Detections Analyzer Manual

SOFTWARE MANUAL FOR DMT DETECTIONS ANALYZER (FOR IDAR, MDR, XRDS, BLACK MARLIN, SPEARFISH

BILL HICKMAN

DMT, LLC 45180 BUSINESS CT., SUITE 500, STERLING, VA 20166
Description

The Detection Analyzer\(^1\) program is an analysis tool used to review previously recorded radar data from one or more DMT Radars as well as recorded AIS and/or Blue Force Tracker (BFT) data. This tool provides various filters that allow the user to quickly identify data tracks of interest and to display these tracks on a standard DMT Client display. The filters include selection of specific time intervals and other key parameters of radar tracks, such as finding long duration tracks with an “age” filter, or locating tracks with significant movement using a “minimum path length” filter.

The Detection Analyzer program is a fully self-contained program with all necessary support applications embedded directly in this program. It is intended to run with a minimum of setup actions by the user, which include identifying the type of data to replay (radar, AIS and/or BFT), identifying the directory containing the “standard” data directories, and choosing the date for data replay.

The Detection Analyzer program provides a “static” view of the data being analyzed. That is, the basic analysis technique is to organize all detection data into a main list of distinct tracks, and to generate smaller lists of tracks by applying one or more filters to the main list. This gives the user the ability to quickly isolate and examine tracks that occur during specific time intervals, or meet other selection criteria.

This program serves as a companion tool to the DMT Quick Replay program which provides the user with a “dynamic” view of the selected data files.\(^2\) Together these two analysis programs provide an effective way to review recorded radar/AIS/BFT data files and quickly identify events of interest.

Setup

The Detection Analyzer program looks for data files that are stored in the “standard” format used by the DMT Remote Client program to create these files. The “parent” directory for all stored files is \texttt{C:\DMTLLC}. Under this directory the DMT Remote Client stores track data into daily files (single files for all data from given date) with the following standard filenames;

- (Radar Tracks) \texttt{C:\DMTLLC\detections\Alarms_yymmdd.txt}
- (AIS Tracks) \texttt{C:\DMTLLC\AISStreamFiles\AISStream_yymmdd.txt}
- (BFT Tracks) \texttt{C:\DMTLLC\BlueStreamFiles\BlueStream_yymmdd.txt}

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\(^1\) Refers to the current release version \textit{DetectionAnalyzer v1.2}
\(^2\) Refers to the current release version \textit{DMTQuickReplay v1.2}
where the strings “yymmdd” are the time stamps for the recorded data (e.g., two digit year, month and day of the recording). In addition, the program will look for background map files in the parent directory for use with the Tactical Plot, as described later in the Operations section.

The initial setup selection made by the user is to identify the “parent” directory containing data directories in this standard format. Normally, the selection would be “C:\DMTLLC” if running the Detections Analyzer program on the same machine as the DMT Remote Client that created the files.

For data files not located in this standard location (i.e., copied from another machine into the host machine, or for a mapped network drive containing the files), the user will simply select the directory within which the standard data directories are located.

Figure 1 shows the appearance of the Detections Analyzer user dialog at program startup.

![Figure 1 Parent Directory selection dialog.](image)

This form shows the currently selected parent directory in the textbox, and also shows availability of various data with colored labels Radar, AIS, and BFT. The color of the label will indicate whether or not data are available with this parent directory choice. In Figure 1 all data labels are green, which means that the selection (C:\DMTLLC) contains the expected directories for all three data types. If any of the standard data directories are not present in the parent directory, the corresponding label would appear in red.

Note that a Reset File button also appears at the top of this and all other user dialogs. Clicking on this button will clear all selections made so far, and will return the Detections Analyzer program to the initial setup state of Figure 1.

At this point, the required user action is to “select” the parent directory by mouse clicking on the Select button. Note that this button will only be available (visible) if at least one data type is available (at least one green label). If no data are available with the current parent directory selection, the user must select a different directory containing usable data before the program will proceed.
To change the parent directory selection, make a single mouse click on the textbox. This action will bring up a standard Folder Browser dialog as shown in Figure 2. Here the user can select a different directory on the host machine, a directory in an inserted thumb drive, or a mapped network directory with this dialog. The only requirement is that the selected directory contain one or more of the “standard” data directories.

![Figure 2  Folder Browser user dialog](image)

Once the desired parent directory is selected and the Select button is visible, the user proceeds by mouse clicking the Select button shown in Figure 1 and selects the date for the data replay. Figure 3 shows the next user dialog to appear.

![Figure 3  Initial Date selection dialog](image)
The date selection dialog initially appears with the current date selected in the textbox. Also shown are three columns (Radar, AIS, BFT) which indicate the time interval in which data are available for the selected parent directory and date. Note that in Figure 3 all data columns show a “----” entry, which means no data are available for these selections. At this point the user must select a different date where data files have been recorded. To change the replay date, the user must mouse click on the date textbox, which brings up the Calendar Selection dialog as shown in Figure 4.

![Figure 4 Calendar Selection dialog](image)

The user must now select the desired replay date by scrolling to the appropriate month, click/selecting the day, and mouse clicking on the Select button on the dialog. Here the date 10/6/2015 was selected. Figure 5 now shows the appearance of the date selection dialog with this choice.

![Figure 5](image)

Standard radar data and BFT data exist for this date selection, and the available time intervals for these data types are updated. Note also that the Select button is now visible and
available for a select action. By clicking on the Select button, the program identifies the files to be processed and updates the user dialog as shown in Figure 6.

![Figure 6 Selected data files for replay](image)

This dialog now shows the actual files to be processed, allowing the user to review these selections and to proceed by mouse clicking on the Open/Read Files button, which ends the setup actions and initiates the replay state as described in the next section.

**Operation**

**Overview**

When the replay state is activated, the Detection Analyzer program displays two new forms to the user as shown in Figure 7. These forms include a Tactical Plot and a Replay Controls form. The Tactical Plot is an embedded DMT RemClient program which provides a plotting window to display some or all of the tracks retrieved from the data files. The Replay Controls provide the controls for selecting and displaying tracks on the Tactical Plot.

At this point, the Detection Analyzer program has loaded all selected data files into internal lists that are organized by individual tracks. These track lists may then be displayed in list boxes that appear at the bottom of the Replay Controls form. Note that separate list boxes will be shown for each of the three possible data types: Radar Tracks, BFT Tracks, and AIS Tracks. The appropriate list box will be displayed if data of that type are selected for the replay session.

For the setup example shown thus far, the only data types selected are radar and BFT data files, and only the list boxes for these types are visible. Had the setup included an AIS data file, then a third list box AIS Tracks would be shown. The appearance and functioning of the AIS Tracks list box will be identical to that of the BFT Tracks list box described later.

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3 The AIS list box function is not implemented with this version 1.2. It will be added with Detection Analyzer v1.3.
As mentioned earlier, the basic function of the replay controls is to operate on the internal lists of radar, BFT, and AIS tracks (representing all data from the files) to create smaller lists of tracks meeting various filtering criteria. This general procedure allows the user to quickly isolate tracks of interest and display them visually on the Tactical Plot.

![Image of Tactical Plot and Replay Controls]

**Figure 7  Tactical Plot and Replay Controls at start of replay.**

**Tactical Plot Description**

The Tactical Plot is an embedded DMT RemClient program which is launched when the replay state is activated. It is configured automatically with the background map that was in use by the original DMT RemClient program that created the radar data file. Note that the filename for this map is listed in the header of the radar data file (`Alarms_yymmdd.txt`), and is the base filename (`mapname`) used to specify the required image (`mapname.jpg`) and calibration (`mapname.cal`) files. These map files are looked for in the “parent” directory, selected by the user during setup, within a “\maps\” subdirectory. The **Detections Analyzer** program will attempt to locate and load the map files at the following paths:
If the map files are not found under the parent directory, then the program will check for these files at the “default” location for map files on the host machine running the Detections Analyzer program. This attempt would look for the map files at

C:\DMTLLC\maps\mapname.jpg  
C:\DMTLLC\maps\mapname.cal

Once the map files are located, they will be used to complete the setup/configuration of the Tactical Plot. If these files are not found/loaded, then the replay will fail to setup properly.

For this reason, it is important that the user ensure the desired map files are positioned in a location where the Detections Analyzer program can access them. This requirement is met automatically (i.e., no further user actions needed) when the replay is setup as follows:

- Run the replay on the same computer that was used to create the radar data file and select the parent directory as C:\DMTLLC
- Map a network drive to the C:\DMTLLC directory on the computer that created the radar data, and select that mapped drive directory as the parent directory
- Copy the C:\DMTLLC directory from the computer that created the radar data file onto a portable drive, connect that drive to the machine running the replay, and select the ..\DMTLLC directory on the connected drive as the parent directory.

If the required map files cannot be located during the setup, the user will be provided with a pop-up dialog form to select the required image file on the local computer. This would be the case when files are not at the expected locations or when a radar data file is not included with the replay and the map file name is not specified.

Alternatively, the user can always avoid any problems with locating the mapname.jpg and mapname.cal files by copying them in advance into the C:\DMTLLC\maps directory on the computer running the replay.

**Replay Controls Description**

A brief description of the various controls on the Replay Controls form follows:

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4 This file can be any type of image file recognized by a Windows operating system - not limited to jpeg files only.
5 This file is a text file with map calibration data. It must be exist and be accessible for a successful image file load.
6 The DMT RemClient program uses the directory C:\DMTLLC\maps\ as the default location for all map files.
Tracks Summary Box:
At the top of the form is a summary box showing the total number of distinct tracks and the inclusive time intervals for each track type with available data for replay.

Track Selection Filters:
This box contains filter controls that are applied the full internal track lists to generate sub lists. These filters operate as follows:

1) Time Interval. These controls will set the time interval filter for selecting a tracks sub list. Initially, the Start and Stop values are set to the widest interval that includes all radar, BFT, and AIS track intervals. The start or stop time can be manually changed by clicking on the adjacent Chg button (changes to Set), entering the desired time value, and clicking on the Set button. The time interval may also be changed using the three preset time buttons which operate as follows:
   - (Full) Resets the full time interval that includes all track times
   - (Early) Sets Start to the earliest full track interval time, sets Stop to 6:00am
   - (Late) Sets Start to 6:00pm, sets Stop to the latest full track interval time

The time interval filter operates on tracks as follows:
   - (Radar) Selects tracks with at least one update occurring within the time interval for the sub list shown in the Radar Tracks list box
   - (BFT/AIS) Selects only the track updates within the selected time interval for display on the Tactical Plot

2) Radar Tracks. These filters apply only to radar tracks. In addition to the Time Interval filter, these filters allow the user to further refine the selection of radar tracks into a sub list using the following filters:
   - (Minimum Age) Selects tracks with age >= Minimum age (isolates well developed, persistent tracks from spurious tracks)
   - (Zone 1 Entries) Selects tracks with at least one update position in Zone 1
   - (Min Path(m)) Selects tracks with distance in meters between first and last update positions > Min Path. (isolates tracks that are moving)
   - (Max Spd(MPH)) Selects tracks that are generally moving with speed(MPH) less than the Max Spd. (eliminates fast moving tracks from the sub list)
   - (Select Trk No) This control is only active when a selection of radar tracks has been made. Allows the user to enter a specific track number for selection. (Same action as user clicking on a radar track in the Radar Tracks list)
3) **BFT Tracks.** These controls determine how much of the BFT track trail is displayed on the *Tactical Plot* when a BFT track is selected in the list box. “Full Trail” causes the entire track history trail to be displayed while “Selected Interval” causes only that portion of the track trail within the time interval filter to be displayed.

4) **AIS Tracks.** (Same as for BFT Tracks).

**Radar Tracks List box:**

Displays the sub list of radar tracks generated when the “Select Radar Trks” button is clicked. The “Total Selected” label at the top shows the count of different tracks being displayed in the list box. The “Select Track” label shows the track ID for a selected track in the list. (Selected track means that an entry in the list has been clicked and highlighted).

Note that for radar tracks, the track ID is normally displayed in the format RR-NNNN, where RR is the reporting radar number and NNNN is the track number. For example, track number 8 from radar 1 would have the track ID 01-0008. It is possible (and likely) that duplicate sets of track numbers may be present in the data set, due to wrap-around of the 4-digit track numbers, or due to a radar stopping and restarting at some point in the day (which causes its track numbering to reset).

The *Detections Analyzer* program will recognize and separate different groups of radar tracks having the same track ID numbers. When this situation is the case for a selected track, that track will be identified in the “Select Track” label with the general notation “01-0008 (1 of 2)” meaning that this track is in the first group of two identical track ID groups. But tracks with identical trackIDs located in different groups are always treated as different tracks for display purposes.

**BFT/AIS Tracks List boxes:**

These list boxes always show the complete list of BFT and AIS tracks that are contained in the respective data files. These lists are not affected by the filter/sorting actions performed on the radar tracks.

**Replay Operation**

The basic function performed for a “data replay” is to generate a list of tracks in one or more track list boxes, and then to view the track positions (trail) on the *Tactical Plot* for selected tracks of interest. The procedure for radar tracks is different from that for BFT and AIS tracks; both are described separately below.
Radar Tracks Replay:

The radar replay starts with the controls in reset state as shown in Figure 7. Here the Radar Tracks list box is empty and the selection button caption reads “Select Radar Trks”. The user proceeds with a replay by selecting a time interval and one or more filters in the Radar Tracks filters box and clicking on the “Select Radar Trks” button. This action causes the filters to be applied to the main internal list of radar tracks, and a sub list of tracks matching the filter criteria to be generated and displayed in the Radar Tracks list box.

Figure 8 shows a sample selection operation where the full time interval is used, and the following filters are selected: Minimum age = 6 and Minimum Path = 100m. Note the change in appearance of the controls when a replay is active:

- The Selection button caption changes to “Reset Tracks List”
- The Time Interval and Radar Tracks group boxes are disabled
- A new button becomes visible “All Radar Trks
- The Radar Tracks list box is loaded with the filtered list of radar tracks

This filter set has returned a total of 144 matching tracks which are listed with one track per entry line in the list box. The data provided with each track entry include (1) track ID, (2) track age, (3) start and stop times for the track, (4) Zone 1 entry field, (5) the path length in meters from initial to last track update position, and (6) average track speed over all updates.

Also shown is the appearance of controls after selecting an entry on the Radar Tracks list box with a mouse click. Here, track 01-0424 was selected from the list, which caused the last track position plus all updates to be plotted on the Tactical Plot with the standard track symbols. Clicking on the same (highlighted) entry will clear the plot.

Additional tracks may be plotted simultaneously by click selecting the desired tracks without clicking on a highlighted track (i.e., clicking sequentially on each desired track for display). The action of clicking a highlighted entry will cause all plotted tracks to be cleared.

Also available is the “All Radar Trks” button which will cause all entries in the Radar Tracks list box to be plotted and the button caption to change to “Reset All”. Clicking again on the “Reset All” button will clear the plot.

To return the controls to the reset state, mouse click on the “Reset Radar List” button which will clear the Radar Tracks list box and restore the controls to the ready state for selecting the next replay tracks list.
**BFT/AIS Tracks Replay:**

The *BFT* and *AIS Tracks* list boxes always display the full list of tracks reported in the respective data files. The BFT list box organizes track reports by the Unit ID of the reporting unit, and shows the total number of position updates along with the start and stop times for reports. The AIS list box shows similar information using the ship’s MMSI for the ID.

![Figure 8 Example radar tracks list creation and track display](image)

Similar to the Radar Tracks replay, BFT or AIS tracks may be plotted on the *Tactical Plot* by clicking on the desired line entry, which causes the entry to become highlighted and the track to appear on the plot. Clicking on a different entry will display that track along with the current track on the plot. Clicking at any time on a highlighted entry will clear all BFT tracks or all AIS tracks depending on which list box is used.

The main difference between the radar tracks and the BFT/AIS tracks display is that the full track trail is always displayed for radar tracks while the BFT/AIS track plots can be either the full trail or a segment of the full trail. This feature is selected with the controls located in the
BFT Tracks and the AIS Tracks filter boxes. Here the choices are “Selected Interval” or “Full Trail”. If the interval choice is checked, then only the track updates within the current time interval selection will be displayed on the plot. Otherwise, the full trail is shown.

Figure 9 illustrates a “Selected Interval” plot for the BFT track 2. The plot shows the trail segment for this track during the time interval 15:52:21 – 15:55:25. The standard track symbol for BFT tracks is shown in this example, where the track position for the latest time is shown with the circle icon with inscribed letter “B”, and the previous updates in the trail shown with crosses.

Figure 10 shows how the BFT track 2 plot would appear with the “Full Trail” option selected. Here all reported position updates for this track are plotted, with the track symbol located at the last position.
Figure 10  BFT Track plot for Full Trail