CW and RTTY Skimmer and the Reverse Beacon Network

Presented by N6TV
n6tv@arrl.net
Overview

- What is CW Skimmer and RTTY Skimmer?
- What is the Reverse Beacon Network?
- How does it work?
- What can the RBN do for me?
- How can I use it?
- How can I help?
- What’s new?
It all starts with one developer

- Alex Shovkoplyas, VE3NEA
  (b. 1965, ex-UR5EMI, in Canada since 1998)

- Honored as RAC Radio Amateur of the Year for 2014
What is CW Skimmer?

1. Hardware: PC + Software Defined Radio (SDR)
2. Wideband RX Antenna, 1.8-30 MHz, e.g. DX Engineering ARAH3-1P Active Dipole or DXE (formerly Pixel) Magnetic Loop RF-PRO-1B®:
Software

3. CW (or RTTY) Skimmer or Skimmer Server
CW Skimmer by VE3NEA

- Works with many SDRs
- Decodes *multiple* CW signals in real time
- Can monitor *entire* CW band (one at a time)
- Waterfall Display
- Band Scope
- Uses MASTER.DTA
- Telnet Server (emulates a DX Cluster)
Skimmer Server by VE3NEA

- Natively supports only the QS1R SDR (no longer made)
- Supports Red Pitaya running free SDR receiver software
- Decodes multiple CW signals in real time
- Monitors up to 8 bands at once with a single SDR
- No Waterfall Display
- No Band Scope
- No MASTER.DTA
- Telnet Server
RTTY Skimmer Server

- Natively supports only the QS1R SDR (no longer made)
- Supports Red Pitaya running free SDR receiver software
- Decodes multiple RTTY signals in real time
- Monitors up to 8 bands with single SDR
- Requires high-end CPU
- Limited Band Scope
- No MASTER.DTA
- Telnet Server
Telnet server
(localhost port 7300)

- Emulates a DX Cluster Node

| DX de N6IU-#: | 14058.7 | WR7HE | 24 dB | 31 WPM | CQ | 2350 |
| DX de N6IU-#: | 14029.6 | NN7D  | 29 dB | 25 WPM | CQ | 2350 |
| DX de N6IU-#: | 14059.5 | YW4D  | 35 dB | 31 WPM | CQ | 2350 |
| DX de N6IU-#: | 14022.6 | J39BS | 11 dB | 25 WPM | CQ | 2350 |
| DX de N6IU-#: | 14066.8 | NF6A  | 38 dB | 30 WPM | CQ | 2350 |
| DX de N6IU-#: | 14054.4 | N5UM  | 26 dB | 28 WPM | CQ | 2350 |
| DX de N6IU-#: | 14021.2 | NN5J  | 35 dB | 31 WPM | CQ | 2350 |
| DX de N6IU-#: | 14061.4 | VX5S  | 12 dB | 28 WPM | CQ | 2350 |
| DX de N6IU-#: | 14064.2 | WQ5L  | 15 dB | 28 WPM | CQ | 2350 |
| DX de N6IU-#: | 14032.2 | VE7XF | 18 dB | 27 WPM | CQ | 2350 |
| DX de N6IU-#: | 14042.9 | NT5C  | 45 dB | 31 WPM | CQ | 2350 |
| DX de N6IU-#: | 14032.2 | VE7XF | 18 dB | 27 WPM | CQ | 2350 |
| DX de N6IU-#: | 14039.2 | EA3FP | 15 dB | 31 WPM | CQ | 2350 |
| DX de N6IU-#: | 14052.5 | W0YR  | 20 dB | 28 WPM | CQ | 2350 |
| DX de N6IU-#: | 14022.9 | AB7E  | 32 dB | 25 WPM | CQ | 2350 |
| DX de N6IU-#: | 14028.4 | WH6R  | 7 dB  | 29 WPM | CQ | 2350 |
| DX de N6IU-#: | 14065.6 | KH7B  | 25 dB | 29 WPM | CQ | 2350 |

To ALL de SKIMMER <09522>: Clicked on "VE7XF" at 14032.2

| DX de N6IU-#: | 14069.6 | KF6T  | 13 dB | 28 WPM | CQ | 2350 |
| DX de N6IU-#: | 14069.1 | N0Q0M | 25 dB | 28 WPM | CQ | 2350 |

To ALL de SKIMMER <09522>: Clicked on """" at 14031.4

| DX de N6IU-#: | 14035.5 | KF8GE | 12 dB | 26 WPM | CQ | 2350 |
| DX de N6IU-#: | 14028.4 | WH6R  | 7 dB  | 29 WPM | CQ | 2350 |
| DX de N6IU-#: | 14036.1 | N21U  | 16 dB | 28 WPM | CQ | 2350 |
| DX de N6IU-#: | 14062.7 | N4QS  | 11 dB | 29 WPM | CQ | 2350 |
| DX de N6IU-#: | 14045.1 | Y01FM | 20 dB | 32 WPM | CQ | 2350 |
| DX de N6IU-#: | 14059.6 | YW4D  | 35 dB | 31 WPM | CQ | 2350 |

Reports Signal to Noise ratio, CW Speed, CQers
What is the Reverse Beacon Network (RBN)?

- Uses *any* CW or RTTY signal as a beacon
- Multiple Skimmers world-wide record signal strength (S/N ratio in dB) and CW speed (WPM)
- A free “Aggregator” program forwards Skimmer spots to a central server
- Central server distributes spots via web page and public telnet servers
- You don’t need to have an SDR to use it
How do spots get to you?

- **Antenna**: Pixel RF Pro-1A
- **SDR**: Red Pitaya
- **PC**: Skimmer Server, Aggregator
- **RBN**: Via Internet
- **“Retail” DX clusters**
- **You**
Acknowledgements

- RBN web site and first aggregator originated by PY1NB (similar to his other web site, www.dxwatch.com). Felipe pays most of the bills.
- Lots of code by W3OA (aggregator), F5VIH (Spots analysis tool)
- CW Skimmer evangelized and tested by N4ZR (also publishes RBN blog) – “RBN Chief Evangelist”
- Telnet server support by K5TR, W2QO, KM3T
Felipe Ceglia, PY1NB

- Created and maintains the Reverse Beacon Network
- Hosts dxwatch.com and reversebeacon.net
Dick Williams, W3OA

- Created and maintains the current RBN Aggregator software
Nick Sinanis, F5VIH

- Wrote the RBN Spots Analysis Tool
Pete Smith, N4ZR

- RBN Chief Evangelist
- Presenter at Contest Forum this Saturday
- Groups.IO Group: RBN-OPS [https://groups.io/g/RBN-OPS](https://groups.io/g/RBN-OPS) (187+ members)
What can the RBN do for me?

- It can improve your score
  - Fills spots in band map (SOA, Multi-op)
  - Spots *you* (very often, *if* you call CQ *properly*)

- Entering a contest?
  - Before: Check antenna F/B, signal strength
  - During: See where you are being heard, view skimmer-generated propagation maps
  - After: Compare signal strength with the competition
How can I use RBN to improve my score?

- Make sure the Skimmers find and spot you.
- Access RBN via your favorite DX Cluster, for CW and RTTY contests (when allowed).
- RBN will post far more spots than DXers.
  - With smaller pileups, less competition.
- RBN quickly fills the band map in your logging software.
- RBN helps locate clear spots to call CQ (between stations that you may not hear).
How can I use RBN to improve my score (cont’d):

- The RBN reveals band openings, shows where *you* are being heard
- At K3LR, sunrise on 15m: “Spotted by S50ARX-#”
- First EU answered our 15m CQs 25 minutes later
How do I CQ “properly”?

- Send *everything* at the *same consistent speed*
  - *Never* use >/< or +++/-- to change speed in messages
- Call CQ or TEST and send your call twice
  - CQ N6TV N6TV
  - TEST N6TV N6TV
  - CQ N6TV N6TV TEST
- Use proper spacing (let computer send)
  - Don’t send with paddles and *rush-everything-together*
- Change your freq. *slightly* to get spotted again
What counts as “CQ”? 

- Originally just: “CQ”, “TEST”, and “QRZ” 
- VE3NEA Added: “FD”, “SS”, “NA” and “UP” 
- Examples: 
  - P5DX P5DX UP 
  - SS N6TV N6TV 
  - NA N6TV N6TV 
  - FD N6TV N6TV FD 
- Short calls like “W1F” should always be sent twice to help Skimmer identify it quickly
How to improve your chances in a Skimmer-generated pileup

- Use XIT or the “randomize TX” feature of your logging program to call a bit off frequency.
How do I use the RBN to Check My Antennas?

- To test performance, just call CQ on CW or RTTY, check RBN web site (turn beam, repeat)
- Use RBN web site’s “Spots Analysis Tool” to compare your signal to the competition
- Download raw data files for deeper analysis
  - Every RBN spot posted since February, 2009 is archived on the RBN web site
Accessing the RBN (SOA, Multi)

1. Many DX clusters combine RBN and human spots using AR-Cluster V6 (see www.dxcluster.info for address listing).
   - Some ARC V6 clusters offer CT1BOH spot quality filters (flags busts, uniques)

2. dxc.ve7cc.net port 23
   CC Cluster software – removes many bad spots (uniques) and dupes
Filtering Spots (old way)

- **DXSpider**
  - accept/spots by_zone 1, 3, 4, 6, 7, 31 and not by WZ71 or call N6TV
  - [http://www.dxcluster.org/main/filtering_en.html#toc1](http://www.dxcluster.org/main/filtering_en.html#toc1)

- **ARCluster V6**
  - set dx filter call=N6TV or (unique>1 and (spotterstate=CA or spotterstate=NV or spotterstate=UT))
  - [http://www.n8noe.us/ARC.html](http://www.n8noe.us/ARC.html)
Filtering Spots (new way)

- Use **CC User** software by VE7CC to log in to dxc.ve7cc.net port 23
- CC User sets filters with a full-feature, Graphical User Interface (GUI)
- CC Cluster nodes *automatically* reject “unique” (busted) spots, eliminates dupes
- New **AR-Cluster Client** by AB5K
- Updated Tutorial:
  - [http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html](http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html)
AR-Cluster Client by AB5K

www.n8noe.us/ARC.html
Many nodes combine RBN and “legacy” (human) spots

- dxc.ve7cc.net port 23 (CC Cluster, many filtering options, use CC User to set them)
- dxc.w9pa.net port 7373 (AR Cluster)
  set dx extension skimmerquality
- dxc.n7tr.com port 7373 (AR Cluster, but pre-filters to show only spots from Zones 3 and 4)
Real-time propagation maps

- http://www.dxmaps.com
- Click “HF” and band of interest
- Leave page open, it refreshes automatically
Using www.reversebeacon.net

- Great for post-contest analysis
- Plot signal strengths
- Raw data files can be downloaded / analyzed
  - Millions of spots archived
www.reversebeacon.net

Welcome to the reverse beacon network!

The Reverse Beacon Network is a revolutionary new idea. Instead of beacons actively transmitting signals, the RBN is a network of stations listening to the bands and reporting what stations they hear, when and how well.

If you already know all this, skip directly to the main page.

So why should you care? Well, to begin with, you can see band openings in near-real time on an animated map. You can call a quick CQ, and see which reverse beacons hear you, and how strong you are. Try it!

But the real breakthrough is in the database of past "spots". You can instantly find out what stations, from a given country or zone, have been heard, at what times and on what frequencies. You can see when you've been spotted, who spotted you, and how loud you were. Try it!

Check out our blog!

Aggregator 2.1 - new insight for Skimmer ops

The newest Aggregator, Version 2.1, is now available, after extensive beta testing. This post explains the new features of this release, tab by tab. First of all, there is an entirely new tab titled "Skimmer Traffic." Here's what it looks like...
Where was I heard?

![Reverse Beacon Network search results for N6TV](image-url)
Plot spots on a map

<table>
<thead>
<tr>
<th>de</th>
<th>dx</th>
<th>freq</th>
<th>cq/dx</th>
<th>snr</th>
<th>speed</th>
<th>time</th>
</tr>
</thead>
<tbody>
<tr>
<td>W4AX</td>
<td>HB9TPT</td>
<td>10115.5</td>
<td>CQ</td>
<td>6 dB</td>
<td>19 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>EA4TX</td>
<td>HB9TPT</td>
<td>10115.5</td>
<td>CQ</td>
<td>8 dB</td>
<td>19 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>IK3STG</td>
<td>HB9TPT</td>
<td>10115.5</td>
<td>CQ</td>
<td>17 dB</td>
<td>20 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>K8ND</td>
<td>VE1ZZ</td>
<td>1623.5</td>
<td>CQ</td>
<td>28 dB</td>
<td>19 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>W3OA</td>
<td>VE1ZZ</td>
<td>1823.6</td>
<td>CQ</td>
<td>21 dB</td>
<td>19 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>K1TTT</td>
<td>VE1ZZ</td>
<td>1823.5</td>
<td>CQ</td>
<td>35 dB</td>
<td>19 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>WZ7I</td>
<td>VE1ZZ</td>
<td>1823.5</td>
<td>CQ</td>
<td>36 dB</td>
<td>20 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>KB9AMG</td>
<td>VE1ZZ</td>
<td>1823.5</td>
<td>CQ</td>
<td>14 dB</td>
<td>19 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>RZ3DVP</td>
<td>MS5RAI</td>
<td>10117.5</td>
<td>CQ</td>
<td>12 dB</td>
<td>28 wpm</td>
<td>0945z 02 Apr</td>
</tr>
<tr>
<td>KH6LC</td>
<td>LU9DO</td>
<td>14012.0</td>
<td>CQ [LoTW]</td>
<td>28 dB</td>
<td>14 wpm</td>
<td>0945z 02 Apr</td>
</tr>
</tbody>
</table>
Which bands are open at *my* QTH?
Spots analysis tool

Welcome to the Reverse Beacon Network!

Welcome to the Reverse Beacon Network!

The Reverse Beacon Network (RBN) is an idea. Instead of beacons actively transmitting signals, the RBN is a network of people listening to different bands and reporting what stations they hear, when and how well.

If you already know what the reverse beacon network is, then you can see the main page.

So why should you care? Well, you can see information about band openings in real-time on your computer. You can call a quick check to see if any beacons hear you, and how strong your signal is.

Check out our blog!

Aggregator 2.1 - new insight for Skimmer ops

The newest Aggregator, Version 2.1, is now available, after extensive beta testing. This...
Pick a Date, a Skimmer, add callsigns to compare

1. Select a comparison date
   10/01/2011

2. Select a Reverse Beacon
   - North America
     - AA4VV 354 spots
     - K1TTT 3318 spots
     - **K3MM 6926 spots**
     - K8ND 3751 spots
     - KA9SWE 657 spots
     - KB9AMG 181 spots
     - KC0VKN 877 spots

3. Enter callsigns to compare
   - **N6TV** 58 spots
   - **K6XX** 29 spots
   - Add callsign
And the winner is ... K6XX!
Raw data downloads

Screen shot of REVERSE BEACON NETWORK website showing the 'download raw data' link and raw data downloads for specific months and years.
Raw data is text file, Comma Separated Values

callsign, de_pfx, de_cont, freq, band, dx, dx_pfx, dx_cont, mode, db, date, speed, tx_mode
JE1SGH, JA, AS, 28032.6, 10m, K6UW, K, NA, CQ, 29, 2014-02-15 00:00:00, 32, CW
XV4Y, 3W, AS, 14041.1, 20m, PT5T, PY, SA, CQ, 22, 2014-02-15 00:00:00, 28, CW
XV4Y, 3W, AS, 14021, 20m, PX2F, PY, SA, CQ, 23, 2014-02-15 00:00:00, 23, CW
NC7J, K, NA, 28005.5, 10m, N2IC, K, NA, CQ, 11, 2014-02-15 00:00:00, 33, CW

- **Total World-Wide RBN CW spots, CQ WW:**
  - 2013: 5,743,545 (33.2 spots per second)
  - 2014: 6,200,340 (35.9) – up 8.0%
  - 2015: 7,085,553 (41.0) – up 14.0%
  - 2016: 6,060,130 (35.1) – down 14.5%
  - 2017: 7,004,509 (40.5) – up 15.6%

- **ARRL DX CW:**
  - 2014: 4,146,399 (86,383 spots per hour)
  - 2015: 5,537,017 (115,354) – up 33.5%
  - 2016: 3,924,585 (81,762) – down 29.1%
  - 2017: 4,285,719 (89,286) – up 9.2%
  - 2018: 4,474,188 (93,212) – up 4.4%
What’s the Average CW Speed of a Spot?

- **CQ WW CW:**
  - 2013: 30.6 WPM
  - 2014: 30.8
  - 2015: 30.7
  - 2016: 30.8
  - 2017: 30.8

- **ARRL DX CW:**
  - 2014: 29.6 WPM
  - 2015: 30.1
  - 2016: 29.9
  - 2017: 29.6
  - 2018: 29.4
RTTY Skimmer Stats

- CQ World-Wide RTTY (48 hours):
  
  2015: 922,311 (5.3 spots per second)
  2016: 994,212 (5.8) – up 7.8%
  2017: 1,154,444 (6.7) – up 16.1%

- ARRL January RTTY Roundup (30 hours):
  
  2016: 457,033 (15,234 spots per hour)
  2017: 470,377 (15,679) – up 2.9%
  2018: 566,063 (18,869) – up 20.3%
How can I help?

- Set up an SDR, feed Skimmer Spots to the RBN, using the Aggregator program
  - More skimmers needed in Asia/Africa/South America

- Call a bit off frequency (Win-test and N1MM both provide automatic randomization if desired)
What’s New?

- NCDXF and other HF Beacons can be spotted on RBN
  - [reversebeacon.blogspot.com/2014/02/ncdxf-beacon-spotting-redux.html](http://reversebeacon.blogspot.com/2014/02/ncdxf-beacon-spotting-redux.html)
- CW Skimmer 2.0
- CW Skimmer Server 1.6
- RTTY Skimmer Server 1.3
- Aggregator v4.4
- Skimmer Server using Red Pitaya on 8 bands
For more information

- http://www.reversebeacon.net
- http://www.dxmaps.com
- http://www.bcdxc.org/ve7cc/default.htm#download
- http://www.dxatlas.com/CwSkimmer
- http://www.dxatlas.com/SkimServer
- http://microtelecom.it/perseus/ (Perseus SDR)
- https://redpitaya.com/ (Red Pitaya)
For more information

- [http://www.dxengineering.com/parts/ins-rf-pro-1b](http://www.dxengineering.com/parts/ins-rf-pro-1b) (RF Pro-1B loop antenna)
- [http://www.dxengineering.com/parts/dxe-arah3-1p](http://www.dxengineering.com/parts/dxe-arah3-1p) (Active Broadband Dipole antenna)
- [http://www.pvrc.org/~n4zr/rbn.pdf](http://www.pvrc.org/~n4zr/rbn.pdf)
- [http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html](http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html)
- [http://reversebeacon.blogspot.com](http://reversebeacon.blogspot.com)
- [http://www.ve7cc.net/](http://www.ve7cc.net/)
- [http://www.qrz.com/db/n6tv](http://www.qrz.com/db/n6tv)
Questions?