

Black Cat NetFinder Documentation
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Black Cat NetFinder imports and analyzes text files consisting of pairs of callsigns from monitored radio communications traffic, helping you construct diagrams showing the participants of each network.

A network is defined as the collection of callsigns which are in communication with each other, either directly (A communicates with B) or indirectly (A communicates with B, B with C, therefore A,B, and C are all in the same network).

Black Cat NetFinder performs the laborious task of sifting through this data, determining which stations are in the same network.

Some assumptions:

A given callsign is only in one network. If you believe your logging data contains the same callsign used in multiple networks you will need to divide it into separate files and process each collection as its own project.

Data files:

Black Cat NetFinder currently imports logging data from several file formats:

- Black Cat ALE
- Black Cat GMDSS CSV Database output
- KiwiSDR ALE logs
- A plain text format for user created loggings

The plain text files must adhere to the following format:

The first line must be only this text: PLAIN TEXT FORMAT

Subsequent lines are data, with one line per logging. Each line contains up to four fields, tab delimited, with the following fields:

From Callsign
To Callsign

Frequency and mode
Timestamp

The first field is the FROM callsign, this field is mandatory.

The second field is the TO callsign, it is optional (i.e. in the case of an ALE sounding).

The third field (also optional) is the frequency in kHz, optionally with a single space character followed by the mode (a single word).

The fourth field (also optional) is a timestamp, of the form YYYY-MM-DD HH:MM:SS

Basics:

Start Black Cat NetFinder, you'll have an empty project.

The first step is to add one or more data files - see the previous section for information on which types of files are accepted. Choose Add Data... from the File menu and select one or more data files.

These files will be read, parsed, and loaded into the project, if there are any errors reading the files, you'll be informed. Then the networks will be built from the callsign data, note that this can take some time, especially with a large amount of data. When finished, you'll see a new window with a summary of what happened.

One or more networks will be created, each one will be given a name such as Network 1, Network 2, etc. You can of course rename your networks, this is done from the list of networks. Select one of the networks, and click on it again until you're able to edit the text.

The data itself is displayed in three lists. The first one displays any data that only contains logs with a "from" (sender) callsign, such as ALE soundings. Frequency and timestamp information is displayed, if present in the data file. As only one callsign is present, this information cannot be automatically used to build networks, but may be of use to you, such as to see which callsigns use which frequencies, etc.

The second list displays any data that only contains logs with a "to" (recipient) callsign. Similar to the above list otherwise.

The third and more useful list contains logs with both a "from" and "to" callsign, and are used to automatically build networks. Frequency and timestamp information is displayed as well, along with the network to which each message was assigned.

A popup menu at the top of the window is populated with each of the created networks. This is used to select which network is drawn, as well as which is used to populate the various lists. You can also use Next Network and Previous Network from the Edit menu, as well as their shortcut keys, to advance through the networks without using the popup menu.

Several other lists are created as well. Besides the aforementioned list of networks, these are:

A list of all callsigns assigned to the current network, along with the number of messages sent to or from each callsign.

A list of all frequencies used in the current network, along with the number of messages on each.

A list of all callsigns in the current network, with the number of messages sent to it.

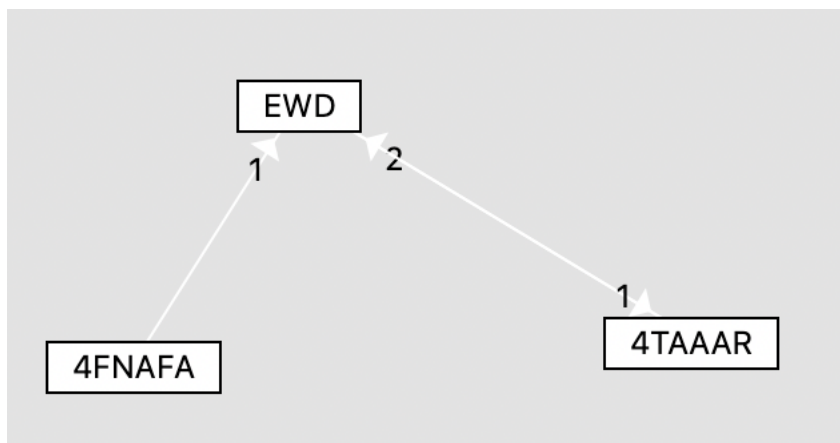
A list of all callsigns in the current network, with the number of messages from it.

A list of all callsigns in the current network, with the number of messages sent to and from it.

A list of all callsigns in the project, with the assigned network.

Selecting a different network from the popup menu will change the current network, re-populating the lists as well as re-drawing it on the network diagram, which you can select using the Diagram tab, and which will be discussed next.

Below is a very simple network:



There are three callsigns in this network, with arrows connecting them, and providing some additional information:

4FNAFA sent one message to EWD.
EWD sent one message to 4TAAAR.
4TAAAR sent two messages to EWD.

You can click on a callsign, and move it around the diagram, the arrow(s) will follow it.

When networks are created, their callsigns are randomly placed on the diagram. Since it can be time consuming and difficult to roughly sort out a bunch of callsigns, there is an Auto Arrange feature. Click the checkbox to turn it on, and then adjust the three sliders and watch the callsigns move around. The model used is similar to the physical model of springs and electrostatic repulsion. The first two sliders set what is equivalent to the spring length and constant, the third the repulsive force. You can adjust them while it is updating, and you can also manually move callsigns around. Uncheck the box when you're satisfied with this rough layout, and want to manually fine tune things. Be careful not to let callsigns escape the borders! If you're not happy with how the arrangement of callsigns is going, select Replot Callsigns from the Edit menu, and the callsigns for that network will be randomly placed again, so you can start over.

Right click on a callsign, and you have several options:

You can anchor it, so that Auto Arranging will not move it. Anchored callsigns automatically be highlighted with a thicker border drawn around them so they can be easily distinguished. You can also set a custom highlight color for a callsign, whether or not it is anchored.

You can hide this callsign so it is not displayed, as well as hide or show neighbors. See the section further down on hiding/showing callsigns.

You can edit the callsign, which will change the text of the callsign in all messages where it appears. This also gives you the option to delete all messages where it appears. Both of these are useful methods of dealing with corrupted callsigns in your data, although keep in mind the larger effects such editing or deletion can have, in altering network participants.

Finally, you can copy the callsign text to the clipboard, for use with other programs, such as pasting into your web browser to conduct an internet search.

Hiding/Showing Callsigns:

It's possible a project could have lots of callsigns in a network. It can become difficult or nearly impossible to clearly see them all, and the program operation can become very slow and sluggish due to the amount of information that needs to be drawn. The solution is to only display part of a network as you work on it.

The easiest way to handle this is to select Hide All Callsigns In A Network from the Edit menu, which will do just what the name suggests. This can be repeated for as many networks as you wish. Then for a network select one callsign from the list of callsigns in the network, right click on it, and select Show Callsign. Now go back to the diagram and this callsign will be displayed. Next right-click on it, and select Show Neighbors, and those neighbors will be un-hidden and drawn. Position them as necessary, and repeat the process.

Forcing two networks to combine:

You may know that two networks are actually the same, and there just is not enough callsign data for the program to figure that out. You can force networks to combine using the "Callsign pairs to merge into a network" list. Right click on this list to add a new entry. Replace the Callsign 1 and Callsign 2 text with a callsign from each network. Then select Update Networks from the Edit menu, and the two networks will be combined into one.

Deleting things:

A message can be deleted by right clicking on it and selecting Delete. It's also possible to edit the To or From callsign of a message. After doing this, you will probably want to select Update Networks from the Edit menu.

Right clicking on a callsign in several of the lists will give you the option to delete it – this means removing all messages or soundings that reference this callsign, as well as removing it from its network. Note that this will rebuild all of the networks.

Other things:

Update Networks in the Edit menu can be used to fix any issues with networks, such as empty networks, and can be useful after editing information.

Auto Center Network will adjust the scroll bars to center the current network as best as possible. Scroll bar values must be positive, so it may not be possible to perfectly center a network, but it will at least make it visible.

Prune Small Networks will let you remove networks with fewer than a specified number of callsigns. It removes these networks, as well as any messages assigned to them.

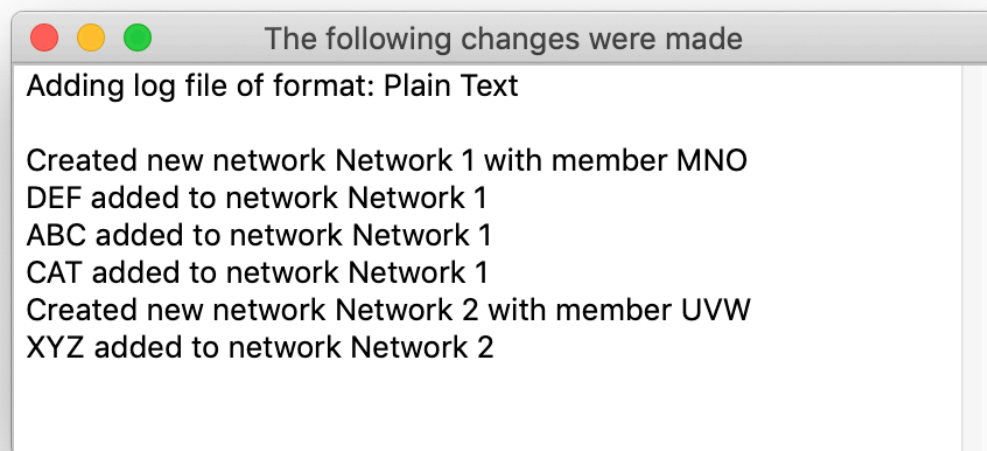
An Example:

An example file is included with the download. Let's go through the process of using it.

Open Black Cat NetFinder, or if it is already open, select new Project from the File menu.

Select Add Data... from the File menu and select the included example file.txt text file. You may also want to open this file in a text editor so you can see the contents, and compare to the earlier description of plain text files.

The file will be processed, and a window will appear showing what was done, you can close this window after reading the contents:



Two networks were created, the first with members MNO, DEF, ABC, and CAT and the second with members UVW and XYZ.

The Data panel will be populated with the logging data:

Frequencies: 7500.0 kHz

Data Lists Diagram							
Frequency	Callsign	Count	Frequency	TimeStamp	To	From	4
7500.0	ABC	2	7500.0	2021-11-27 18:56:05	MNO	DEF	Network 1
7500.0	MNO	1	7500.0	2021-11-27 18:57:06	DEF	ABC	Network 1
			7500.0	2021-11-27 18:58:08	ABC	MNO	Network 1
			7500.0	2021-11-27 18:59:09	UVW	XYZ	Network 2
			7500.0	2021-11-27 19:00:10	XYZ	UVW	Network 2
			7500.0	2021-11-27 19:02:13	CAT	DEF	Network 1
			7500.0	2021-11-27 19:03:15	ABC	DEF	Network 1
			7500.0	2021-11-27 19:04:18	XYZ	UVW	Network 2
			7500.0	2021-11-27 19:05:19	MNO	ABC	Network 1
			7500.0	2021-11-27 19:07:06	DEF	ABC	Network 1
			7500.0	2021-11-27 19:08:05	MNO	DEF	Network 1
			7500.0	2021-11-27 19:09:08	ABC	MNO	Network 1
			7500.0	2021-11-27 19:10:19	MNO	ABC	Network 1

The messages are shown on the right, on the left are what are one way transmissions with just a FROM callsign, such as ALE soundings. Also shown are one way “TO” transmissions, typically with ALE this are corrupted transmissions where part of the message, the FROM portion, was missed. They may however still be useful.

Next switch to the Lists panel which contains details information:

To Callsign	Count	Callsign	To	From	Network	Count	Callsign	To	From
MNO	4	MNO	4	2	Network 1	4	MNO	4	2
DEF	2	DEF	2	4	Network 2	2	DEF	2	4
ABC	3	ABC	3	4			ABC	3	4
UVW	1	UVW	1	2			CAT	1	0
XYZ	2	XYZ	2	1					
CAT	1	CAT	1	0					
Total: 6		Total: 6				4			
From Callsign	Count	Callsign	Network		Frequency	Count			
DEF	4	MNO	Network 1		7500.0	10			
ABC	4	DEF	Network 1						
MNO	2	ABC	Network 1						
XYZ	1	CAT	Network 1						
UVW	2	UVW	Network 2						
		XYZ	Network 2						
Total: 5									

On the left is information about each callsign:

The number of messages to it

The number of messages from it

Another list with both the number of messages to and from each callsign

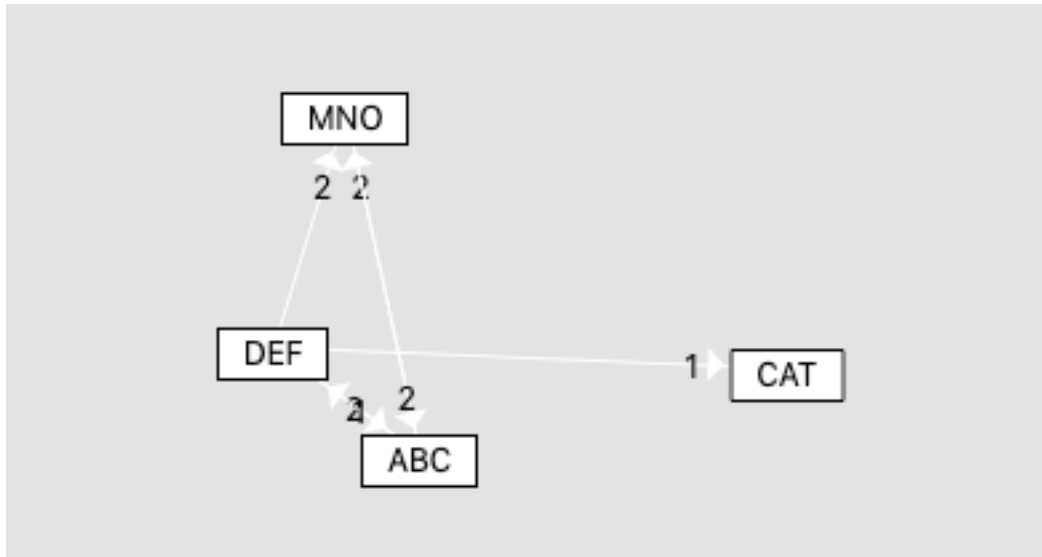
A list of all callsigns in the project, with their assigned network

On the right are three lists, the one on the left is the list of all networks in the project, on the right are two lists, one with data for each callsign in the currently selected network (Network 1) as well as the frequencies in this network.

The popup menu in the upper right corner of the window can be used to change the current network, if we switch to Network 2 we see the following:

Network 2		
Callsign	To	From
UVW	1	2
XYZ	2	1
2		
Frequency	Count	
7500.0	3	

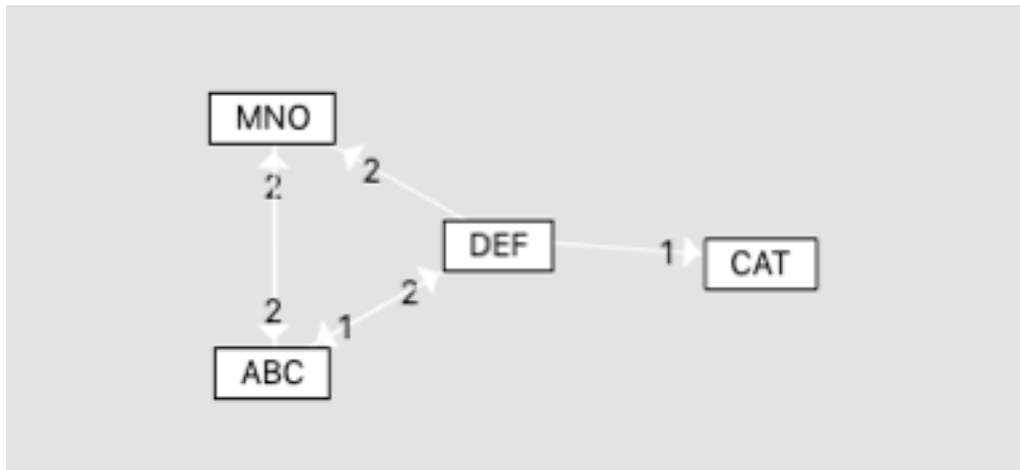
Go back to Network 1 using the popup menu, then select the Diagram panel. It could be blank, because the actual size of the network diagram is larger than the window, and the window is not currently scrolled to display it. While you could scroll around to find it, there is an easier way: select Auto Center Network from the Edit menu. Now you should see something like this, although the relative locations of each callsign / network member will be different than shown below:



We can see the four network members, although they are not optimally placed relative to each other, the initial arrangement is in fact random. You can select each callsign with the mouse and drag it around to better position it, but again, there is an easier way! Tick the Auto Arrange checkbox and the callsigns will begin moving around (see the earlier section of this documentation for details on how this feature is configured). Watch as they reposition themselves, hopefully in a more optimal arrangement.

When you're happy, untick the checkbox. If for some reason the layout does not converge on a practical arrangement, you can click the Replot button and they will again be randomly positioned, and you can start Auto Arrange again.

I ended up with the following layout, after slightly increasing the Spring Length setting to pull them further apart:



The arrows show the flow of messages between stations, with the number of messages also displayed. Hover the cursor over a callsign, and you are told how many neighbors it has, stations it sent messages to or received messages from. Hover over a line connecting two stations and the total number of messages is displayed along with the frequencies used. This information is displayed in the upper left corner of the window.

At this point you may want to save your project, do this by selecting Save Project from the File menu, and give your project a file name.

You can use the popup menu to select the next network, or use Next Network / Previous Network from the Edit menu, or their shortcut keys, to quickly cycle through networks. Again, the network may not be visible, select Auto Center Network from the Edit menu to do this automatically. If you have a lot of networks in a new project, Auto Center All Networks can be used to do this for all of them at the same time.

Again, you may want to save your data, using Save Project, the same file name will be automatically used. Get in the habit of frequently saving just in case something goes wrong.

Editing data:

In addition to directly editing the callsign of an entry under the data tab, you can select multiple rows, and then Edit Sounding Callsign from the contextual (right click) menu to change all of these callsigns at once. This can be done for messages and Lone Tos as well. You can also select and delete multiple rows at a time.

Matrix Tab:

This tab shows a spreadsheet like display of all of the callsigns and frequencies for a network, with the number of messages either to or from each callsign, on a per frequency basis. This can be helpful to see patterns in frequency usage.

Frequencies: 3234.0 USB kHz / 3286.0 USB kHz / 4007.0 USB kHz / 4438.5 USB kHz / 4470.5 USB k

Callsign	3234.0 USB	3286.0 USB	4007.0 USB	4438.5 USB	4470.5 USB	16039.5 USB
FHUCLR						2
M23						6
HEM	2	1			1	1
HCM			2	2		3
HWM						1
M44						1
M12	1	1			1	
CXBEEE			1			
M71				1		

Associated Tab:

One disadvantage of relying solely on two way message traffic is the relative small number of such transmissions, vs one way transmissions, such as ALE soundings. The Associated tab uses all data: messages (either from or two a callsign), FROMs (soundings) and TOs from a user specified set of frequencies.

On the extreme left is a list of all frequencies with traffic of some kind, along with the number of transmissions for each. Double clicking on an entry will place it in the box below this, which is the list of frequencies used for this analysis. You can add up to 100 frequencies to this list.

After adding frequencies, select Update Networks from the Edit menu, and the main spreadsheet display will be populated with all callsigns found on any of these frequencies, as well as the number of transmissions for each.

Callsign	02679.5 USB	04234.0 USB	07315.5 USB	
CF31MD	0	1	1	
ANPOPS	40	26	13	
TV30GA	0	1	2	
LV31GA	5	2	2	
MN30MA	1	0	2	
DV30CO	0	1	3	
BR00LA	0	0	1	
LA2	0	0	1	
LN10LA	0	1	2	
LA20OC	0	0	1	
TV3	0	0	1	
ANP	1	2	0	
LV3	1	0	0	
CF3	0	1	0	

You can remove a frequency from the list of frequencies being analyzed by right clicking on it and selecting Delete.

There could be other associated frequencies use by these callsigns. Select one callsign, and the frequencies used by it will appear in another small list under the main spreadsheet. Double click on a frequency to add it to the list of frequencies being analyzed, or click Add All to add all of them.

You can also click the Add All button located under the lower right corner of the main spreadsheet. This will add all additional frequencies used by each callsign in the spreadsheet.

Obviously, you need to be careful to not inadvertently add frequencies unrelated to your network of interest, although you can later delete them from the frequency list.

A given callsign can be directly added, along with it's frequencies, by entering it into the text box then clicking Add Callsign.

In general, it is an iterative process of starting with one frequency or callsign, and then building up the list of frequencies in use. Remember that Update Networks from the Edit menu must often be used to update the Spreadsheet display after adding frequencies, the updates are not automatic.

Frequencies can be used by more than one network, which means you'll see callsigns that are not really related to each other. One tool to help with this is the popup menu in the lower right corner of the window. It specifies the minimum number of frequencies a callsign must be observed on to appear in the spreadsheet. Even selecting just a value of 2 can help remove many spurious callsigns.

Waterfall Tab:

This displays all received messages, including FROMs and TOs, on a traditional “waterfall” plot, much like an SDR. Time is the Y axis, and frequency the X. Both can be scrolled. Popup menus are also available for each to set the scale.

Hover the mouse cursor over a callsign/message and detailed information about the transmission will be displayed, including the timestamp as well as frequency and mode.

You can right click on a callsign to set a highlight color for all appearances of it on the waterfall. You have possibly two highlighting options, allowing you to select either the FROM or TO callsign in cases where both are present.

You can right click to hide (or then show) messages, Froms (soundings) or Tos.

You can right click to open another window allowing you to specify which callsigns or frequencies should be displayed, to help reduce clutter.

You can right click to select just one callsign to view, or one network of callsigns to view.

You can also select which network of callsigns to view using the network popup menu in the upper right corner of the window. Note that this only has an affect when the waterfall is visible, if it is not visible then changing the popup has no effect.

Note that a given transmission is only displayed in at most one highlight color, so if different colors are selected for each callsign of a message, only one will be used.

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