
User Manual

Sky Analyzer for ASTERIX

SinoATC Ltd.

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1 Introduction

1.1 Overview

Sky Analyzer for ASTERIX is a powerful tool to open, decode, analyze and inspect surveillance data in Eurocontrol All Purpose **ST**ructured Eurocontrol **Su**rveillance **I**nformation **EX**change (ASTERIX) format.

The screenshot displays the Sky Analyzer for ASTERIX software interface. The window title is "indexrei - Sky Analyzer for ASTERIX". The interface includes a menu bar (File, View, Analyze, Tool, Help) and a toolbar with various icons for file operations, analysis, and viewing. The main area is divided into three panes:

- Left Pane:** A list of data items with columns for Timestamp and Size. The selected item is "2016-01-01 01:00:00.000 1273".
- Middle Pane:** A tree view showing the structure of the data record. It includes "Data Block 1", "Data Record 1", and "Data Record 2".
- Right Pane:** Displays the raw data in hexadecimal and a list of data items. The "Data Record - I062" section shows raw data in hexadecimal. The "List of DataItems" section shows a table with columns for DataItem, Name, Size, and Summary.

DataItem	Name	Size	Summary
I062/010	Data Source Identifier	02	SAC:001 SIC:001
I062/015	Service Identification	01	SVC_ID:000
I062/070	Time of Track Information	03	TOD:00:36:09.000
I062/105	Calculated Position in WGS84 Coordinates	08	WGS84:361637N1285728E
I062/100	Calculated Track Position (Cartesian)	06	X:224468.0 Y:-130855.0 LSB:M
I062/185	Calculated Track Velocity (Cartesian)	04	VX:-153.50 VY:103.25 LSB:M/S
I062/060	Track Mode 3/A Code	02	MODE_3/A:3257
I062/380	Aircraft Derived Data	16	SUBFIELDS:03/28
I062/040	Track Number	02	TRACK_NUM:0195
I062/080	Track Status	04	TRACK_STS:MULTI

Figure 1.1: Sky Analyzer for ASTERIX

Sky Analyzer for ASTERIX allows you not only *read* ASTERIX data, but also make further analyzer on it.

It can also work with other tools, and give you a full capability from data recording, inspection, ana-

lyzing to modification, generation and simulation.

1.2 Features

1.2.1 Categories

The ASTERIX format defines different category for different type of surveillance.

Sky Analyzer for ASTERIX supports all commonly used ASTERIX categories, and different versions of some category. It will continue expand its capability to support more categories in future.

The supported categories and versions are:

Category	Title	Version
CAT001	Monoradar Target Reports	1.0
CAT002	Monoradar Service Messages	1.0
CAT004	Safety Net Messages	1.1
CAT008	Transmission of Monoradar Derived Weather Information	1.0
CAT010	Transmission of Monosensor Surface Movement Data	1.1
CAT015	Independent Non-Cooperative Surveillance System Target Reports	1.1
CAT016	Independent Non-Cooperative Surveillance System Configuration Reports	1.0
CAT019	Multilateration System Status Messages	1.2
CAT020	MLT Messages	1.7, 1.8
CAT021	ADS-B Messages	0.23, 0.26, 2.1
CAT023	CNS/ATM Ground Station and Service Status Reports	1.2
CAT034	Transmission of Monoradar Service Messages	1.27
CAT048	Transmission of Monoradar Target Reports	1.15
CAT062	SDPS Track Messages	1.7

Note: Most categories are backward compatible, which means if the version of your data is lower or equal to the version listed in the table above, it can be correctly decoded.

CAT021 is one exception of this backward compatibility.

1.2.2 User Application Profile

The ASTERIX standard defines all possible data items, but the existence and order of these data items are defined by User Application Profile (UAP).

Sky Analyzer for ASTERIX supports all standard UAP, and some widely used property UAPs defined by major ATC system vendors.

The supported UAPs are:

- Standard UAP
- Proprietary UAP of Raytheon radar
- Proprietary UAP of Thales ADS-B

Further more, Sky Analyzer for ASTERIX is able to analyze the data and automatically select a proper UAP to decode it. Normally user don't need to worry about UAP selection.

1.2.3 File Formats

Sky Analyzer for ASTERIX supports a various of different file formats, including both open and property format. It can read and analyze data from all supported file format, there is also one *File Convertor* tool to make conversion between these formats.

The supported file formats are:

- XML Recording File (.rex)
- Compressed XML Recording File (.rez, .rex.xz)
- Binary Recording File Version 2 (.reb)
- Recording Index File (.rei)
- tcpdump/Wireshark Capture File (.pcap)
- Raw ASTERIX Data Stream (.ast .bin)
- Indra ATM System Recording File
- Thales ATM System Recording File
- SiATM ATM System Log File
- AirNet ATM System Log File
- Indra Radar Recording File

Note: Some formats listed above may not appear in your application, it depends on your license type.

Note: Some more proprietary formats are not listed here and supported only in customized/OEM version. Please contact us if you are interested in supporting proprietary file format.

1.2.4 Comm-B Data Selector

Sky Analyzer for ASTERIX is capable to decode Comm-B Data Selector (BDS) data embedded in some data items. It is useful as some important data (e.g. FMS selected altitude) is not defined by ASTERIX and the only way to retrieve it is from BDS.

The supported BDS are:

- BDS 1,0 - Data Link Capability Report
- BDS 2,0 - Aircraft Identification
- BDS 3,0 - TCAS/ACAS Active Resolution Advisory
- BDS 4,0 - Selected Vertical Intention
- BDS 5,0 - Track and Turn Report
- BDS 6,0 - Heading and Speed Report

1.2.5 Data Inspection

Sky Analyzer for ASTERIX has friendly HMI and allows you read, decode and inspect data.

It supports different types of data sources, including

- Recording file
- LAN
- Synchronous serial line

And it supports different types of data frame, including

- Raw data without frame
- HDLC
- UDP
- Proprietary frame type

And there are two views to visually display data

- Message view, to display data frame/block/record/item in a tree structure

- Target list view, to display data record in a table structure

Also there is a powerful scriptable function allows you find and show only data you are interested.

1.2.6 Data Analyze

Apart from *viewing* the data, Sky Analyzer for ASTERIX has a set of tools to make further analyze on surveillance data.

- Radar north marker & sector missing Analyze tool, allows you to analyze the continuity of radar rotation reports;
- Radar coverage analyze tool, allows you to generate radar coverage map by using real history data;
- ADS-B receiver coverage analyze tool, allows you to generate ADS-B receiver coverage map for a single ground station by using real history data;
- ADS-B network coverage analyze tool, allows you to generate ADS-B coverage map for a ADS-B ground station network by using real history data;
- Message transmission delay analyze tool, allows you to detect transmission delay problem.

1.2.7 Data Export

Data and analyze result can be exported into different formats, including

- C/C++ struct
- Microsoft Excel CSV
- Google Earth KML
- HTML
- Adobe PDF

1.2.8 Support Tools

There is also a set of tools to expand the capability of Sky Analyzer for ASTERIX, including

- File Convertor, to make conversion between different data file formats;
- Sky Recorder, a generic purpose tool to record and replay data;
- Sky Playback, a multi channel data playback tool, specially designed to reply ASTERIX data;
- Sky Simulator, an ASTERIX data simulation tool;
- Sky Converter, a radar front-end processor tool to filter, modify and convert live radar data;
- Sky Display, an ATC surveillance data display terminal.

Note: Some of above tools are not free and need to be purchased separately.

1.3 Document Structure

This manual is divided into several chapters.

Part 1. Data Inspection

- Introduction
- Getting Started
- User Interface
- Filter

Part 2. Data Manipulation

- File Converter
- Export to Google Earth KML

Part 3. Data Analyze

- Radar Coverage Analyze
- Radar North Marker & Sector Missing Analyze
- Message Transmission Delay Analyze

Part 4. Appendix

- Changelog

1.4 Copyrights

Sky Analyzer for ASTERIX is a product of SinoATC Ltd., please contact info@sinoatc.com for more information.

2 Getting Started

2.1 User Interface

Sky Analyzer for ASTERIX has a modern and easy to use user interface. The main window composes of menu bar, tool bars, status bar and main view.

All functions can be accessed through main menu, and major functions can be accessed through tool bar.

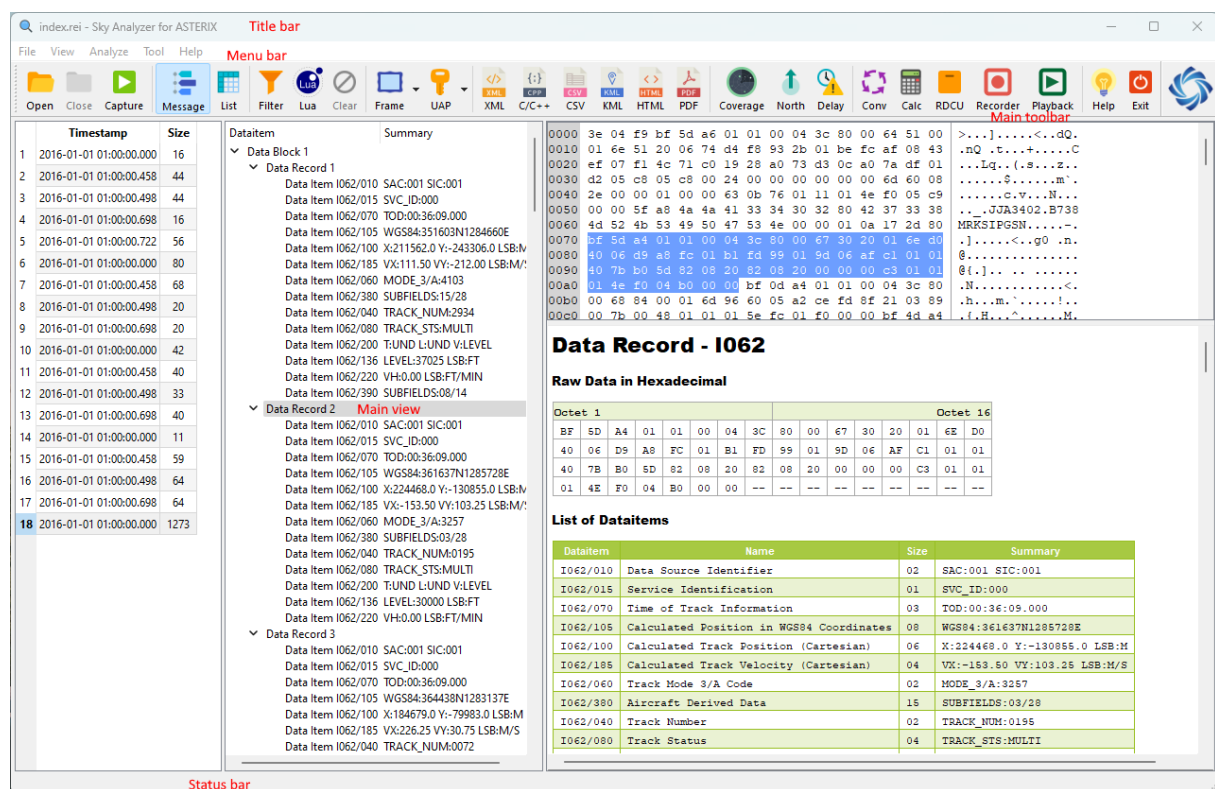


Figure 2.1: Main Window

Detailed information of user interface can be accessed at chapter “User Interface”.

2.2 ASTERIX Step by Step

A typical way of using Sky Analyzer for ASTERIX is to open and analyze data in recorded file. Below is an example to show how to do it step by step.

2.2.1 STEP 1. Prepare file with ASTERIX data

Sky Analyzer for ASTERIX supports different file formats.

You can use the *Sky Recorder* tool to record and generate recording files.

You can also use common tools like *Wireshark* or *tcpdump* to generate recording files.

Here, assuming we already have a data file named “radar.rex”.

2.2.2 STEP 2. Open and load file

Launch the Sky Analyzer for ASTERIX application, select *File -> Open File...*, a standard *Open File Dialog* will appear.

Browse and select our data file “radar.rex”.

In the left panel in main window, many data packets contained in the data file will be shown. A sequence number, time stamp, and size of data packet will be displayed.

In the title bar, the file name will be displayed.

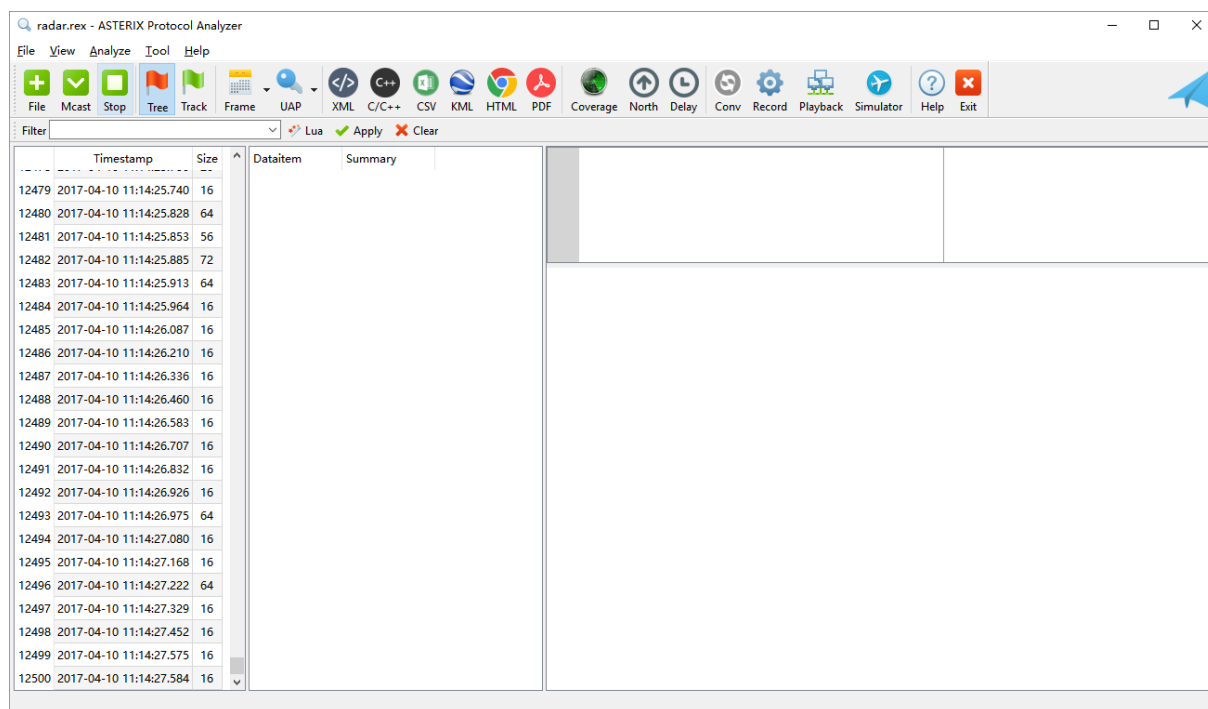


Figure 2.2: File Loaded

If you don't need to load all packets contained in the data file, you can select *File -> Stop Processing* to stop the file loading process at any time.

2.2.3 STEP 3. Decode data

If the data packet contained in data file use default frame type (no frame) and default UAP (ASTERIX standard UAP), you can simply select one data packet, and the data block/record/item will be shown in the middle panel. Also the radar data of this packet will be shown in hex format in the top-right panel.

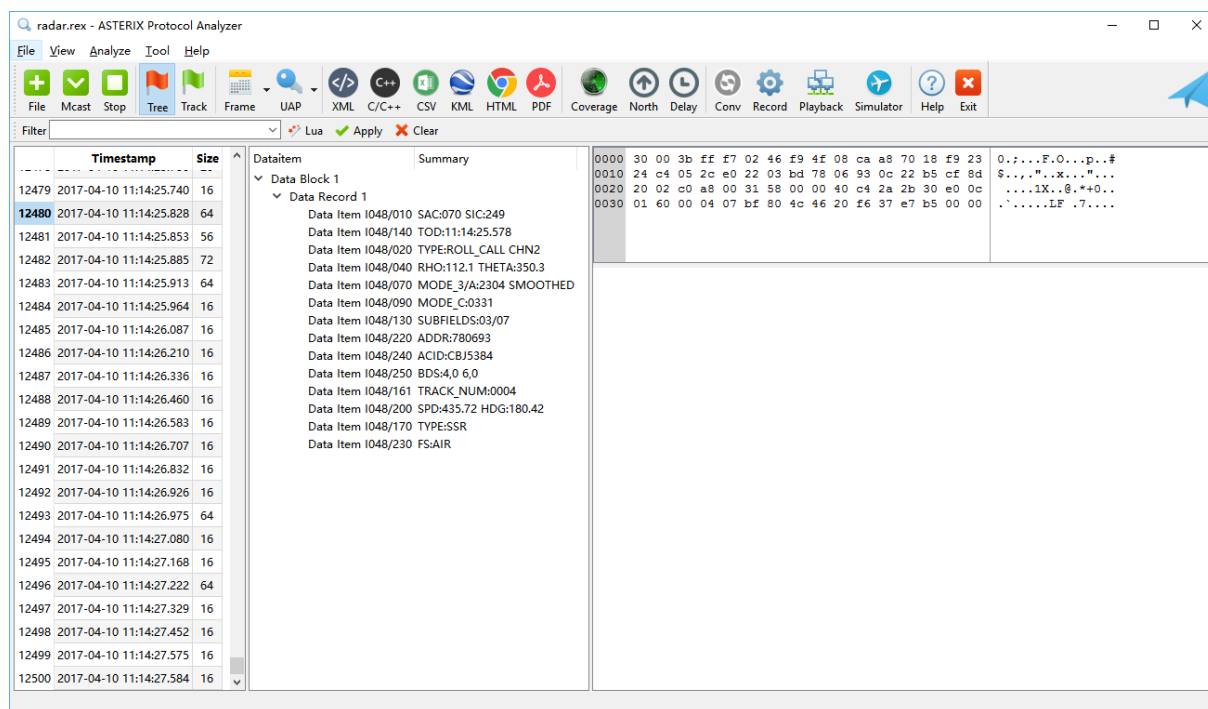


Figure 2.3: Select Data Packet

If you select any data record or data item in middle panel, the detail of this data record/item will shown in the bottom-right panel.

Also please note the data of selected data record/item will be highlighted.

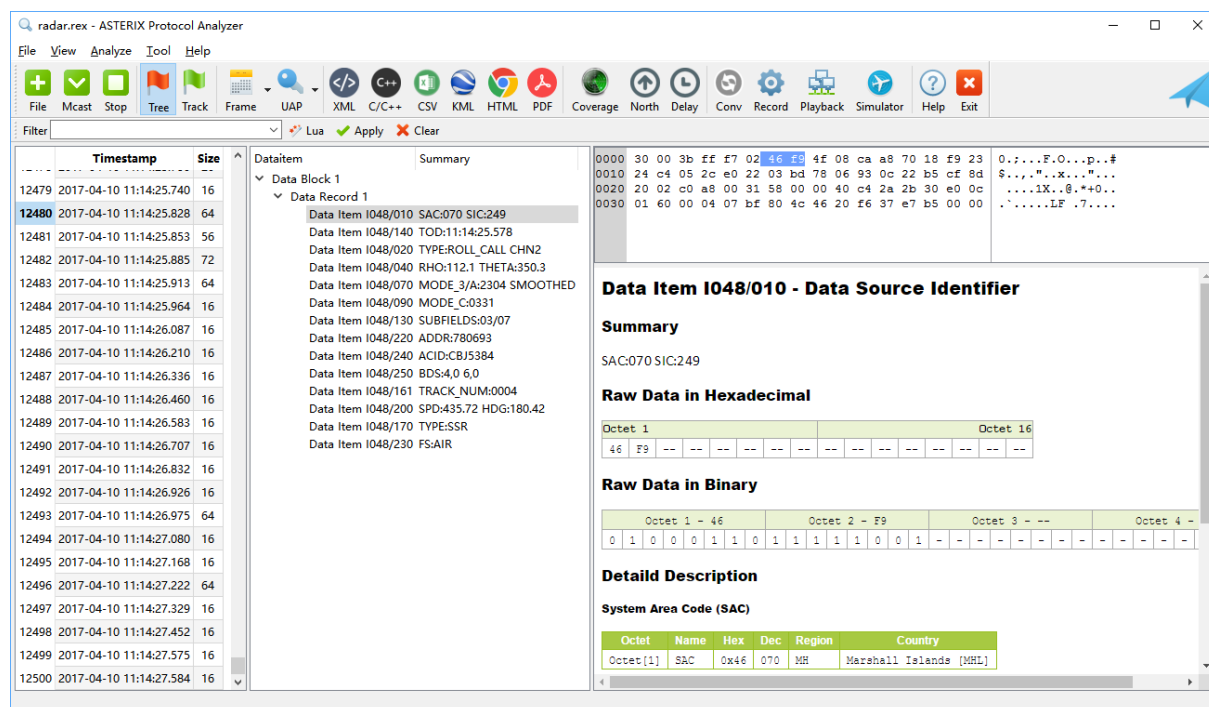


Figure 2.4: Select Data Item

On the other hand, if data packet is not in default frame type and UAP, it can not be correctly decoded before you select correct one.

You can select *View -> Frame* to select frame type, and select *View -> UAP* to select UAP.

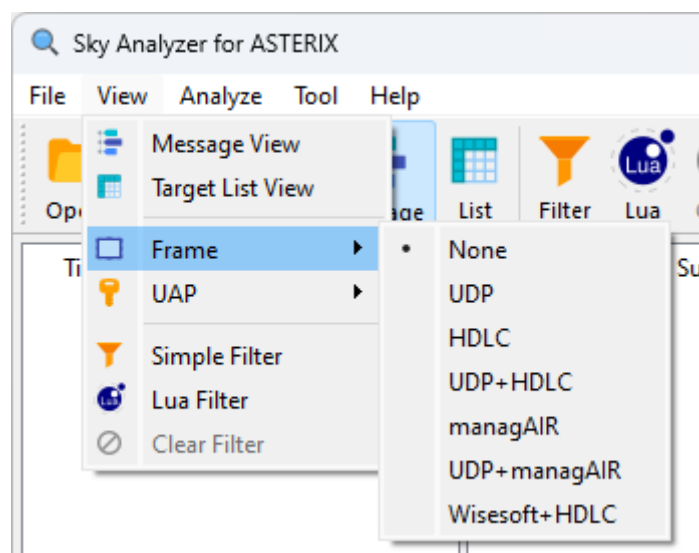


Figure 2.5: Select Frame Type

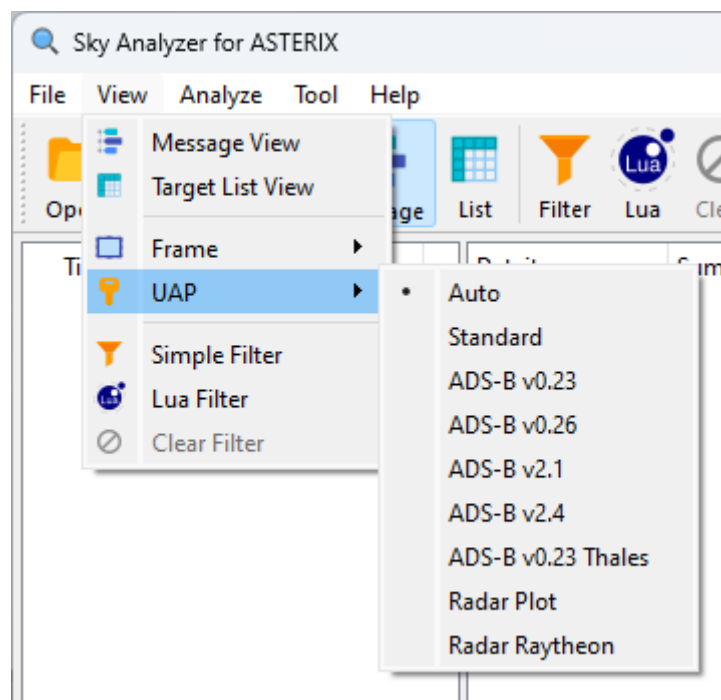


Figure 2.6: Select UAP

For UAP, if *Auto UAP* is selected, Sky Analyzer for ASTERIX will try to guess what is the correct UAP and try to decode data with it, but sometimes it may fail and select a wrong UAP, in this case you should manually select a proper UAP and force the system to decode data with selected UAP.

2.2.4 STEP 4. Inspect data

Once data is correctly decoded, you can use tree view and list view to inspect the detail of ASTERIX data.

2.2.5 STEP 5. Find data with filter

Normally, you will receive a plenty of data packets from a sensor even in a short time.

And a typical task to analyze ASTERIX is to find flights match some specific conditions. For example, flights with hijack alert. You can do this in an easy way by using the *Filter* function.

Here we try to trace flight “CSC8753”. Click *Filter* button in main toolbar, input “CSC8753” in callsign field, and press *Apply*, packets contain flight “CSC8753” will be shown in the UI.

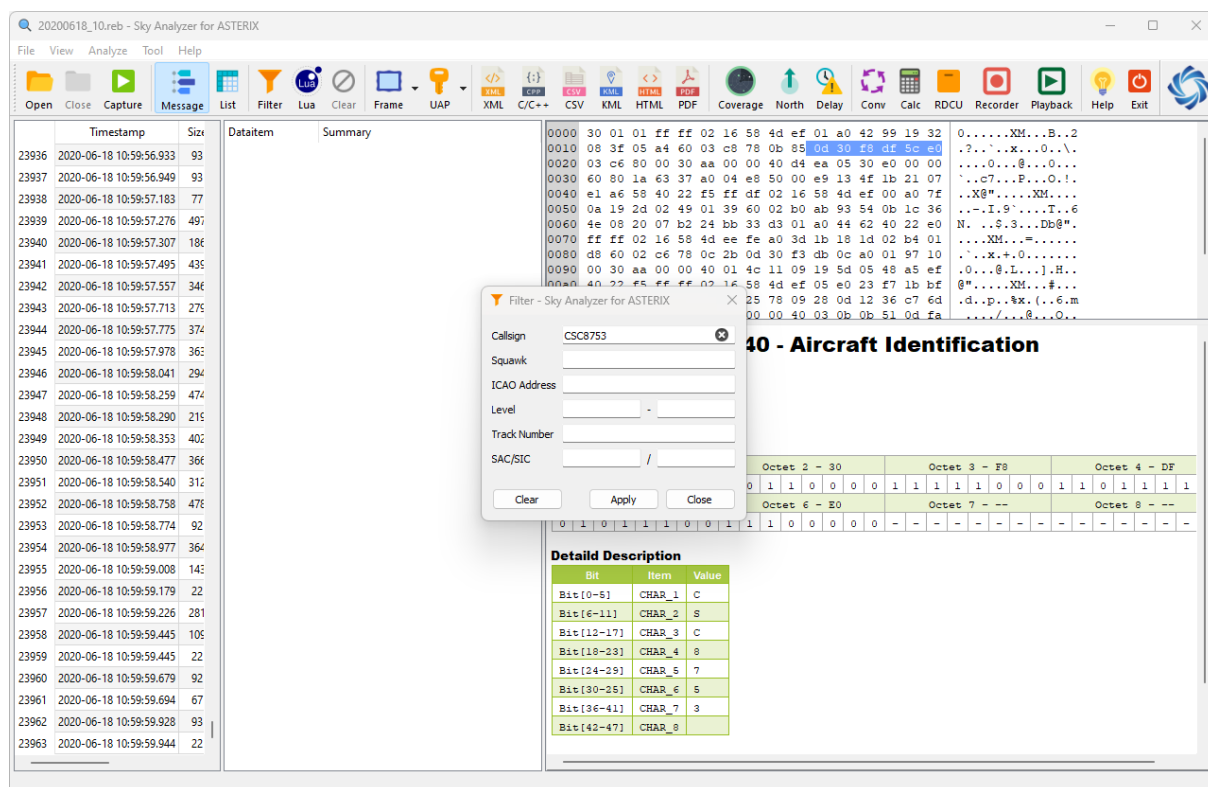


Figure 2.7: Filter Window

The screenshot displays the Sky Analyzer for ASTERIX software interface. The main window is titled "20200618_10.reb - Sky Analyzer for ASTERIX". The interface is divided into several panes:

- Left Pane:** A list of data items with columns for "Timestamp", "Size", and "Dataitem". The list shows various data items including "Data Block 1", "Data Record 1", and "Data Record 2".
- Center Pane:** A tree view showing the structure of the data items. It includes "Data Block 1", "Data Record 1", and "Data Record 2". Under "Data Record 1", there are several data items such as "Data Item I048/010 SAC:022 SIC:088", "Data Item I048/140 TOD:10:46:34.742", "Data Item I048/020 TYPE:ROLL_CALL CHN1", "Data Item I048/040 RHO:199.9 THETA:46.9", "Data Item I048/070 MODE_3/A:4077", "Data Item I048/090 MODE_C:0341", "Data Item I048/130 SUBFIELDS:02/07", "Data Item I048/220 ADDR:780B85", "Data Item I048/240 ACID:CSC8753", "Data Item I048/250 BDS:1.0", "Data Item I048/161 TRACK_NUM:0233", "Data Item I048/042 X:270420.9 Y:252913.8 LSB:M", "Data Item I048/200 SPD:443.63 HDG:236.99", "Data Item I048/170 TYPE:SSR", and "Data Item I048/230 FS:AIR".
- Right Pane:** A detailed view of the selected data item, "Data Item I048/240 - Aircraft Identification". It shows the "Summary" (ACID:CSC8753) and "Raw Data in Binary". Below this, there is a "Detail Description" table.

Data Item I048/240 - Aircraft Identification

Summary

ACID:CSC8753

Raw Data in Binary

Octet 1 - 0D	Octet 2 - 30	Octet 3 - F8	Octet 4 - DF
0 0 0 0 1 1 0 0	0 1 1 0 0 0 0 0	1 1 1 1 0 0 0 1	1 0 1 1 1 1 1 1

Detail Description

Bit	Item	Value
Bit[0-5]	CHAR_1	C
Bit[6-11]	CHAR_2	S
Bit[12-17]	CHAR_3	C
Bit[18-23]	CHAR_4	8
Bit[24-29]	CHAR_5	7
Bit[30-35]	CHAR_6	5
Bit[36-41]	CHAR_7	3
Bit[42-47]	CHAR_8	

Figure 2.8: Tree View

	Country	SAC/SIC	Time Stamp	Type	Track Number	Mode 3/A	Flight Level	Selected Altitude	Callsign	ICAO Address	WGS84 Coordinates	Polar Coordinates	Range	Azimuth	Speed
1	CHN	022/088	10:46:34.742	Track	233	4077	34100		CSC8753	780B85		R:199.9219 T:046.87			
2	CHN	022/088	10:46:38.726	Track	233	4077	34100		CSC8753	780B85		R:199.4414 T:046.98			
3	CHN	022/088	10:46:46.718	Track	233	4077S	34100	34096	CSC8753	780B85		R:198.4805 T:046.99			
4	CHN	022/088	10:46:50.718	Track	233	4077S	34100	34096	CSC8753	780B85		R:197.9922 T:046.95			
5	CHN	022/088	10:46:54.726	Track	233	4077	34100	34096	CSC8753	780B85		R:197.5078 T:046.88			M:231
6	CHN	022/088	10:46:58.718	Track	233	4077	34100	34096	CSC8753	780B85		R:197.0195 T:046.93			T:304
7	CHN	022/088	10:47:02.726	Track	233	4077	34100	34096	CSC8753	780B85		R:196.5391 T:046.75			M:231
8	CHN	022/088	10:47:06.710	Track	233	4077S	34100	34096	CSC8753	780B85		R:196.0547 T:046.92			
9	CHN	022/088	10:47:10.718	Track	233	4077	34100	34096	CSC8753	780B85		R:195.5703 T:046.86			M:231
10	CHN	022/088	10:47:18.703	Track	233	4077	34100	34096	CSC8753	780B85		R:194.6016 T:046.85			M:231
11	CHN	022/088	10:47:22.703	Track	233	4077S	34100	34096	CSC8753	780B85		R:194.1211 T:046.82			
12	CHN	022/088	10:47:26.710	Track	233	4077	34100	34096	CSC8753	780B85		R:193.6367 T:046.70			M:231
13	CHN	022/088	10:47:30.695	Track	233	4077S	34100	34096	CSC8753	780B85		R:193.1523 T:046.85			
14	CHN	022/088	10:47:34.710	Track	233	4077S	34100	34096	CSC8753	780B85		R:192.6680 T:046.69			M:231
15	CHN	022/088	10:47:38.695	Track	233	4077	34100	34096	CSC8753	780B85		R:192.1836 T:046.74			T:304
16	CHN	022/088	10:47:42.695	Track	233	4077	34100	34096	CSC8753	780B85		R:191.7031 T:046.72			M:231
17	CHN	022/088	10:47:46.679	Track	233	4077S	34100	34096	CSC8753	780B85		R:191.2227 T:046.77			
18	CHN	022/088	10:47:50.695	Track	233	4077	34100	34096	CSC8753	780B85		R:190.7344 T:046.72			M:231
19	CHN	022/088	10:47:54.679	Track	233	4077S	34100	34096	CSC8753	780B85		R:190.2578 T:046.69			
20	CHN	022/088	10:47:58.687	Track	233	4077	34100	34096	CSC8753	780B85		R:189.7656 T:046.65			M:231
21	CHN	022/088	10:48:02.679	Track	233	4077S	34100	34096	CSC8753	780B85		R:189.2891 T:046.70			
22	CHN	022/088	10:48:06.687	Track	233	4077	34100	34096	CSC8753	780B85		R:188.8047 T:046.65			M:231
23	CHN	022/088	10:48:10.664	Track	233	4077S	34100	34096	CSC8753	780B85		R:188.3281 T:046.69			
24	CHN	022/088	10:48:14.679	Track	233	4077	34100	34096	CSC8753	780B85		R:187.8398 T:046.55			M:231
25	CHN	022/088	10:48:18.664	Track	233	4077S	34100	34096	CSC8753	780B85		R:187.3555 T:046.68			
26	CHN	022/088	10:48:22.679	Track	233	4077	34100	34096	CSC8753	780B85		R:186.8711 T:046.56			M:231
27	CHN	022/088	10:48:26.664	Track	233	4077S	34075	34096	CSC8753	780B85		R:186.3906 T:046.66			

Figure 2.9: List View

For advanced use of *Filter* function, please refer to chapter “Filter”.

2.2.6 STEP 6. Export data

Once you have find some data you are interested, you can then export and save it in other formats. Here we export the historical data of flight ”KTK2422.

Select *File -> Export Track List as CSV...*, a standard *File Save Dialog* will appear, you can browse and save track list as a CSV file.

Later, you can use *Microsoft Excel* or other compatible application to open and edit this file.

Microsoft Excel 2013

KTK2422 - Microsoft Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW ADD-INS TEAM

Clipboard Font Alignment Number Styles Cell Styles Cells Editing

AutoSum Fill Sort & Find & Filter Select

GBR

	A	B	C	D	E	F	G	H	I	J	K	L	M
	Country	SAC/SIC	Time Stamp	Type	Track Number	Mode 3/A	Flight Level	Callsign	ICAO Address	Polar Coordinates	WGS84 Coordinate	Speed	Head
1	GBR	070/249	00:04.2	Track	16	7244S	361	KTK2422	4249D2	R:112.2617 T:353.44			
2	GBR	070/249	00:08.2	Track	16	7244S	361	KTK2422	4249D2	R:112.7656 T:353.46			
3	GBR	070/249	00:12.2	Track	16	7244S	361	KTK2422	4249D2	R:113.2656 T:353.52			
4	GBR	070/249	00:16.1	Track	16	7244S	361	KTK2422	4249D2	R:113.7617 T:353.58			
5	GBR	070/249	00:20.1	Track	16	7244S	361	KTK2422	4249D2	R:114.2617 T:353.59			
6	GBR	070/249	00:24.1	Track	16	7244S	360	KTK2422	4249D2	R:114.7617 T:353.59			
7	GBR	070/249	00:28.0	Track	16	7244S	361	KTK2422	4249D2	R:115.2617 T:353.63			
8	GBR	070/249	00:32.0	Track	16	7244S	360	KTK2422	4249D2	R:115.7656 T:353.65			
9	GBR	070/249	00:36.0	Track	16	7244S	360	KTK2422	4249D2	R:116.2617 T:353.69			
10	GBR	070/249	00:40.0	Track	16	7244S	361	KTK2422	4249D2	R:116.7578 T:353.73			
11	GBR	070/249	00:43.9	Track	16	7244S	361	KTK2422	4249D2	R:117.2578 T:353.74			
12	GBR	070/249	00:47.9	Track	16	7244S	361	KTK2422	4249D2	R:117.7578 T:353.81			
13	GBR	070/249	00:51.9	Track	16	7244S	361	KTK2422	4249D2	R:118.2578 T:353.84			
14	GBR	070/249	00:55.8	Track	16	7244S	361	KTK2422	4249D2	R:118.7539 T:353.82			
15	GBR	070/249	00:59.8	Track	16	7244S	361	KTK2422	4249D2	R:119.2539 T:353.88			
16	GBR	070/249	01:03.8	Track	16	7244S	360	KTK2422	4249D2	R:119.7539 T:353.91			
17	GBR	070/249	01:07.7	Track	16	7244S	360	KTK2422	4249D2	R:120.2539 T:353.94			
18	GBR	070/249	01:11.7	Track	16	7244S	360	KTK2422	4249D2	R:120.7539 T:353.98			
19	GBR	070/249	01:15.7	Track	16	7244S	361	KTK2422	4249D2	R:121.2500 T:354.06			
20	GBR	070/249	01:19.7	Track	16	7244S	360	KTK2422	4249D2	R:121.7500 T:354.07			
21	GBR	070/249	01:23.6	Track	16	7244S	360	KTK2422	4249D2	R:122.2500 T:354.10			
22	GBR	070/249	01:27.6	Track	16	7244S	361	KTK2422	4249D2	R:122.7500 T:354.10			

KTK2422

READY

Figure 2.10: CSV File in Microsoft Excel

Similarly, you can export datil ASTERIX fields to *Adobe PDF* format, and view/print it with "Adobe Reader*" or other compatible application.

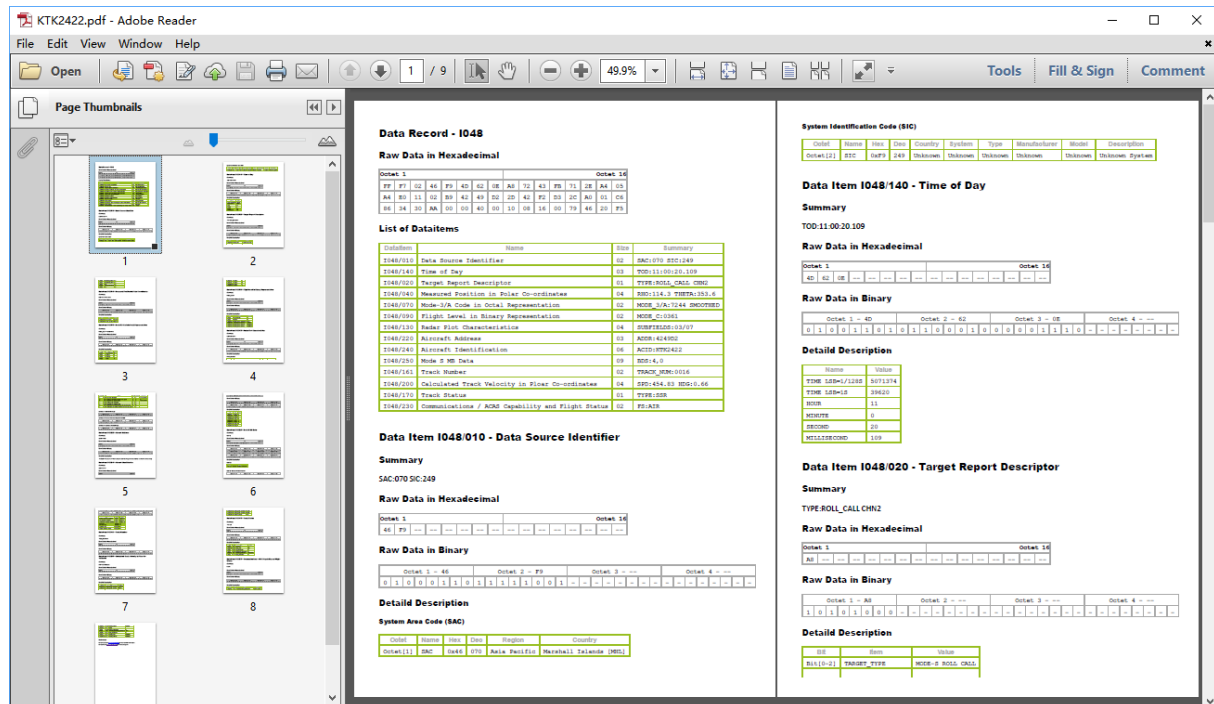


Figure 2.11: PDF File in Adobe Reader

3 User Interface

3.1 Overview

Sky Analyzer for ASTERIX has a modern and easy to use user interface. The main window composes of menu bar, tool bars, status bar and main view. All functions can be accessed through main menu, and major functions can be accessed through tool bar.

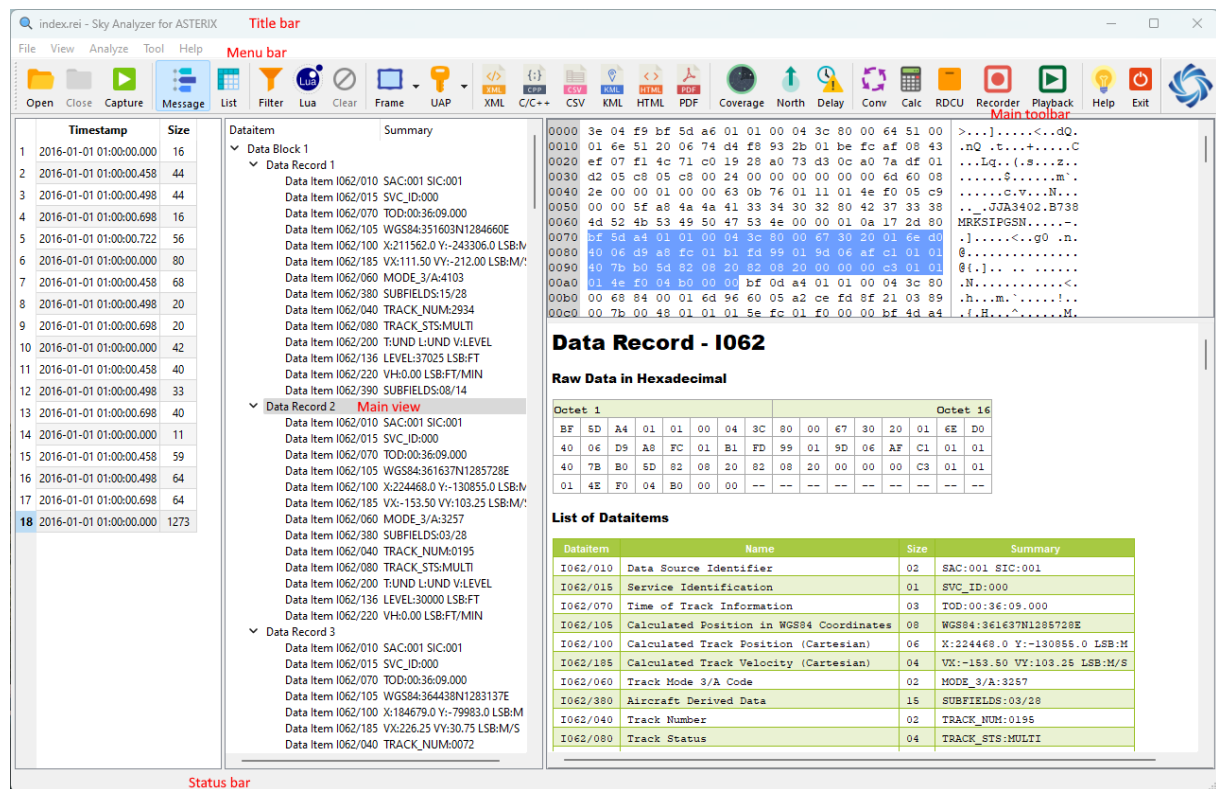


Figure 3.1: Main Window

3.1.1 Title Bar

Title bar is on top of main window.

If a file is loaded, file name will be shown in title bar; if live UDP multicast is enabled, IP address and port number will be shown in title bar.

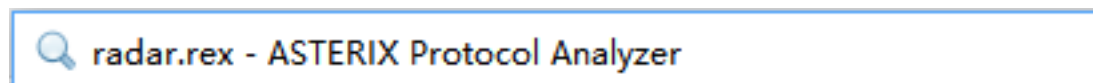


Figure 3.2: Title Bar with File Name

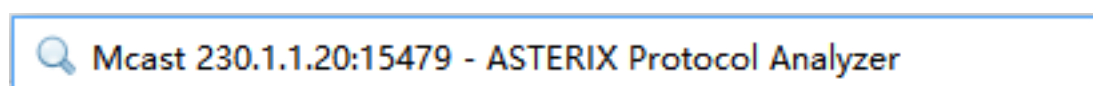


Figure 3.3: Title Bar with Multicast IP & Port

3.1.2 Menu Bar

Menu bar is below title bar. All functions can be accessed through cascade menu.

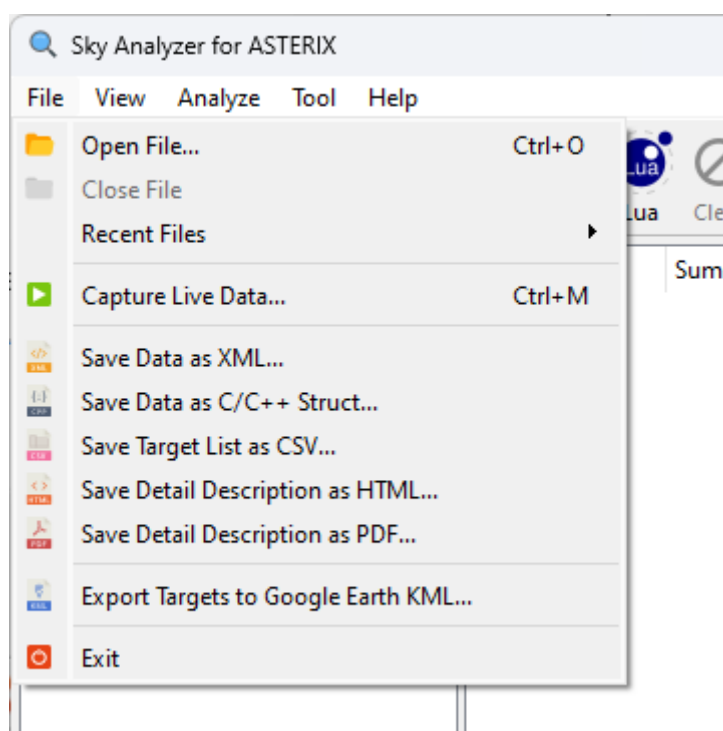


Figure 3.4: Menu Bar

Below is a list of menu/submenu of Sky Analyzer for ASTERIX with description of each menu items.

Menu	Menuitem	Description	Note
File	Open File...	Open data file and load data packets	
	Close File	Close data file	
	Recent Files	List recently opened files	
	Capture Live Data	Capture live data from network	
	...		
	Save Data as XTMl...	Export displayed data into XML format file	
	Save Data as C/C++ Struct...	Export selected data into C struct	
	Export Track List as CSV...	Export displayed list in track view into CSV format file	Compatible with Microsoft Excel
	Save Detail Description as HTML...	Export displayed ASTERIX detail into HTML format file	
	Save Detail Description as PDF...	Export displayed ASTERIX detail into PDF format file	
	Export Targets to Google Earth KML...	Export displayed tracks into Google Earth KML format file	See detail in relative section
	Exit	Exit Analyzer application	
View	Message View	Switch main UI to message view	See detail in relative section
	Target List View	Switch main UI to target list view	See detail in relative section
	Frame	Select frame type to decode data	
	UAP	Select UAP to decode data	
	Simple Filter	Open simple filter window	
	Lua Filter	Open Lua filter window	
	Clear Filter	Cancel current filter	

Menu	Menuitem	Description	Note
View- Frame	None	No frame, means ASTERIX data is directly included in data packet	This is the default value
	HDLC	HDLC frame	This is typical frame when data is read from synchronous serial line
	UDP	MAC + UDP frame	This is typical frame when data is captured from LAN
View- UAP	Auto	Automatically select proper UAP	This is the default value. User should manually select correct UAP if the it is wrong
	Standard	Standard UAP defined in ASTERIX standard	
	ADS-B v0.23	UAP defined in ASTERIX Cat021 version 0.23	
	ADS-B v0.26	UAP defined in ASTERIX Cat021 version 0.26	
	ADS-B v0.23 Thales	UAP used by Thales ADS-B ground station	
	Radar Plot	UAP defined for plots in ASTERIX Cat001	
AnalyzeRadar	Coverage	Open radar coverage analyze tool	See detail in relative section
	North Marker & Sector Missing	Open radar north marker and sector message missing analyze tool	See detail in relative section
	Message Transmission Delay	Open radar message transmission delay analyze tool	See detail in relative section
Tool	File Converter...	Open file format conversion tool	See detail in relative section
	Data Recorder...	Launch <i>Data Recording and Playback</i> application	

Menu	Menuitem	Description	Note
	ASTERIX Playback...	Launch <i>ASTERIX Playback</i> application	
	ASTERIX Simulator	Launch <i>ASTERIX Simulator</i> application	
	Options...	Open <i>Options Window</i>	
Help	Contents	Show help	
	Open Samples	Open and load sample data	
	Install License...	Install license file for registered user	
	Website	Open default web browser and open ASTERIX Toolkit website	
	About	Show <i>About Window</i>	

Note: Some menu items listed above may not appear in your application, or not applicable in your application, it depends on your license type.

3.1.3 Tool Bar

There are several tool bars.

Main toolbar contains commonly used function tool buttons, the function is exactly the same with corresponding menu item.

Filter toolbar is used for filter function.

3.1.4 Status Bar

Status bar is at the bottom of main window, it shows status information and application message.

3.1.5 Main View

In the middle of main window, it is the main view. There are different types of view, message view and target list view.

3.2 Message View

Message view is the default view after Sky Analyzer for ASTERIX starts up. In this view, ASTERIX data is shown in a tree style hierarchy.

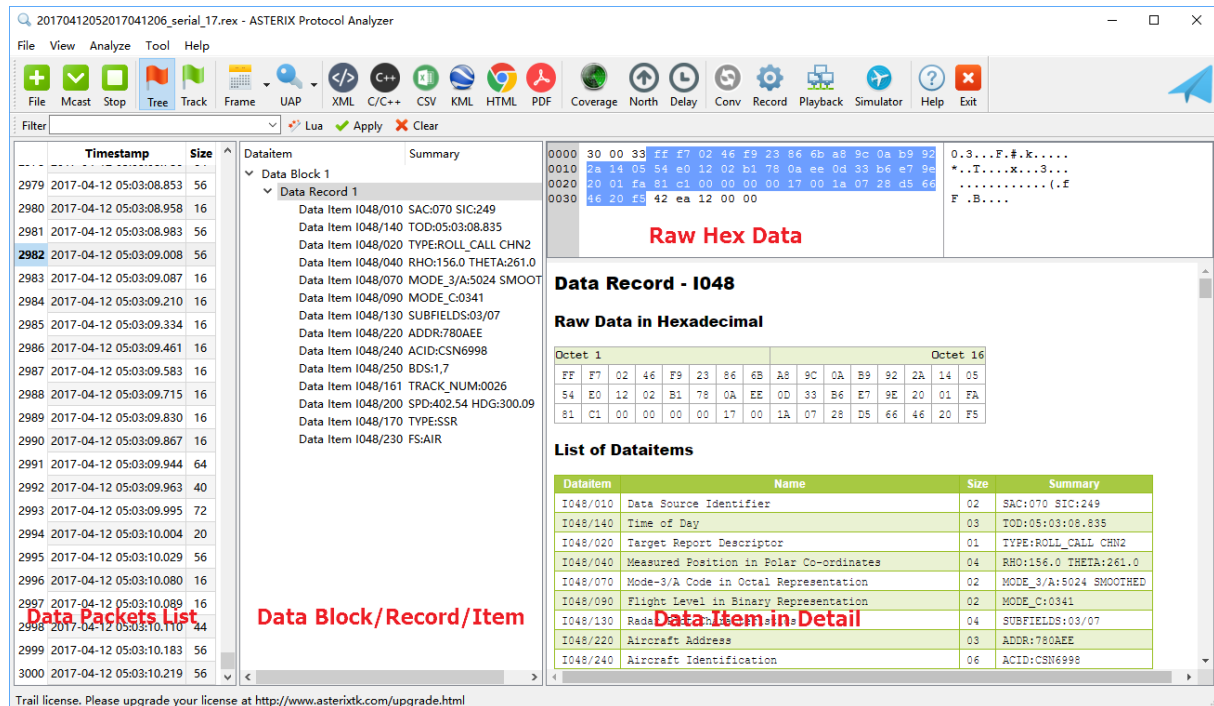


Figure 3.5: Tree View

The message view composes of four parts:

- Data packet list
- Data block/record/item tree
- Raw hex data
- Data record/item detail

3.2.1 Packet List

Packet list is on left of tree view, loaded data packets are shown in this list. A sequence number, timestamp and size is displayed for each data packet.

The timestamp here is the receiving UTC time, if data is loaded from file, it means the time when packet is saved into the file.

Note: For some file formats, timestamp is not available, the timestamp field will be displayed as “N/A”.

Note: For some file formats, timestamp has only valid time, and no valid date, the timestamp field will be displayed with only time.

When one packet is selected, its content will be displayed in the raw hex data panel.

When one packet is selected, system will try to decode it with selected frame and UAP. If it can be successfully decoded, the structure of this data packet will be display in the data block panel.

3.2.2 ASTERIX Tree

ASTERIX tree is in the middle of tree view, it shows standard ASTERIX data struct in a tree style hierarchy, which are:

- Data Block
- Data Record
- Data Item

The concept of these terms are defined in Eurocontrol ASTERIX documents.

The encoding policy supported by Sky Analyzer for ASTERIX is:

- One data packet can include one or more data blocks
- One data block can include up to 32 data records
- One data record can include up to 32 data items

When one data block or data record or data item is selected, the corresponding data will be highlighted in raw data display panel.

When one data record or data item is selected, the decoded ASTERIX fields will be displayed in detail in detail panel.

3.2.3 Raw Data Display

Raw data display is on top-right of tree view. Data of data packet will be shown in hexadecimal format in it. If one data block/record/item is selected, the corresponding data will highlighted.

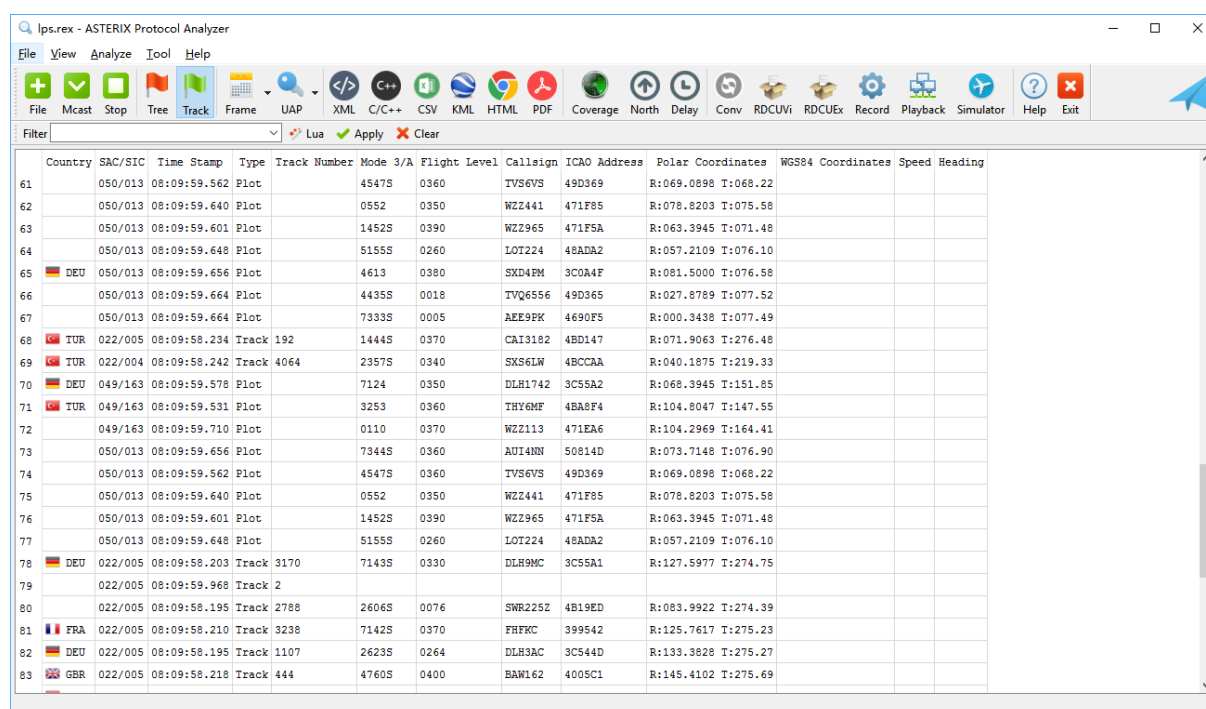
3.2.4 Detail Display

Detail display panel is on bottom-right of tree view. It is a standard web browser, when a data record/item is selected, a HTML page will be generated and displayed in detail display panel.

The content in this panel depends on the selected data.

3.3 Target List View

Target list view is used to display important properties of aircraft in a table.



	Country	SAC/SIC	Time Stamp	Type	Track Number	Mode 3/A	Flight Level	Callsign	ICAO Address	Polar Coordinates	WGS84 Coordinates	Speed	Heading
61		050/013	08:09:59.562	Plot		4547S	0360	TVS6VS	49D369	R:069.0898 T:068.22			
62		050/013	08:09:59.640	Plot		0552	0350	WZZ441	471F85	R:078.8203 T:075.58			
63		050/013	08:09:59.601	Plot		1452S	0390	WZZ965	471F5A	R:063.3945 T:071.48			
64		050/013	08:09:59.648	Plot		5155S	0260	LOT224	48ADA2	R:057.2109 T:076.10			
65	DEU	050/013	08:09:59.656	Plot		4613	0380	SKD4FM	3C0A4F	R:081.5000 T:076.58			
66		050/013	08:09:59.664	Plot		4435S	0018	TVQ6556	49D365	R:027.8789 T:077.52			
67		050/013	08:09:59.664	Plot		7333S	0005	AEE9FK	4690F5	R:000.3438 T:077.49			
68	TUR	022/005	08:09:58.234	Track	192	1444S	0370	CAI3182	4BD147	R:071.9063 T:276.48			
69	TUR	022/004	08:09:58.242	Track	4064	2357S	0340	SKS6LW	4BCCAA	R:040.1875 T:219.33			
70	DEU	049/163	08:09:59.578	Plot		7124	0350	DLH1742	3C55A2	R:068.3945 T:151.85			
71	TUR	049/163	08:09:59.531	Plot		3253	0360	THY6MF	4BA8F4	R:104.8047 T:147.55			
72		049/163	08:09:59.710	Plot		0110	0370	WZZ113	471EA6	R:104.2969 T:164.41			
73		050/013	08:09:59.656	Plot		7344S	0360	AUI4NN	50814D	R:073.7148 T:076.90			
74		050/013	08:09:59.562	Plot		4547S	0360	TVS6VS	49D369	R:069.0898 T:068.22			
75		050/013	08:09:59.640	Plot		0552	0350	WZZ441	471F85	R:078.8203 T:075.58			
76		050/013	08:09:59.601	Plot		1452S	0390	WZZ965	471F5A	R:063.3945 T:071.48			
77		050/013	08:09:59.648	Plot		5155S	0260	LOT224	48ADA2	R:057.2109 T:076.10			
78	DEU	022/005	08:09:58.203	Track	3170	7143S	0330	DLH9NC	3C55A1	R:127.5977 T:274.75			
79		022/005	08:09:59.968	Track	2								
80		022/005	08:09:58.195	Track	2788	2606S	0076	SWR225Z	4B19ED	R:083.9922 T:274.39			
81	FRA	022/005	08:09:58.210	Track	3238	7142S	0370	FHF6C	399542	R:125.7617 T:275.23			
82	DEU	022/005	08:09:58.195	Track	1107	2623S	0264	DLH3AC	3C544D	R:133.3828 T:275.27			
83	GBR	022/005	08:09:58.218	Track	444	4760S	0400	BAW162	4005C1	R:145.4102 T:275.69			

Figure 3.6: Track View

The columns in this table are:

Column	Description	Note
Country	Country of the aircraft, according to its ICAO address	If some ICAO address can't be recognized, airdb should be updated
Reception Time	Time when data packet is received	

Column	Description	Note
SAC/SIC	SAC/SIC of sensor	This is useful when data comes from multiple sensors
Time Stamp	Time of source data	The meaning of this time is defined by corresponding ASTERIX category, normally it is time of measurement
Type	Plot, Track & ADS-B	
Track Number	Track number	Valid only when type is "Track"
Mode 3/A	Mode 3/A code, suffix 'S' means "smoothed", 'G' means "garbled"	
Flight Level	Mode C code	
Selected Altitude	Selected altitude	
Callsign	Mode-S callsign	
ICAO Address	ICAO 24-bit address of aircraft	
WGS84 Co-ordinates	Latitude and longitude	Valid for ADS-B, Mlat and system track
Polar Coor-dinates	Rho and theta	Valid only for radar
Range	Range	
Azimuth	Azimuth	
Speed	Ground speed	
Heading	Heading	
Cartesian Velocity	Velocity in Cartesian plane (X-Y)	
Doppler Velocity	Doppler velocity	
Vertical Rate	Climbing and descending rate	

When system reads one qualified data record, it will extract properties included in the data record, and generate a row. If any property is not applicable to the data record, the corresponding column will be displayed as blank.

4 Filter

4.1 Overview

The filter function allows you to show only the data you are interesting, it is useful when you want to

- Trace one or several specific aircraft(s), by track number, callsign or Mode-S address;
- Find data with special characteristic, e.g. SSR is 7500;
- Analyze data from a specific sensor;
- Etc.

When a filter is applied

- System will check all loaded data, and shows only data which can match the filter;
- System will check new incoming data (read from file, or received from network), and shows only data which can match the filter;
- Unmatched data will not be shown, but still kept in memory.

There are two types of filter, simple filter and Lua filter.

4.2 Simple Filter

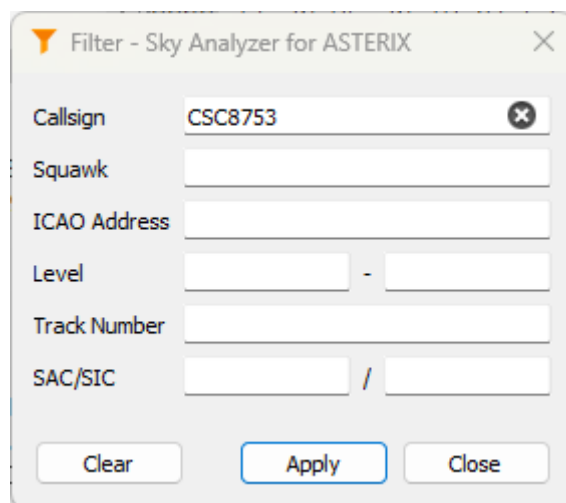
4.2.1 Introduction

A simple filter, as explained by its name, is simple and easy to use. It's useful when you just need to filter data with one condition, e.g. callsign is CSC8753.

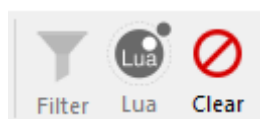
In main window, when clicking on *Simple Filter* button, it will open a *Simple Filter Window*.



Figure 4.1: Simple Filter Button

A screenshot of the 'Filter - Sky Analyzer for ASTERIX' dialog box. It contains several input fields: 'Callsign' with the value 'CSC8753', 'Squawk', 'ICAO Address', 'Level' (with a range separator '-'), 'Track Number', and 'SAC/SIC' (with a range separator '/'). At the bottom are three buttons: 'Clear', 'Apply' (highlighted with a blue border), and 'Close'.**Figure 4.2:** Simple Filter Window

When clicking on “Clear” button, the filter will be cancelled.

**Figure 4.3:** Simple Filter Cancelled

Warning: If a large number of messages have been loaded, system need to reload all data when you cancel a filter, this process could take a while and cause UI no response for a short time. It will recover when all data is reloaded.

4.2.2 Syntax

The syntax of simple filter is:

Filter Field	Description	Example	Note
Callsign	Callsign	KAL937	
Squawk	Squawk	3562	Range 0000-7777
ICAO Address	24-bit ICAO Address	7F1E00	

Filter Field	Description	Example	Note
Level	Flight level band	290 - 380	The lower level must be less than the upper level
Track number	Track number	65	
SAC/SIC	Sensor SAC and SIC	126/31	

4.3 Lua Filter

4.3.1 Introduction

Lua filter, is based on Lua script language. You can use Lua script to write a complex filter, and match specific data you are interesting.

For example, with Lua filter, you can match data which is

for aircrafts belong to Lufthansa (DLH), registered in Germany, with flight level between F290 to F320, and are in emergency status.

To use lua filter, first you need to click on the “Lua” button in main toolbar.



Figure 4.4: Lua Filter Button

Then a *Lua Script Filter Window* will appear.

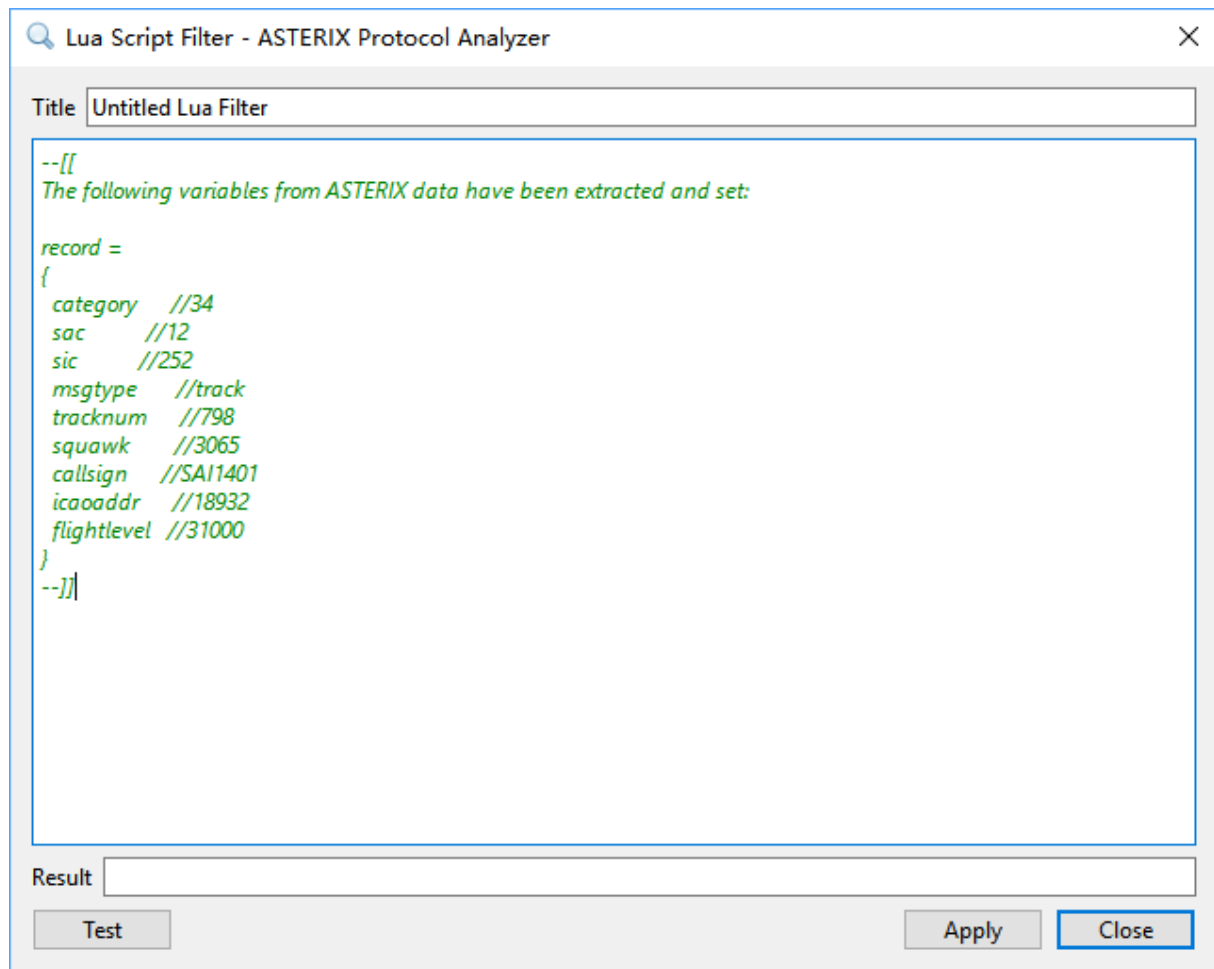
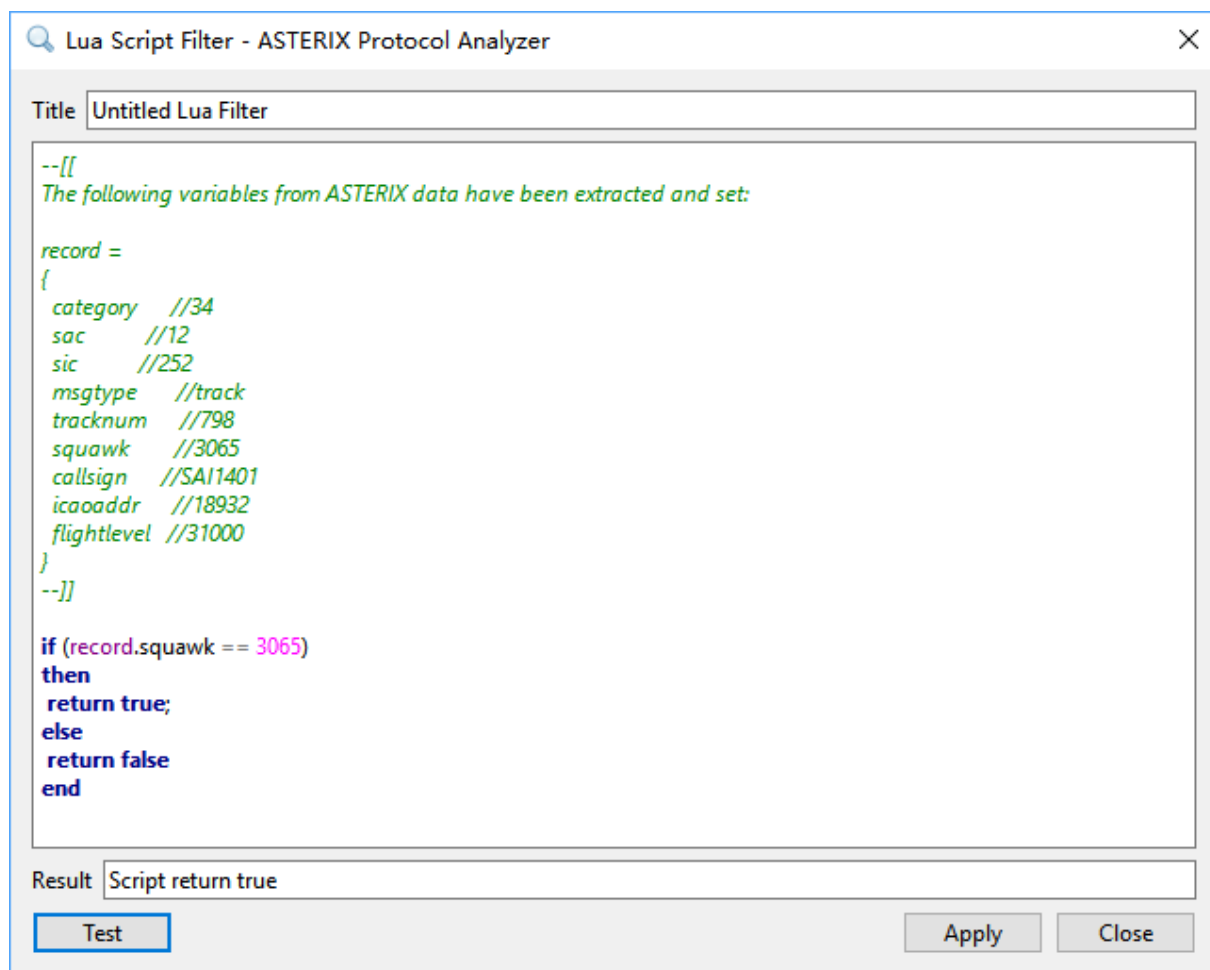


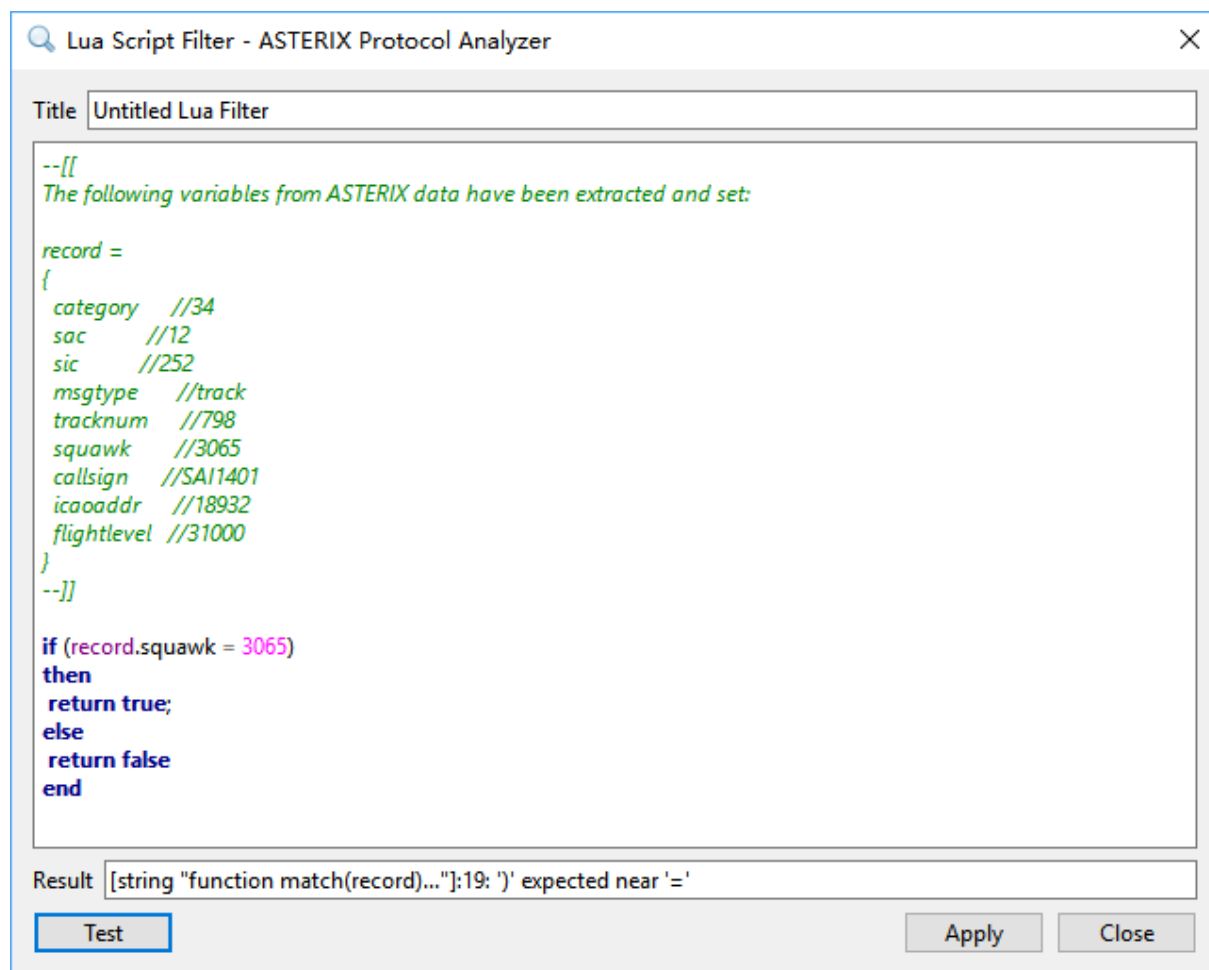
Figure 4.5: Lua Filter Window

In this window, you can type any valid Lua script. A syntax highlight mechanism similar with any code editor has been integrated into this window, so you can detect potential errors in script when you type them.

Please be aware of the green color comments in this window, those are preset data which can be used to test your script. When you finish your filter script, you can click on “Test” button, and system will try to use you script to match data in comments, and show matching result in the “Result” text field. The result can be:

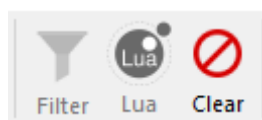
- True, your script match test data and return **true**.
- False, your script doesn’t match test data and return **false**.
- Error, there is error when interpreting your script, an error message will be shown in “Result” text field.

**Figure 4.6:** Lua Filter Test Success

**Figure 4.7:** Lua Script with Error

When your script is ready to use, you can click “Apply” button to apply the filter, or click “Close” button to close this window without applying the filter.

When click on “Clear” button in main toolbar, the filter will be cancelled.

**Figure 4.8:** Filter Cancel Button

4.3.2 Syntax

The syntax of Lua script language can be found at Lua website. The Lua version used by Lua filter is 5.3.

Every time, when system need to check if one data record can match the filter or not, it will use the data to construct a Lua table name `record`. The following fields are included in the `record` table:

Field	Description	Example
category	ASTERIX category number	34
sac	Sensor SAC	12
sic	Sensor SIC	252
msgtype	Message type, can be north, sector, plot, track	"track"
tracknum	Track number	798
squawk	SSR code	3065
callsign	Callsign	"SAI1401"
icaoaddr	ICAO 24-bit address	18932
flightlevel	Mode-C level in feet	31000

If any field is not applicable, it will be set to `nil`.

The filter script should check if the data contained in `record` can match its purpose or not. If match, the script must return `true`, and the `record` will be kept in result; if not match, the script must return `false`, and the `record` will be ignored.

Example:

```
if (string.sub(record.callsign, 1, 3) == "DLH" and record.squawk == 7500)
then
    return true;
else
    return false
end
```

This script means, if the callsign in `record` starts with "DLH" and squawk is 7500 (hijack), the data will match the filter and be kept in result, all others will be ignored.

5 File Converter

5.1 Overview

File Converter is a tool which can make conversion between different recording formats.

It reads data packet from input file, extract payload data from frame, and save data into another file format.

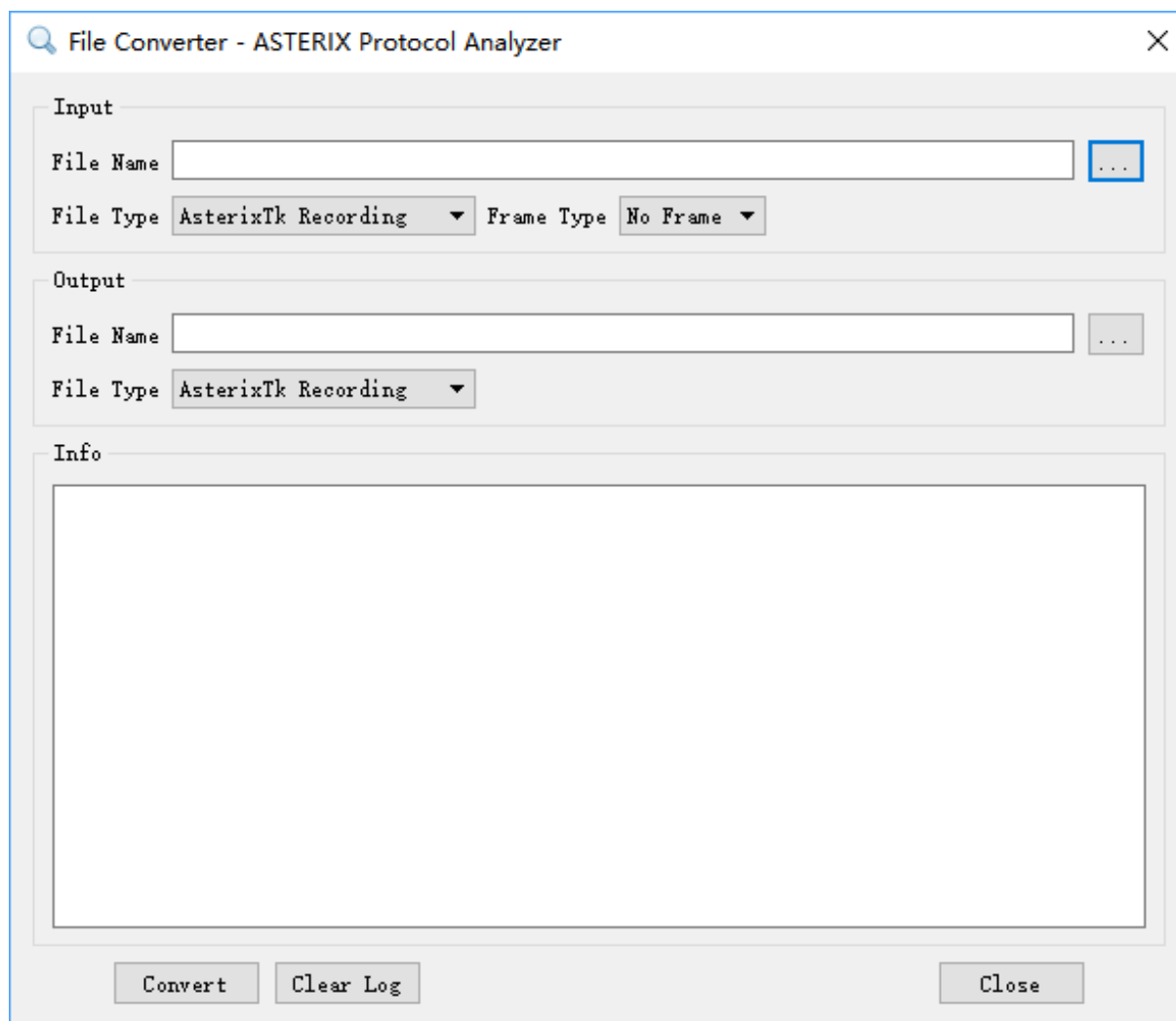


Figure 5.1: File Converter

5.2 Usage

5.2.1 Input

File Name, the input file path. File must be readable.

File Type, the input file formats. Different with other functions, *File Converter* will not automatically detect file format, it will try to read file according to the file format selected here.

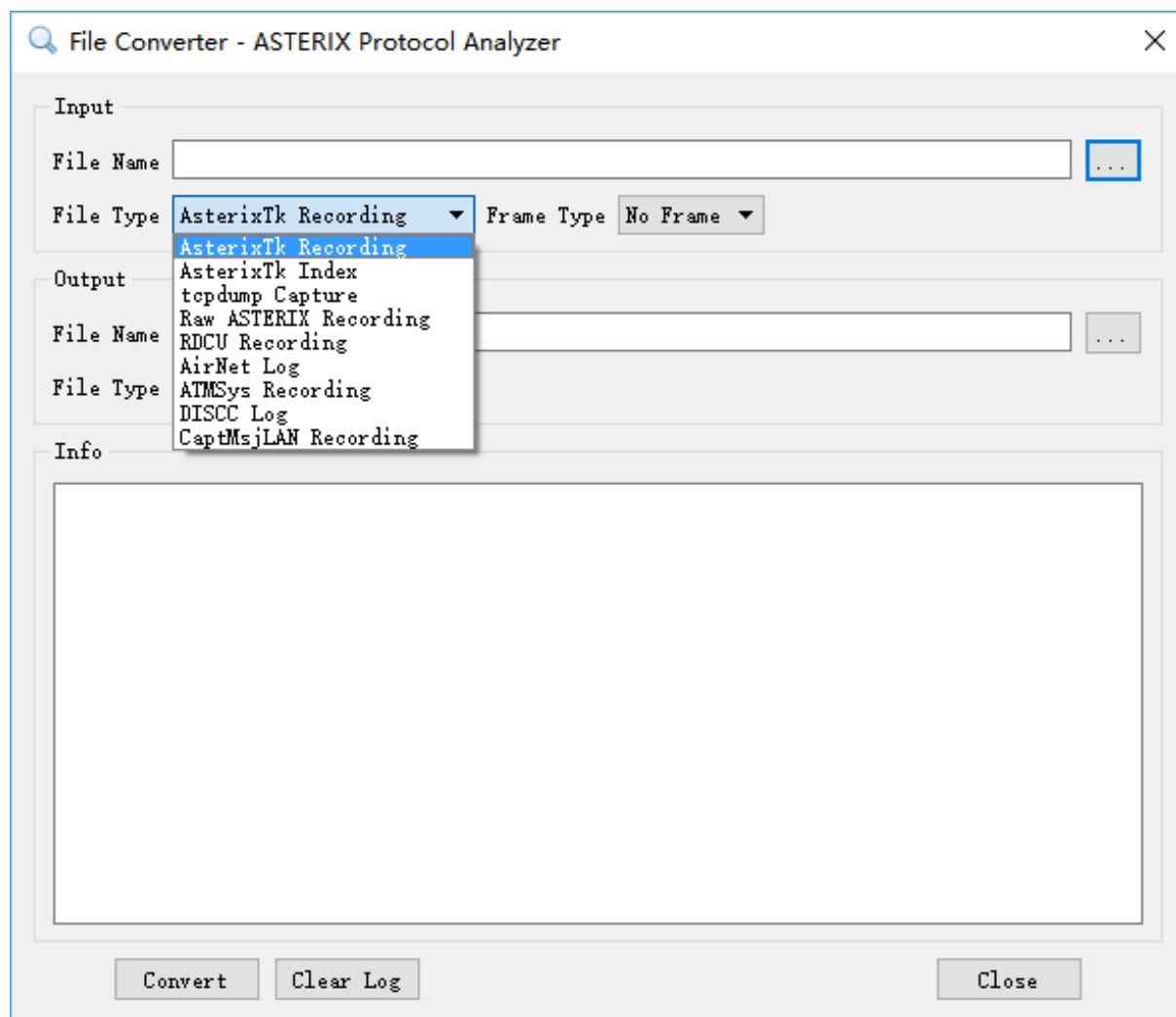


Figure 5.2: Input File Type

Note: Depending on your license type, different file formats will be listed here.

Frame Type, the frame type of data packets contained in input file.

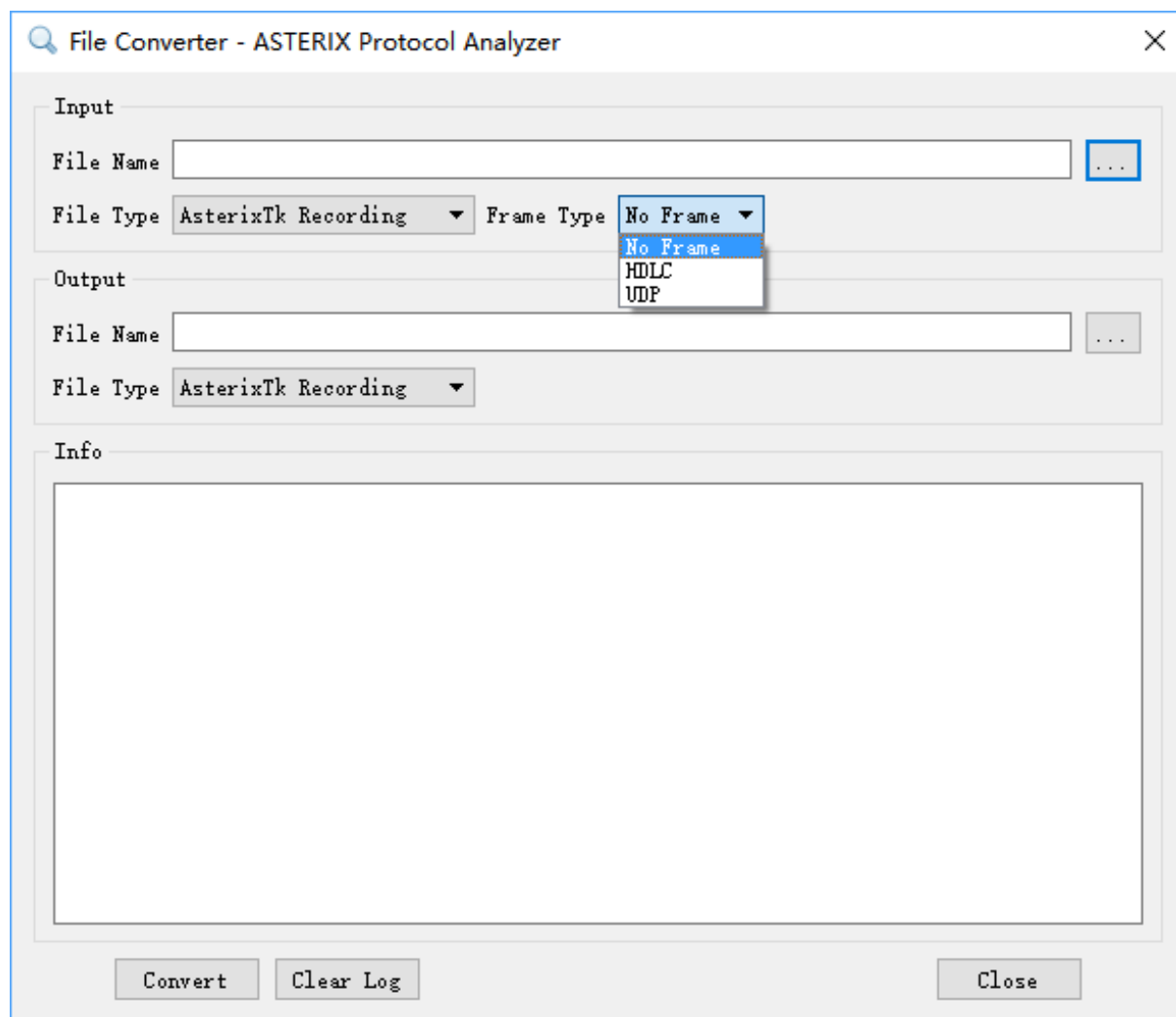


Figure 5.3: Input Frame Type

Note: *File Converter* will extract payload data according to selected frame type, and save it into output file. So if you want to keep the original frame in output file, you should select “No Frame” here.

5.2.2 Output

File Name, the output file path. File must be writable.

File Type, the output file formats. *File Converter* will save output file into selected format regardless the file name suffix.

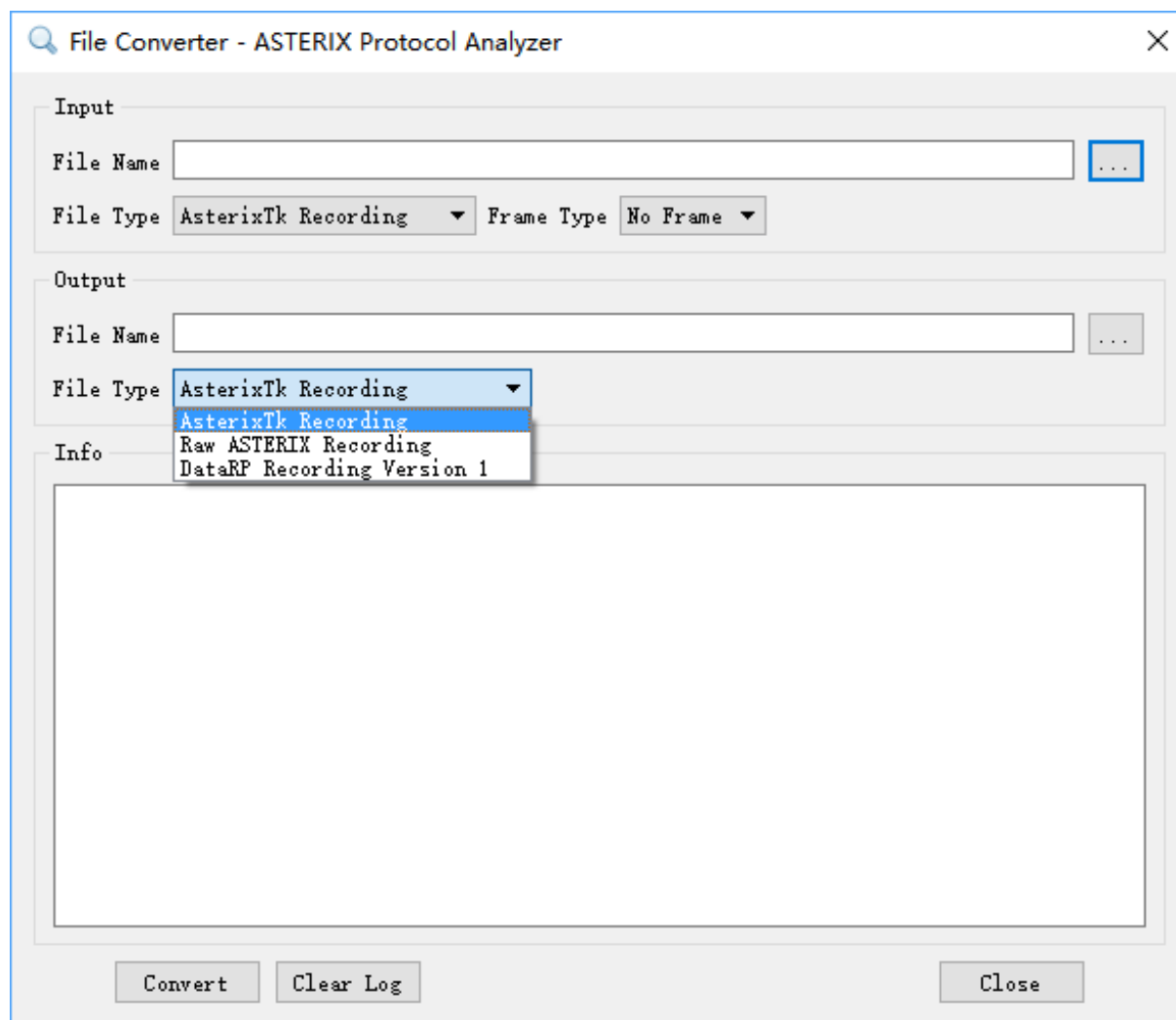
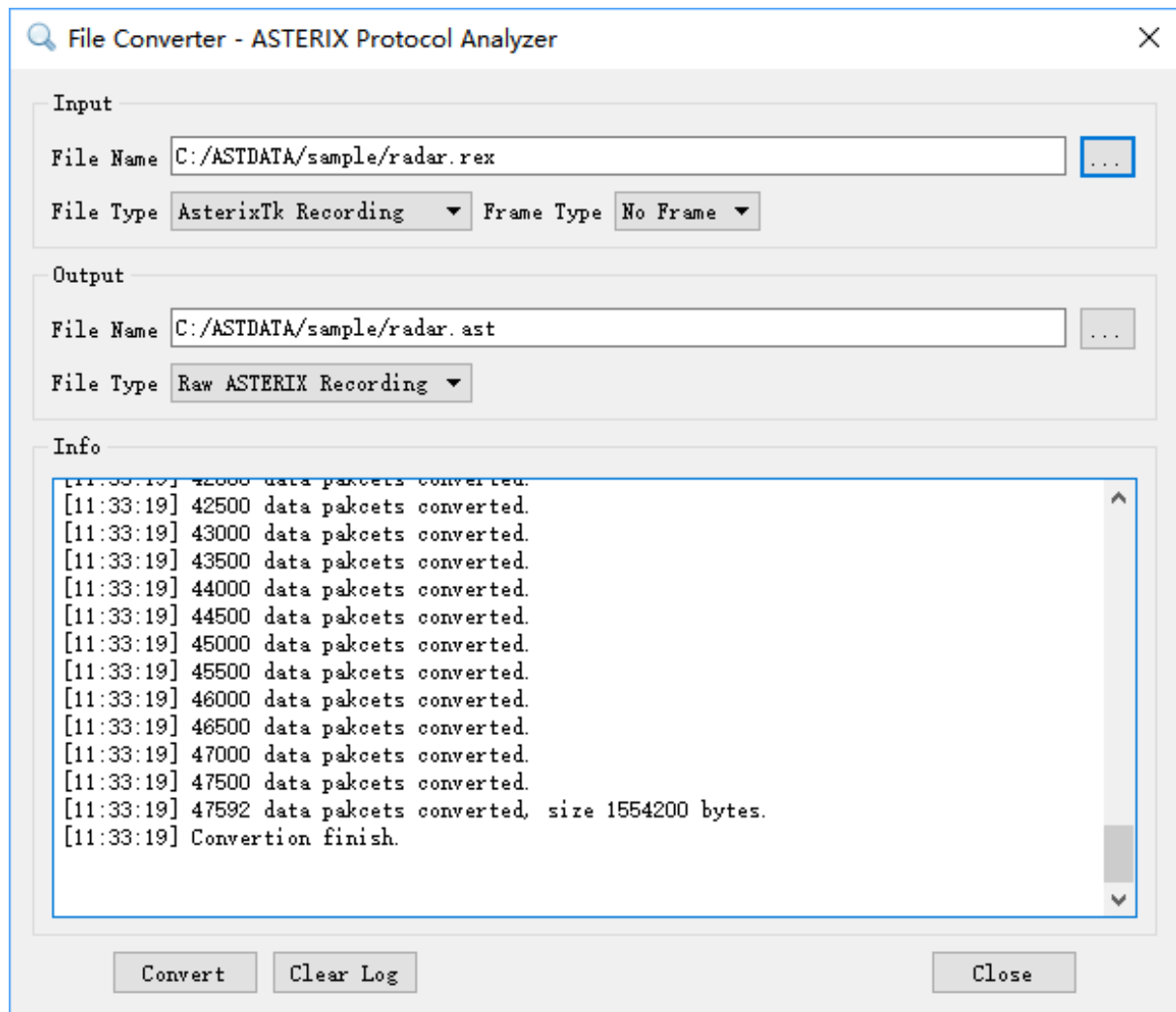


Figure 5.4: Output File Type

5.2.3 Information

When you press *Convert* button, *File Converter* will starts to make conversion and logging messages will be displayed in info panel. Error messages will be shown when error occurs during the conversion.

**Figure 5.5:** Log Messages

6 Export to Google Earth KML

6.1 Overview

Sky Analyzer for ASTERIX provides a tool to export **tracks** into KML format, and later it's possible to visualize the tracks in *Google Earth* application.

To generate KML file, the ASTERIX data record must contain the following information:

- Valid track number or ICAO 24-bit address
- Valid position in WGS-84 coordinates

For CAT062, it requires

- I062/040 - Track Number
- I062/105 - Calculated Track Position (WGS-84)
- I062/380 - Aircraft Derived Data, subfield #1

6.2 Operation

The Google Earth KML export dialog is as below.

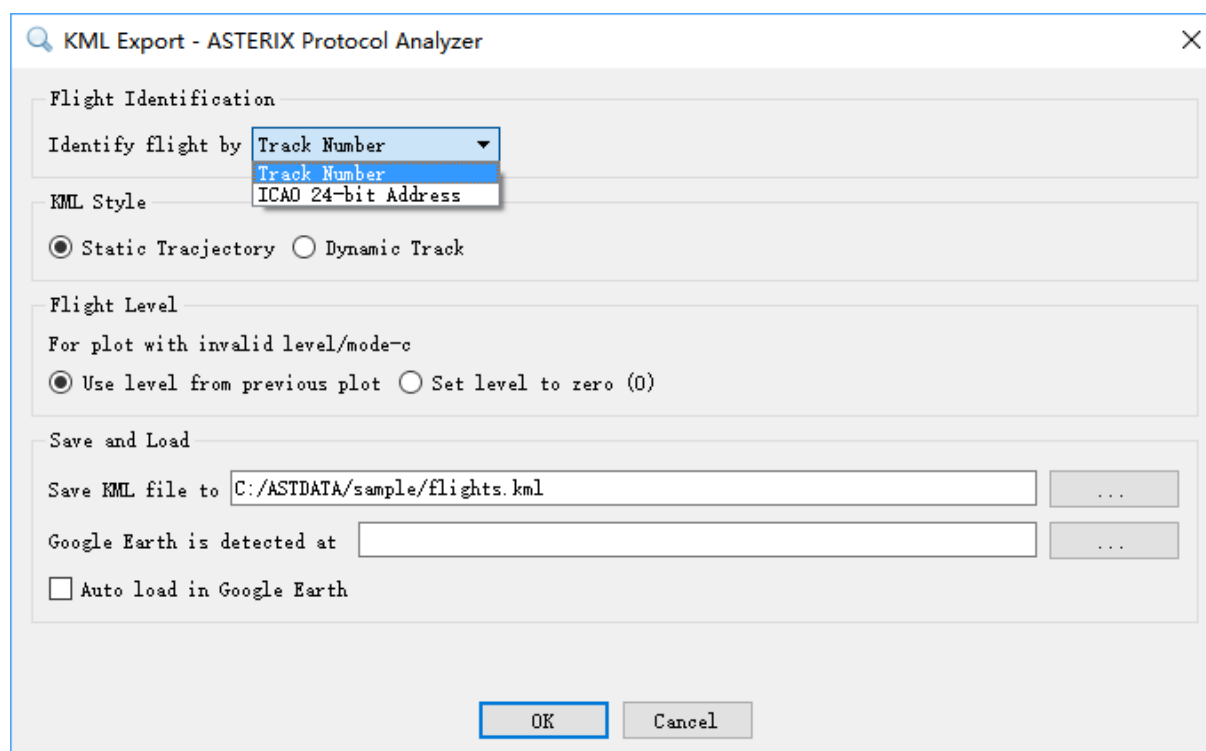


Figure 6.1: KML Export Window

It composes the following options:

Option	Description
Flight Identification	One aircraft should be identified and distinguished by <i>track number</i> or <i>ICAO 24-bit address</i> .
KML Style	It's possible to generate two types of KML, <i>static</i> and <i>dynamic</i> . A static KML will show static trajectory of each aircraft; A dynamic KML will show flight animation.
Flight Level	If flight level doesn't exist in data record, it's possible to use the flight level in previously received data record of the same aircraft, or just set it to zero.
Save KML file to	Location to save KML file.
Google Earth is detected at	If <i>Google Earth</i> is installed, system will detect its installation path.
Auto load in Google Earth	Launch <i>Google Earth</i> and load generated KML.

7 Radar Coverage Analyze

7.1 Overview

The radar coverage analyze tool aims to generate radar coverage map in different levels, by using historical plots. Internally, the coverage surface of each level is divided into many sector cells. The angle of each cell is 1 ACP ($\approx 0.08789^\circ$), and the edge length is 1 NM.

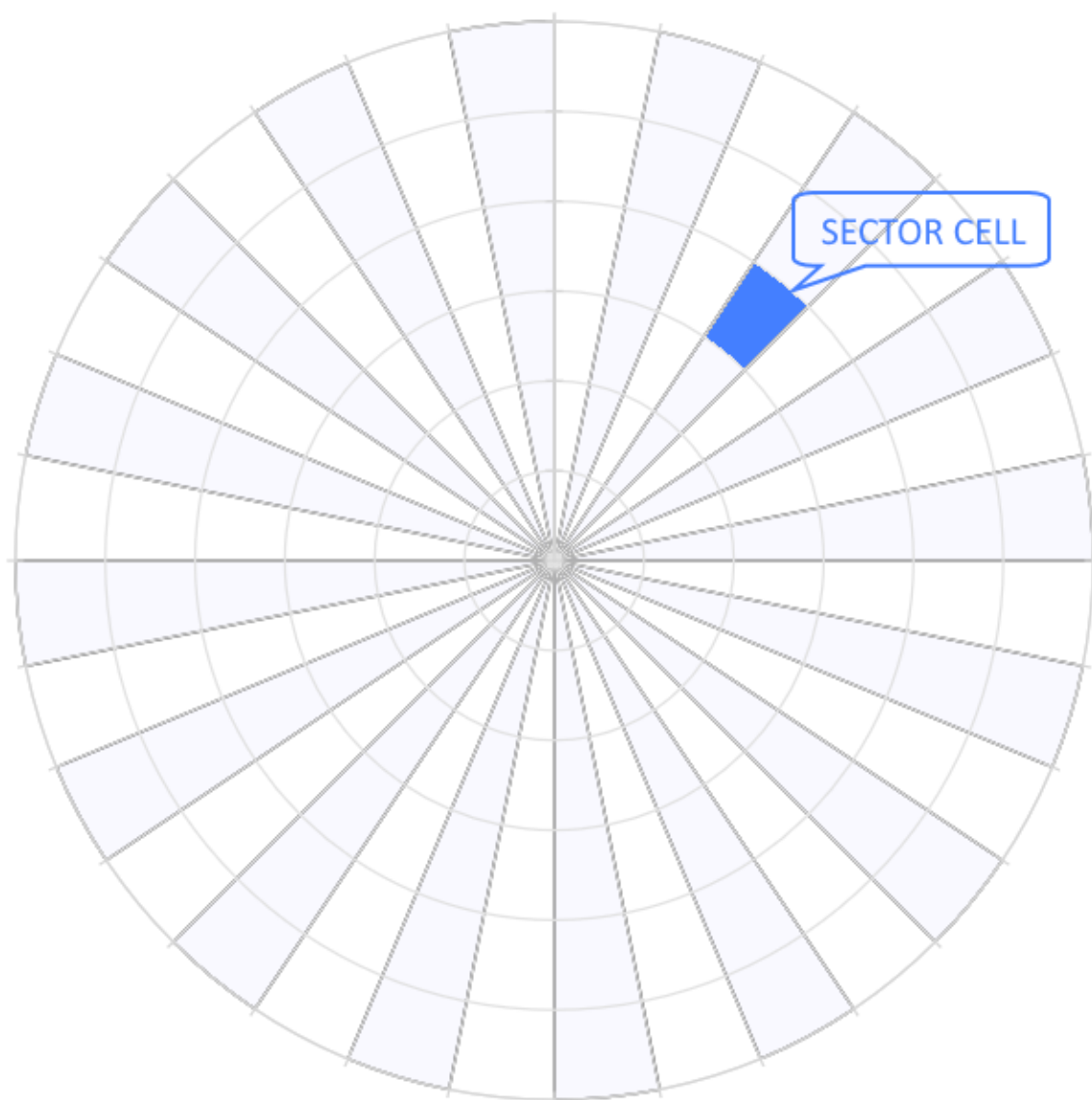


Figure 7.1: Radar Coverage Sector

When more than 3 plots are detected in one cell, this cell will be marked as “covered”. And with enough plots of different azimuth and distance from radar site, it’s able to determine the coverage of every cell and finally get the coverage map of the whole surface. Considering most civil flights operate in limited predefined routes, to get a full coverage map it may need a long period (more than one month) of recorded plots.

7.2 Preparation

To generate an useful coverage map, you need to prepare recorded radar plots in ASTERIX CAT001 or CAT048 formats. And the following data items shall exist.

For CAT001

- I001/010 - Data Source Identifier
- I001/040 - Measured Position in Polar Coordinates
- I001/090 - Mode-C Code in Binary Representation

For CAT048

- I048/010 - Data Source Identifier
- I048/040 - Measured Position in Slant Polar Coordinates
- I048/090 - Flight Level in Binary Representation

Plots are preferred as they are not filtered by radar tracker software. However tracks are accepted and measured as they are not smoothed by radar tracker.

Recording shall be stored in XML recording file format (.rex files). The *File Converter* can be used to convert files in other formats into REX format.

7.3 Main Window

7.3.1 Introduction

The main window of radar coverage analyze tool is as below.

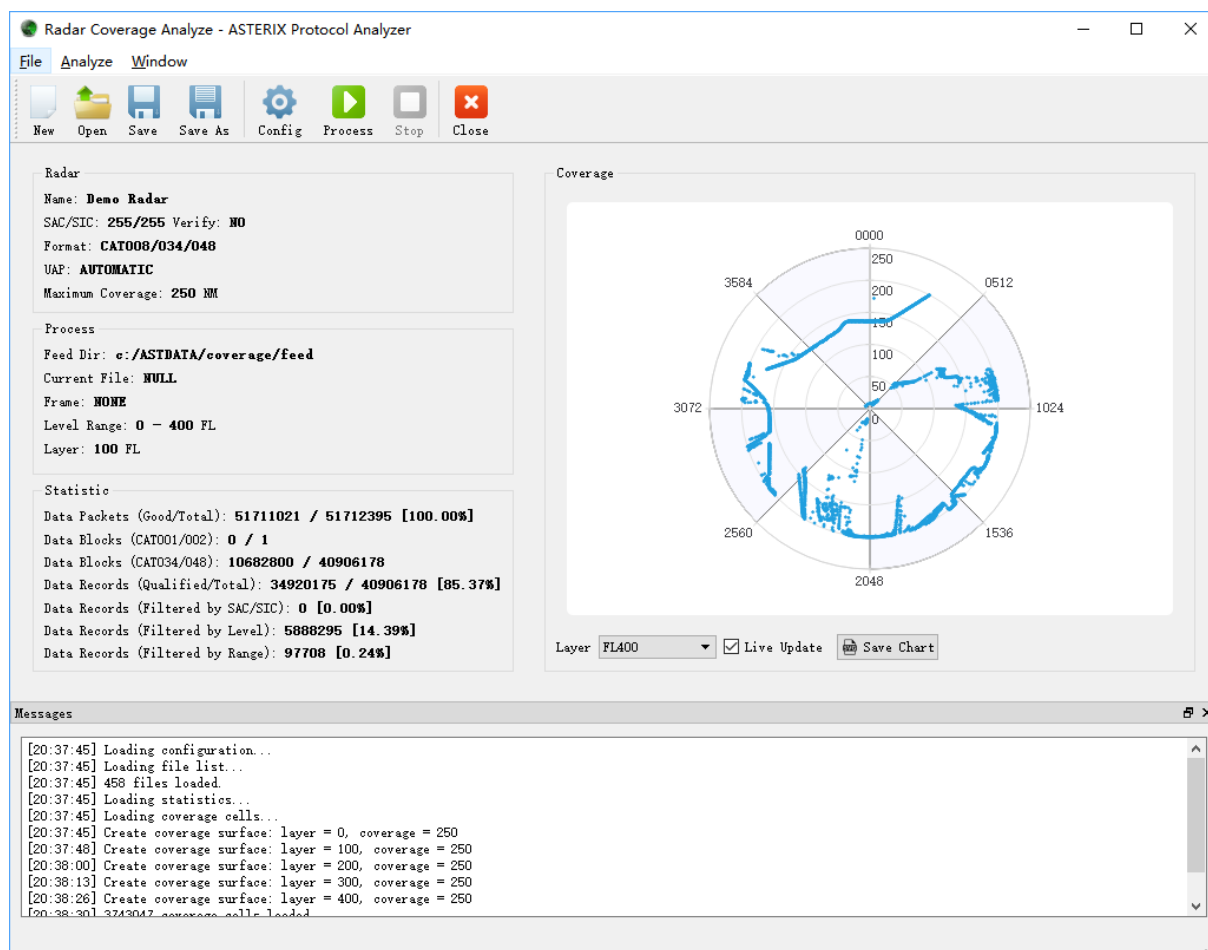


Figure 7.2: Radar Coverage Window

It composes of the following parts:

- **Actions**

Menu and tool bars, including select-able menu items and tool buttons for different actions.

- **Messages**

On bottom of the window, messages and logs are shown here.

- **Information Panel**

On left of the window, displays important configuration and statistic information.

- **Coverage Chart**

On right of the window, the coverage map of selected level will be displayed here.

7.3.2 Actions

Actions	Description
New	Create a new analyze
Open	Open and load analyze from an existing SQLite database file
Save	Save current analyze to a SQLite database file
Save As	Save current analyze to a new SQLite database file
Settings	Open configuration window
Process	Start or continue processing
Stop	Stop processing. The process will exit when current file is finished. It could take quite a while if current file is big. This is to avoid plots in current files are processed twice if you continue processing later.
Close	Close the radar coverage analyze window
Layer	Select one layer to display its coverage chart
Live Up-date	Update chart display during process. Display it could slightly increase processing speed if there is a big amount of data
Save Chart	Save current coverage chart to a SVG image file

7.3.3 Statistics

Name	Description
Data Packets - Total	All data packets that have been read and processed from recording files
Data Packets - Good	Data packets that can be correctly decoded. If this value is too low, check if frame type is correct.
Data Blocks - CAT001	Data Blocks of CAT001

Name	Description
Data Blocks - CAT002	Data Blocks of CAT002
Data Blocks - CAT034	Data Blocks of CAT034
Data Blocks - CAT048	Data Blocks of CAT048
Data Records - Total	All data records extracted from data blocks
Data Records - Qualified	Data records with plot or track that can be used to update radar coverage map
Data Records - Filtered by SAC/SIC	Data records ignored due to its SAC/SIC doesn't match configuration
Data Records - Filtered by Level	Data records ignored due to its level is lower than minimal level, or its level is greater than maximum level, or its level is not valid
Data Records - Filtered by Range	Data records ignored due to its distance is greater than radar maximum coverage, or its range is not valid

7.4 Configuration Window

7.4.1 Introduction

The configuration window is as below.

Radar Coverage Analyze - ASTERIX Protocol Analyzer

Radar

Name: Demo Radar

SAC/SIC: 255 255

Format: CAT008/034/048

UAP: Automatic

Maximum Coverage (NM): 250

Frame Type: None

Analyze

☐ Verify SAC/SIC

Minimal Level (FL): 0

Maximum Level (FL): 400

Level per Layer (FL): 100

Feed Dir: c:/ASTDATA/coverage/feed

OK Cancel

Figure 7.3: Radar Coverage Config Window

It contains parameters used for generating radar coverage map.

Parameter	Description	Constraint
Radar Name	The name of radar for analyze.	Any literal text
SAC	System Area Code, used to filter data from other sensors	0~255
SIC	System Identification Code, used to filter data from other sensors	0~255
Format	Data format for Mode-S radar or conventional radar	
Maximum Coverage	Radar maximum coverage, any plots far from this value will be ignored.	0~300 NM
Frame Type	The frame type of data in recording file	
Verify SAC/SIC	Turn on/off the filter of SAC/SIC. When selected, only plots with matching SAC/SIC are processed	

Parameter	Description	Constraint
Minimal Level	Plots under this level will be ignored	0~420 FL
Maximum Level	Plots above this level will be ignored	0~420 FL
Level per Layer	The levels between two coverage surfaces. Plots will be assigned to a layer closest to its actual level	0~100 FL
Feed Dir	Directory to read radar plots recording files. All files under this directory with “.rex” suffix will be processed.	

If any field contains an error, a warning message will be displayed.

Radar Coverage Analyze - ASTERIX Protocol Analyzer

Radar

Name: Demo Radar

SAC/SIC: 255

Format: CAT008/034/048

UAP: Automatic

Maximum Coverage (NM): 250

Frame Type: None

Analyze

☐ Verify SAC/SIC

Minimal Level (FL): 0

Maximum Level (FL): 400

Level per Layer (FL): 98

Feed Dir: c:/ASTDATA/coverage/feed

MAX LEVEL AND LAYER MISMATCH

OK Cancel

Figure 7.4: Warnings in Radar Coverage Config Window

8 Radar North Marker & Sector Missing Analyze

8.1 Overview

The radar north marker and sector message missing analyze tool is used to detect any missing north marker message and sector message received from a specific radar.

For north marker message, system will calculate time interval of two north marker messages. If the interval is greater than radar rotation period plus a tolerance value, system will assume one north marker message is missing, and a warning message will be printed.

For sector message, system will check if the sector number in a sequence of messages is continue. If not, system will assume one or more sector messages are missing, and warning message(s) will be printed.

8.2 Preparation

To make a correct analyze on north marker and sector messages, it requires:

- A valid time is included in north marker message
- A valid sector is included in sector message

It means, the following dataitems must be included in received ASTERIX message.

Category 002

- I002/000 - Message Type
- I002/030 - Time of Day
- I002/020 - Sector Number

Category 034

- I034/000 - Message Type
- I034/030 - Time of Day
- I034/020 - Sector Number

8.3 User Interface

The main window of radar north marker & sector missing analyze tool is as below.

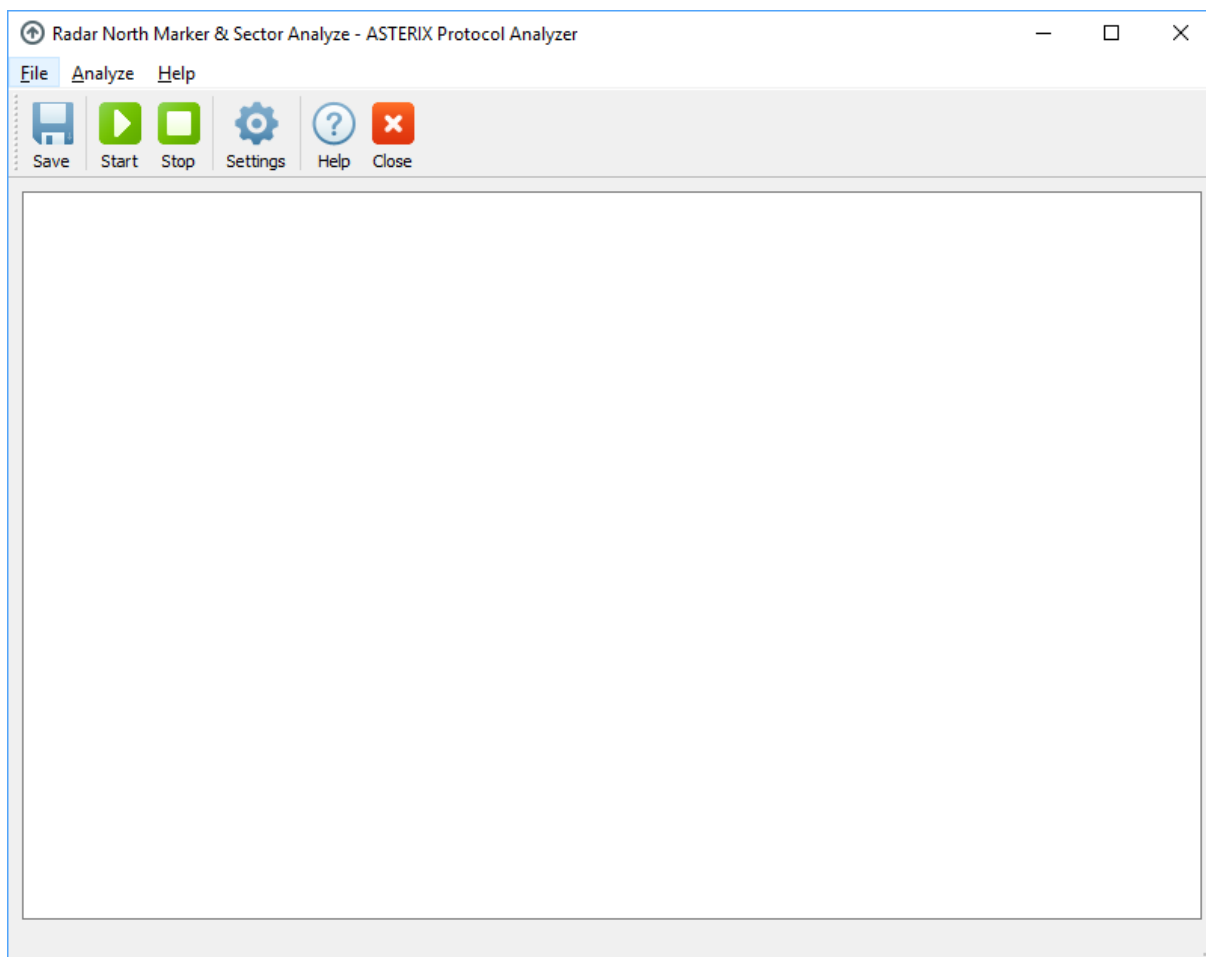


Figure 8.1: Main Window

Before starting analyze, it's necessary to open the configuration window by clicking on *Settings* button.

Radar North Marker & Sector Analyze - ASTERIX Protocol Analyzer

Radar

SAC/SIC 0 0

Rotation Period (sec) 5

Sector Number 32

UAP Automatic

Frame Type None

Analyze

☐ Verify SAC/SIC

☒ North Mark Missing

Delay Tolerance (%) 20

☒ Sector Missing

Recording File C:/ASTData/sample/radar.rex

OK Cancel

Figure 8.2: Settings Window

The meaning of each parameter is listed below.

Parameter	Description
-----------	-------------

SAC/SIC	SAC and SIC of radar
Rotation Period	Radar antenna rotation period
Sector Number	Number of sectors a radar will report in one antenna rotation
UAP	UAP of radar data
Frame Type	Frame type of radar data
Verify SAC/SIC	If selected, only data match SAC and SIC will be processed. If not selected, all data will be processed.
North Marker Missing	If selected, system will analyze radar north marker message missing

Parameter Description

Delay	Tolerance on north marker message delay, in a north marker is received more than
Tolerance	antenna rotation period + tolerance, system will assume one north marker message is missing in the middle
Sector Missing	If selected, system will analyze sector message missing
Recording File	Recording file for analyze, support rex and rei file

When all parameters are set, analyze can be started by clicking on *Start* button; and process can be interrupted by clicking on *Stop* button.

During the process, if any north marker or sector message missing is detected, a log message will be printed.

When analyze finish, statistic information will be printed.

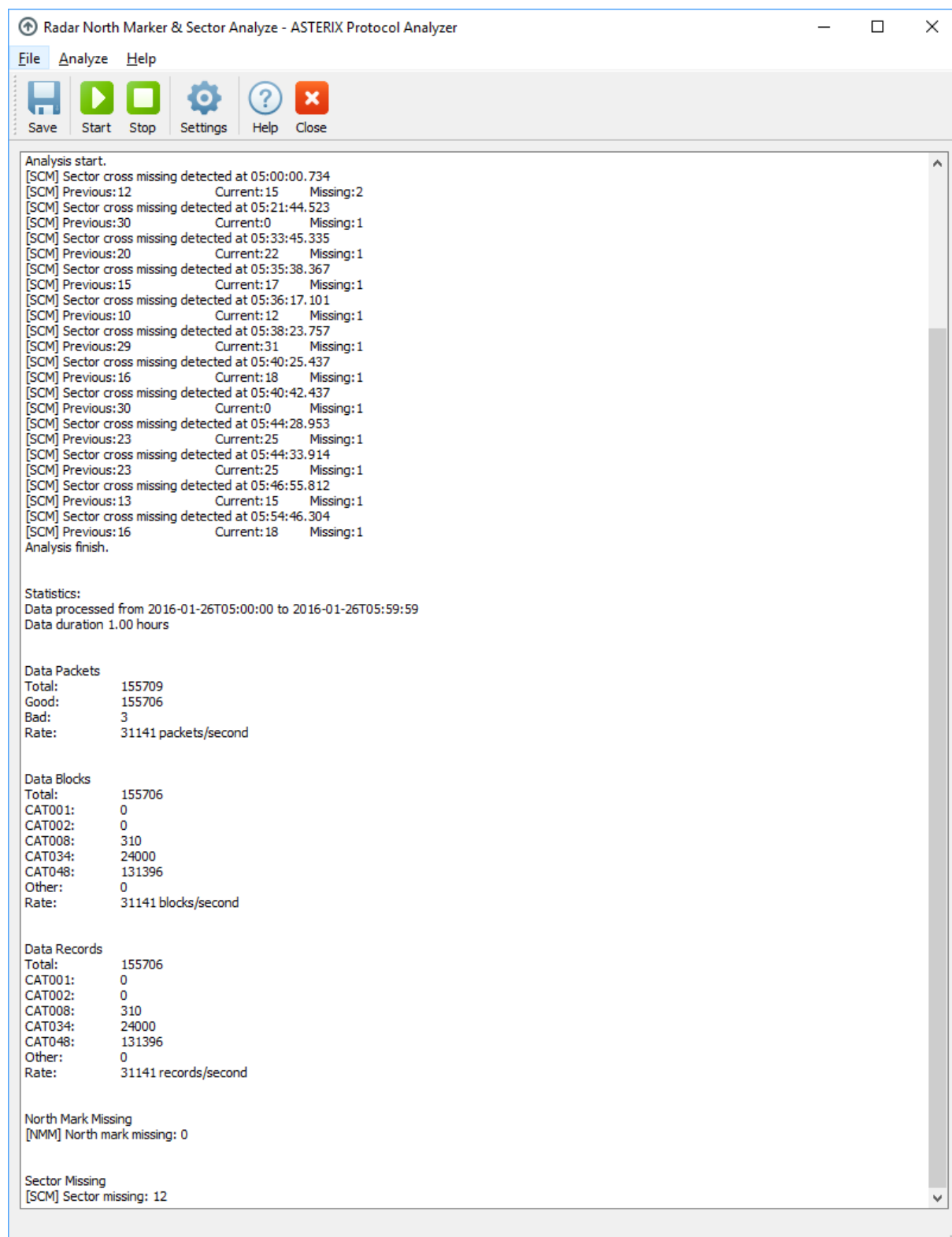


Figure 8.3: Process Log

9 Message Transmission Delay Analyze

9.1 Overview

The message transmission delay analyze tool is used to calculate delay time during transmission from surveillance sensor to receiver.

System will compare the timestamp encoded in ASTERIX message, which is the sensor transmission time (Tx), and the timestamp encoded in data packet, which is the receiving time (Rx). The difference between Rx and Tx is considered as transmission delay.

When the calculated is greater than a warning level, a message will be shown in log.

When the calculated is greater than a discard level, or is less than zero, it will not be used for further statistic, and a message will be shown in log.

9.2 Preparation

To generate a correct delay time, it requires:

- A valid Rx time is included in data packet
- A valid Tx time is included in ASTERIX data
- Both Rx and Tx time must be UTC time, or in a same time zone
- Both Rx and Tx clock must be synchronized with a common time source, normally GPS

The timestamp in the following dataitems will be used as Tx time:

- I002/030 - Time of Day
- I034/030 - Time of Day

9.3 User Interface

The main window of message transmission delay analyze tool is as below.

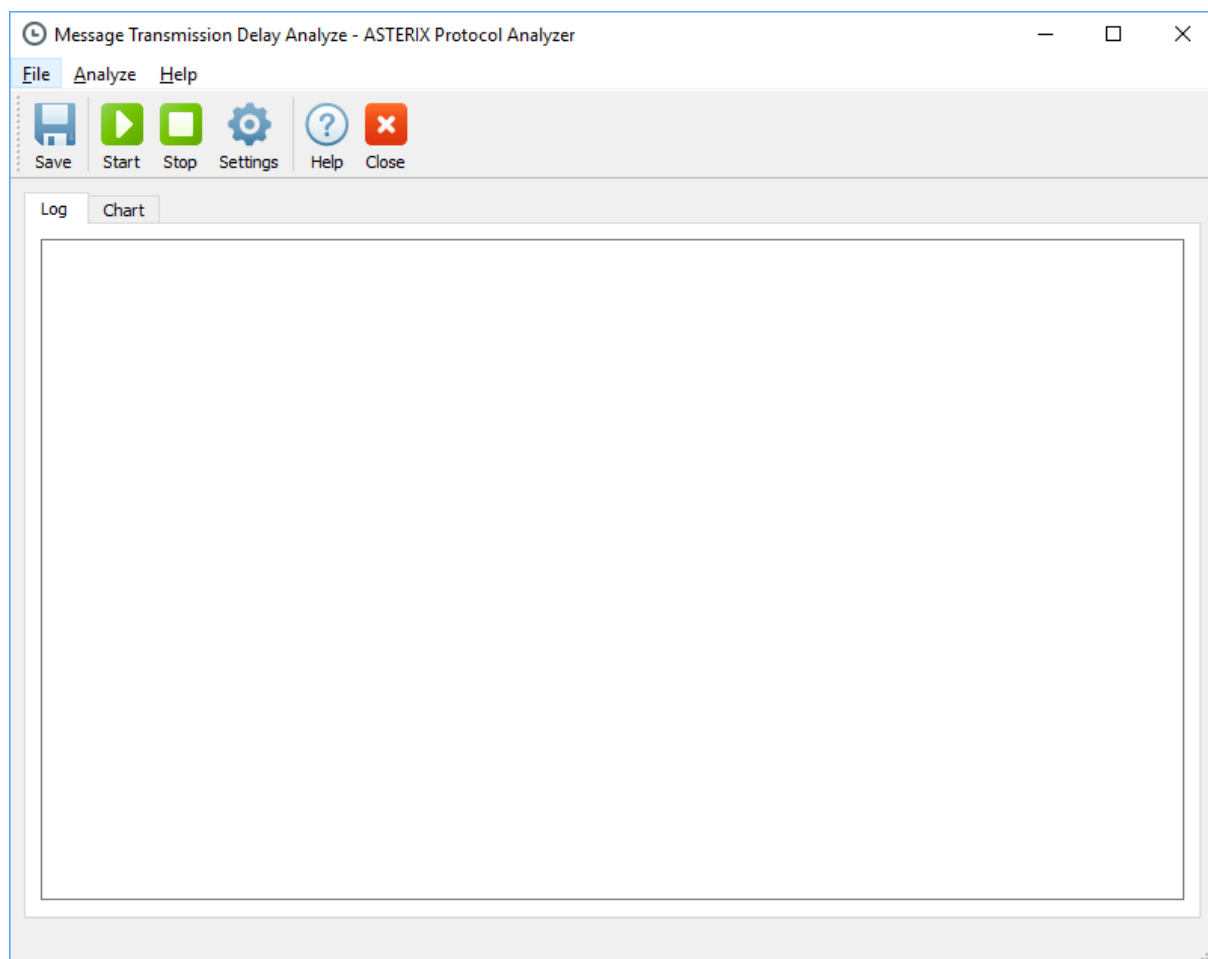


Figure 9.1: Main Window

Before starting analyze, it's necessary to open the configuration window by clicking on *Settings* button.

Message Transmission Delay Analyze - ASTERIX Protocol Analyzer

Sensor

SAC/SIC

UAP

Frame Type

Analyze

☐ Verify SAC/SIC

Warning threadhold (msec)

Maximum allowed delay (msec)

Recording File ...

Transmission Delay is available for packets with valid receiving timestamp.
It will compare receiving timestamp in packet and transmission timestamp in message to calculate transmission delay.
If the calculated delay is more than maximum allowed delay, the packet will be ignored.

Figure 9.2: Settings Window

The meaning of each parameter is listed below.

Parameter	Description
SAC/SIC	SAC and SIC of sensor
UAP	UAP of sensor data
Frame Type	Frame of sensor data
Verify SAC/SIC	If selected, only data match SAC and SIC will be processed. If not selected, all data will be processed.
Warning thread hold	If calculated delay is greater than this value, a log message will be printed
Maximum allowed delay	If calculated delay is greater than this value, a log message will be printed, and this delay will not be used in statistic
Recording File	Recording file for analyze, support rex and rei file

When all parameters are set, analyze can be started by clicking on *Start* button; and process can be interrupted by clicking on *Stop* button.

During the process, if any message match the warning or discard threshold, a log message will be printed.

When analyze finish, statistic information will be printed, and a delay chart will be shown in the *Chart* table.

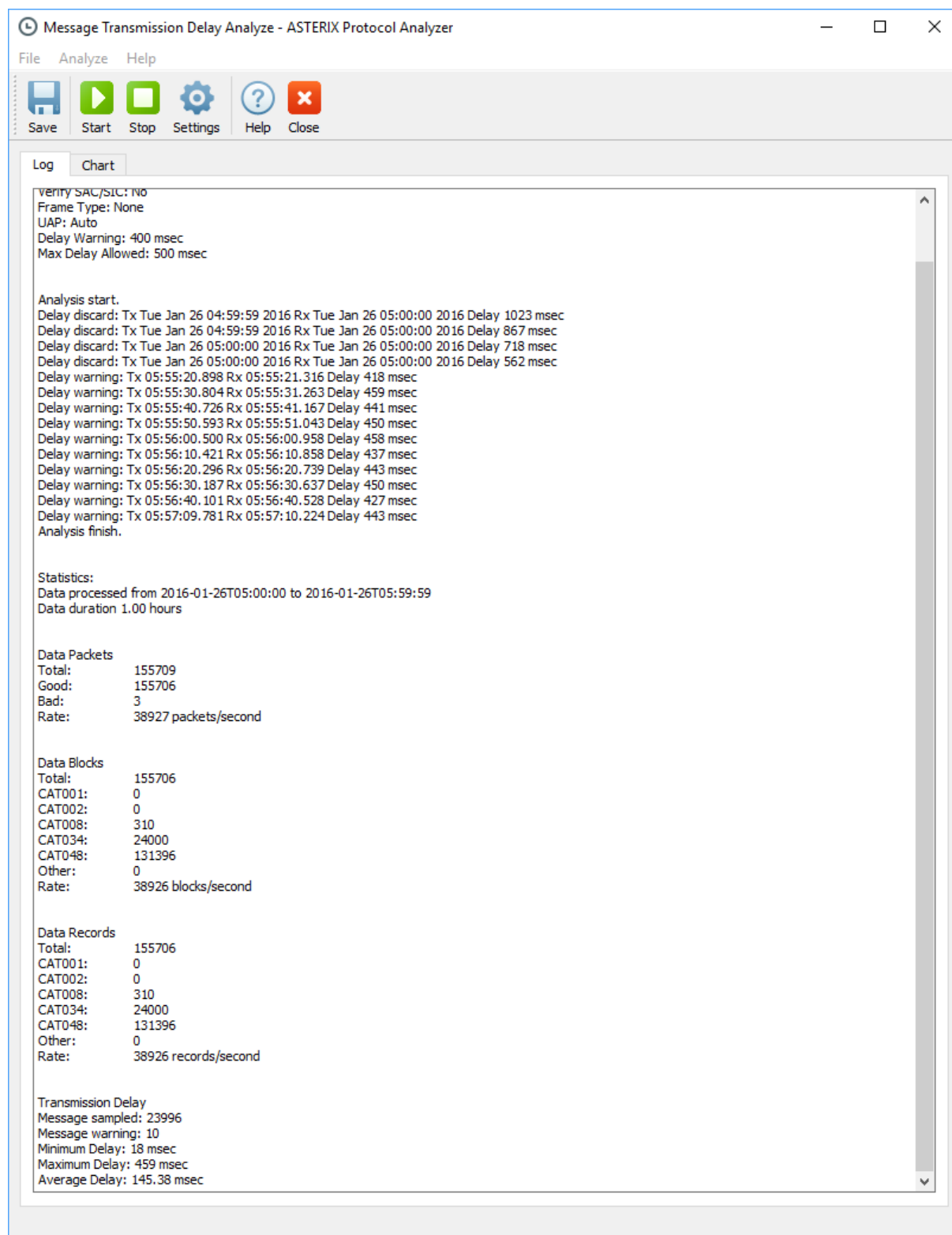


Figure 9.3: Process Log

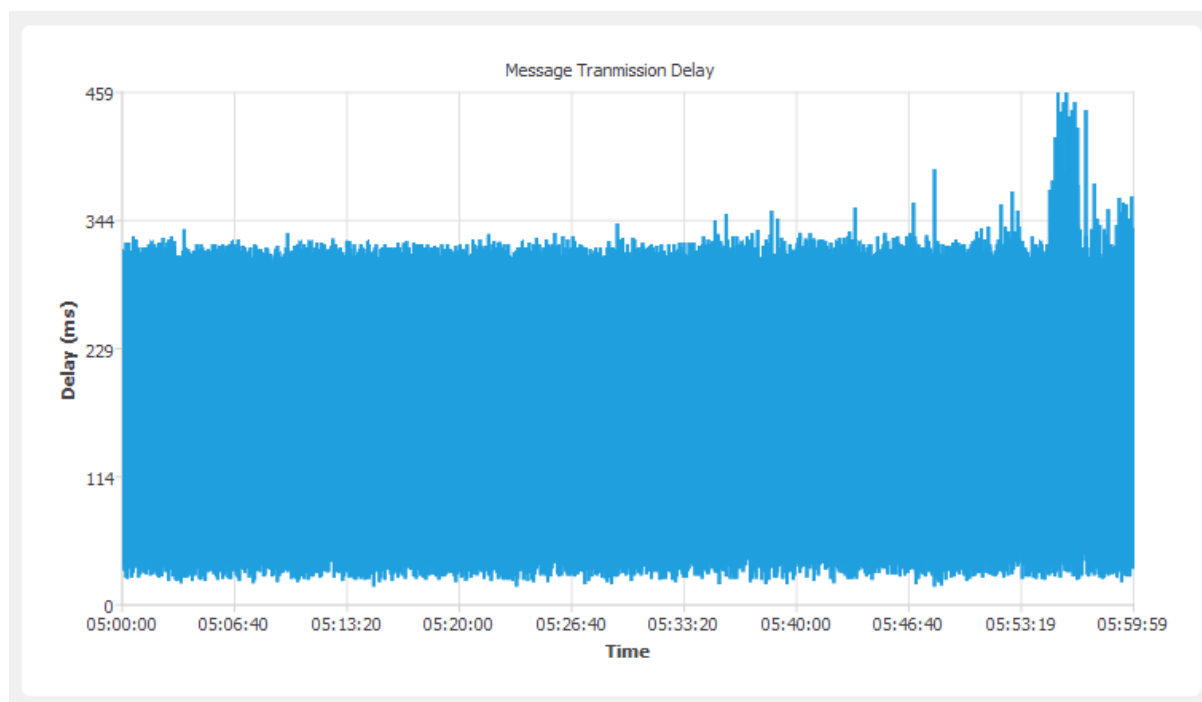


Figure 9.4: Delay Chart

10 Appendix

10.1 Change Log

10.1.1 Version 1

10.1.1.1 Version 1.24.0 Release 2022-12-23

- Support ASTERIX CAT015;
- Support ASTERIX CAT016;
- New column “Timestamp Rx” in list view;
- New column “Range” in list view;
- New column “Azimuth” in list view;
- New column “Doppler Velocity” in list view;
- Simple filter support “category”;
- UI improvement on Windows high DPI display;
- Support Windows 11;
- Update user manual;
- Bug fix.

10.1.1.2 Version 1.23.0 Release 2021-11-25

- New tool “Coordinate Calculator”;
- New column “Selected Altitude” in list view;
- KML output improves coordinate accuracy;
- Can specify WGS-84 coordinate format in settings;
- Bug fix.

10.1.1.3 Version 1.22.0 Release 2021-10-21

- New column “Velocity” and “Vertical Rate” in list view;
- New filter function;

- Support new Indra file format (OEM);
- Bug fix.

10.1.1.4 Version 1.21.0 Release 2021-03-22

- Remove WebKit dependency;
- Support Wisesoft frame type;
- Bug fix: crash when receiving data from UDP;
- Bug fix: stop when receiving data from UDP.

10.1.1.5 Version 1.20.0 Release 2020-12-25

- Support ASTERIX CAT021 v2.4;
- New recent files feature;
- KML export supports CAT021 data with valid track number.

10.1.1.6 Version 1.19.0 Release 2020-10-08

- Support ASTERIX CAT065;
- Update OEM functions.

10.1.1.7 Version 1.18.0 Release 2020-07-19

- New capture window to receive live data from UDP multicast/broadcast/unicast;
- File converter support REB file;
- Use offline help contents first;
- Update UI;
- Update OEM functions.

10.1.1.8 Version 1.17.0 Release 2020-06-12

- Rename to “Sky Analyzer for ASTERIX”;
- Support ASTERIX CAT004;
- Update OEM functions.

10.1.1.9 Version 1.16.2 Release 2020-04-10

- Update external interfaces;
- Bug fix: Introduce extra checking for UDP frame;
- Update copyright info.

10.1.1.10 Version 1.16.1 Release 2020-02-29

- REB format updated to version 2;
- Remove supports to REB format version 1;
- Support Google China Map;
- Remove supports to Open Street Map;
- Fix bugs.

10.1.1.11 Version 1.16.0 Release 2019-05-24

- Support ASTERIX CAT010 v1.10;
- Support ASTERIX CAT062 v1.16;
- Update depending libraries;
- Update copyright info;
- Fix bug in BDS5,0.

10.1.1.12 Version 1.15.0 Release 2018-07-11

- Launch external tools from menu and toolbar;
- Support new binary recording format;
- Fix bug in WGS-84 decoding.

10.1.1.13 Version 1.14.1 Release 2018-05-08

- Update depending libraries.

10.1.1.14 Version 1.14.0 Release 2018-04-18

- Support ASTERIX CAT240;
- New Settings window to configure hex and bin display;
- Improve tcpdump *.pcap file compatibility.

10.1.1.15 Version 1.13.0 Release 2018-01-07

- Support filter by ICAO address.

10.1.1.16 Version 1.12.0 Release 2017-12-14

- Support *.bin raw ASTERIX data file format;
- Bug fix: CAT021 Thales UAP.

10.1.1.17 Version 1.11.0 Release 2017-11-17

- Supports up to 64 datarecords in one datablock;
- Improved OEM support;
- Bug fix: I020/400 decode error;
- Bug fix: WGS-84 coordinate decode error.

10.1.1.18 Version 1.10.3 Release 2017-10-21

- Bug fix: SSR code in simple filter is not working.

10.1.1.19 Version 1.10.2 Release 2017-05-05

- Update user manual;
- File converter supports DataRP v1 format;
- Bug fix.

10.1.1.20 Version 1.10.1 Release 2017-04-08

- Alternative service provider for embedded map;
- Different color theme for detail display;
- User manual for radar coverage analyze.

10.1.1.21 Version 1.10.0 Release 2017-01-09

- New radar coverage analyze tool;
- Sensor status analyze has been separated into two parts;

- Support more property file formats;
- Bug Fix: No response when reading .ast file.

10.1.1.22 Version 1.9.0 Release 2016-12-11

- PDF export;
- 64-bit support on Windows;
- Windows XP not supported any more;
- CAT021 support encoding;
- Bug Fix.

10.1.1.23 Version 1.8.2 Release 2016-09-21

- Bug Fix: Can't stop reading multicast data.

10.1.1.24 Version 1.8.1 Release 2016-09-01

- Bug Fix: CAT021 v0.23 UAP error;
- Bug Fix: XML recording file extension error.

10.1.1.25 Version 1.8.0 Release 2016-06-25

- Support multiple datablocks in one packet;
- CAT001 support list view;
- Bug Fix.

10.1.1.26 Version 1.7.2 Release 2016-05-04

- Display sensor info by using libairdb;
- Bug Fix.

10.1.1.27 Version 1.7.1 Release 2016-04-04

- Support CAT021 version 2.x;
- Bug Fix: Track view polar coordination display;
- Bug Fix: File type match error for files with multiple suffix.

10.1.1.28 Version 1.7.0 Release 2016-02-23

- Lua script filter;
- New UI;
- Load sample data;
- Bug Fix: Crash when loading data file from index file.

10.1.1.29 Version 1.6.2 Release 2016-01-29

- Bug Fix: SSA NMM doesn't work and always report 0 north mark missing.

10.1.1.30 Version 1.6.1 Release 2016-01-27

- SSA NMM/SCM/TMD now works with CAT034;
- Improve performance when load large number (1 million and more) of packets;
- Improve performance of filter.

10.1.1.31 Version 1.6.0 Release 2016-01-26

- New SSA configuration window;
- SSA transmission delay (TMD) statistic function;

10.1.1.32 Version 1.5.0 Release 2016-01-09

- RDCUViewer function;
- RDCUExtractor function;
- Feature show/hide according to license file;

10.1.1.33 Version 1.4.0 Release 2015-12-23

- Filter out unmatched data records in one datablock;
- Export data to Google Earth;
- Export data to C struct;
- Site status analysis tool;
- File format conversion tool;
- Install license function;

10.1.1.34 Version 1.3.0 Release 2015-11-08

- Display country name/flag when Mode-S address is available;
- New frame type: iCON and UDP+iCON.

10.1.1.35 Version 1.2.3 Release 2015-09-22

- Fix crash on clicking data packet while filtering.

10.1.1.36 Version 1.2.2 Release 2015-09-18

- Improve filter performance;
- Display filter progress.

10.1.1.37 Version 1.2.1 Release 2015-08-12

- Support keyword “Mode-C”.

10.1.1.38 Version 1.2.0 Release 2015-03-31

- Auto UAP selection.

10.1.1.39 Version 1.1.0 Release 2015-03-27

- Support SiATM output format;
- Button to launch DataPlayback tool;
- Tool launch problem under Linux.

10.1.1.40 Version 1.0.0 Release 2015-01-19

- Adapt to liblicense;
- New UI icons.

10.1.2 Version 0

10.1.2.1 Version 0.9.0 Release 2014-12-16

- Adapt to libasterix 0.8.0;
- Adapt to libastfile 0.1.0;
- Adapt to liblicense.

10.1.2.2 Version 0.8.0 Release 2014-11-03

- Support VisualAST recording file format.

10.1.2.3 Version 0.7.0 Release 2014-10-07

- Improved UI;
- Live multicast input;
- Export list to CSV file;
- Export data to XML file;
- External tools;
- Register info collection.

10.1.2.4 Version 0.6.0 Release 2014-10-05

- New list view.

10.1.2.5 Version 0.5.1 Release 2014-09-26

- Show datarecord html detail.

10.1.2.6 Version 0.5.0 Release 2014-08-28

- Support AirNet recording file format;
- Show runtime info in about window.

10.1.2.7 Version 0.4.2 Release 2014-07-15

- Adapt to libasterix 0.7.0;
- New UAP for CAT001 plot.

10.1.2.8 Version 0.4.1 Release 2014-06-29

- Adapt to new qlicense lib.

10.1.2.9 Version 0.4.0 Release 2014-06-24

- Support RDCU recording file format;
- Increase file loading speed;
- Use standard Windows localtion for file access.

10.1.2.10 Version 0.3.0 Release 2014-03-09

- Filter function;
- Data frame type auto selection function.

10.1.2.11 Version 0.2.1 Release 2013-10-31

- Data frame type selection function.

10.1.2.12 Version 0.2.0 Release 2013-08-08

- Support tcpdump/Wireshark file format.

10.1.2.13 Version 0.1.2 Release 2013-08-07

- Adapt to libasterix 0.5.2;
- UAP selection function.

10.1.2.14 Version 0.1.1 Release 2013-07-25

- Adapt to libasterix 0.4.0;
- Print and “save as HTML” function for dataitem detail.

10.1.2.15 Version 0.1.0 Release 2013-07-21

- New look and feel in dataitem detail display.

10.1.2.16 Version 0.0.3 Release 2013-07-19

- Adapt to new libasterix headers.

10.1.2.17 Version 0.0.2 Release 2013-07-17

- Use WebKit to display dataitem details.

10.1.2.18 Version 0.0.1 Release 2013-07-10

- Initial release.