

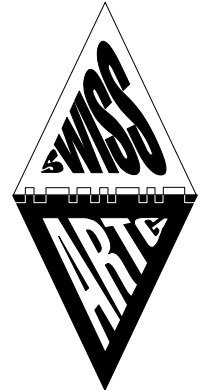


HAMNET (Highspeed Amateurradio Multimedia Network) **for** **Emergency Communication**

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Who is SWISS-ARTG ?



- Founded in 1971
- 300 members
- Promotion of digital amateur radio modes
- Run several Packet-Radio digipeaters
- Transition to HAMNET
- APRS-iGates
- HF Gateway HB9AK running PACTOR (1-4) and WINMOR

Digipeater, FAX- und 10GHz-Beacon Hörnli HB9AK, 15. März 2000



History: Digital Backbone in HB9



Packet-Radio:

- 20+ Jahre old
- 1200 - 19200 Kbps
- Many digipeaters are being switch off
- But many are in transition to HAMNET nodes

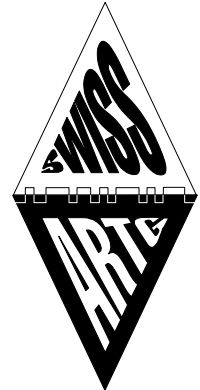
Applications:

- DXCluster
- Mailbox
- APRS
- Chat / Converse

Packet Radio-, Phone- and ATV-Networks are not compatible

Digipeater, FAX- und 10GHz-Beacon Hörnli HB9AK, 15 March 2000

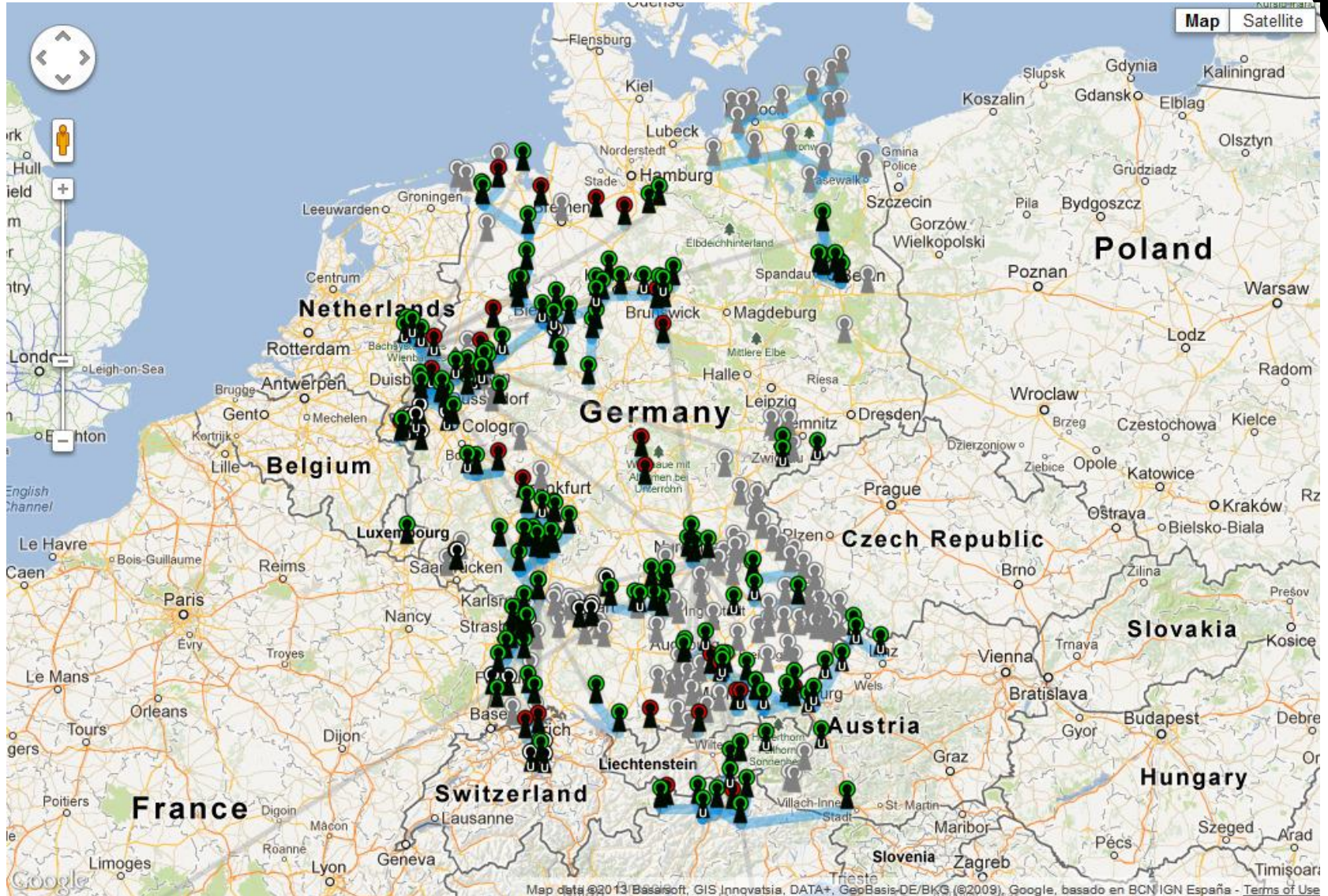
Digital Backbone - HAMNET - Highspeed Amateurradio Multimedia Network



- What is HAMNET?
 - The projekt started in 2005 in Austria (OE) and since 2009 a country-wide roll-out takes place.
 - HAMNET is a data network for amateur radio based in TCP/IP which in first place connects repeater (voice, data, video) onto a common platform. Users can participate either through a direct connection on UHF/SHF or via Internet-Gateway.
 - Applications are:
 - Packet Radio backbone network
 - D-STAR backbone network
 - APRS backhaul network
 - Remote-TRX
 - D-ATV
 -



Current Network in Central Europe



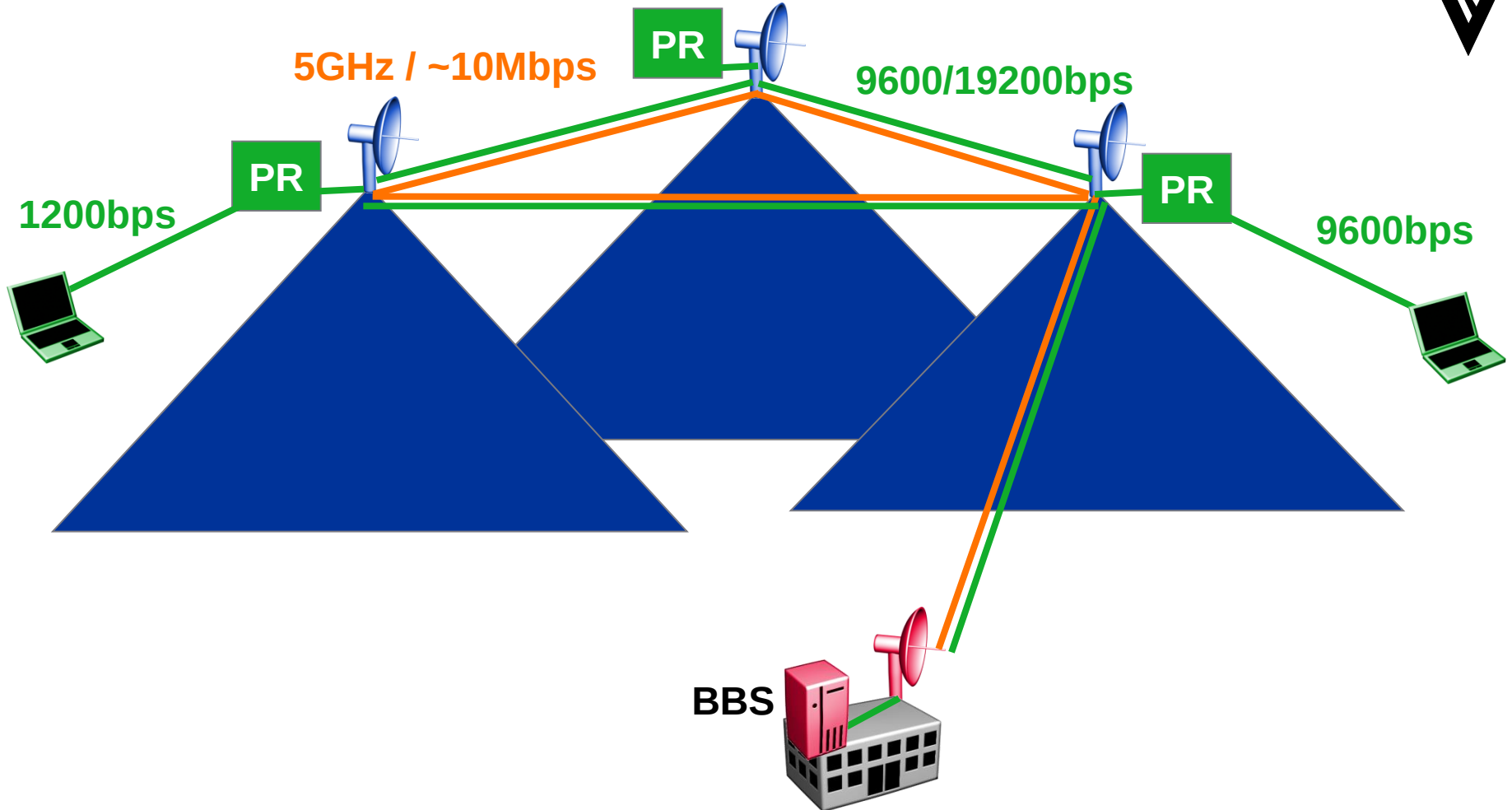
<http://hamnetdb.net/?m=as&q=&as=-All-&tab=map>



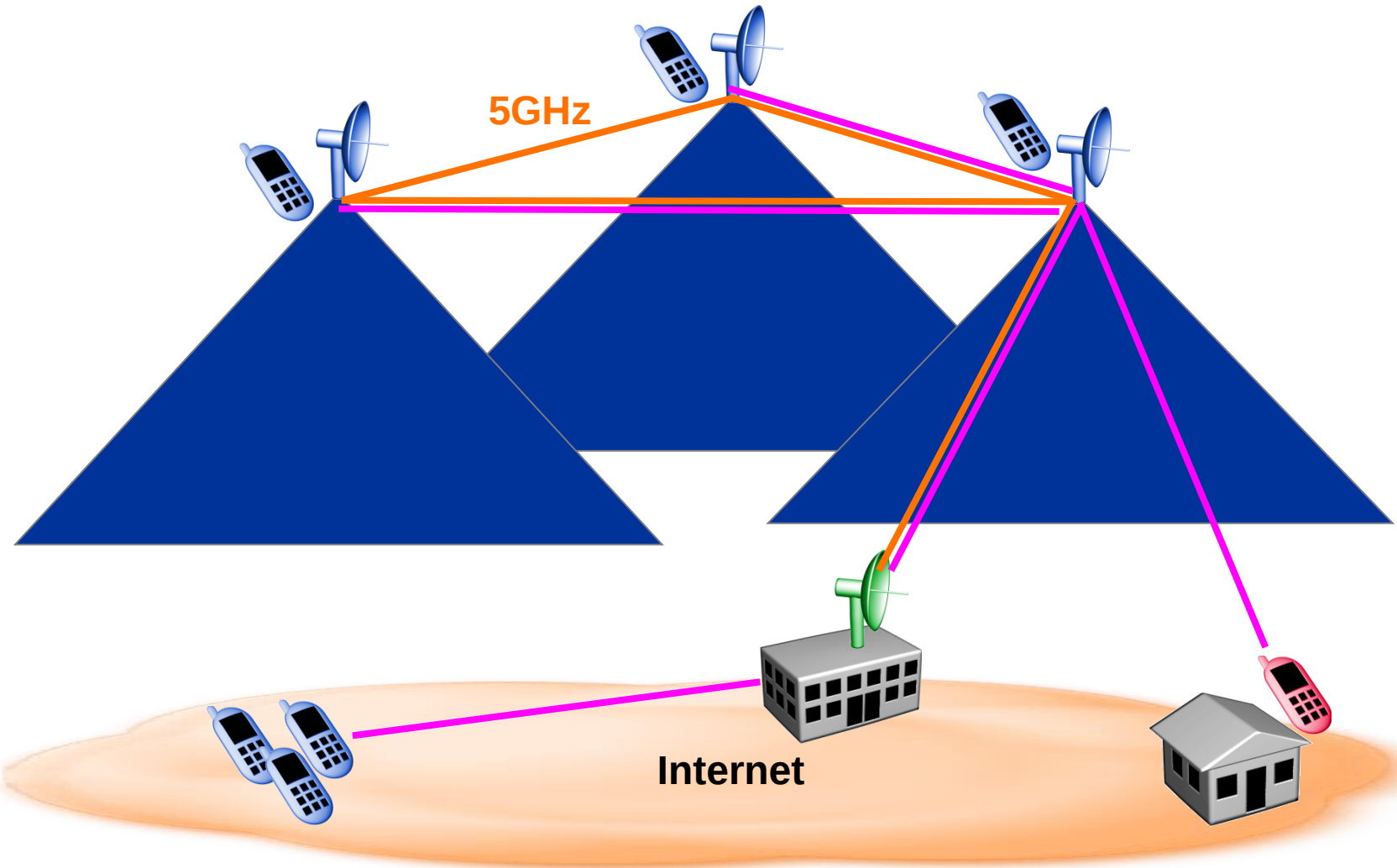
Applications



HAMNET – Applications: Packet Radio

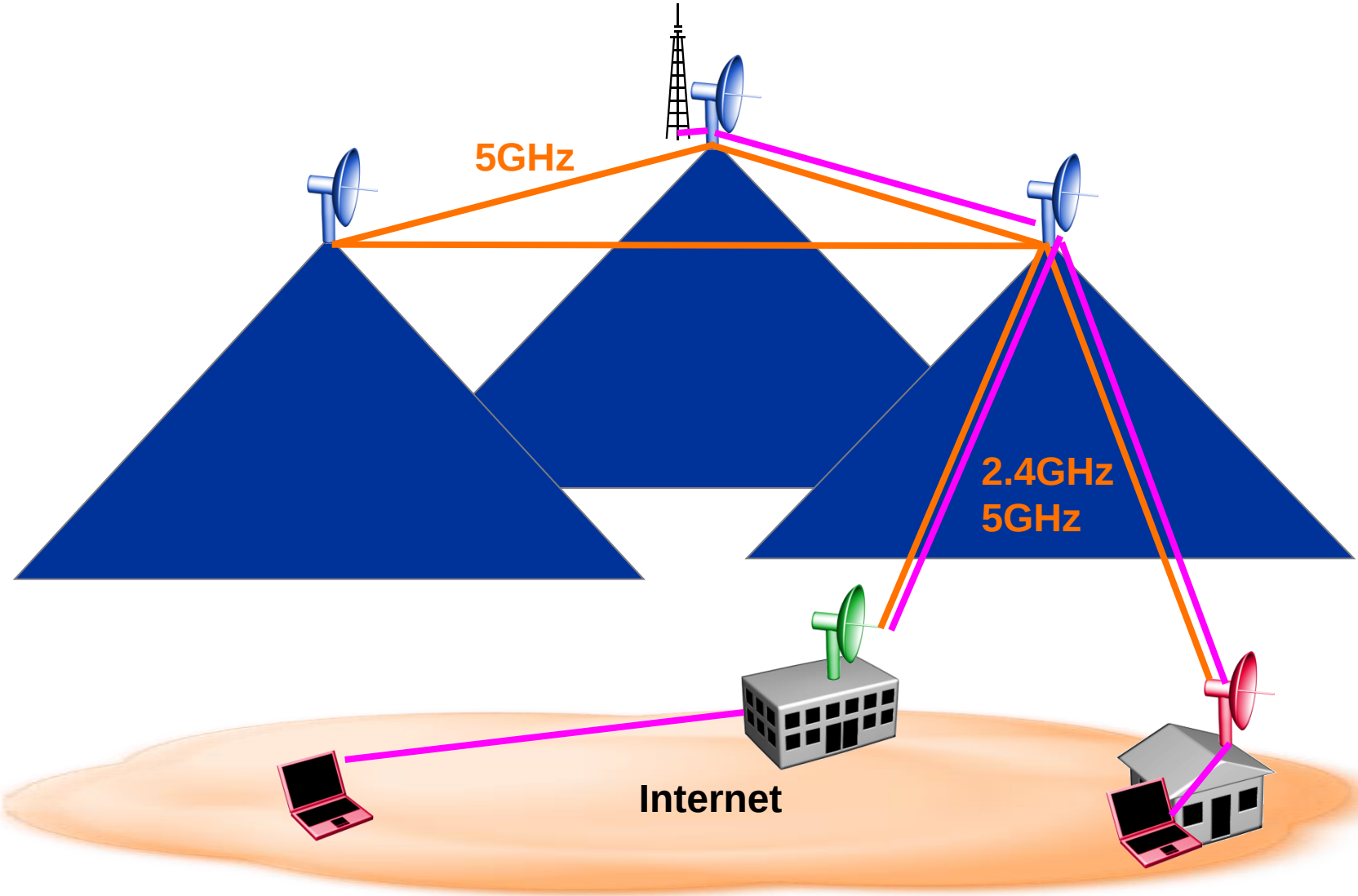


HAMNET – Applications: D-STAR-Relais



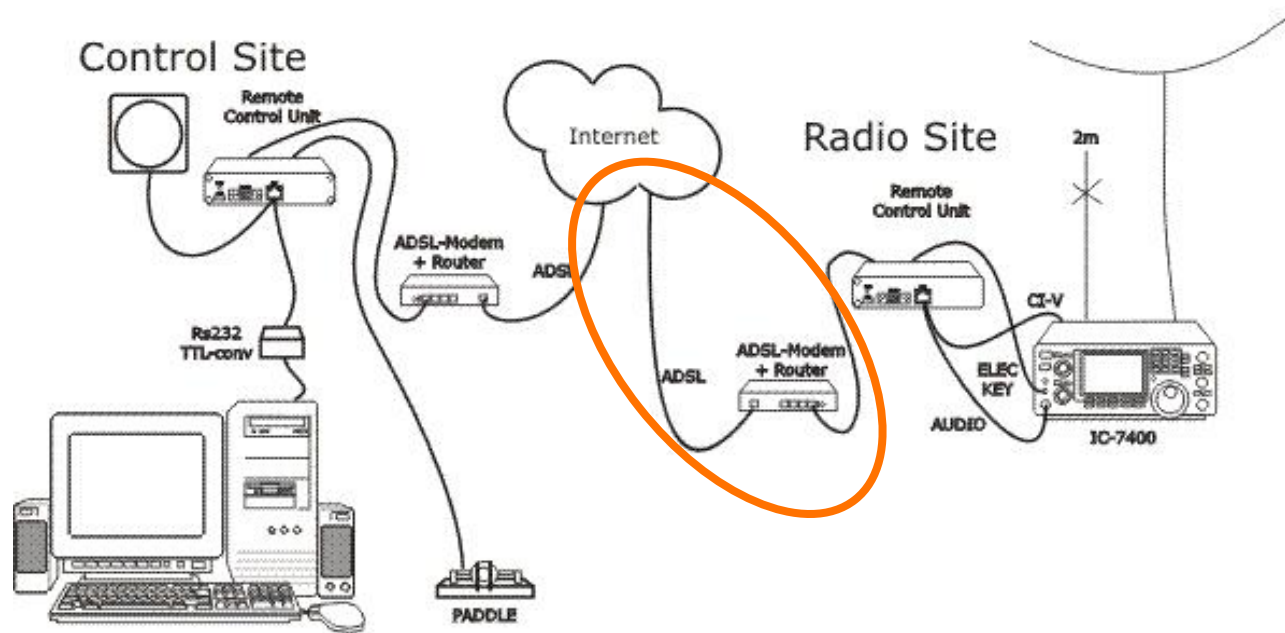


HAMNET – Application: Remote-TRX



Remote-TRX

<http://www.remoterig.com> by SM2O / SM2OAN





Hardware involved:

WLAN (Wireless Local Area Network)



WLAN Standard

- WLAN Standard IEEE 802.11g (2,4GHz)
 - The standard IEEE 802.11g supports eight different datarates: 6, 9, 12, 18, 24, 36, 48 and 54 MBit/s. An automatic fallback is included. Modulation is according to Orthogonal Frequency Division Multiplexing (OFDM).
- WLAN Standard IEEE 802.11a (5GHz)
 - The WLAN-Standard 802.11a supports eight different datarates: 6, 9, 12, 18, 24, 36, 48 and 54 MBit/s. An automatic fallback is included.
 - Individual datarates are supported by different means of modulation: 6 and 9 MBit/s are based on BPSK, 12 and 18 MBit/s are based on QPSK, 24 and 36 MBit/s are based on 16-QAM and finally 48 and 54 MBit/s are based on 64-QAM.



QRG used: HB9 view

Frequenzband	Status für terrestrische Verbindungen	Status für Verbindungen über Amateur- funk-Satelliten	Maximale Senderleistung ^{a)}
2300 - 2308 MHz	sekundär ^c	nicht zulässig	100 W
2308 - 2312 MHz	sekundär ^b	nicht zulässig	100 W
2312 - 2400 MHz	sekundär ^c	nicht zulässig	100 W
2400 - 2450 MHz	sekundär ^c	sekundär ^c	100 W
5650 - 5670 MHz	sekundär ^c	sekundär ^{c, d}	100 W
5670 - 5725 MHz	sekundär ^c	nicht zulässig	100 W
5725 - 5850 MHz	sekundär ^b	nicht zulässig	100 W

- Kanal 1: 2412 MHz
- Kanal 2: 2417 MHz
- Kanal 3: 2422 MHz
- Kanal 4: 2427 MHz
- Kanal 5: 2432 MHz
- Kanal 6: 2437 MHz

- a Die Spitzenleistung beim Senderausgang ist die Durchschnittsleistung, die ein Sender während einer Periode der Hochfrequenzschwingung bei der höchsten Spitze der Modulationshüllkurve maximal abgeben darf (PEP).
- b Sekundär bedeutet: Frequenzband, das auch anderen Funkanwenderinnen und -anwendern zur Verfügung steht, die in der Benützung Vorrang haben.
- c Frequenzband, das nur mit Bewilligung der Konzessionsbehörde benützt werden darf.
- d Nur für Verbindungen von der Erde zum Satelliten.
- e ERP: Effective Radiated Power.

QRG @ 20MHz RF-Bandwidth:

5730, 5735, 5740, 5745, 5750, 5775, 5780, ... MHz

QRG @ 10MHz RF-Bandwidth:

14 5725, 5730, 5735, 5740, 5745, 5750, 5755, 5775, 5780, 5785, ... MHz



Linkplanning

- QRG: 2.3 or 5.7 GHz
- TX: 20dBm (100mW)
- Antenna: 20dBi
- RX: -90dBm (@ 6Mbps ... 18Mbps)
- **Line of Sight is required !**



HB9AK (Hoernli) – HB9ZRH (Uetliberg)

Schritt 1

Eingabe der Daten zur geplanten Linkstrecke.

Frequenz

Anfangspunkt

Rufzeichen:

oder

Koordinate (WGS84)
(Breite/Länge)

Höhe (über Grund) Meter

Linkstrecke berechnen

Eingaben löschen

Endpunkt

Rufzeichen:

oder

Koordinate (WGS84)
(Breite/Länge)

Höhe (über Grund) Meter

Schritt 2

Überprüfen der Standorte von Anfangs- und Endpunkt der Linkstrecke und ggf. Korrektur der in Schritt 1 eingegebenen Daten.



Anfangspunkt der Linkstrecke Höhe: 1107.4 m Antenne: 12 m über Grund
Richtung: 266.15° (auf Norden bezogen)
Elevation: -0.43°

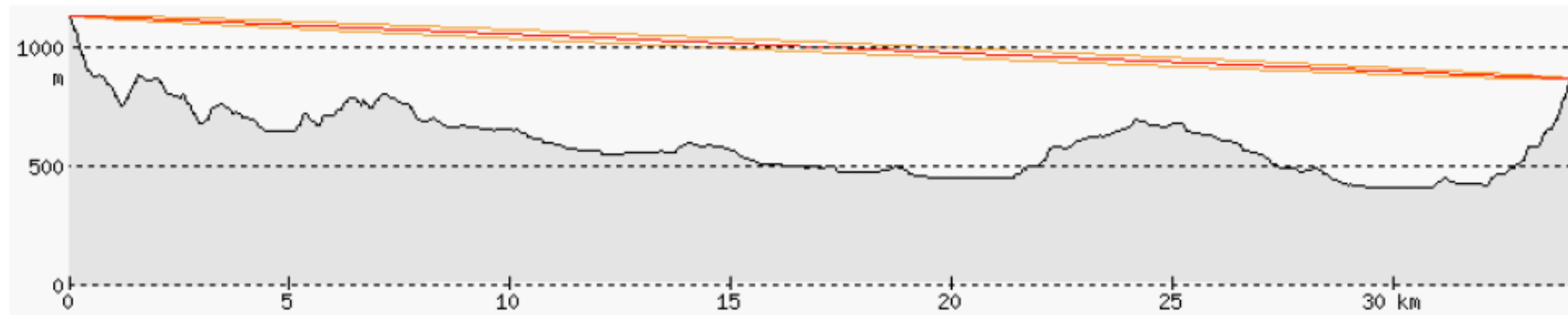


Endpunkt der Linkstrecke Höhe: 853.3 m Antenne: 10 m über Grund
Richtung: 86.15° (auf Norden bezogen)
Elevation: 0.43°

HB9AK (Hoernli) – HB9ZRH (Uetliberg)

Ergebnis

Das zu erwartende Höhenprofil der Linkstrecke



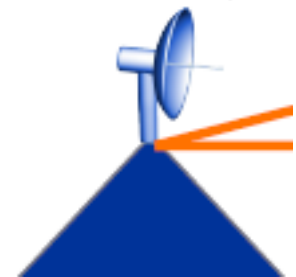
Länge der Linkstrecke: 34 km



Investment for Radio Field Station

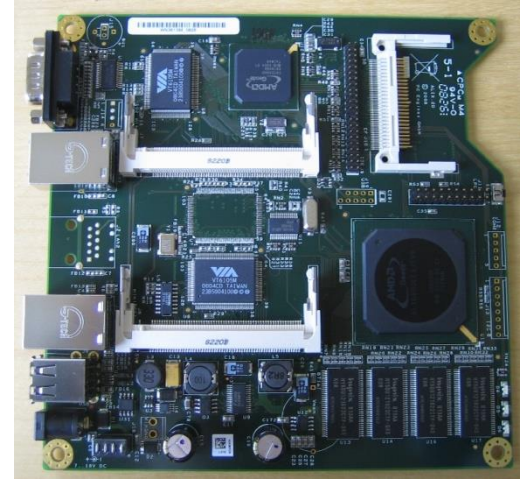
- Router, Inkl Software:
 - Alix 2d2 board, WLAN card, outdoor housing: 200 EUR
- 23dBi Flatpanel antenna: 50 EUR
- Total 250 EUR

- Alternative:
 - Ubiquiti NSM5:NanoStation M5: 130 EUR
- Additional Equipment required:
 - PC, Power-Supply, Mounting Hardware

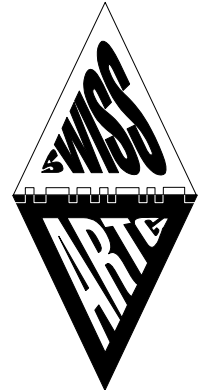


More Hard- & Software

- Router
 - ALIX 2d2 from PC Engines
 - OpenWRT
 - Ubiquiti Nanostation or Bullet
 - RouterBoard from Mikrotik
- miniPCI WLAN card
- Antenna, mostly flatpanel with 15-23dBi gain on 5 GHz
- Pigtail, cable, connectors, DC-power, etc.



HAMNET Node HB9RF – Huenenberg / ZG





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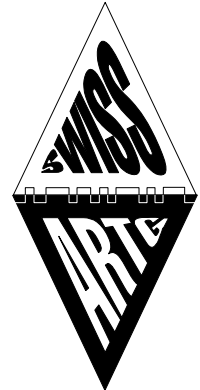
HW & SW

- Off the shelf Hard- and Software
- Lightweight
- Manageable by „standard“ IT know-how
 - Webbrowser for Configuration
 - No special training required

Applications for Emergency Communication



- Information delivery of Text and Pictures
- Internet Access
- VoIP Telephony
- Webcam



SWISS AMATEUR RADIO TELEPRINTER GROUP

