

Shortwave robots and reverse beacons

Björn Ekelund - Ericsson Research



Tweet



A P R

@apr



My friend CX4AAU searching [@bjornekelund](#) SM7IUN's QSL from the 70s

Översätt tweeten



Tweeta ditt svar



SM7IUN

SCA: M1-03

WASM: M

WSA: 425

WAZ: 14 WAC: EU

DXCC: SWEDEN

| To: | Date. | Time. | Band. | Mode. | Ur sigs. | PLWR. | QSL. |
|--------|------------------|-------|-------|-----------------------|----------|-------|------|
| | Year. Month. Day | UT | MHZ | 2x | RST | Watts | |
| CX4AAU | 790917 | 1938 | 28 | SSB SSB | 58 | 25 | PSE |

Rig: Argonaut 509

Linear PA. Tube: 6DQ5

Antenna:

2 el. Quad, up 20'

o Dipole, up 20'

o GP, up 25'

Scag #313

Thanks for QSO!

de: Björn

Björn Ekelund
Gruvgatan 4
26050 Billesholm
Sweden

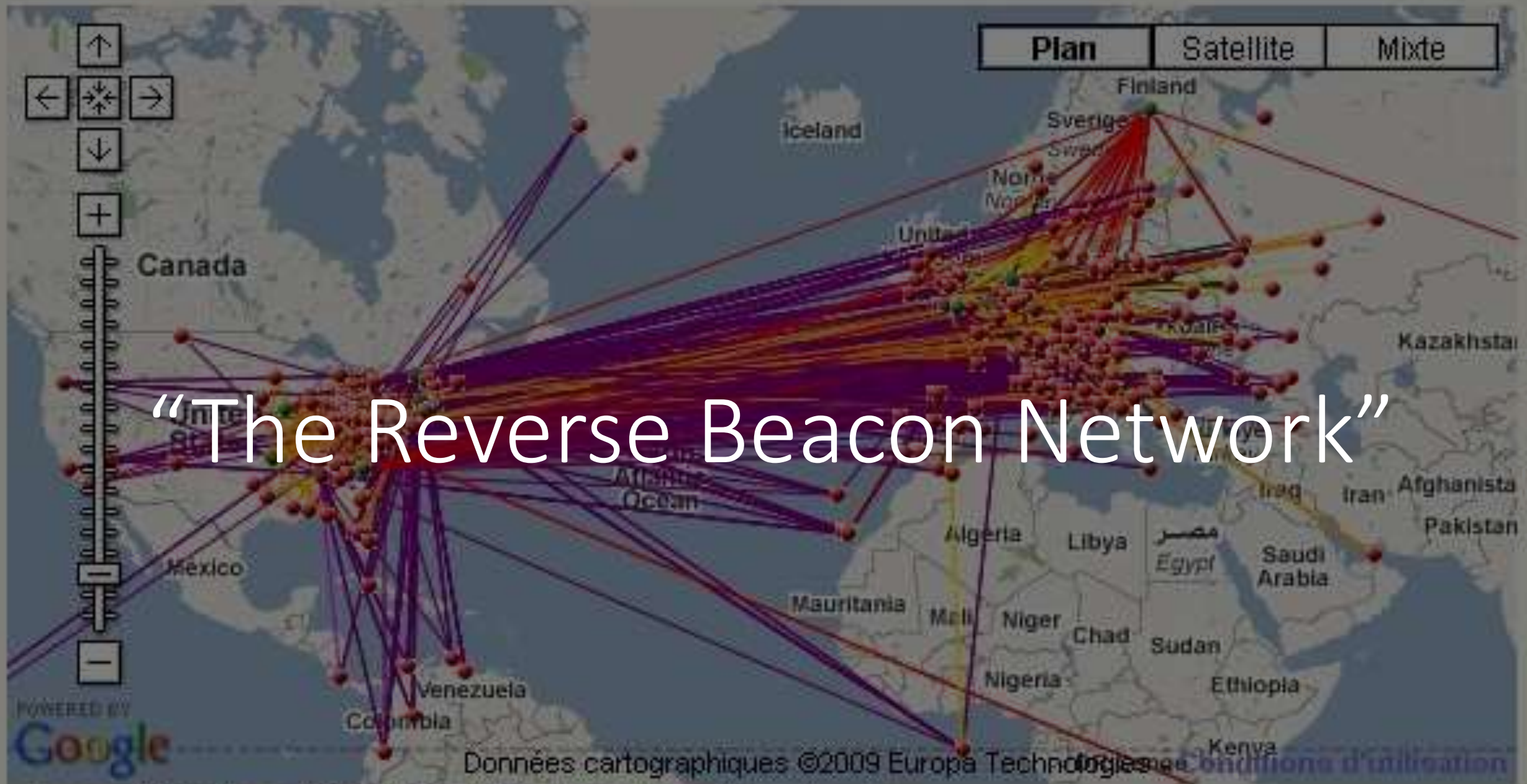


Beacons?

NCDXF/IARU International Beacon Project

Transmission Schedule

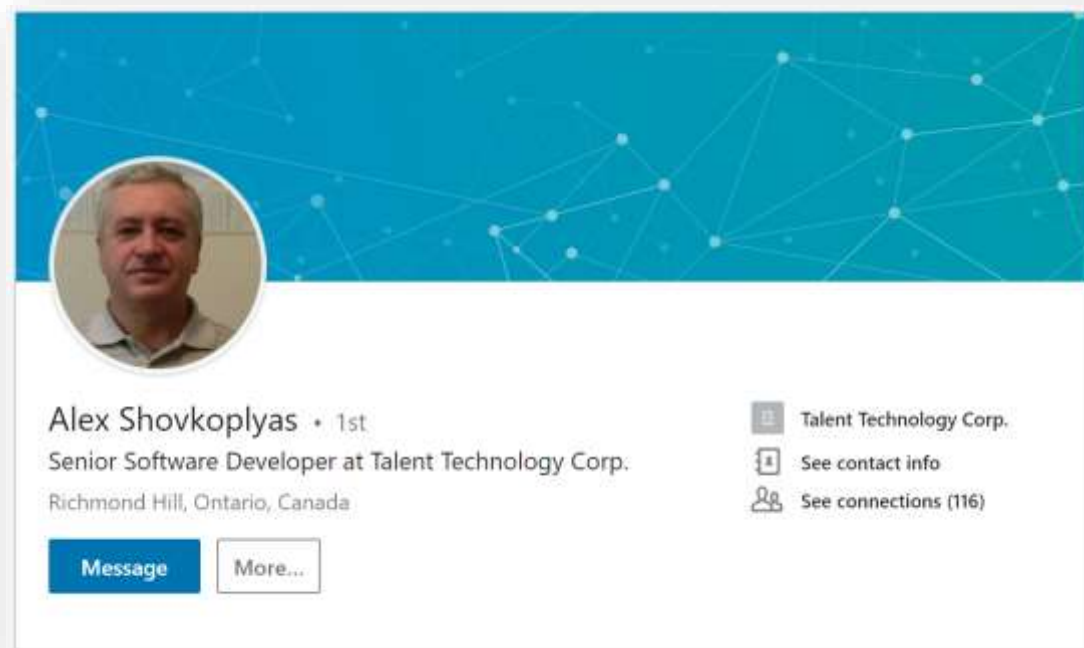
“The Reverse Beacon Network”



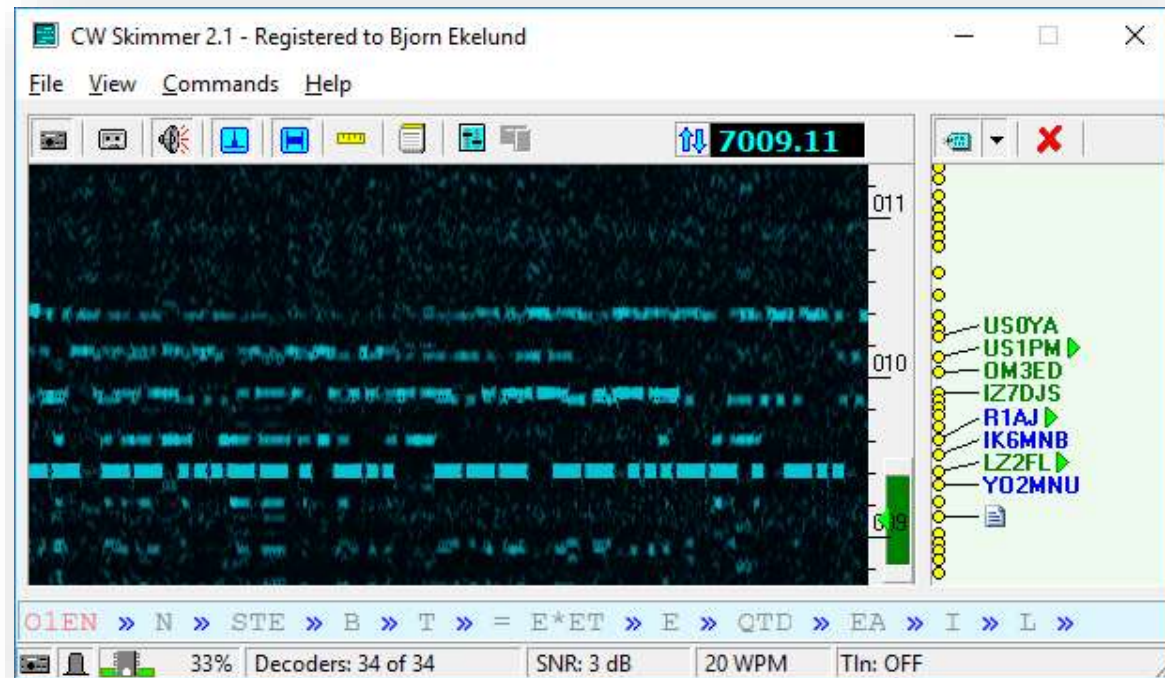
/ 1600m / 80m / 40m / 30m / 20m / 17m / 15m / 12m / 10m / 7m
world wide / zoom to US / zoom to Europe / zoom to North Atlantic

It started with one brilliant engineer...

Alex Shovkoplyas, VE3NEA (b. 1965,
ex-UR5EMI, Canadian resident since 1998)
"Canadian ham of the year" 2014

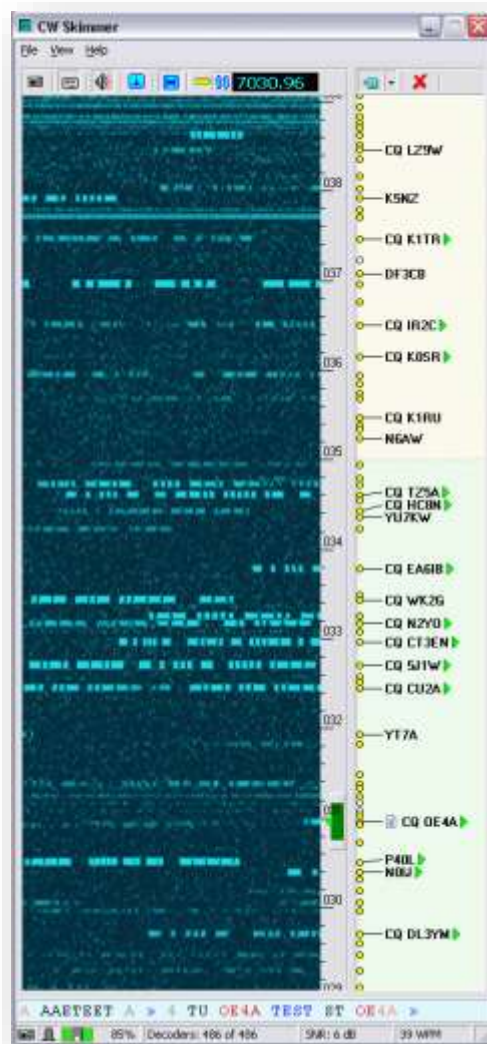


Morse code decoder "CW Skimmer"



Published by Alex in 2008 after “seven years of thinking”.
Based on Bayesian statistics, a “kind of” AI.
Originally intended as a tool to manage DX pile-ups.

“CW Skimmer”



- Works with a range of SDR front-ends
- Parallel decoding of Morse code signals across an entire passband
 - Standard 3.5kHz audio
 - Wideband I-Q up to 192kHz bandwidth
- Graphical “waterfall” illustration of signals
- Uses a recognized call sign data base for sanity checking

2008: The planets lined up...

Alex VE3NEA



Felipe PY1NB

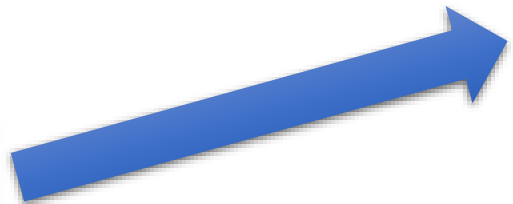


Dick W3OA

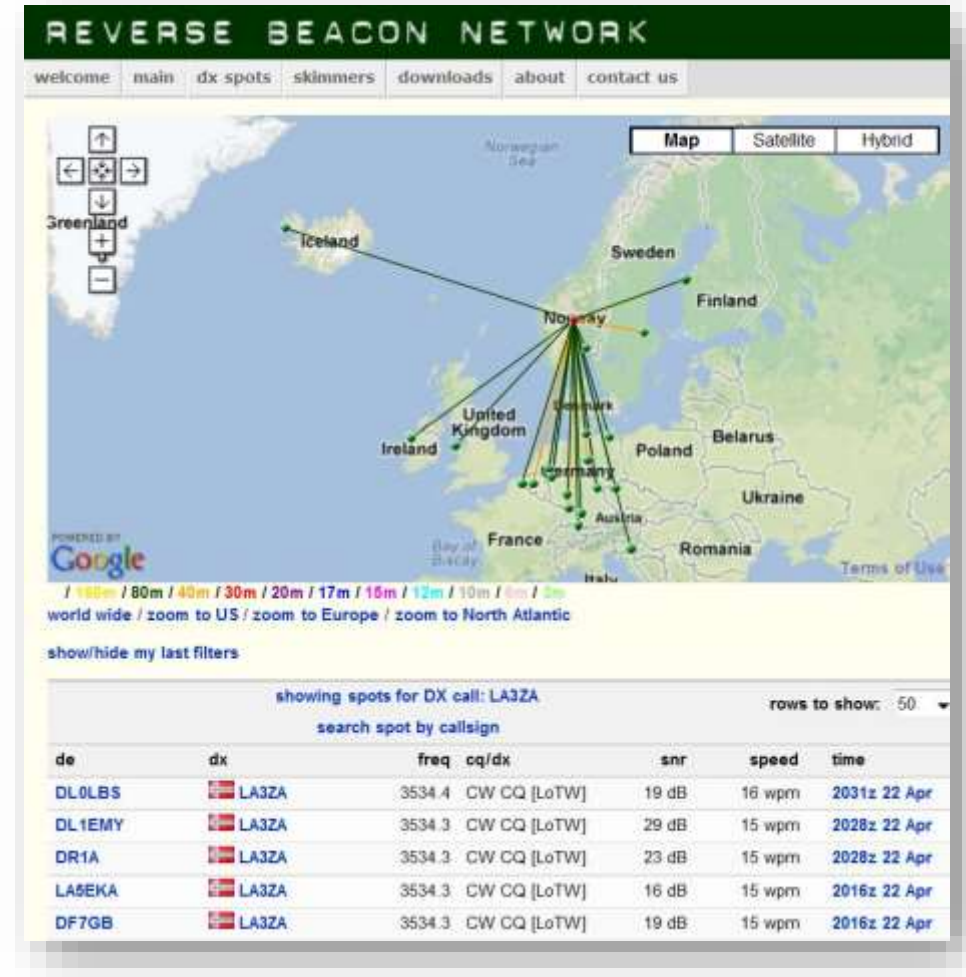


Nick F5VIH

Pete N4ZR

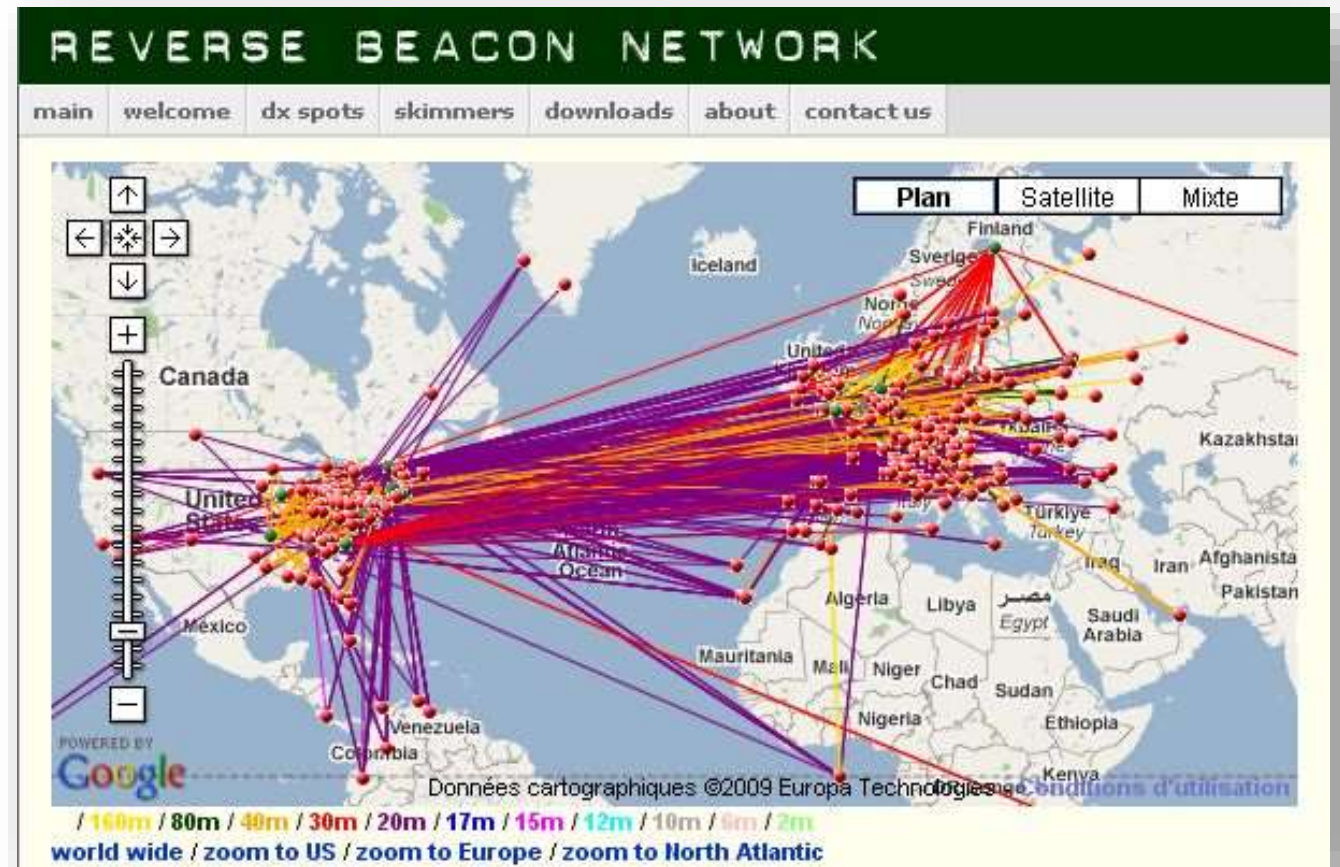


Phil N8VB

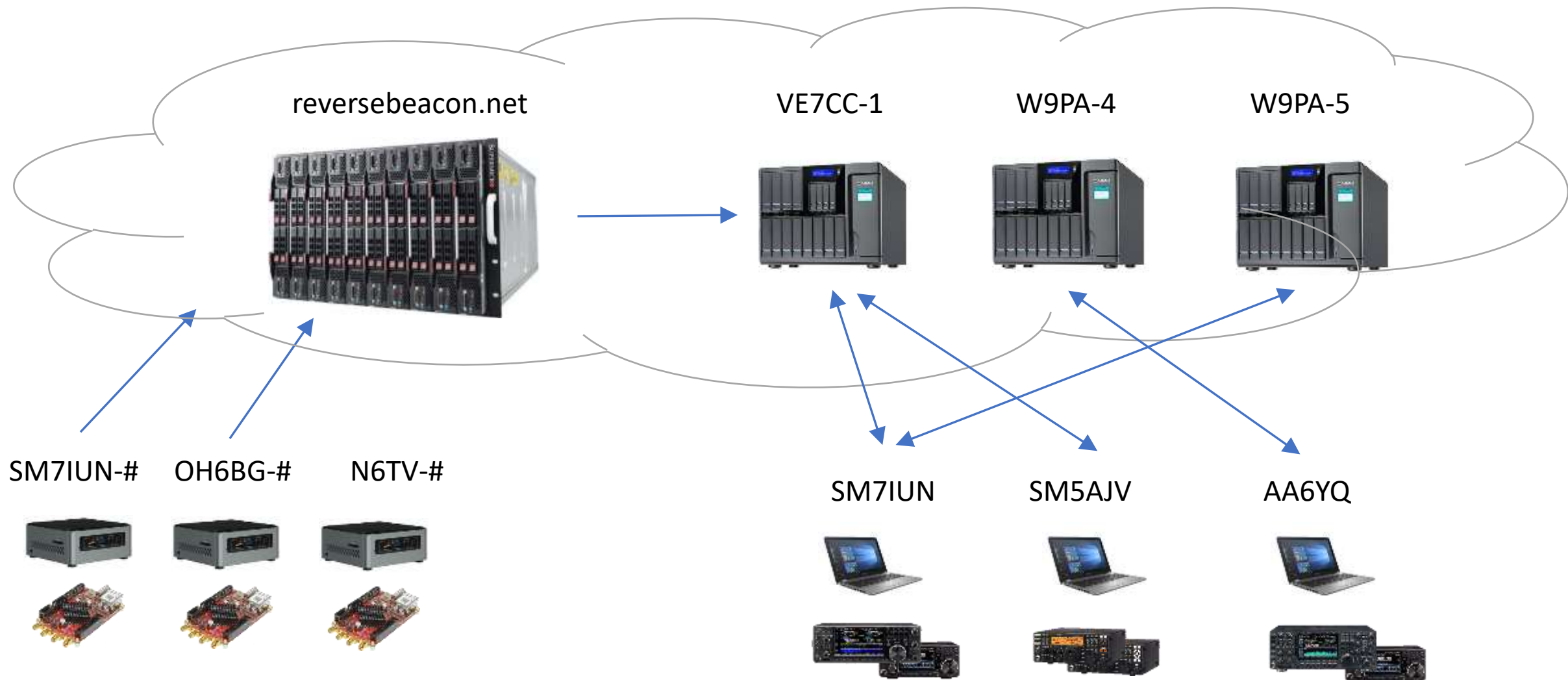


The Reverse Beacon network

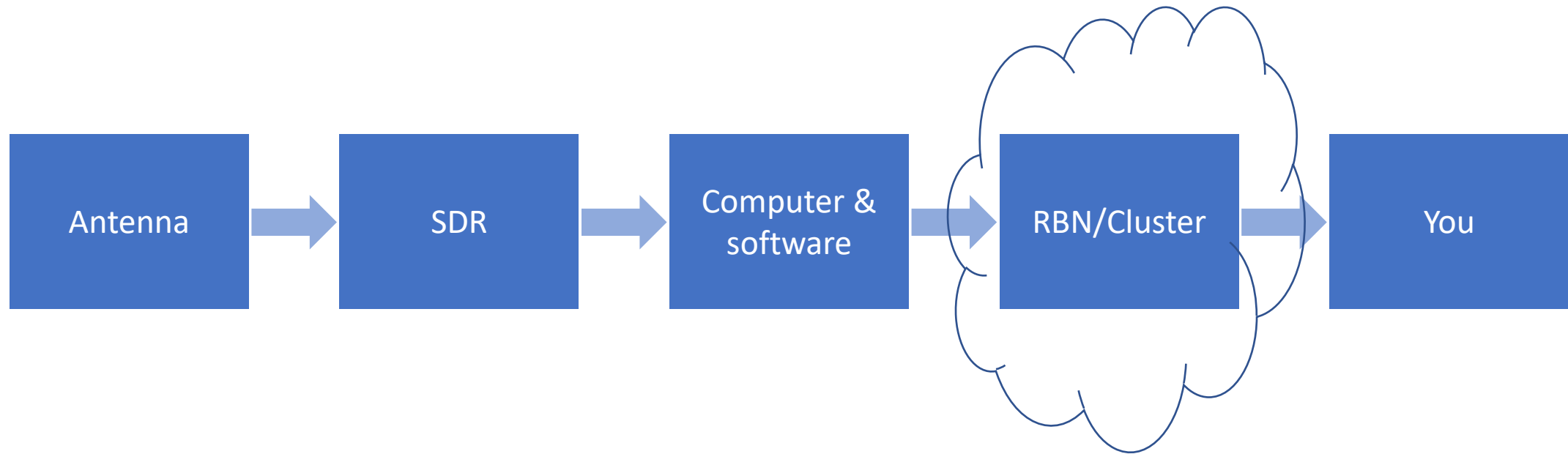
- A global network of skimmer receivers for both Morse code and digital protocols
- ~200 24/7 “skimmers”
- Global coverage
- Highest density in EU & NA



Reverse beacon network & The DX cluster



The whole chain



What are the parts in a skimmer?

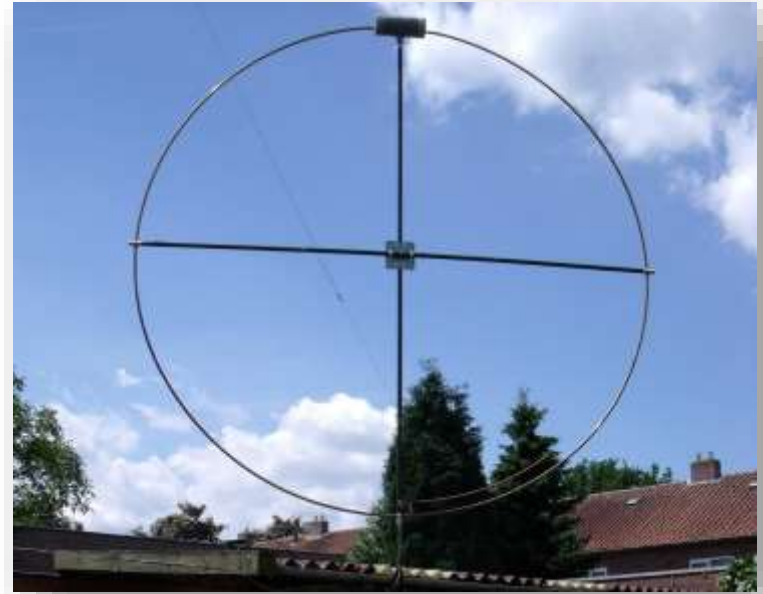


```
for i in people.data.users:
    response = client.api.statuses.user_timeline.get(screen_name=i.screen_name,
    params={'count': 100, 'max_results': 100, 'tweet_mode': 'extended'})
    if len(response.data) > 0:
        tweet = response.data[0]
        tweet_id = tweet.id
        tweet_text = tweet.text
        today = datetime.now()
        howlong = (today - tweet.created_at).days
        if howlong > daywindow:
            print i.screen_name, 'has tweeted in the past', daywindow,
            totaltweets += len(response.data)
        for j in response.data:
            if j.entities.urls:
                for k in j.entities.urls:
                    newurl = k['expanded_url']
                    urlset.add(newurl, i.screen_name)
    else:
        print i.screen_name, 'has not tweeted in the past', daywindow
```



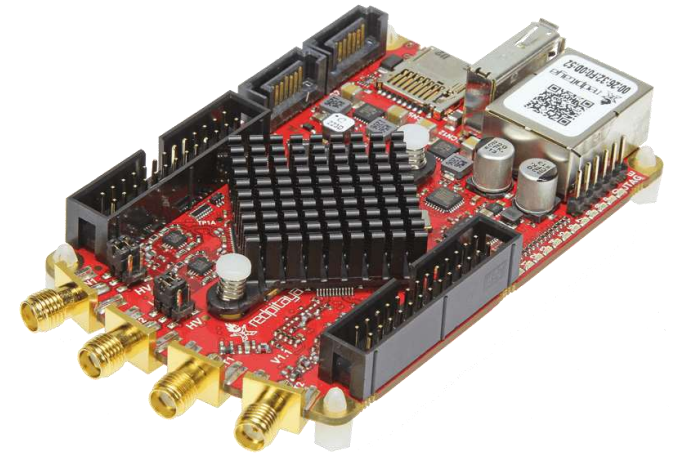
#1 Antenna

- Should be
 - broadband, preferably 1.8-50MHz
 - always connected
 - be immune to local noise or in a low noise environment
- Does not need
 - to work for transmission
 - to be very efficient, SNR is more important than RSSI
 - to be large



#2 Receiver

- Should
 - have a digital quadrature output sampled at 48, 96 or 192kHz
 - be wideband, preferably 1.8-50MHz
 - be support multiple receiver instances
 - preferably be networked (Ethernet)
- Does not need
 - knobs and buttons
 - an audio chain



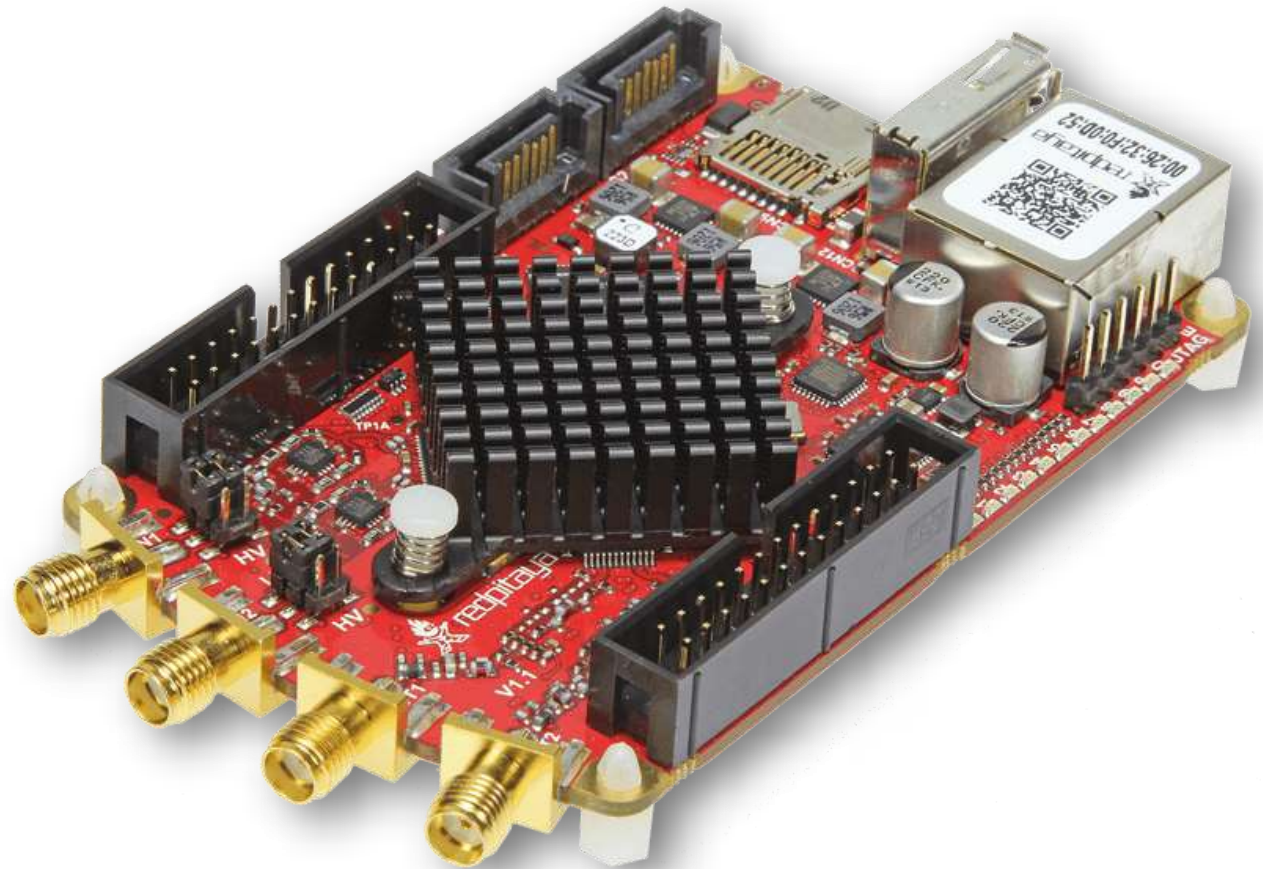
SDR receivers



“The Raspberry Pi of DSP”

Red Pitaya 125-14

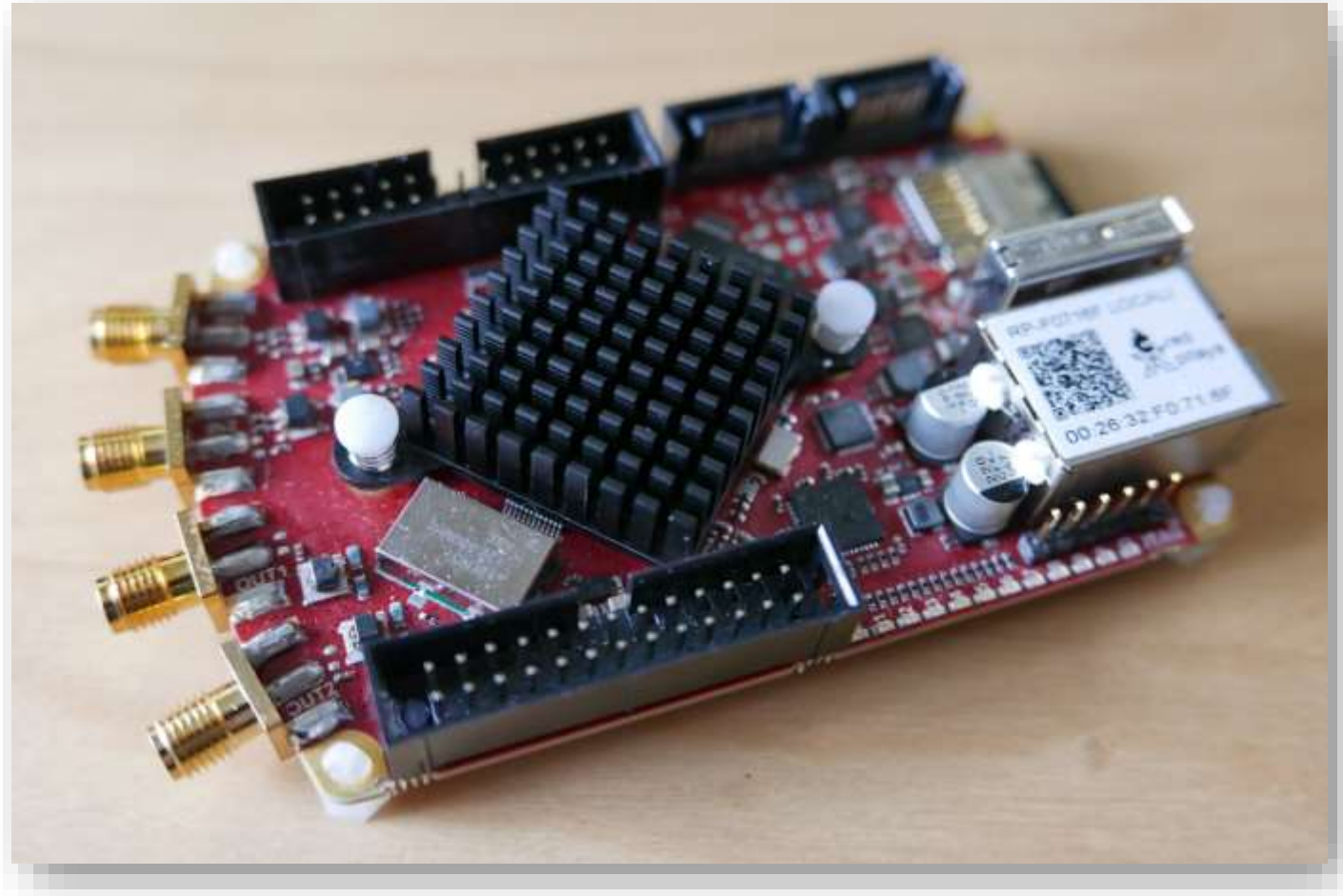
- Based on Xilinx Zynq 7010
 - 28,000 logical cells FPGA
 - 80 programmable DSP slices
 - 100 GMAC/s performance
 - 667MHz Cortex A9 MPcore with Neon and CoreSight
 - Two 125MHz 14 bit ADC/DAC
 - Four 100kHz ADC/DAC
 - 16 GPIO
-
- Started as a Kickstarter project
 - Over 30,000 sold
 - Base ports for Ubuntu and Alpine Linux
 - Free Xilinx Vivado tool suite



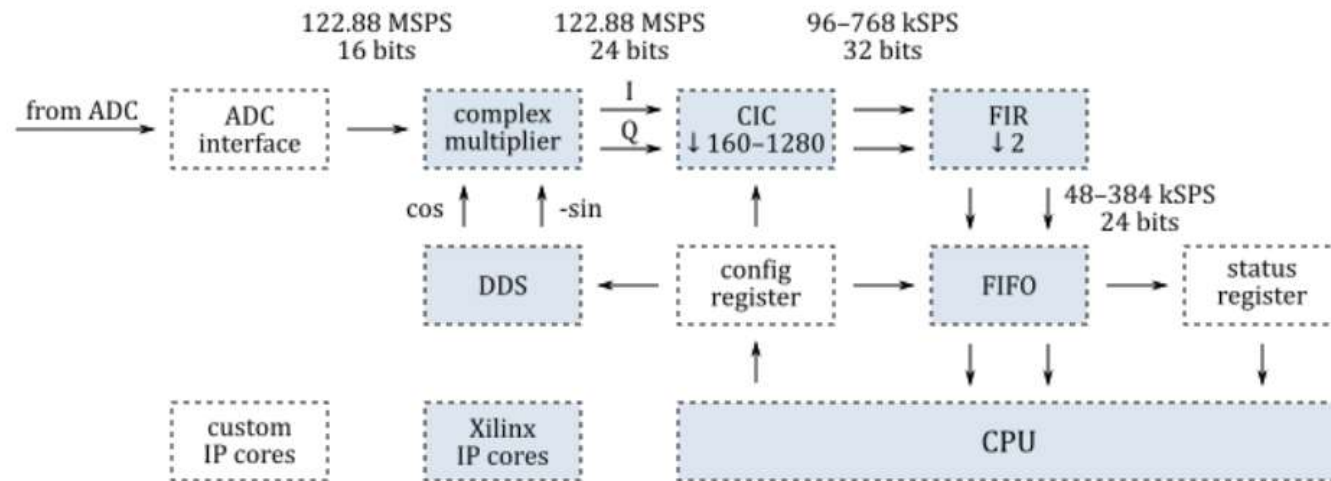
“The Raspberry Pi of DSP”

Red Pitaya 122.88-16

- Based on Xilinx Zynq 7020
- 85,000 logical cells FPGA
- 220 programmable DSP slices
- 276 GMAC/s performance
- 667MHz Cortex A9 MPcore with Neon and CoreSight
- Two 122.88MHz 16 bit ADC/DAC
- Four 100kHz ADC/DAC
- 16 GPIO
- ABLNO XO <50fs jitter



Pavel Demin @ KU Leuven



1. List of components
2. Links
3. Development machine
4. LED blinker
5. SDR receiver
6. SDR transceiver
7. SDR transceiver compatible with HPSDR
8. SDR receiver compatible with HPSDR
9. Embedded SDR transceiver
10. Wideband SDR transceiver
11. Multiband WSPR transceiver
12. Multiband FT8 transceiver
13. Pulsed Nuclear Magnetic Resonance
14. Multichannel Pulse Height Analyzer
15. Scanning system
16. Vector Network Analyzer
17. Alpine with pre-built applications



Pavel Demin • 1st

IT Engineer at Université catholique de Louvain
Brussels Area, Belgium

Message

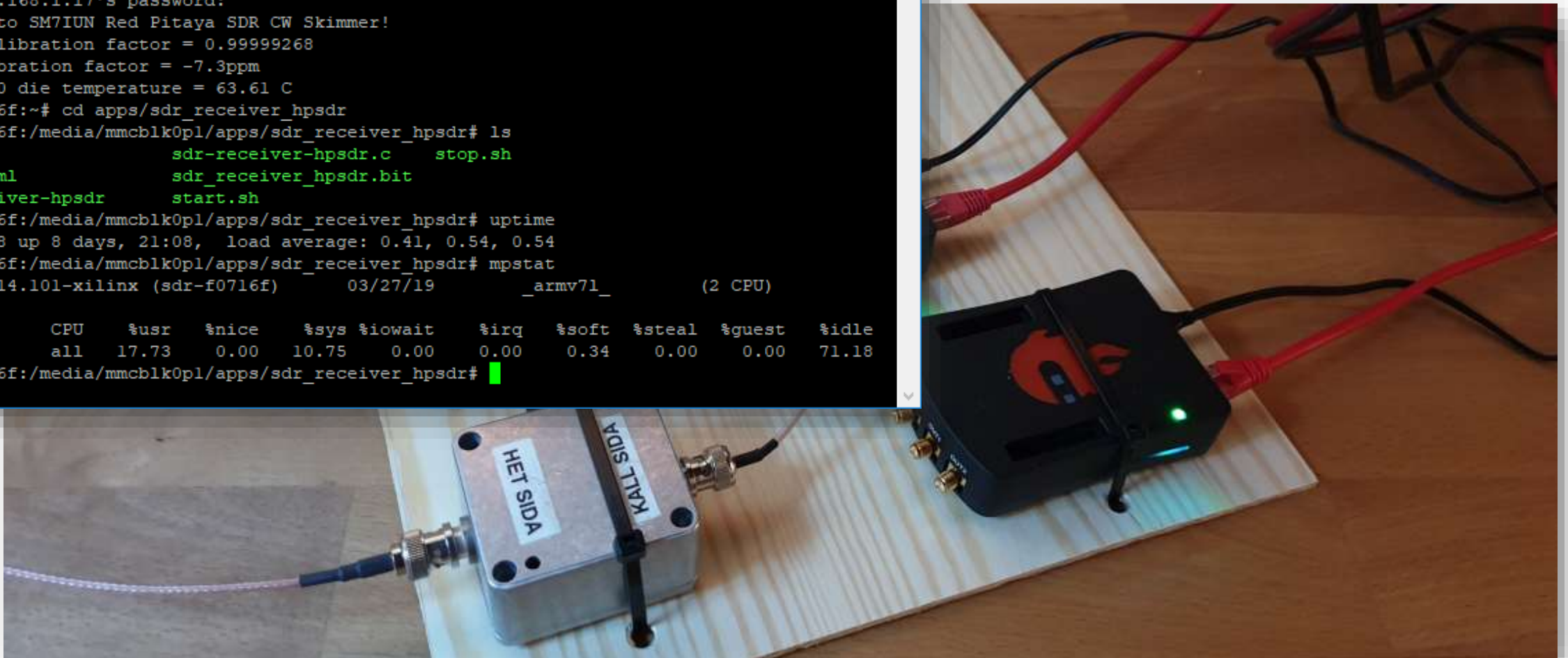
More...

- Université catholique de Louvain
- Université Joseph Fourier - Grenoble 1
- See contact info
- See connections (94)

CW and FT8 skimmers @ SM7IUN

```
192.168.1.17 - PuTTY
login as: root
root@192.168.1.17's password:
Welcome to SM7IUN Red Pitaya SDR CW Skimmer!
HPSDR calibration factor = 0.99999268
FT8 calibration factor = -7.3ppm
Zynq 7020 die temperature = 63.61 C
sdr-f0716f:~# cd apps/sdr_receiver_hpsdr
sdr-f0716f:/media/mmcblk0p1/apps/sdr_receiver_hpsdr# ls
Makefile          sdr-receiver-hpsdr.c  stop.sh
index.html        sdr_receiver_hpsdr.bit
sdr-receiver-hpsdr start.sh
sdr-f0716f:/media/mmcblk0p1/apps/sdr_receiver_hpsdr# uptime
 12:20:18 up 8 days, 21:08,  load average: 0.41, 0.54, 0.54
sdr-f0716f:/media/mmcblk0p1/apps/sdr_receiver_hpsdr# mpstat
Linux 4.14.101-xilinx (sdr-f0716f)      03/27/19      _armv7l_      (2 CPU)

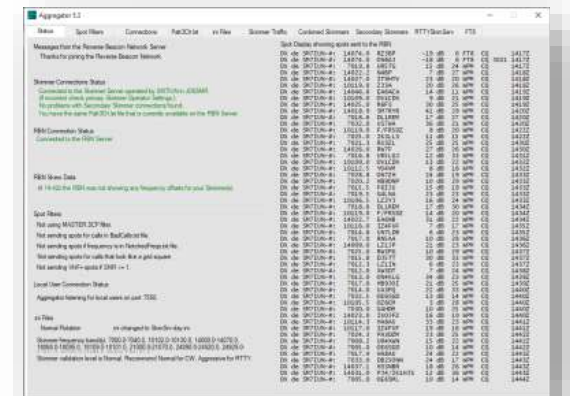
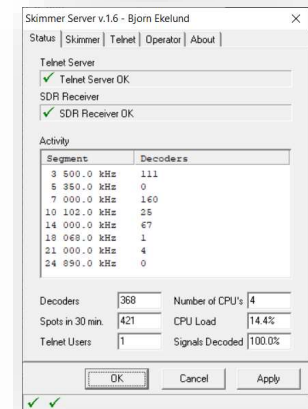
12:20:19      CPU      %usr    %nice    %sys %iowait    %irq    %soft    %steal    %guest    %idle
12:20:19    all     17.73     0.00    10.75     0.00     0.00     0.34     0.00     0.00    71.18
sdr-f0716f:/media/mmcblk0p1/apps/sdr_receiver_hpsdr#
```



#3 Host computer and software



- **“CW Skimmer Server” or “RTTY Skimmer Server”**
 - Decodes the Morse code transmissions in the passband of the radio front end
 - Computationally intense. RTTY more than CW.
 - CW is 5-25% on 2GHz Core i5 depending on bandwidth
- **“RBN Aggregator”**
 - Consolidates and curates streams of decoded call signs from several radio front ends
 - Adds origin information
 - Controls daylight/twilight/night cycle
 - Etc. housekeeping
- Decoding of the FT8 digital transmission protocol is much less computationally intense and can be done in the radio front end.



Skimmer “site architecture”

RBN

Morse code



Radio
Teletype



Digital FT8



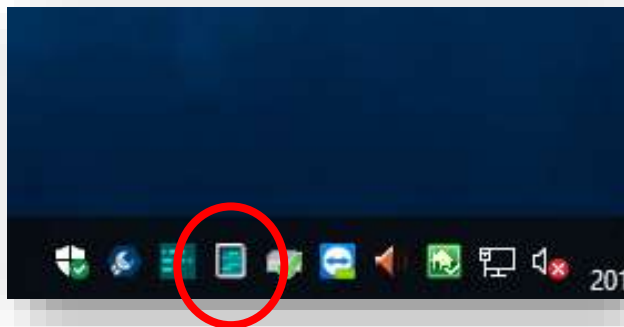
Windows PC

[illegible]

CW Skimmer Server

An “embedded” CW Skimmer with Telnet interface for RBN Aggregator or a DX cluster node

8 × 91kHz segments shortwave bands = 10-15% CPU load on 2GHz Core i5



<http://www.dxatlas.com/SkimServer>

Skimmer Server v.1.6 - Bjorn Ekelund

Status | Skimmer | Telnet | Operator | About

Telnet Server

✓ Telnet Server OK

SDR Receiver

✓ SDR Receiver OK

Activity

| Segment | Decoders |
|--------------|----------|
| 3 500.0 kHz | 111 |
| 5 350.0 kHz | 0 |
| 7 000.0 kHz | 160 |
| 10 102.0 kHz | 25 |
| 14 000.0 kHz | 67 |
| 18 068.0 kHz | 1 |
| 21 000.0 kHz | 4 |
| 24 890.0 kHz | 0 |

Decoders 368 Number of CPU's 4

Spots in 30 min. 421 CPU Load 14.4%

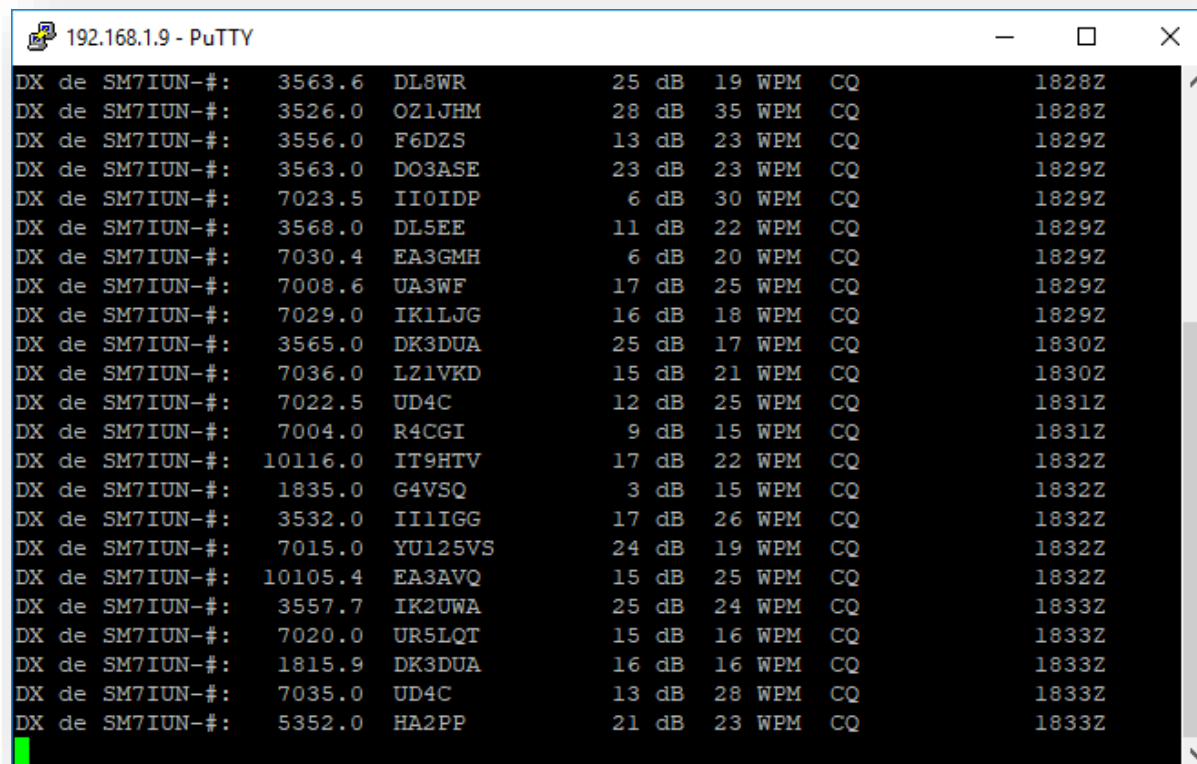
Telnet Users 1 Signals Decoded 100.0%

OK Cancel Apply

✓ ✓

CW Skimmer Server

Simple Telnet feed with frequency, call sign, SNR, transmission speed and time



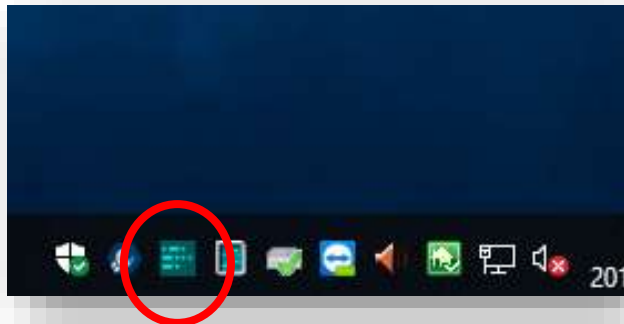
| | | | | | | |
|-----------------|---------|---------|-------|--------|----|-------|
| DX de SM7IUN-#: | 3563.6 | DL8WR | 25 dB | 19 WPM | CQ | 1828Z |
| DX de SM7IUN-#: | 3526.0 | OZ1JHM | 28 dB | 35 WPM | CQ | 1828Z |
| DX de SM7IUN-#: | 3556.0 | F6DZS | 13 dB | 23 WPM | CQ | 1829Z |
| DX de SM7IUN-#: | 3563.0 | DO3ASE | 23 dB | 23 WPM | CQ | 1829Z |
| DX de SM7IUN-#: | 7023.5 | II0IDP | 6 dB | 30 WPM | CQ | 1829Z |
| DX de SM7IUN-#: | 3568.0 | DL5EE | 11 dB | 22 WPM | CQ | 1829Z |
| DX de SM7IUN-#: | 7030.4 | EA3GMH | 6 dB | 20 WPM | CQ | 1829Z |
| DX de SM7IUN-#: | 7008.6 | UA3WF | 17 dB | 25 WPM | CQ | 1829Z |
| DX de SM7IUN-#: | 7029.0 | IK1LJG | 16 dB | 18 WPM | CQ | 1829Z |
| DX de SM7IUN-#: | 3565.0 | DK3DUA | 25 dB | 17 WPM | CQ | 1830Z |
| DX de SM7IUN-#: | 7036.0 | LZ1VKD | 15 dB | 21 WPM | CQ | 1830Z |
| DX de SM7IUN-#: | 7022.5 | UD4C | 12 dB | 25 WPM | CQ | 1831Z |
| DX de SM7IUN-#: | 7004.0 | R4CGI | 9 dB | 15 WPM | CQ | 1831Z |
| DX de SM7IUN-#: | 10116.0 | IT9HTV | 17 dB | 22 WPM | CQ | 1832Z |
| DX de SM7IUN-#: | 1835.0 | G4VSQ | 3 dB | 15 WPM | CQ | 1832Z |
| DX de SM7IUN-#: | 3532.0 | II1IGG | 17 dB | 26 WPM | CQ | 1832Z |
| DX de SM7IUN-#: | 7015.0 | YU125VS | 24 dB | 19 WPM | CQ | 1832Z |
| DX de SM7IUN-#: | 10105.4 | EA3AVQ | 15 dB | 25 WPM | CQ | 1832Z |
| DX de SM7IUN-#: | 3557.7 | IK2UWA | 25 dB | 24 WPM | CQ | 1833Z |
| DX de SM7IUN-#: | 7020.0 | UR5LQT | 15 dB | 16 WPM | CQ | 1833Z |
| DX de SM7IUN-#: | 1815.9 | DK3DUA | 16 dB | 16 WPM | CQ | 1833Z |
| DX de SM7IUN-#: | 7035.0 | UD4C | 13 dB | 28 WPM | CQ | 1833Z |
| DX de SM7IUN-#: | 5352.0 | HA2PP | 21 dB | 23 WPM | CQ | 1833Z |

- Typically CW Skimmer Server does not report party stations, only “CQ-ers”
- Spotting keywords:
CQ QRZ TEST NA SS FD UP
- Short call signs (e.g. SE5E) should be repeated for secure spotting
- Remember that spotting is not guaranteed even if propagation is sufficient, e.g. due to interference

RBN Aggregator

Curates and aggregates spots before uploading to RBN cloud.
Negligible CPU load on host.

Telnet client for CW and RTTY skimmers.
UDP broadcast listener for FT8 skimmers.



Aggregator 5.4b1

Status Spot Filters Connections Patt3Ch.lst ini Files Skimmer Traffic Combined Skimmers Secondary Skimmers RTTYSkimServ FT8

Messages from the Reverse Beacon Network Server
Thanks for joining the Reverse Beacon Network

Skimmer Connections Status
Connected to the Skimmer Server operated by SM7IUN in JO65MR.
(If incorrect check primary Skimmer Operator Settings.)
No problems with Secondary Skimmer connections found.
You have the same Patt3Ch.lst file that is currently available on the RBN Server.

RBN Connection Status
Connected to the RBN Server.

RBN Skew Data
At 16:29z the RBN was not showing any frequency offsets for your Skimmer(s).

Spot Filters
Not using MASTER.SCP filter.
Not sending spots for calls in BadCalls.txt file.
Not sending spots if frequency is in NotchedFreqs.txt file.
Not sending spots for calls that look like a grid square.
Not sending VHF+ spots if SNR <= 1.

Local User Connection Status
Aggregator listening for local users on port 7550.

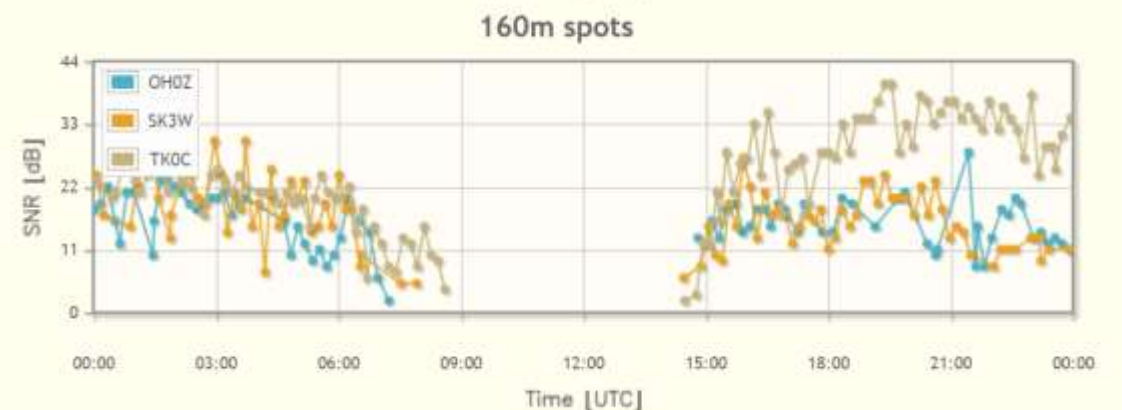
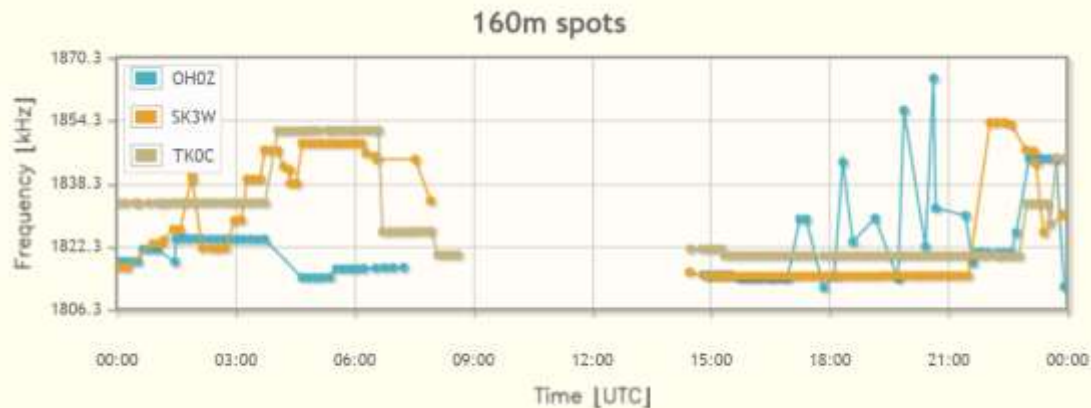
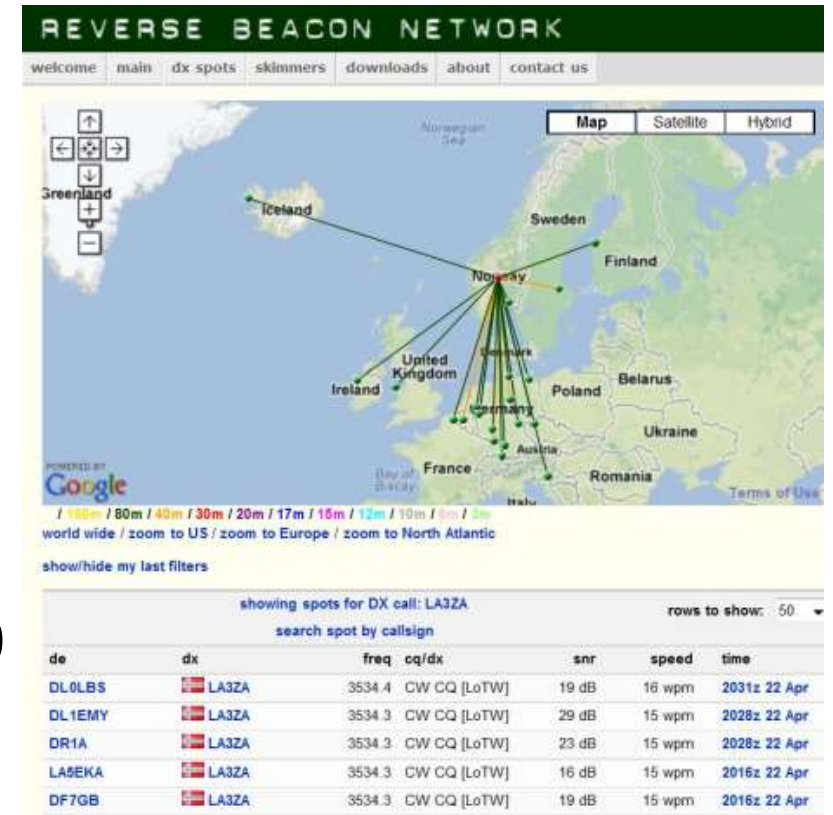
ini Files
Normal Rotation .ini changed to SkimSrv-gray.ini
Skimmer frequency band(s): 3500.0-3570.0, 7000.0-7040.0, 10102.0-10130.0, 14000.0-14070.0, 14099.0-14101.0, 18068.0-18095.0, 18109.0-18111.0, 21000.0-21070.0,
Skimmer validation level is Normal. Recommend Normal for CW, Aggressive for RTTY.

Spot Display showing spots sent to the RBN

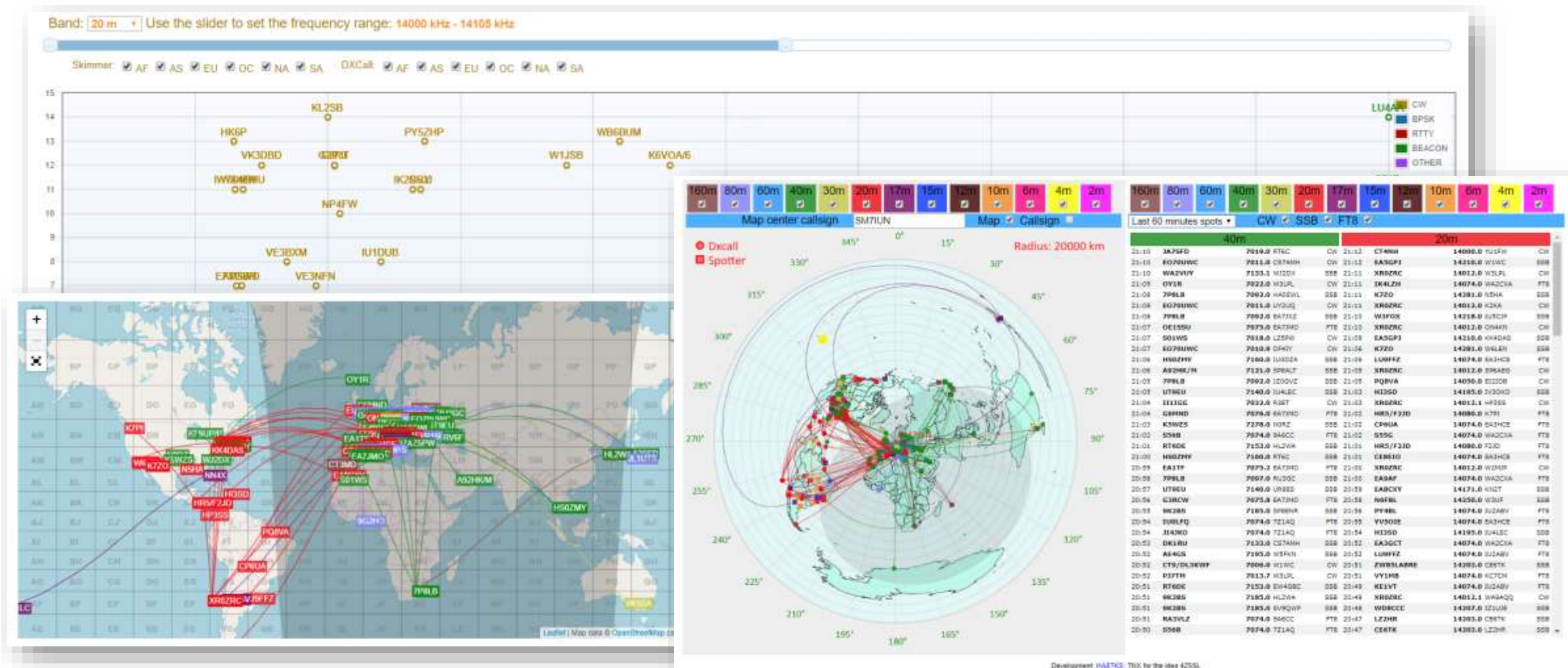
| | | | | | | |
|-----------------|---------|---------|-------|--------|----|-------|
| DX de SM7IUN-#: | 7013.0 | F6IJ | 21 dB | 22 WPM | CQ | 1617Z |
| DX de SM7IUN-#: | 7017.0 | RK3Q/7 | 28 dB | 24 WPM | CQ | 1618Z |
| DX de SM7IUN-#: | 7009.6 | HB90BQR | 27 dB | 21 WPM | CQ | 1618Z |
| DX de SM7IUN-#: | 10116.0 | I27WMM | 31 dB | 30 WPM | CQ | 1619Z |
| DX de SM7IUN-#: | 7038.1 | YL3AJT | 31 dB | 15 WPM | CQ | 1619Z |
| DX de SM7IUN-#: | 7026.6 | D36ZM | 23 dB | 28 WPM | CQ | 1620Z |
| DX de SM7IUN-#: | 7019.7 | GOCBO | 18 dB | 14 WPM | CQ | 1620Z |
| DX de SM7IUN-#: | 14039.3 | W7QC | 10 dB | 26 WPM | CQ | 1621Z |
| DX de SM7IUN-#: | 7013.0 | F6IJ | 17 dB | 20 WPM | CQ | 1621Z |
| DX de SM7IUN-#: | 7014.3 | R1ZY | 22 dB | 25 WPM | CQ | 1621Z |
| DX de SM7IUN-#: | 10114.0 | RX3Q | 25 dB | 25 WPM | CQ | 1621Z |
| DX de SM7IUN-#: | 7011.3 | RV6LNZ | 19 dB | 24 WPM | CQ | 1622Z |
| DX de SM7IUN-#: | 14006.0 | LZ2HR | 3 dB | 30 WPM | CQ | 1622Z |
| DX de SM7IUN-#: | 14011.6 | SV0AMS | 10 dB | 19 WPM | CQ | 1622Z |
| DX de SM7IUN-#: | 10113.5 | W3WP | 24 dB | 22 WPM | CQ | 1622Z |
| DX de SM7IUN-#: | 7013.3 | R1ZY | 21 dB | 25 WPM | CQ | 1622Z |
| DX de SM7IUN-#: | 14060.0 | EA5EQ | 2 dB | 12 WPM | CQ | 1623Z |
| DX de SM7IUN-#: | 14020.7 | ZB2CW | 6 dB | 26 WPM | CQ | 1623Z |
| DX de SM7IUN-#: | 10110.0 | LZ7DL | 10 dB | 23 WPM | CQ | 1623Z |
| DX de SM7IUN-#: | 10118.4 | YT2ZE | 16 dB | 20 WPM | CQ | 1624Z |
| DX de SM7IUN-#: | 7011.0 | RK4CT | 22 dB | 28 WPM | CQ | 1624Z |
| DX de SM7IUN-#: | 7025.0 | UA6EED | 15 dB | 27 WPM | CQ | 1624Z |
| DX de SM7IUN-#: | 7006.3 | RU3KA | 20 dB | 21 WPM | CQ | 1625Z |
| DX de SM7IUN-#: | 14100.0 | Z56DN | 10 dB | 18 WPM | CQ | 1625Z |
| DX de SM7IUN-#: | 14018.0 | 5V7EI | 7 dB | 26 WPM | CQ | 1625Z |
| DX de SM7IUN-#: | 7016.3 | RU3KA | 19 dB | 21 WPM | CQ | 1626Z |
| DX de SM7IUN-#: | 7018.5 | DL1GZH | 14 dB | 13 WPM | CQ | 1626Z |
| DX de SM7IUN-#: | 10119.4 | G58VL | 35 dB | 20 WPM | CQ | 1626Z |
| DX de SM7IUN-#: | 7038.2 | RN6HI/B | 7 dB | 17 WPM | CQ | 1627Z |
| DX de SM7IUN-#: | 14028.4 | K2TV | 17 dB | 22 WPM | CQ | 1627Z |
| DX de SM7IUN-#: | 7007.0 | OK3EE | 42 dB | 18 WPM | CQ | 1628Z |
| DX de SM7IUN-#: | 10113.0 | LZ2JB | 15 dB | 14 WPM | CQ | 1629Z |
| DX de SM7IUN-#: | 10114.1 | UB7K | 33 dB | 25 WPM | CQ | 1629Z |
| DX de SM7IUN-#: | 7025.0 | UA6EED | 19 dB | 27 WPM | CQ | 1629Z |
| DX de SM7IUN-#: | 3520.0 | R3OR | 8 dB | 26 WPM | CQ | 1630Z |
| DX de SM7IUN-#: | 7017.0 | RK3Q/7 | 26 dB | 25 WPM | CQ | 1630Z |
| DX de SM7IUN-#: | 14052.0 | IT9FRT | 19 dB | 14 WPM | CQ | 1630Z |
| DX de SM7IUN-#: | 3541.0 | DK5JPL | 17 dB | 28 WPM | CQ | 1630Z |
| DX de SM7IUN-#: | 10114.1 | UB7K | 33 dB | 25 WPM | CQ | 1630Z |
| DX de SM7IUN-#: | 14030.0 | 4Z4DX | 23 dB | 20 WPM | CQ | 1630Z |
| DX de SM7IUN-#: | 14028.5 | HZ1TT | 31 dB | 26 WPM | CQ | 1631Z |
| DX de SM7IUN-#: | 7030.3 | G0EVJ | 3 dB | 22 WPM | CQ | 1631Z |
| DX de SM7IUN-#: | 7013.0 | HB9JCI | 6 dB | 24 WPM | CQ | 1631Z |
| DX de SM7IUN-#: | 3521.0 | SP1JPM | 22 dB | 28 WPM | CQ | 1632Z |
| DX de SM7IUN-#: | 3518.0 | UA6KAC | 16 dB | 23 WPM | CQ | 1632Z |
| DX de SM7IUN-#: | 7013.3 | R1ZY | 27 dB | 25 WPM | CQ | 1632Z |
| DX de SM7IUN-#: | 10113.5 | RW3WP | 26 dB | 22 WPM | CQ | 1632Z |
| DX de SM7IUN-#: | 7011.0 | PA2SAM | 20 dB | 28 WPM | CQ | 1632Z |
| DX de SM7IUN-#: | 14010.0 | EA1XT | 13 dB | 36 WPM | CQ | 1632Z |
| DX de SM7IUN-#: | 7026.2 | YT4EW | 11 dB | 22 WPM | CQ | 1633Z |

The Reverse Beacon network

- A cloud service
- “A shortwave communications data lake”
 - All data available for download
- 300,000,000+ data points collected since 2009
- Extensive suite of online analysis tools

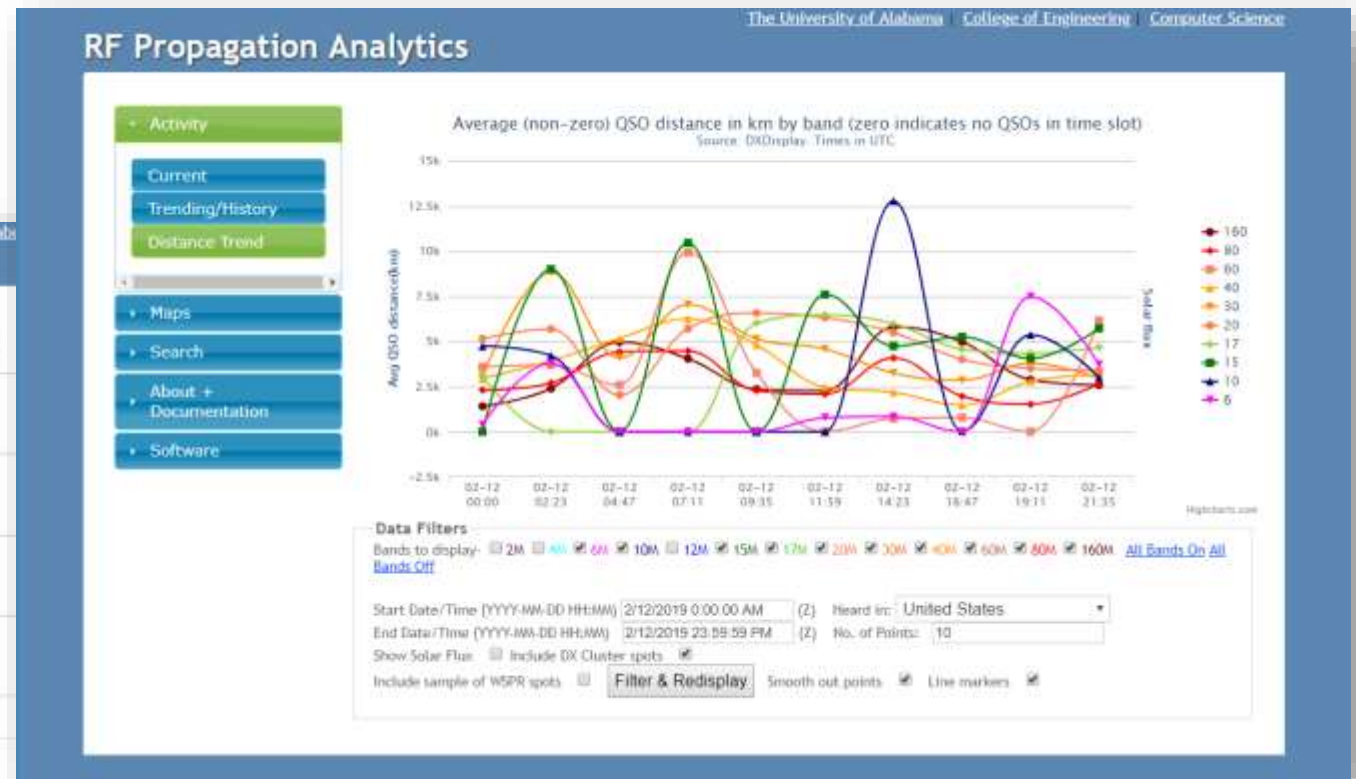
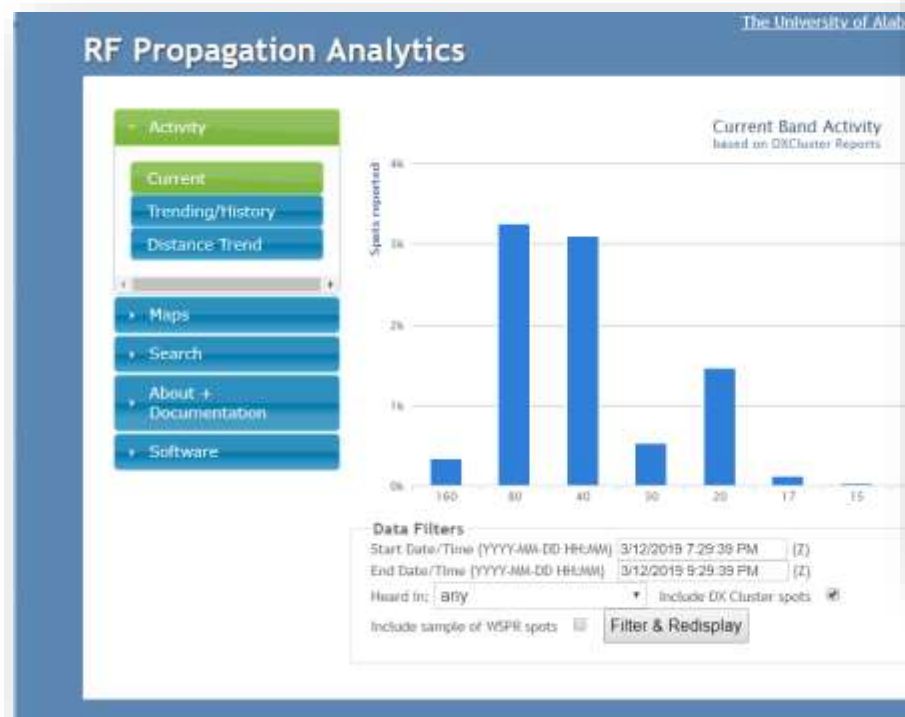


Cloud-to-cloud: HA8TKS



<https://dxcluster.ha8tk.s.hu>

Cloud-to-cloud: University of Alabama



Cloud-to-cloud: DX maps

The screenshot displays the DXMAPS 4.0 interface, which provides real-time information on QSO/SWL activity. The main map shows a world grid with numerous black lines representing QSO connections between various locations. The interface includes a navigation bar at the top with links to Site, Personal, Radio, Software, DX maps, DX news, and a search bar. Below the navigation bar, there are tabs for Map, List, Graph, and Chat. The map is currently set to 'World' and 'Gray line' mode. A sidebar on the left offers options for Royalty-free audio tracks, including Free files, Corporate music, Sound effects, Background music, Music for videos, and And more! A 'START NOW' button is also present. The right side of the interface features a table of active stations, organized by continent (Europe, Africa, N.America, S.America, Asia, Oceania, World). The table lists call signs, frequencies, and other details. A 'WWW.DXMAPS.COM' banner is visible at the top of the map area.

DXMAPS 4.0 - QSO/SWL real time information (Information about...)

Map List Graph Chat

Europe Africa N.America S.America Asia Oceania World / Gray line Select options Modes

2200 m 600 m 160 m 80 m 60 m 40 m 30 m 20 m 17 m 15 m 12 m 10 m All bands Ticker

Click on the map for info of that location
Right-click for more options

WWW.DXMAPS.COM - QSO/SWL 18:14-18:50c
SFI=70 A=12 K=2 Unsettled SWX=Minor storm

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DXMAPS 4.0 - QSO/SWL real time information

Map List Graph Chat

Europe Africa N.America S.America Asia Oceania World / Gray line Select options Modes

2200 m 600 m 160 m 80 m 60 m 40 m 30 m 20 m 17 m 15 m 12 m 10 m All bands Ticker

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WWW.DXMAPS.COM 18:57z WWW info: SFI=70 A=12 K=2 Unsettled SWX=Minor storm

| | | | |
|------------------------------------|---------------|-------------------|----------------------------------------|
| 2019-03-17 18:57 IK2QEB (JN55LD) | 14 218.0 SSB | 5V7EI (JJ06) | 4399 km |
| 2019-03-17 18:54 I7OEB (JM99AX) | 14 218.0 SSB | XR0ZRC (FF06) | 12851 km Up 6 Trx |
| 2019-03-17 18:54 F8JUV (JN18BW) | 14 074.0 FT8 | 6W7ON4AVT (IK14M) | 4220 km FT8 |
| 2019-03-17 18:50 IV3RJT (JN65SW) | 14 215.0 SSB | 9G2DX (IJ95) | 4705 km trn 4 qso 73 s |
| 2019-03-17 18:50 DL9IU (JO50KQ) | 14 074.4 FT8 | CE2FME (FF47) | 12189 km trn FT8 qso |
| 2019-03-17 18:50 F8BNU (JO10K) | 14 032.0 CW | 5X3C (KJ61HW) | 6066 km trn for qso.73 up |
| 2019-03-17 18:49 TA5FA (KN90UX) | 14 248.0 SSB | 5X3C (KJ61HW) | 4397 km |
| 2019-03-17 18:48 E15GSB (JO51WU) | 14 218.0 SSB | 5V7EI (JJ06) | 5109 km Thanks Lads La Fheile Padraig |
| 2019-03-17 18:44 K0DMW (EN35) | 14 097.1 WSPR | F1AGR (JN04RJ) | 6955 km EN35<=>JN04RJ WSPR SNR=-29 |
| 2019-03-17 18:44 QZ7IT (JO65DF) | 14 097.1 WSPR | V53ARC (JO87) | 8649 km JO65DF<=>JO87 WSPR SNR=-22 |
| 2019-03-17 18:44 G4CUB (JO93FI) | 14 097.2 WSPR | F1AGR (JN04RJ) | 1010 km IO93FI<=>JN04RJ WSPR SNR=-25 |
| 2019-03-17 18:44 IZ0FKE (JN61FW) | 14 097.2 WSPR | G0CCL (JO02BF) | 1472 km JN61FW<=>JO02BF WSPR SNR=-11 |
| 2019-03-17 18:44 QZ7IT (JO65DF) | 14 097.1 WSPR | G0CCL (JO02BF) | 865 km JO65DF<=>JO02BF WSPR SNR=-23 |
| 2019-03-17 18:44 EA2AAE (IN82KU) | 14 097.1 WSPR | G0CCL (JO02BF) | 1069 km IN82KU<=>JO02BF WSPR SNR=-24 |
| 2019-03-17 18:42 TA5FA (KN90UX) | 14 248.0 SSB | 5X3C (KJ61HW) | 4397 km up5 |
| 2019-03-17 18:42 TR0TTEL (JJ40RL) | 14 218.0 SSB | OE3ZJC (JN85HH) | 5361 km |
| 2019-03-17 18:41 DL7JAN (JN49IF) | 14 248.0 SSB | 5X3C (KJ61HW) | 5727 km up5 |
| 2019-03-17 18:40 IW9GYL (JM77MN) | 14 022.0 CW | E51DOM/MM (JF97) | 7796 km up 0.8 great ears!! Enjol 3Y0I |
| 2019-03-17 18:36 EA7JZZ (IM87EC) | 14 215.0 SSB | 9G2DX (IJ95) | 3521 km Trn QSO, 5/7 in Spain, 73 |
| 2019-03-17 18:36 IK2WSO (JN45OL) | 14 218.0 SSB | 5V7EI (JJ06) | 4401 km 5 to 10 up |
| 2019-03-17 18:36 IV3JOKO (JN66IS) | 14 215.0 SSB | 9G2DX (IJ95) | 4694 km |
| 2019-03-17 18:35 IK2YDJ (JN55) | 14 218.0 SSB | XR0ZRC (FF06) | 12580 km trn for qso |
| 2019-03-17 18:34 VK3KHZ (QF22PE) | 14 097.1 WSPR | H89TJM (JN38FQ) | 16524 km QF22PE<=>JN38FQ WSPR SNR=-25 |
| 2019-03-17 18:34 DLPA0EHG (JO32SQ) | 14 097.1 WSPR | EATADI (IM77AI) | 2000 km JO32SQ<=>IM77AI WSPR SNR=-20 |
| 2019-03-17 18:34 QZ7IT (JO65DF) | 14 097.1 WSPR | G0CCL (JO02BF) | 865 km JO65DF<=>JO02BF WSPR SNR=-20 |
| 2019-03-17 18:34 EA8BFX (IL38BO) | 14 097.2 WSPR | F1AGR (JN04RJ) | 2210 km IL38BO<=>JN04RJ WSPR SNR=-22 |
| 2019-03-17 18:34 EA8BFX (IL38BO) | 14 097.1 WSPR | MIAFZ (JO01DE) | 2774 km IL38BO<=>JO01DE WSPR SNR=-20 |
| 2019-03-17 18:34 SM4VEY (JO59WK) | 14 097.0 WSPR | EATADI (IM77AI) | 2755 km JO59WK<=>IM77AI WSPR SNR=-11 |
| 2019-03-17 18:34 OP0GVW (BS59VI) | 14 097.1 WSPR | G0CCL (JO02BF) | 13675 km IB59UH<=>JO02BF WSPR SNR=-26 |
| 2019-03-17 18:34 TF1VHF (HP84WL) | 14 097.0 WSPR | EATADI (IM77AI) | 3199 km HP84WL<=>IM77AI WSPR SNR=-22 |
| 2019-03-17 18:34 QZ7IT (JO65DF) | 14 097.0 WSPR | EATADI (IM77AI) | 2415 km JO65DF<=>IM77AI WSPR SNR=-2 |
| 2019-03-17 18:34 EA8BFX (IL38BO) | 14 097.1 WSPR | G0CCL (JO02BF) | 2869 km IL38BO<=>JO02BF WSPR SNR=-3 |
| 2019-03-17 18:34 EA8BFX (IL38BO) | 14 097.1 WSPR | PD1RA (JO22XF) | 3094 km IL38BO<=>JO22XF WSPR SNR=-21 |
| 2019-03-17 18:34 DK8FTJA (JN58OE) | 14 097.1 WSPR | H215K (KL91) | 3860 km JN58OE<=>KL91 WSPR SNR=-24 |
| 2019-03-17 18:33 IK4ZGX (JN54KV) | 14 022.0 CW | E51DOM/MM (JF97) | 8640 km trn |
| 2019-03-17 18:33 5V7XRO (JJ06OF) | 14 218.0 SSB | IK8BQE (JN70EN) | 4035 km a great dvar |
| 2019-03-17 18:32 IK4SE (JN54PL) | 14 218.0 SSB | 5V7EI (JJ06) | 4335 km mondo pescatori... |
| 2019-03-17 18:31 OE3IDE (JN78KK) | 14 218.0 SSB | 5V7EI (JJ06) | 4867 km NOT XR0ZRC |
| 2019-03-17 18:31 IT8ZZ (JM88QD) | 14 223.0 SSB | IK8BQE (JN70EN) | 282 km e ascolta poi scrivi |
| 2019-03-17 18:31 F4WBL (JN25) | 14 218.0 SSB | XR0ZRC (FF06) | 12163 km |
| 2019-03-17 18:30 IK8ROF (JN70EN) | 14 218.0 SSB | XR0ZRC (FF06) | 12594 km |

<https://www.dxmaps.com>

Cloud-to-cloud: VOACAP

VOACAP Quick Guide

HF Propagation Prediction and Ionospheric Communications Analysis

by Jari Perkkio, OH5BG/OC6G

What is VOACAP?

VOACAP (Voice of America Coverage Analysis Program) is free professional high-frequency (HF) propagation prediction software from NTIA-ITS, originally developed for Voice of America (VOA).

This 'work-in-progress' guide should get you well started with the software. A more comprehensive discussion about the finer details of using the software can be found in George Lane's book [Signal-to-Noise Predictions Using VOACAP: A User's Guide](#). The book is now available on CD-ROM.

There is now also [The Official VOACAP Blog](#) - well, it's not too official.

NOTE: Running automated scripts to access VOACAP services is strictly prohibited unless agreed upon in advance.

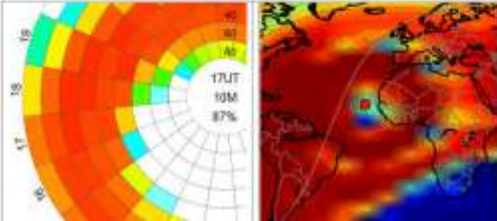
FOLLOW ME ON TWITTER FOR THE LATEST NEWS

If you wish to keep abreast of the latest developments on the site, follow me on Twitter at: [twitter.com/VOACAP](#)

VOACAP PREDICTIONS FOR MARITIME HF

Using Maritime HF SSB transceivers? I have now launched a VOACAP HF propagation prediction site for M: [http://voacap.com/marine](#) - work's in progress still. Comments & suggestions welcome.

VOACAP Online Prediction Services




VOACAP Online HF Predictions (Amateur Radio) - 21:19:43 UTC (10:19 PM)

Select TX QTH: or Select a location: or Set Grid: or Set Grid:

Select RX QTH: or Select a location: or Set Grid: or Set Grid:

or Latitude: Longitude:

or Latitude: Longitude:



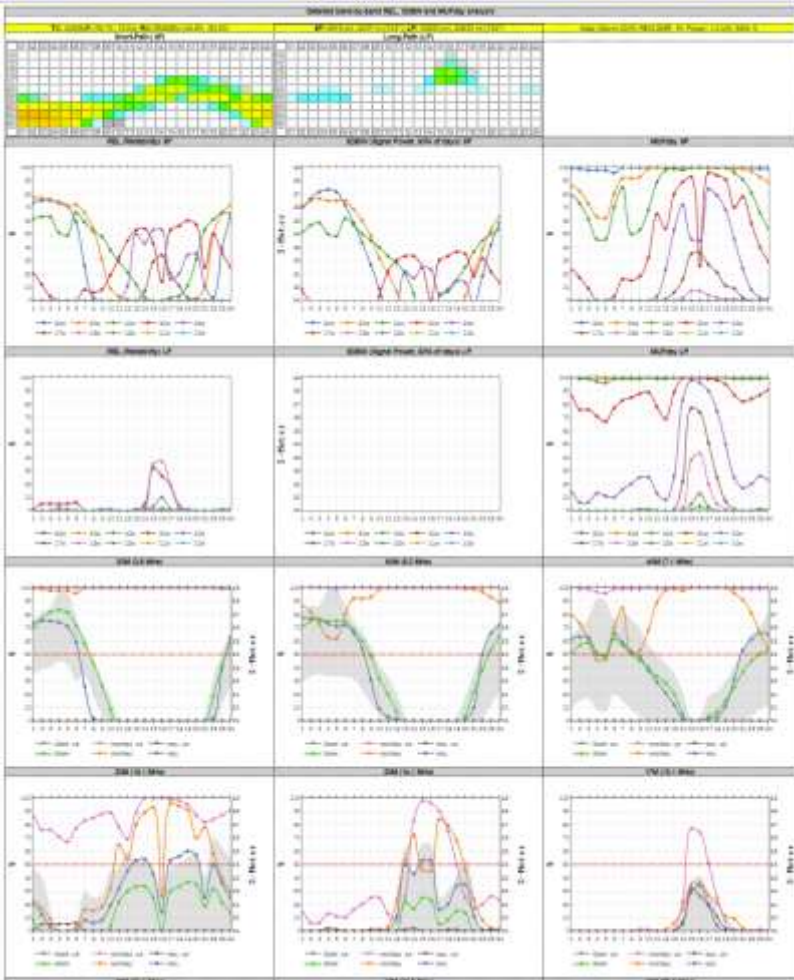
21:19

05/12/2019

TX: J48.21, 17N.03 (33.55 N, 12.03 W) (Dist: 17783 km - 11049 mi) (33° - 36° Lat: 33.4618, 140.0179) Long: 22223 km - (13810 mi) (153° - 219°) (Alt: 33.4618, 36.0179)

[Send by Band Prediction](#) [Send by F1070](#) [Send by F1070](#) [No user Prediction](#) [QSO Window](#) [Tone](#) [Power](#) [TPO Graph](#) [Spectrum](#) [F10.7 Map](#) [S1070 Map](#)

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<http://www.voacap.com>

Client software: SpotCollector

Part of the larger DXLab radio station management suite.

Integration with propagation prediction tools, call sign data base, station logbook, awards rule base, etc.

SpotCollector 8.3.0 @ 2019-03-12 21:52 Z [CC,DXK,PF,DXV,PV] 6 entries (log: SM7IUN.mdb)

WWV 03-12 2106 Z
SFI 71 History
Q: 6 A 9 1 K

Outgoing spot
Call CT1ILT 1 840,0 Freq Cluster
Notes X Local

Spot source status
Report Stats Prop Config Help

| | Freq | Call | DXCCCountry | Mode | LastTime | Notes | Source | Network | LastOr | NA | SA | EU | AF | AS | Odx | State | Need | SPS | SPPro |
|--|----------|--------|-----------------|------|-----------------|----------------------|----------|---------|--------|----|----|----|----|----|------|-------|------|-----|-------|
| | 1 820,6 | 3B8XF | Mauritius Islan | CW | 2019-03-12 2144 | QX 1822.25 | DL1ROJ | EI7MRE | EU | | | Y | | | 359 | | DZ | | |
| | 1 824,6 | JA5DQH | Japan | CW | 2019-03-12 2142 | CW 18 dB 22 WPM CQ | JF2IWL-# | VE7CC | AS | | | Y | | Y | 1270 | | DZ | | |
| | 1 840,0 | 7P8LB | Lesotho | FT8 | 2019-03-12 2141 | FT8 normal | EU0EU-@ | CQDX | EU | | | Y | Y | | 897 | | DZ | | |
| | 7 092,0 | 7P8LB | Lesotho | SSB | 2019-03-12 2142 | only Ja | IV3RJT | CQDX | EU | | | Y | | | 630 | | D | 3 | |
| | 10 110,0 | XR0ZRC | Juan Fernandi | CW | 2019-03-12 2145 | QX 10111.88 IOTA SAC | EA4ZK | EI7MRE | EU | | Y | Y | | Y | 936 | | DZ | -8 | 3 |
| | 14 012,0 | XR0ZRC | Juan Fernandi | CW | 2019-03-12 2149 | still 569 here | DM5EM | EI7MRE | EU | Y | Y | Y | | | 538 | | D | 7 | 38 |

Sort
☐ First ☐ Call
☐ Last ☒ Freq
☐ Rcv ☐ Az

Filter: SQL [Need F]
ce2sv X AutoHide Need Call DXCC Freq Tag Band Mode Cont Origin
Audio Age LoTW eQSL Mrthn S
Need F Need C N+ EU CWops Unkwn Need S My spot Myneed

Color codes
verified unneeded unconfmd unwrkd B or M unwrkd counter special tag

What use is the RBN for me?

Contesting



- Band openings
- Band-map filler
- Spots you
- Find clear spots
- Strategizing
- Benchmarking competition

DX-ing



- Band openings
- Alerts for rare stations
- Propagation reports

Antenna experiments



- Antenna directivity
- Radiation angle
- A-B testing