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 **A**ll Purpose **ST**ructured **E**urocontrol Su**R**veillance **I**nformation E**X**change (ASTERIX) format.

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File View Analyze Tool Help			
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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.

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

The supported categories and versions are:

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 embeded 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.

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Image: Copen Close <	CSV KML HTML PDF Coverage North Delay Cov	Calc RDCU Recorder Playback Main toolbar
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Status bar		4

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 tiles.

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.

radar.rex - ASTERIX Protocol Analyzer File View Analyze Tool Help	- 🗆 X
Image: State protection Image: State protection <td></td>	
Filter V 🤣 Lua 🗸 Apply 🗙 Clear	
Timestamp Size Dataitem Summary	
12479 2017-04-10 11:1425.740 16	
12480 2017-04-10 11:14:25.828 64	
12481 2017-04-10 11:14:25.853 56	
12482 2017-04-10 11:14:25:885 72	
12483 2017-04-10 11:14:25.913 64	
12484 2017-04-10 11:14:25.964 16	
12485 2017-04-10 11:14:26.087 16	
12486 2017-04-10 11:14:26.210 16	
12487 2017-04-10 11:14:26.336 16	
12488 2017-04-10 11:14:26:460 16	
12489 2017-04-10 11:14:26.583 16	
12490 2017-04-10 11:14:26:707 16	
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12492 2017-04-10 11:14:26.926 16	
12493 2017-04-10 11:14:26.975 64	
12494 2017-04-10 11:14:27.080 16	
12495 2017-04-10 11:14:27.168 16	
12496 2017-04-10 11:14:27.222 64	
12497 2017-04-10 11:14:27:329 16	
12498 2017-04-10 11:14:27.452 16	
12499 2017-04-10 11:14:27.575 16	
12500 2017-04-10 11:14:27.584 16 🗸	

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.

radar.rex - ASTERIX Protocol Analyzer File View Analyze Iool Help	- 0	1 ×
File Mcast Stop Tree Track Fram	■ UAP XML C/C++ CSV KML HTML PDF Coverage North Delay Conv Record Playback Simulator Help Exit	
Filter Timestamp Size 12479 2017-04-10 11:14:25.740 16 12480 2017-04-10 11:14:25.828 64 12481 2017-04-10 11:14:25.828 64 12482 2017-04-10 11:14:25.838 72 12483 2017-04-10 11:14:25.838 72 12484 2017-04-10 11:14:25.836 76 12485 2017-04-10 11:14:25.836 16 12486 2017-04-10 11:14:25.336 16 12487 2017-04-10 11:14:25.336 16 12488 2017-04-10 11:14:25.333 16 12489 2017-04-10 11:14:25.633 16 12491 2017-04-10 11:14:25.037 16 12492 2017-04-10 11:14:27.080 16 12492 2017-04-10 11:14:27.080 16 12492 2017-04-10 11:14:27.080 16 12492 2017-04-10 11:14:27.080 16 12492	✓ Lua ✓ Apply X Clear Dataitem Summary ✓ Data Block 1 0000 ✓ Data Block 1 24 c4 05 2c e0 22 03 bf 07 80 c6 30 0c 22 25 cf 8d ✓ Data Item 1048/101 SAC:070 SIC:249 0102 20 cc 08 80 03 58 00 04 0c 42 a2 2b 30 e0 0c Data Item 1048/102 TOPE:ROLL_CALL CHN2 016 00 0 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/000 MODE_C:0331 016 00 0 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/000 MODE_C:0331 016 00 0 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 ARD:112.1 THETA:350.3 01 60 00 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 MODE_C:0331 01 60 00 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 ARD:112.1 THETA:350.3 01 60 00 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 ACID:CBI384 016 00 00 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 ACID:CBI384 016 00 00 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 SD:40.60 0000 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 SD:40.60 0000 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 SD:40.60 0000 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200 SD:40.60 0000 04 07 bf 80 4c 46 20 f6 37 e7 b5 00 00 Data Item 1048/200	

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.

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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 toobar, input "CSC8753" in callsign field, and press *Apply*, packets contain flight "CSC8753" will be shown in the UI.

User Manual

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23936	2020-06-18 10:59:56.933	93						0010 0	08 3f (03 c6)	05 a4 80 00	60 03 30 aa	c8 78	0b 85	0d 30	f8 df 30 e0	5c e	0.1	`x.	0\.			
23937	2020-06-18 10:59:56.949	93						0030	60 80 3	la 63	37 a0	04 e8	50 00	e9 13	4f 1b	21 0	7	c7P	0.!.			
23938	2020-06-18 10:59:57.183	77						0040 e	el a6 1	58 40	22 f5 :	ff df	02 16	58 4d	ef 00	a0 7	1f	.X0"	.XM			
23939	2020-06-18 10:59:57.276	497						0060	4e 08 :	20 02	b2 24 1	bb 33	d3 01	a0 44	62 40	22 e	20 N.	\$.3.	Db@".			
23940	2020-06-18 10:59:57.307	186						0070 1	ff ff	02 16	58 4d	ee fe	a0 3d	1b 18	1d 02	b4 0	1.	XM	=			
23941	2020-06-18 10:59:57.495	439						0080 0	00 30 i	02 C6 aa 00	78 UC . 00 40 I	26 0a 01 4c	30 E3 11 09	ab 0c 19 5d	a0 01 05 48	a5 e	10 . ef .0	00.L.				
23942	2020-06-18 10:59:57.557	34£					-	00.00 4	40 22	FS FF	ff 02	16 58	4d ef	05 e0	23 f7	lb b	of 0'	"XM				
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23944	2020-06-18 10:59:57.775	374					Callsion	CSC8	753		C											
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23946	2020-06-18 10:59:58.041	294					JOIN A					- 11										
23947	2020-06-18 10:59:58.259	474					ICAO Ad	oress				- 11										
23948	2020-06-18 10:59:58.290	219					Level					- 11										
23949	2020-06-18 10:59:58.353	402					Track Nu	mber				- 1										
23950	2020-06-18 10:59:58.477	366					SAC/SIC			1		0	octet 2	- 30		c	Octet	3 - F8		Octe	t 4 -	DF
23951	2020-06-18 10:59:58.540	312										0	1 1 0	0 0 0	0 1	1	1 1	1 0 0	0 1	1 0 .	1 1	1 1
23952	2020-06-18 10:59:58.758	478					Clea	ar	Apply		Close	0	ctet 6	- E0		0	Octet	7		Octe	t 8 -	
23953	2020-06-18 10:59:58.774	92						0 1	0 1	1 1	0 0	1 1	1 0 (0 0 0	0 -	-						
23954	2020-06-18 10:59:58.977	364						Detail	ld Deed	vintio												
23955	2020-06-18 10:59:59.008	143						Detail	Bit	Item	Value											
23956	2020-06-18 10:59:59.179	22						Bit [0	0-5]	CHAR_1	c											
23957	2020-06-18 10:59:59.226	281						Bit [6	6-11]	CHAR_2	s											
23958	2020-06-18 10:59:59.445	109						Bit[]	12-17]	CHAR_3	c											
23959	2020-06-18 10:59:59.445	22						Bit[]	18-23]	CHAR_4	8											
23960	2020-06-18 10:59:59.679	92						Bit [2	24-29]	CHAR_S	7											- I
23961	2020-06-18 10:59:59.694	67						Bit[3	su-25] 36-411	CHAR_6	3											
23962	2020-06-18 10:59:59.928	93						Bit[4	42-471	CHAR 8												
23963	2020-06-18 10:59:59.944	22																				

Figure 2.7: Filter Window

User Manual

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2	2020-06-18 10:41:34.374	470	✓ Data R	lecord 1		SIC 000			0020 0.	1 10 0 3 a8 8	01 06 86 46	22 f5	ff ff	02 16	58 4b	02 44	48 U/ a0 83	/	XK.i			
3	2020-06-18 10:41:42.376	471	Da	ita item 1048/0 ita item 1048/1	10 SAC:024 40 TOD-10-	16:34 742			0040 9	27 5	58 27	52 05	63 60	01 bc	78 07	26 Oc	80 b6	5 .'X'R.c	x.6			
4	2020-06-18 10:41:46 350	471	Da	ta Item 1048/0	20 TYPE:R0	OLL CALL C	HN1		0050 cl	b 2d (60 01	bc c0	00 30	b8 00	00 40	03 24	36 18	8`0	@.\$6.			'
1	2020-00-16 10:41:40.333	4/1	Da	ata Item 1048/0	40 RHO:19	9.9 THETA:4	6.9		0060 2	5790	08 82	21 0d	40 22	fd ff	ff 02	16 58	4b c5	5 %y!.@'	XK.			
0	2020-06-18 10:41:50.383	4/9	Da	ata Item 1048/0	70 MODE_	3/A:4077			0070 5	c au : c 40 t	9a 10 f8 e3	20 40 7d e0	03 ae	18 00	30 a4	00 00	40 d4	4				
6	2020-06-18 10:41:54.370	486	Da	ata Item 1048/0	90 MODE_	C:0341			0090 1	a 57 2	2b a0	04 01	60 80	3a 65	36 a0	04 dc	50 05	5 .W+`	:e6P.			
7	2020-06-18 10:41:58.364	479	Da	sta Item 1048/1	30 SUBFIEL	DS:02/07			00a0 1	7360	dc 36	1d 07	c3 a6	58 40	22 f5	ff ff	02 16	6 .6.6	x@"			
8	2020-06-18 10:42:02.357	479	Da	ta item 1048/2 ta item 1048/2		SUB85 C8753		- 11	00b0 5	84b (c5 68	e0 2d	1 1d 26	ab 03	5a 03	89 70	03 cc	2 XK.h8	Zp			
9	2020-06-18 10:42:06.360	471	Da	ta Item 1048/2	50 BDS:1,0			- 1	0000 1	/ /0 \	04 73	00 30	09 03	70 60	03 00	00 00	21 10	.x.s.o	1/.			_
10	2020-06-18 10:42:14 371	486	Da	ata Item 1048/1	61 TRACK	NUM:0233			Data	a Ite	em	1048	3/240) - A	ircra	aft lo	lent	tificati	on			1
11	2020 06 10 10 42 10 257	470	Da	sta Item 1048/0	42 X:27042	0.9 Y:25291	3.8 LSB:N	1														
	2020-00-10 10.42.10.337	470	Da	ita Item 1048/2	00 SPD:443	.63 HDG:23	6.99		Summa	ary												
12	2020-06-18 10:42:22.379	480	Da	ita item 1048/ 1 ita item 1048/2	70 TYPE:53 30 ES-AIR	ĸ			ACID:CSC8	753												
13	2020-06-18 10:42:26.359	478	✓ Data R	Record 2	50 T 5.AIT																	
14	2020-06-18 10:42:30.369	470	Da	ata Item 1048/0	10 SAC:022	SIC:088			Raw Da	ata in	Binar	У										
15	2020-06-18 10:42:34.351	486	Da	ata Item 1048/1	40 TOD:10:	46:34.820				Oatat	1 - 01			Detet 2	- 20		0.	atot 2 - F0		Oata	- 4 -	DE
16	2020-06-18 10:42:38.376	498	Da	sta Item 1048/0	20 TYPE:RO	OLL_CALL C	HN1		0.0	000000	1 - 01	0.1		1 1	0 0 0	0 1	1 1	1 1 0	0 0 1	1 0		1 1
17	2020-06-18 10:42:42.370	423	Da	sta Item 1048/0	40 RHO:13	1.6 THETA:	15.3 400TUE			Ootot	5 - 50			latot 6	- 20	, 0 1	1 1	. 1 1 0		Ooto		
18	2020-06-18 10:42:46 375	455	Da	ita Item 1048/0	90 MODE	C:0344	1001112		0 1	0 1	1 1	0.0	1 1	1 0	0 0 0	0 -						
10	2020-00-10-10.42.40.575	400	Da	ta Item 1048/1	30 SUBFIEL	DS:02/07				• -				1 0								
19	2020-06-18 10:42:50.368	431	Da	sta Item 1048/2	20 ADDR:7	80726			Detaild	Desc	riptio	n										
20	2020-06-18 10:42:54.348	447	Da	ata Item 1048/2	40 ACID:CI	HB6225			Bi	t	Item	Valu	e									
21	2020-06-18 10:42:58.347	431	Da	sta item 1048/2	50 BDS:4,0				Bit[0-	-5]	CHAR	1 C										
22	2020-06-18 10:43:02.341	447	Da	ata Item 1048/1	42 X:20036	3.2 Y:13879	8.7 L SB·N	4	Bit[6-	-11]	CHAR	2 S										
23	2020-06-18 10:43:06.335	431	Da	ata Item 1048/2	00 SPD:478	.56 HDG:46	.48		Bit[12	-17]	CHAR	з с										
24	2020-06-18 10:43:10.344	447	Da	ata Item 1048/1	70 TYPE:SS	R			Bit[18	-23]	CHAR	4 8										
25	2020-06-18 10-43-14 227	423	Da	ata Item 1048/2	30 FS:AIR				Bit[24	-29]	CHAR_	5 7										
26	2020 06 10 10:43:14:337	455	V Data R	(ecord 3	10 540-02	510.000			Bit[30	-25]	CHAR_	6 5										1
20	2020-00-16 10:43:18.331	400	Da	ita item 1048/0 ita item 1048/1	10 SAC:024 40 TOD-10-	16-34 718			Bit[30	5-41]	CHAR	7 3										
27	2020-06-18 10:43:22.325	431	Da	sta Item 1048/0	20 TYPE:R0	OLL CALL C	HN1		Bit[42	-47]	CHAR_	8										
28	2020-06-18 10:43:26.334	447	Da	ata Item 1048/0	40 RHO:15	4.1 THETA:4	15.4															
29	2020-06-18 10:43:30.327	431																				

Figure 2.8: Tree View

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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		40775	34100		34096			CSC8753	780B85					R:198	.4805	T:046.99				
4	CHN	022/088	10:46:50.718	Track	233		40775	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:23
5	CHN	022/088	10:46:58.718	Track	233		4077	34100		34096			CSC8753	780B85					R:197	.0195	T:046.93				T:30(
7	CHN	022/088	10:47:02.726	Track	233		4077	34100		34096			CSC8753	780B85					R:196	.5391	T:046.75				M:23
3	📕 CHN	022/088	10:47:06.710	Track	233		40775	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:23
0	🔲 CHN	022/088	10:47:18.703	Track	233		4077	34100		34096			CSC8753	780B85					R:194	.6016	T:046.85				M:23
1	📕 CHN	022/088	10:47:22.703	Track	233		4077S	34100		34096			CSC8753	780B85					R:194	.1211	T:046.82				
2	📕 CHN	022/088	10:47:26.710	Track	233		4077	34100		34096			CSC8753	780B85					R:193	.6367	T:046.70				M:239
3	CHN	022/088	10:47:30.695	Track	233		4077S	34100		34096			CSC8753	780B85					R:193	.1523	T:046.85				
4	📕 CHN	022/088	10:47:34.710	Track	233		4077S	34100		34096			CSC8753	780B85					R:192	.6680	T:046.69				M:23
.5	📕 CHN	022/088	10:47:38.695	Track	233		4077	34100		34096			CSC8753	780B85					R:192	.1836	T:046.74				T:30(
6	📒 CHN	022/088	10:47:42.695	Track	233		4077	34100		34096			CSC8753	780B85					R:191	.7031	T:046.72				M:239
.7	📕 CHN	022/088	10:47:46.679	Track	233		4077S	34100		34096			CSC8753	780B85					R:191	.2227	T:046.77				
8	📕 CHN	022/088	10:47:50.695	Track	233		4077	34100		34096			CSC8753	780B85					R:190	.7344	T:046.72				M:23
9	📕 CHN	022/088	10:47:54.679	Track	233		40775	34100		34096			CSC8753	780B85					R:190	.2578	T:046.69				
:0	CHN	022/088	10:47:58.687	Track	233		4077	34100		34096			CSC8753	780B85					R:189	.7656	T:046.65				M:239
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:23
13	📕 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:23
25	CHN	022/088	10:48:18.664	Track	233		4077S	34100		34096			CSC8753	780B85					R:187	.3555	T:046.68				
16	📕 CHN	022/088	10:48:22.679	Track	233		4077	34100		34096			CSC8753	780B85					R:186	.8711	T:046.56				M:23
27	CHN	022/088	10:48:26.664	Track	233		40775	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.

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1	Countr	V SAC/SIC	Time Stamp	Type	rack Numbe	Mode 3/A	Flight Level	Callsign	ICAO Address	Polar Coor	dinates	WGS84 Coordinat	e: Speed	Head
2	GBR	070/249	00:04.2	Track	16	7244S	361	KTK2422	4249D2	R:112.2617	T:353.44			
3	GBR	070/249	00:08.2	Track	16	7244S	361	KTK2422	4249D2	R:112.7656	T:353.46			
4	GBR	070/249	00:12.2	Track	16	7244S	361	KTK2422	4249D2	R:113.2656	T:353.52			
5	GBR	070/249	00:16.1	Track	16	7244	361	KTK2422	4249D2	R:113.7617	T:353.58			
6	GBR	070/249	00:20.1	Track	16	7244S	361	KTK2422	4249D2	R:114.2617	T:353.59			
7	GBR	070/249	00:24.1	Track	16	7244S	360	KTK2422	4249D2	R:114.7617	T:353.59			
8	GBR	070/249	00:28.0	Track	16	7244S	361	KTK2422	4249D2	R:115.2617	T:353.63			
9	GBR	070/249	00:32.0	Track	16	7244	360	KTK2422	4249D2	R:115.7656	T:353.65			
10	GBR	070/249	00:36.0	Track	16	7244S	360	KTK2422	4249D2	R:116.2617	T:353.69			
11	GBR	070/249	00:40.0	Track	16	7244S	361	KTK2422	4249D2	R:116.7578	T:353.73			
12	GBR	070/249	00:43.9	Track	16	7244S	361	KTK2422	4249D2	R:117.2578	T:353.74			
13	GBR	070/249	00:47.9	Track	16	7244	361	KTK2422	4249D2	R:117.7578	T:353.81			
14	GBR	070/249	00:51.9	Track	16	7244S	361	KTK2422	4249D2	R:118.2578	T:353.84			
15	GBR	070/249	00:55.8	Track	16	7244S	361	KTK2422	4249D2	R:118.7539	T:353.82			
16	GBR	070/249	00:59.8	Track	16	7244S	361	KTK2422	4249D2	R:119.2539	T:353.88			
17	GBR	070/249	01:03.8	Track	16	7244	360	KTK2422	4249D2	R:119.7539	T:353.91			
18	GBR	070/249	01:07.7	Track	16	7244S	360	KTK2422	4249D2	R:120.2539	T:353.94			
19	GBR	070/249	01:11.7	Track	16	7244S	360	KTK2422	4249D2	R:120.7539	T:353.98			
20	GBR	070/249	01:15.7	Track	16	7244S	361	KTK2422	4249D2	R:121.2500	T:354.06			
21	GBR	070/249	01:19.7	Track	16	7244	360	KTK2422	4249D2	R:121.7500	T:354.07			
22	GBR	070/249	01:23.6	Track	16	7244S	360	KTK2422	4249D2	R:122.2500	T:354.10			
	000	070/040	01.07.0	T!-	10	70440	001	ICTICO 400	404000	D-100 7000	T.054.00			
	•	K1K2422	(+)						: 4					
REA	DY													+ 100%

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.

Q index.rei - Sky Analyzer for ASTERIX	C Title bar		- 🗆 ×
File View Analyze Tool Help	Menu bar		
Open Close Capture Message	List Filter Lua Clear Frame UAP	+ CSV KML HTML PDF Coverage North Delay Conv	alc RDCU Recorder Playback Help Exit
Timestamp Size	Dataitem Summary	0000 3e 04 f9 bf 5d a6 01 01 00 04 3c 80 00 64 5	51 00 >] <dq.< th=""></dq.<>
1 2016-01-01 01:00:00.000 16	✓ Data Block 1	0010 01 6e 51 20 06 74 d4 f8 93 2b 01 be fc af 0	08 43 .nQ .t+C
2 2016-01-01 01:00:00.458 44	Data Record 1 Data Inco 1052/010 SAC:001 SIC:001	0030 d2 05 c8 05 c8 00 24 00 00 00 00 00 00 6d 6	50 08\$m`.
3 2016-01-01 01:00:00.498 44	Data Item 1062/010 SAC:001 SIC:001	0040 2e 00 00 01 00 00 63 0b 76 01 11 01 4e f0 0	05 c9c.vN
4 2016-01-01 01:00:00.698 16	Data Item 1062/070 TOD:00:36:09.000	0050 00 00 5f a8 4a 4a 41 33 34 30 32 80 42 37 3	33 38JJA3402.B738
5 2016-01-01 01:00:00 722 56	Data Item I062/105 WGS84:351603N1284660E	0070 bf 5d a4 01 01 00 04 3c 80 00 67 30 20 01 0	e d0 .1<
5 2016 01 01 01 00 00 00 00	Data Item 1062/100 X:211562.0 Y:-243306.0 LSB:M	0080 40 06 d9 a8 fc 01 b1 fd 99 01 9d 06 af c1 (01 01 @
0 2010-01-01 01:00:00.000 80	Data Item 1062/165 VX:111.30 VY:-212.00 LSB:IVI/: Data Item 1062/060 MODE 3/4:4103	0090 40 7b b0 5d 82 08 20 82 08 20 00 00 00 c3 0	01 01 @{.]
7 2016-01-01 01:00:00.458 68	Data Item 1062/380 SUBFIELDS:15/28	00b0 01 4e f0 04 60 00 00 6f 0d a4 01 01 00 04 3 00b0 00 68 84 00 01 6d 96 60 05 a2 ce fd 8f 21 0	3C 80 .N
8 2016-01-01 01:00:00.498 20	Data Item I062/040 TRACK_NUM:2934	00c0 00 7b 00 48 01 01 01 5e fc 01 f0 00 00 bf	ld a4 .{.H^M.
9 2016-01-01 01:00:00.698 20	Data Item 1062/080 TRACK_STS:MULTI	Data Dagard 1000	
10 2016-01-01 01:00:00.000 42	Data Item 1062/200 TOND LOND VILEVEL Data Item 1062/136 LEVEL-37025 LSR-ET	Data Record - 1062	
11 2016-01-01 01:00:00.458 40	Data Item 1062/220 VH:0.00 LSB:FT/MIN	Row Data in Havadaaimal	1
12 2016-01-01 01:00:00.498 33	Data Item I062/390 SUBFIELDS:08/14	Kaw bata in nexadecinal	
13 2016-01-01 01:00:00.698 40	 Data Record 2 Main view 	Octet 1	Octet 16
14 2016-01-01 01:00:00.000 11	Data Item 1062/010_SAC:001_SIC:001 Data Item 1062/015_SVC_ID:000	BF 5D A4 01 01 00 04 3C 80 00 67 30 20	01 6E D0
15 2016-01-01 01:00:00 458 59	Data Item 1062/070 TOD:00:36:09.000	40 06 D9 A8 FC 01 B1 FD 99 01 9D 06 AF	C1 01 01
16 2016-01-01 01:00-00 498 64	Data Item 1062/105 WGS84:361637N1285728E	40 7B B0 5D 82 08 20 82 08 20 00 00 00	C3 01 01
17 2015 01 01 01 00 00 500 54	Data Item 1062/100 X:224468.0 Y:-130855.0 LSB:N	01 4E F0 04 B0 00 00	
17 2016-01-01 01:00:00.698 64	Data Item 1062/185 VX:-153.50 VY:103.25 LSB:M/!	List of Dataitoms	
18 2016-01-01 01:00:00.000 12/3	Data Item 1062/380 SUBFIELDS:03/28		
	Data Item I062/040 TRACK_NUM:0195	Dataitem Name S	Size Summary
	Data Item I062/080 TRACK_STS:MULTI	I062/010 Data Source Identifier (02 SAC:001 SIC:001
	Data Item 1062/200 T:UND L:UND V:LEVEL	I062/015 Service Identification (01 SVC_ID:000
	Data Item 1062/230 VH:0.00 LSB:FT/MIN	I062/070 Time of Track Information (03 TOD:00:36:09.000
	✓ Data Record 3	I062/105 Calculated Position in WGS84 Coordinates (08 WGS84:361637N1285728E
	Data Item 1062/010 SAC:001 SIC:001	I062/100 Calculated Track Position (Cartesian) (06 X:224468.0 Y:-130855.0 LSB:M
	Data Item 1062/015 SVC_ID:000	I062/185 Calculated Track Velocity (Cartesian) (04 VX:-153.50 VY:103.25 LSB:M/S
	Data Item 1062/107 IOD:00:30:09.000 Data Item 1062/105 WGS84:364438N1283137E	1062/060 Track Mode 3/A Code (02 MODE_3/A:3257
	Data Item 1062/100 X:184679.0 Y:-79983.0 LSB:M	1062/380 Aircraft Derived Data	TDACK NUM-0105
	Data Item 1062/185 VX:226.25 VY:30.75 LSB:M/S	TO62/080 Track Status	A TRACK_NUMIUTI
	Data Item 1062/040 TRACK_NUM:0072	1002/000 LEACE Status	TRACK_SIS.HUBII
Stat	us 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.



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	
	Radar Raytheon	UAP used by Raytheon radar	
Analyz	eRadar Coverage	Open radar coverage analyze tool	See detail in relative section
	Radar 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</i> <i>Playback</i> application	

Menu	Menuitem	Description	Note
	ASTERIX Playback	Launch ASTERIX Playback application	
	ASTERIX Simulator	Launch ASTERIX Simulator application	
	Options	Open Options Window	
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 About Window	

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.

Help Exit	
Help Exit	
ng	
ng	^
ng	,
ng	

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	

User Manual

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
Туре	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

T Filter - Sk	y Analyzer for ASTERIX X
Callsign	CSC8753
Squawk	
ICAO Address	
Level	·
Track Number	
SAC/SIC	/
Clear	Apply 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.
🔍 Lua Script Filter - ASTERIX Protocol Analyzer		×
Title Untitled Lua Filter		
[[The following variables from ASTERIX data have been extracted and set:		
record = { category //34 sac //12 sic //252 msgtype //track tracknum //798 squawk //3065 callsign //SAI1401 icaoaddr //18932 flightlevel //31000 }J]		
Result		
Test	Apply	Close

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.

🔍 Lua Script Filter - ASTERIX Protocol Analyzer		×
Title Untitled Lua Filter		
[[The following variables from ASTERIX data have been extracted and set:		
record = { category //34 sac //12 sic //252 msgtype //track tracknum //798 squawk //3065 callsign //SAI1401 icaoaddr //18932 flightlevel //31000 }		
]] if (record.squawk == 3065) then return true; else return false end		
Result Script return true Test	Apply	Close

Figure 4.6: Lua Filter Test Success

🔍 Lua Script Filter - ASTERIX Protocol Analyzer	\times
Title Untitled Lua Filter	
[[The following variables from ASTERIX data have been extracted and set:	
record = { category //34 sac //12 sic //252 msgtype //track tracknum //798 squawk //3065 callsign //SAI1401 icaoaddr //18932 flightlevel //31000 }]]	
<pre>if (record.squawk = 3065) then return true; else return false end Result [string "function match(record)"]:19: ')' expected near '='</pre>	
Test Apply Close	

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.

🔍 File Converter - ASTERIX Protocol Analyzer	×
Input File Name File Type AsterixTk Recording Frame Type No Frame Output	
File Name File Type AsterixTk Recording Info	
Convert Clear Log	Close

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.

🔍 File Conv	erter - ASTERIX Protocol Analyzer		×
Input			
File Name			
File Type	AsterixTk Recording 🔻 Frame T	npe No Frame 🔻	
Output	AsterixIk Index topdump Capture		
File Name	Raw ASTERIX Recording RDCU Recording		
File Type	AirNet Log ATMSys Recording DISCC Log		
Info	CaptMsjLAN Recording		
Co	wert Clear Log		Close

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.

🔍 File Converter - ASTERIX Protocol Analyzer	×
Input	
File Name	
File Type AsterixTk Recording 🔻 Frame Type No Frame 🔻	
Output HDLC UDP	
File Name	
File Type AsterixTk Recording 🔻	
Info	
Convert Clear Log Close	

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 regarding less the file name suffix.

🔍 File Converter - ASTERIX Protocol Analyzer	×
Input	
File Name	
File Type AsterixTk Recording 🔻 Frame Type No Frame 🔻	
Output	
File Name	
File Type AsterixTk Recording -	
Info Raw ASTERIX Recording DataRP Recording Version 1	
Convert Clear Log Clos	se

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.

🔍 File Converter - ASTERIX Protocol Analyzer	×
Input File Name C:/ASTDATA/sample/radar.rex File Type AsterixTk Recording ▼ Frame Type No Frame ▼]
Output File Name C:/ASTDATA/sample/radar.ast File Type Raw ASTERIX Recording ▼ T-f:	
Into [11:33:19] 42500 data pakeets converted. [11:33:19] 43000 data pakeets converted. [11:33:19] 43500 data pakeets converted. [11:33:19] 44000 data pakeets converted. [11:33:19] 44500 data pakeets converted. [11:33:19] 45500 data pakeets converted. [11:33:19] 45500 data pakeets converted. [11:33:19] 46500 data pakeets converted. [11:33:19] 46500 data pakeets converted. [11:33:19] 46500 data pakeets converted. [11:33:19] 47500 data pakeets converted. [11:33:19] 47500 data pakeets converted. [11:33:19] 47500 data pakeets converted. [11:33:19] 47500 data pakeets converted. [11:33:19] 47592 data pakeets converted. [11:33:19] Convertion finish.	
Convert Clear Log Close	

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

- 1062/040 Track Number
- 1062/105 Calculated Track Position (WGS-84)
- 1062/380 Aircraft Derived Data, subfield #1

6.2 Operation

The Google Earth KML export dialog is as below.

🔍 KML Export - ASTERIX Protocol Analyzer	×
Flight Identification Identify flight by Track Number Track Number Track Number KML Style ICAO 24-bit Address I Static Tracjectory Dynamic Track	
Flight Level For plot with invalid level/mode-c Use level from previous plot () Set level to zero (0)	
Save and Load Save MML file to C:/ASTDATA/sample/flights.kml Google Earth is detected at Auto load in Google Earth	
OK Cancel	

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</i> 24-bit address.
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 Google Earth 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
- 1001/040 Measured Position in Polar Coordinates
- I001/090 Mode-C Code in Binary Representation

For CAT048

- I048/010 Data Source Identifier
- 1048/040 Measured Position in Slant Polar Coordinates
- 1048/090 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.





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

ActionsDescription		
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	
Setting	gOpen configuration window	
Proces	sStart 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 Pr	otocol Analyzer X
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 Pr	rotocol Analyzer X	
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) 98 ÷	
Feed Dir c:/ASTDATA/coverage/feed		
	Caller	

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
- 1002/030 Time of Day
- I002/020 Sector Number

Category 034

- 1034/000 Message Type
- 1034/030 Time of Day
- 1034/020 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.

User Manual

💮 Radar North Marker & Sector Analyze - AS	TERIX Protocol Analyzer X
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 Tolarance (%) 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	Tolerance on north marker message delay, in a north marker is received more than 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.

User Manual

💮 Radar Norti	th Marker & Sector Analyze - ASTERIX Protocol Analyzer		×
<u>F</u> ile <u>A</u> nalyze	Help		
Save Start	t Stop Settings Help Close		
Analysis start. [SCM] Sector or [SCM] Previous [SCM] Sector or [SCM] Previous [SCM] Sector or [SCM]	tross missing detected at 05:00:00.734 s:12 Current:15 Missing:2 tross missing detected at 05:21:44.523 s::30 Current:0 Missing:1 tross missing detected at 05:33:45.335 s:20 Current:22 Missing:1 tross missing detected at 05:33:45.335 s:20 Current:22 Missing:1 tross missing detected at 05:33:36.76 s::15 Current:17 Missing:1 tross missing detected at 05:36:17.101 s:15 Current:12 Missing:1 tross missing detected at 05:36:37.7 s:29 Current:12 Missing:1 tross missing detected at 05:40:25.437 s:16 Current:18 Missing:1 tross missing detected at 05:40:24.24.37 s:30 Current:0 Missing:1 tross missing detected at 05:44:28.953 s:23 Current:25 Missing:1 tross missing detected at 05:44:33.914 s:23 Current:25 Missing:1 tross missing detected at 05:44:64:55.812 s:13 Current:15 Missing:1 tross missing detected at 05:54:46.304 s:16 Current:18 Missing:1		
Statistics: Data processed Data duration 1	d from 2016-01-26T05:00:00 to 2016-01-26T05:59:59 1.00 hours		
Data Packets Total: Good: Bad: Rate:	155709 155706 3 31141 packets/second		
Data Blocks Total: CAT001: CAT002: CAT008: CAT034: CAT048: Other: Rate:	155706 0 310 24000 131396 0 31141 blocks/second		
Data Records Total: CAT001: CAT002: CAT034: CAT048: Other: Rate: North Mark Miss	155706 0 0 310 24000 131396 0 31141 records/second		
[NMM] North ma Sector Missing [SCM] Sector m	nark missing: 0		*

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:

- 1002/030 Time of Day
- 1034/030 Time of Day

9.3 User Interface

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

User Manual



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 - ASTER	IX Protocol Analyzer X
Sensor SAC/SIC 0 0 UAP Auto T Frame Type None T	Analyze Verify SAC/SIC Warning threadhold (msec) 200 Maximum allowed delay (msec) 10000
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.	
	OK Cancel

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.

🕒 Message Transmission Delay Analyze - ASTERIX Protocol Analyzer	_	×
File Analyze Help		
Save Start Stop Settings Image: Close		
Log Chart		
Verity SAC/SIC: No Frame Type: None UAP: Auto Delay Warning: 400 msec Max Delay Allowed: 500 msec		 ^
Analysis start. Delay discard: Tx Tue Jan 26 04:59:59 2016 Rx Tue Jan 26 05:00:00 2016 Delay 1023 msec Delay discard: Tx Tue Jan 26 04:59:59 2016 Rx Tue Jan 26 05:00:00 2016 Delay 867 msec Delay discard: Tx Tue Jan 26 05:00:00 2016 Rx Tue Jan 26 05:00:00 2016 Delay 718 msec Delay discard: Tx Tue Jan 26 05:00:00 2016 Rx Tue Jan 26 05:00:00 2016 Delay 718 msec Delay warning: Tx 05:55:20.898 Rx 05:55:11.316 Delay 418 msec Delay warning: Tx 05:55:30.804 Rx 05:55:31.263 Delay 418 msec Delay warning: Tx 05:55:50.593 Rx 05:55:41.167 Delay 441 msec Delay warning: Tx 05:55:0.593 Rx 05:55:41.167 Delay 459 msec Delay warning: Tx 05:55:0.593 Rx 05:55:10.433 Delay 459 msec Delay warning: Tx 05:56:0.500 Rx 05:56:10.988 Delay 450 msec Delay warning: Tx 05:56:10.421 Rx 05:56:10.858 Delay 437 msec Delay warning: Tx 05:56:0.296 Rx 05:56:10.858 Delay 437 msec Delay warning: Tx 05:56:0.30.87 Rx 05:56:40.739 Delay 443 msec Delay warning: Tx 05:56:0.101 Rx 05:56:40.528 Delay 459 msec Delay warning: Tx 05:56:0.3187 Rx 05:56:40.528 Delay 459 msec Delay warning: Tx 05:56:0.3187 Rx 05:56:40.528 Delay 443 msec Delay warning: Tx 05:56:0.3187 Rx 05:56:40.528 Delay 450 msec Delay warning: Tx 05:56:40.318 Rx 05:56:40.528 Delay 443 msec Delay warning: Tx 05:56:40.318 Rx 05:56:40.528 Delay 443 msec Delay warning: Tx 05:56:40.318 Rx 05:56:40.528 Delay 443 msec Delay warning: Tx 05:56:40.318 Rx 05:57:10.224 Delay 443 msec Analysis finish.		
Statistics: Data processed from 2016-01-26T05:00:00 to 2016-01-26T05:59:59 Data duration 1.00 hours Data Packets Total: 155709 Good: 155706 Bad: 3		
Rate: 38927 packets/second		
Data Blocks Total: 155706 CAT001: 0 CAT002: 0 CAT008: 310 CAT034: 24000 CAT048: 131396 Other: 0 Rate: 38926 blocks/second		
Data Records Total: 155706 CAT001: 0 CAT002: 0 CAT003: 310 CAT048: 131396 Other: 0 Rate: 38926 records/second		
Transmission Delay Message sampled: 23996 Message warning: 10 Minimum Delay: 18 msec Maximum Delay: 459 msec Average Delay: 145.38 msec		*

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;

User Manual

- 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: 1020/400 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 unmatch datarecords 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 glincense 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.