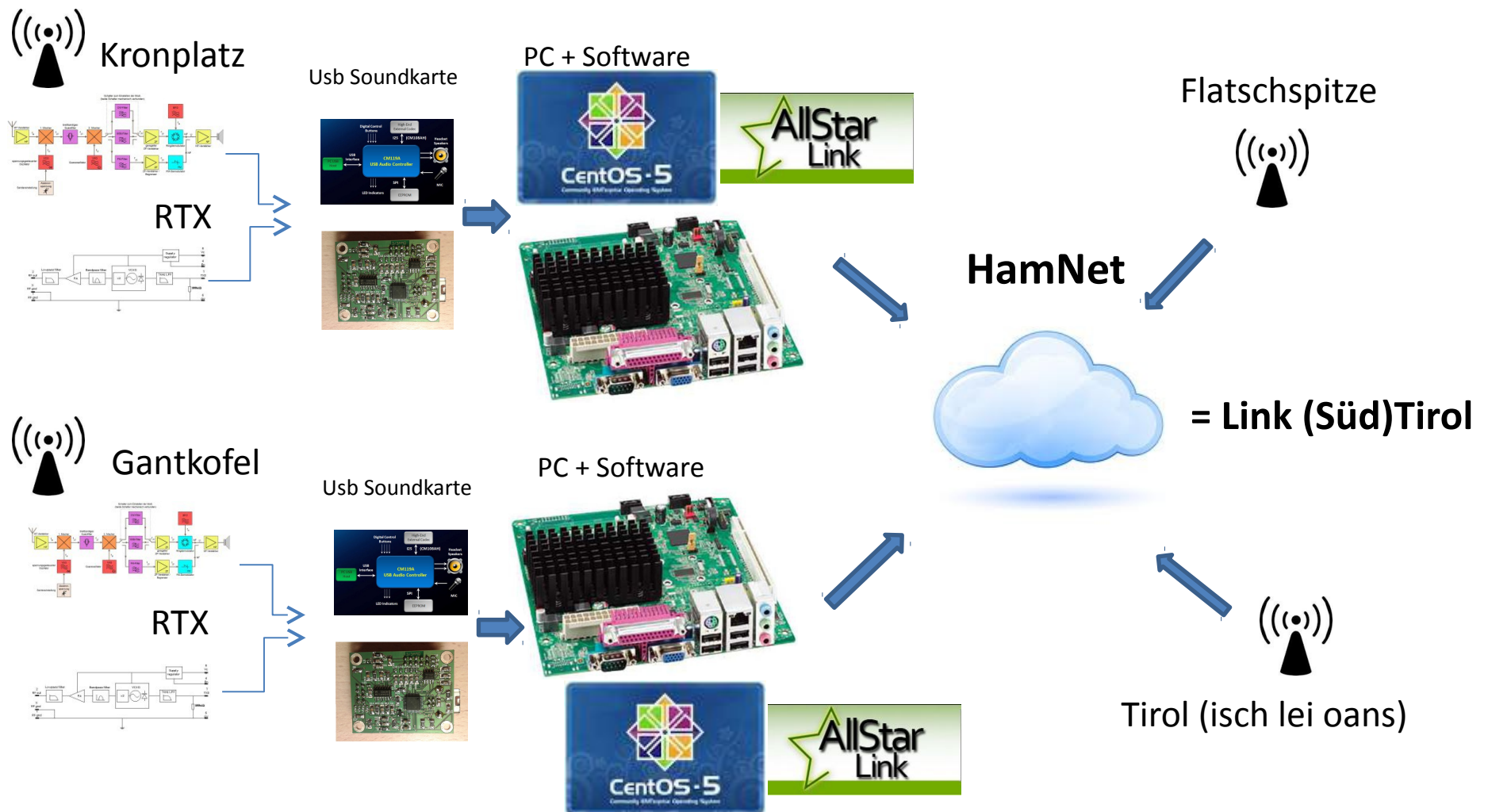
Application Examples - FM Repeater Group (SVXLink)

- Hansa-Link Network

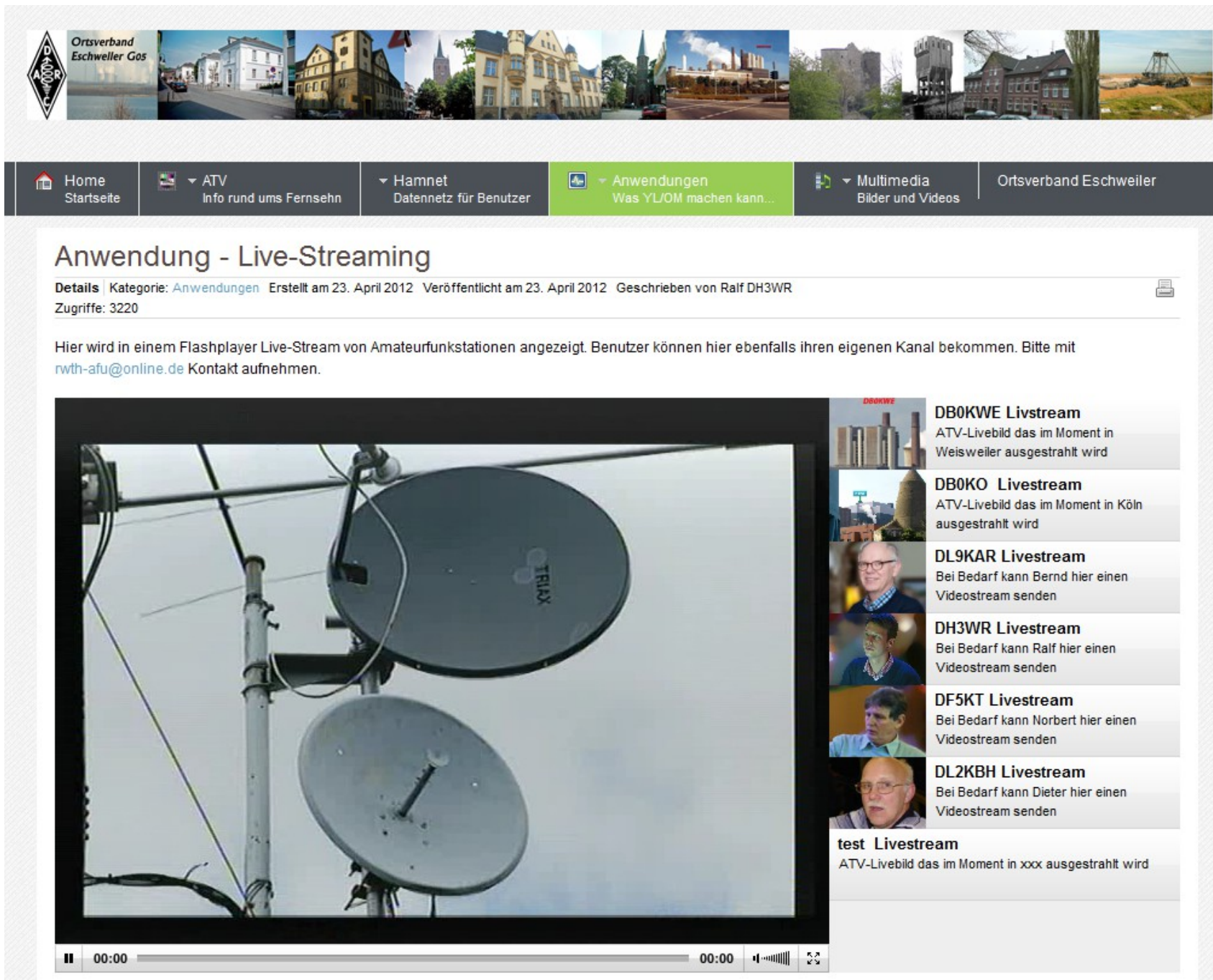


Application Examples - FM Repeater Group (Allstarlink)

- Link (Süd) Tirol



Application Examples – ATV Livestreaming



The screenshot displays a website interface for 'Ortsverband Eschweiler G05'. The top navigation bar includes links for 'Home Startseite', 'ATV Info rund ums Fernsehen', 'Hamnet Datennetz für Benutzer', 'Anwendungen Was YL/OM machen kann...', 'Multimedia Bilder und Videos', and 'Ortsverband Eschweiler'. The main content area features a section titled 'Anwendung - Live-Streaming' with details: 'Kategorie: Anwendungen', 'Erstellt am 23. April 2012', 'Veröffentlicht am 23. April 2012', and 'Geschrieben von Ralf DH3WR'. Below this, a text block states: 'Hier wird in einem Flashplayer Live-Stream von Amateurfunkstationen angezeigt. Benutzer können hier ebenfalls ihren eigenen Kanal bekommen. Bitte mit rwth-afu@online.de Kontakt aufnehmen.'

The central video player shows a live stream of two satellite dishes on a mast. The top dish is labeled 'TRIAX'. To the right of the video player is a list of live stream options:

- DB0KWE Livestream**
ATV-Livebild das im Moment in Weisweiler ausgestrahlt wird
- DB0KO Livestream**
ATV-Livebild das im Moment in Köln ausgestrahlt wird
- DL9KAR Livestream**
Bei Bedarf kann Bernd hier einen Videostream senden
- DH3WR Livestream**
Bei Bedarf kann Ralf hier einen Videostream senden
- DF5KT Livestream**
Bei Bedarf kann Norbert hier einen Videostream senden
- DL2KBH Livestream**
Bei Bedarf kann Dieter hier einen Videostream senden
- test Livestream**
ATV-Livebild das im Moment in xxx ausgestrahlt wird

The video player controls at the bottom show a play button, a progress bar at 00:00, a volume icon, and a full screen icon.

Application Examples – Social Network

Status: online Willkommen, DH3WR! Abmelden

hambbook

- Startseite
- Freunde
- Nachrichten (2)
- Eigene Bilder

Neue Statusnachricht

Freundschaftsanfragen

1 Freundschaftsanfrage

19.01.2014, 21:31 **DF3AK** möchte Ihr Freund werden. Annehmen Ablehnen **Neu**

Aktuelles

DC1DMR hat DM3IKE zu seinen Freunden hinzugefügt.
05.02.2014, 16:23 **Neu**

| 0 | 0 |


DC1DMR hat DF3AK zu seinen Freunden hinzugefügt.
26.01.2014, 10:17 **Neu**

| 0 | 0 |


DM4KCS hat DH3WR zu seinen Freunden hinzugefügt.
07.01.2014, 10:06

| 0 | 0 |

Application Examples - Searchengines

Administration Web Suche Datei Suche Host Browser Impressum dieses Peers Hilfe / YaCy 

P2P Web Search



Text Bilder Audio Videos [Mehr Optionen](#)

1-10 aus 1.545

- [Köln-Aachen Rundspruch](#)
Köln-Aachen Rundspruch. DB0KWE Home Startseite ATV Info rund ums Fernsehen Frequenzen Dokumentation Antennen und Sendeleistung Hamnet Datennetz für Benutzer Benutzereinstiege Hardware beim User Linkstrecken
<http://db0kwe.ampr.org/index.php/2012-04-30-21-01-08/rundspruch>
Sat, 19 Jan 2013 | [Citations](#) | [**](#)
- [Diskussion:Links Distrikt G Köln-Aachen – Amateurfunk Wiki](#)
Dc2cb Links Distrikt DI8rds G **Köln** Aachen
http://amateurfunk-wiki.de.ampr.org/index.php/Diskussion:Links_Distrikt_G_Köln-Aachen
Thu, 24 Jan 2013 | [Citations](#) | [Cache](#) | [**](#)
- [IAK - Interessengemeinschaft Amateurfunk Köln-Wahn](#)
"PSK 31" A ARDF Air Amateurfunk Ausbildung CQ Clubstation Cologne Contest DARC DF0FKW E Elektronik Foxoring Ham IAK Interessengemeinschaft Klasse Koeln VHF **Köln Köln** Wahn Lehrgang Morse Notfunk On Packet Pocket Porz Projekt Prüfungsvorbereitung QRV QSL QSO Radio SHF Selbstbau Trainer UHF Wahn
http://echolink.db0sda.ampr.org/index.php?option=com_mailto&tmpl=component&link=2d9bd6779eaa0bcb6f5b09058ddb3a19a44f88e6
Thu, 06 Feb 2014 | [Citations](#) | [Cache](#) | [**](#)
- [IAK - Interessengemeinschaft Amateurfunk Köln-Wahn](#)
"PSK 31" A ARDF Air Amateurfunk Ausbildung CQ Clubstation Cologne Contest DARC DF0FKW E Elektronik Foxoring Ham IAK Interessengemeinschaft Klasse Koeln VHF **Köln Köln** Wahn Lehrgang Morse Notfunk On Packet Pocket Porz Projekt Prüfungsvorbereitung QRV QSL QSO Radio SHF Selbstbau Trainer UHF Wahn
http://echolink.db0sda.ampr.org/index.php?option=com_mailto&tmpl=component&link=66590a1811f008cc0b3ec6b06f1028fad85bc119
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- [Links Distrikt G Köln-Aachen – Amateurfunk Wiki](#)
Distrikt G HAMNET **Köln** Aachen Links Linkstrecken
http://44.225.71.134/index.php/Links_Distrikt_G_Köln-Aachen
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- [Multimedia - Rundsprucharchiv](#)
<http://db0kwe.ampr.org/index.php/multimedia/rundspruch>
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- [Frequenzplan um Köln.pdf](#)
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- [Frequenzplan um Köln.pdf](#)
http://44.225.57.98/PDF/Frequenzplan_um_Köln.pdf
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amateurfunk links
interessengemeinschaft

Protocol Navigator

- http (997)
- ftp (3)

Filetype Navigator

- php (148)
- htm (32)
- html (15)
- pdf (13)
- ppt (1)

Anbieter Navigator

- 44.225.28.20 (155)
- db0res.ampr.org (150)
- db0kwe.ampr.org (142)
- db0res-svr.ampr.org (127)
- db0res.de (66)
- db0sda.ampr.org (49)
- 44.225.56.130 (39)
- amateurfunk-wiki.de.ampr.org (33)
- db0tv.ampr.org (29)
- web.db0kwe.as64634.de.ampr.org (27)
- wxnet.db0tv.ampr.org (22)
- echolink.db0sda.ampr.org (21)
- 44.225.56.11 (15)
- db0sys.ampr.org (15)
- db0dz.ampr.org (12)
- 44.225.48.145 (11)
- 44.225.48.196 (11)
- 44.225.71.134 (8)
- db0ko.ampr.org (7)
- db0pra.ampr.org (5)

Application Examples - WebSDR

Your name or callsign:

View: waterfall blind Allow keyboard:

Waterfall: Java HTML5

5550 145600 145650 145700 145750 145800

thm zb ub **DB0FUE** tu eh wz pe uc zw zu tha ann ax xg/S6 and

Frequency: kHz
--- -- - + ++ +++
Or tune by clicking/dragging/scrollwheel on the frequency scale.

Memories:

recall	erase	store	144675.00 kHz FM	Home
recall	erase	store	145637.50 kHz FM	DB0FUE
recall	erase	store	(new)	

Bandwidth:
11.09 kHz @ -6dB; 11.55 kHz @ -60dB.

wider	CW-wide	LSB	USB	AM	FM
narrower	CW-narrow	LSB-nrw	USB-nrw	AM-nrw	FM-nrw

Or drag the passband edges on the frequency scale.

Waterfall view:

zoom out	zoom in
max out	max in

Or use scroll wheel and dragging on waterfall.

Speed: ▾
Size: ▾
View: ▾
 Hide labels

<http://websdr.org>

Application Examples - Webcams



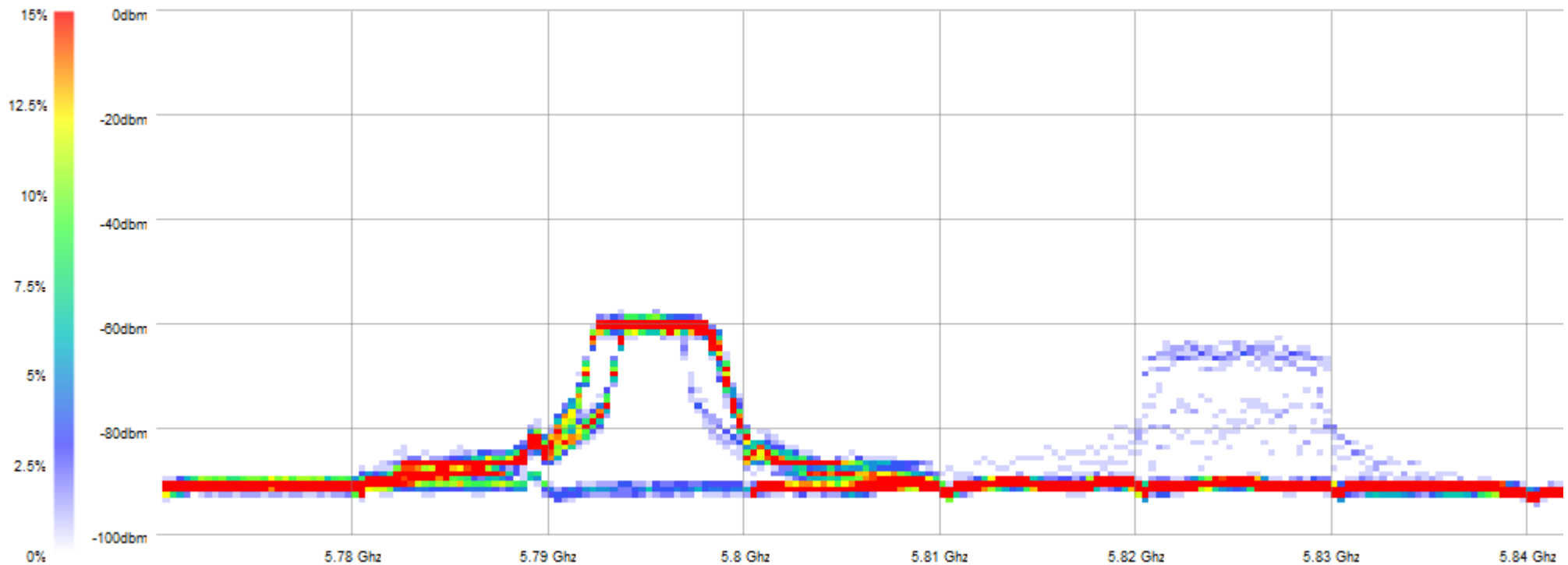
ToDo – More bands

- 9cm: More expensive compared to 6cm/13cm
- 3cm: Ubiquiti PowerBridge M10
 - not much power
 - high price
- 24 GHz: Ubiquiti airFiber AF24
 - short range (license free band)
 - high price
- Selfmade Up-/Downconverter?
 - Full duplex with Mikrotik NStreme Dual possible
 - One card in TX mode
 - One card in RX mode



ToDo – Filters

- 5 MHz bandwidth
 - +/- 20 MHz → own signal seen again (lower level)
 - +/- 40 MHz → own signal seen again (less lower level)
- 10 MHz bandwidth
 - +/- 40 MHz → own signal seen again (lower level)



Todo – Better Routing Protocols

- Most routing protocols doesn't take changing conditions on a radio link into account
 - Packet loss (any kind of reason, e.g. Interference)
 - Changing throughput due to adaptive modulation and coding (AMC)
 - TX-ccq and RX-ccq (Client connection quality)
 - Flapping routes, unreliable connections...
- There are some protocols to test (B.A.T.M.A.N., OLSR, Mikrotik MME)
 - Protocols can be tested within a region, however sometimes communication between two stations might be better routed using a path through an external autonomous system...
 - Routing protocols need to be supported by the platforms

Todo – User Access Technology

- Connectivity more important than speed
- Reduced bandwidth = less noise → longer range
- Lower band = better for non-line-of-sight requirements
- **Wishlist**
 - 70cm band: 2 MHz, 1 MHz, 500 kHz, **200 kHz**, 100 kHz
 - 23cm band: 10 MHz, 5 MHz, 2 MHz, **1 MHz**, 500 kHz, 200 kHz (10 MHz / 5 MHz available from Doodlelabs)
- We already run D-Star DD 128kbit/s User Access on 23cm on net44

ToDo – Access to net44

- Access to network 44 needs to be improved
 - by RF (more sites, more bands, more technology)
 - by VPN (more VPN dial-in gateways)
 - by IPIP (better instructions how to join)
 - by BGP direct connected networks (more material to convince local ISPs to announce net44 networks)
- Access to network 44 needs to be simplified
 - Better instructions
 - Easier ways to connect
 - Better worldwide concept

Vision – Intranet for radio amateurs

- We want to create a huge intranet for radio amateurs using network44
 - Users should be able to provide services for radioamateurs in an easy way (e.g. end-to-end communication to single devices)
 - webcam.dg8ngn.ampr.org
 - web.dg8ngn.ampr.org
 - notebook.dg8ngn.ampr.org
 - The chicken-egg problem will be solved by content on the network
 - Hambook (Facebook for radio amateurs on net44)
 - Interconnected search engines to find content (yacy)

Vision – Authentication platform

- Providing services for radio amateurs on the internet leads always to the same question:

How can I authenticate radio amateur operators?

- We need a global and easy solution to answer this question for services like:
 - D-Star, Packet Radio, Access to net44, Echolink, Allstarlink, DX-Clusters, ...
- Once we have a global solution more applications with access through the internet will be available due to easy implementation for programmers