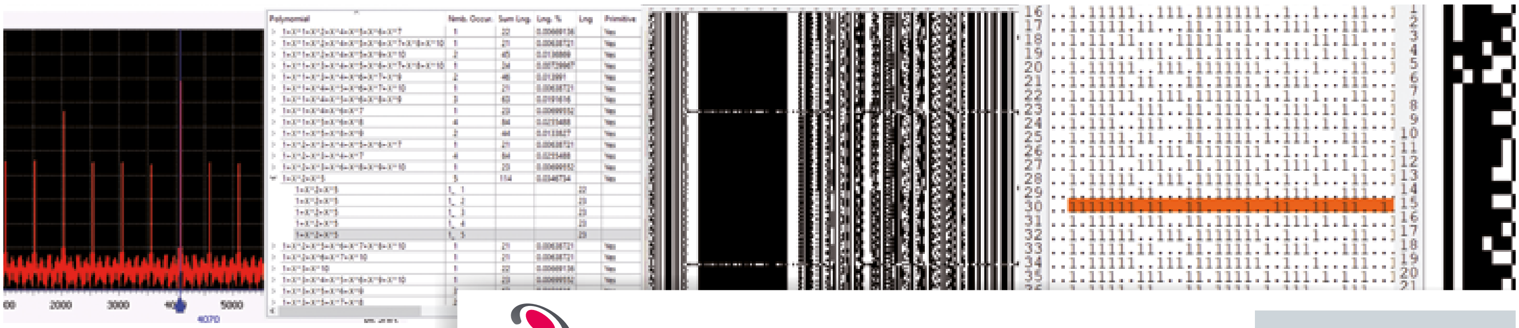
PROCITEC®



go2ANALYSE

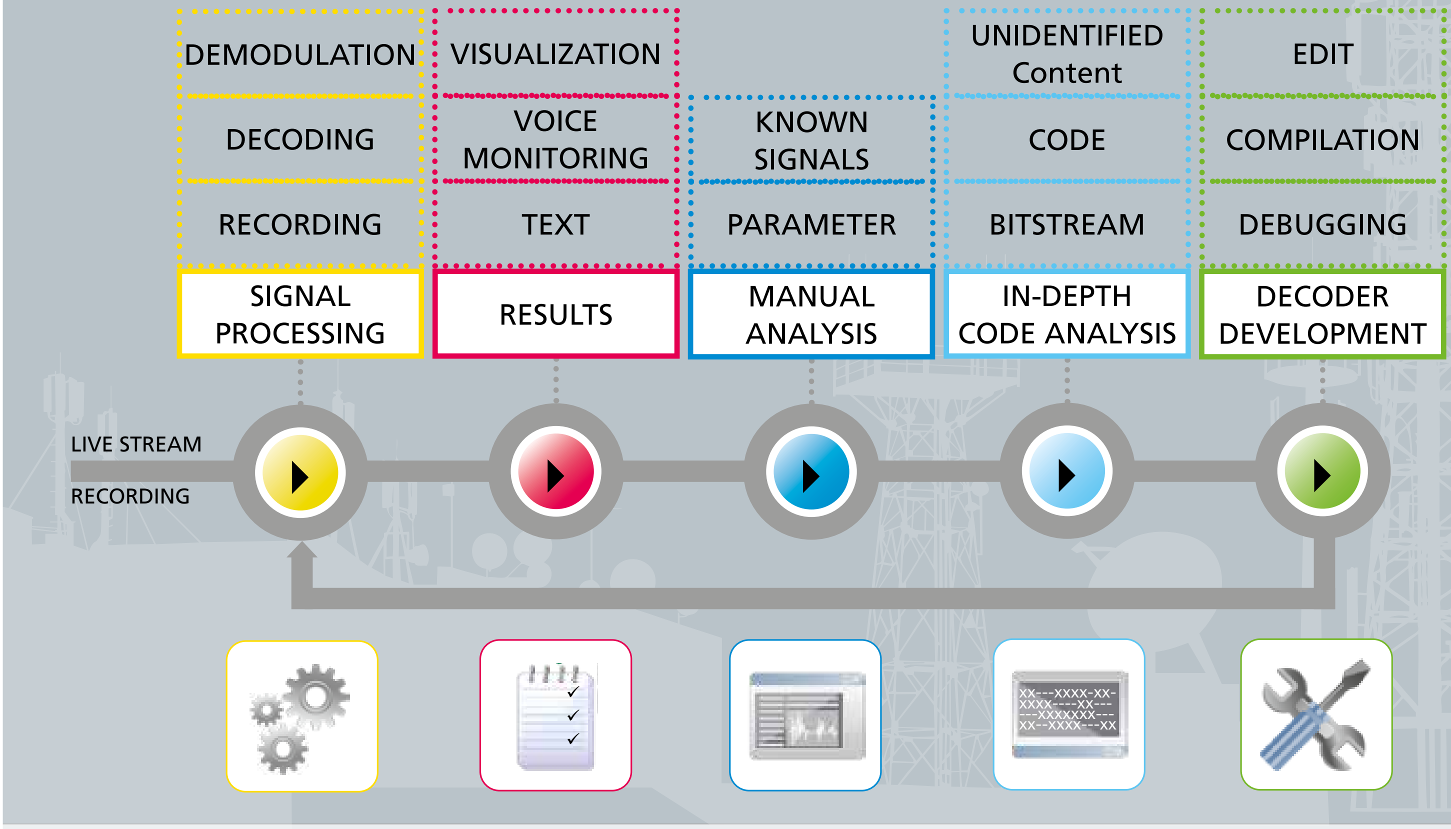
Bitstream Viewing Analysis and Processing Tool

Key facts

go2ANALYSE is a user-friendly and powerful tool for the forensic analysis of unidentified data signals at the bitstream level.

- Powerful offline bitstream analysis tool
- Check unidentified bitstreams against known/ existing decoders
- Identify previously unrecovered coding details and parameters
- Analyse existing decoders
- Process generic bitstreams
- Search for repeating and non-periodic patterns and recursive sequences
- Apply demultiplexing and deinterleaving
- Engage use of DDL decoders
- Apply multiple alphabets and create user-defined code tables
- Record, save and replay your analysis steps

WORKFLOW



SIGNAL PROCESSING	RESULTS	MANUAL ANALYSIS	IN-DEPTH CODE ANALYSIS	DECODER DEVELOPMENT
DEMODULATION	VISUALIZATION		UNIDENTIFIED Content	EDIT
DECODING	VOICE MONITORING	KNOWN SIGNALS	CODE	COMPILATION
RECORDING	TEXT	PARAMETER	BITSTREAM	DEBUGGING

go2ANALYSE

Offline analysis, manipulation of bitstreams to determine a signal's code characteristics.

- Wide range of logical, statistical, demultiplexing, deinterleaving, Linear Feedback Shift Register (LFSR)/Linear Recursive Sequence (LRS) search and binary modulation functions
- Adapt or modify functions by applying a scripting language
- Use of DDL decoders
- Record, save and replay analysis steps
- Write specific test programs to identify coding structures (e.g. CRC-polynomials)
- Scripts used for code analysis can be used in the resulting decoders
- Easy implementation of libraries and use of external programs
- Processing of pre-conditioned bitstreams

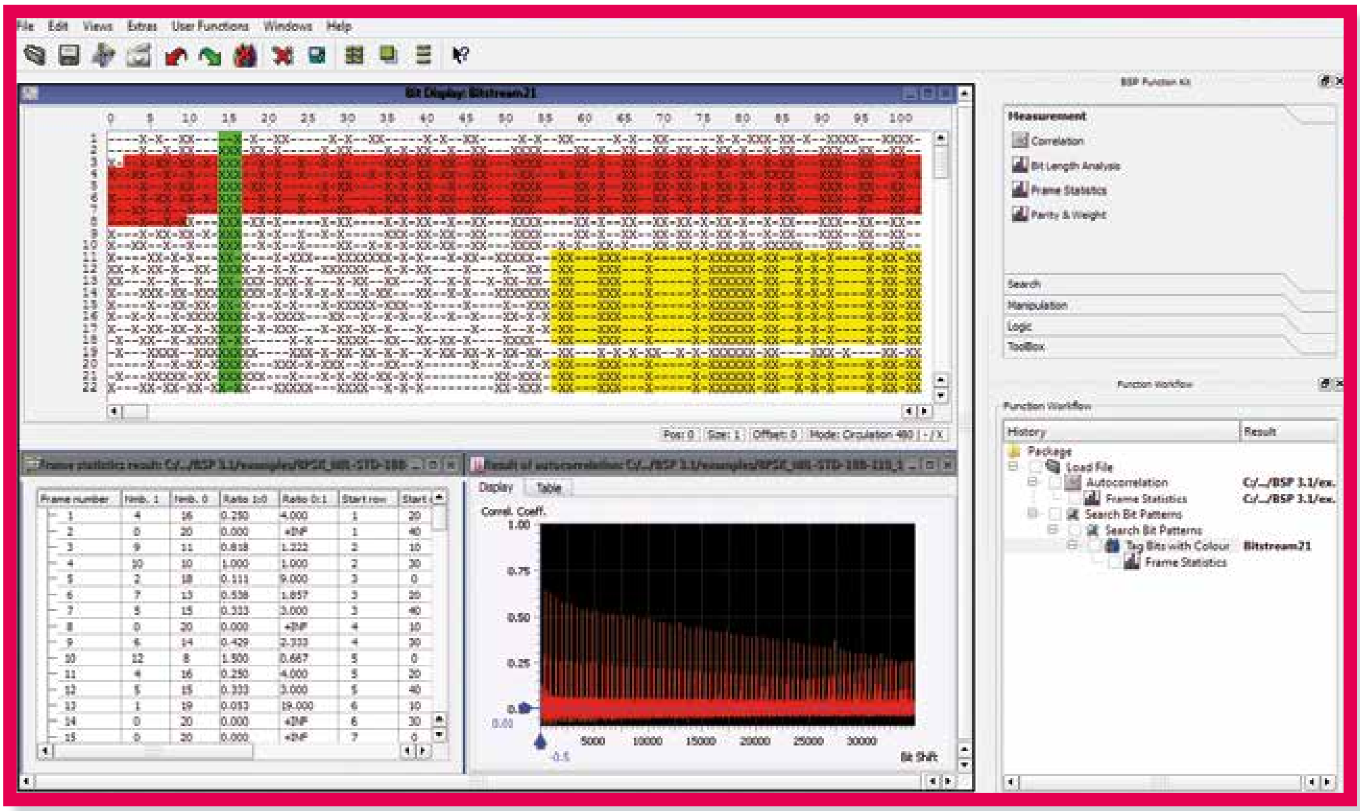
Data Analysis Tool for specialists

go2ANALYSE enables signals development and coding specialists to collate information for analysis, reporting, and to modify existing and create new decoders.

go2ANALYSE offers a wide range of statistical, mathematical and manipulation functions to determine the characteristics of the analyst's applied coding, combined with important features such as bitstream visualization in various formats, logic operations, and editing functions.

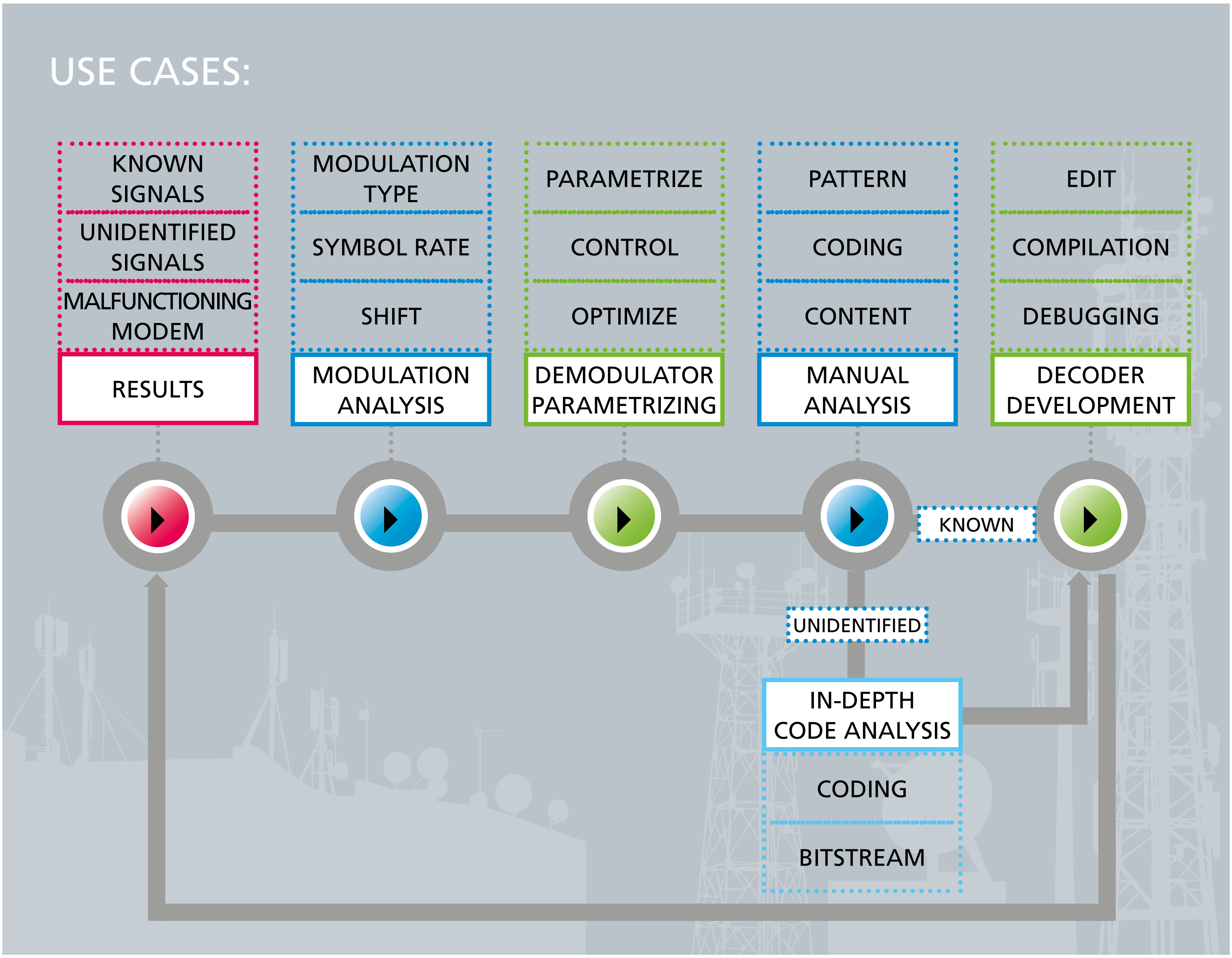
go2ANALYSE facilitates the analysis and provides functions to record, save and replay the user's analysis steps. Existing DDL decoders can be applied to the bitstream currently being processed, and the code-tables and alphabets in use are fully accessible for modification.

go2ANALYSE is intended for signals analysts familar with the theory of coding, demodulation and error correction, and an understanding of mathematical functions and algorithms.



Frame number	Nmb. 1	Nmb. 0	Ratio 1:0	Ratio 0:1	Start row	Start
1	4	16	0.250	4.000	1	20
2	0	20	0.000	+INF	1	40
3	9	11	0.818	1.222	2	10
4	10	10	1.000	1.000	2	30
5	2	18	0.111	9.000	3	0
6	7	13	0.538	1.857	3	20
7	5	15	0.333	3.000	3	40
8	0	20	0.000	+INF	4	10
9	6	14	0.429	2.333	4	30
10	12	8	1.500	0.667	5	0
11	4	16	0.250	4.000	5	20
12	5	15	0.333	3.000	5	40
13	1	19	0.053	19.000	6	10
14	0	20	0.000	+INF	6	30
15	0	20	0.000	+INF	7	0

History	Result
Package	
Load File	
Autocorrelation	C:/.../BSP 3.1/ex.
Frame Statistics	C:/.../BSP 3.1/ex.
Search Bit Patterns	
Search Bit Patterns	
Tag Bits with Colour	Bitstream21
Frame Statistics	



Use Case

In depth analysis of unidentified signal protocols

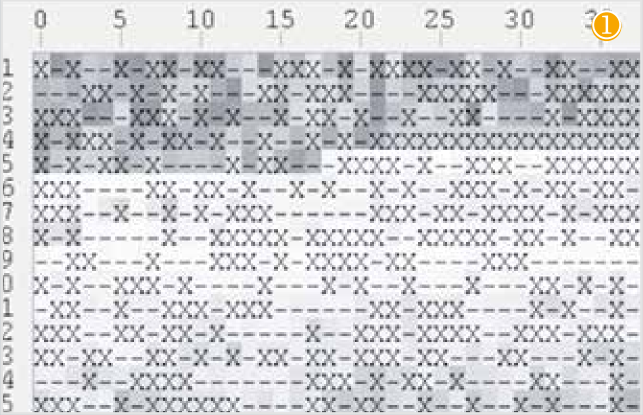
Modern communications surveillance and radio-monitoring systems support the operator in many ways, but are very often unable to fully process new, ‘first-heard’ protocols or unidentified modem types, which may also be beyond the skillset of the system operator to achieve using manual techniques.

Data signals analysts and technical experts must use their specialist skillsets (and often many hours!), employing manual bitstream analysis techniques in order to deliver a reportable product and related signal/protocol decoder.

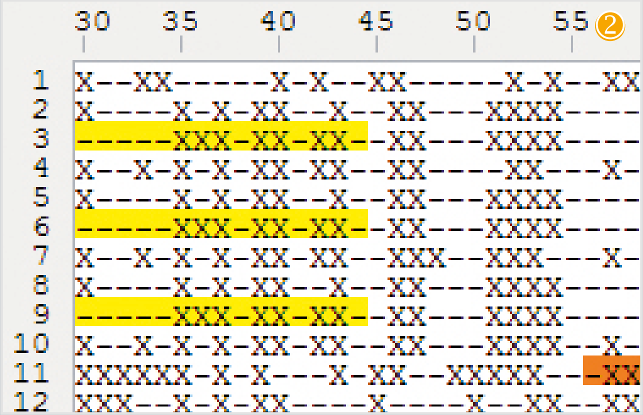
During these manual bitstream analysis and development initiatives, go2ANALYSE captures the full timeline of applied functions and commands which have resulted in the data signal analyst’s successful decoder solution.

Using ‘Analysis Decoders’, bitstreams can be visualised, forensically analysed, and ultimately decoded. The Analysis Decoders can be used standalone, without the need for associated go2SIGNALS tools such as go2DECODE and go2MONITOR.

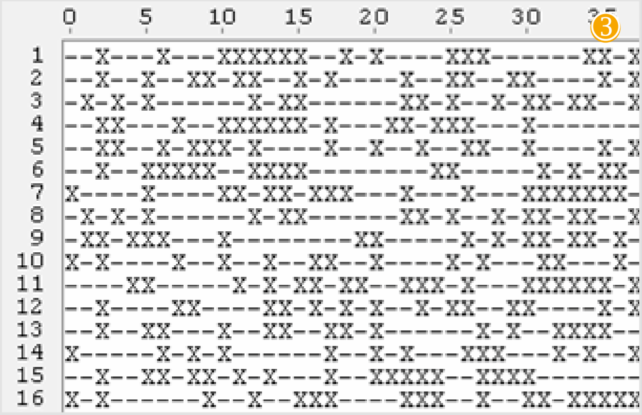
Utilising programming languages (such as DDL, C, or C++), commands and functions can be implemented in the decoders and exported for use in manual or automatic communications surveillance and radio-monitoring systems.



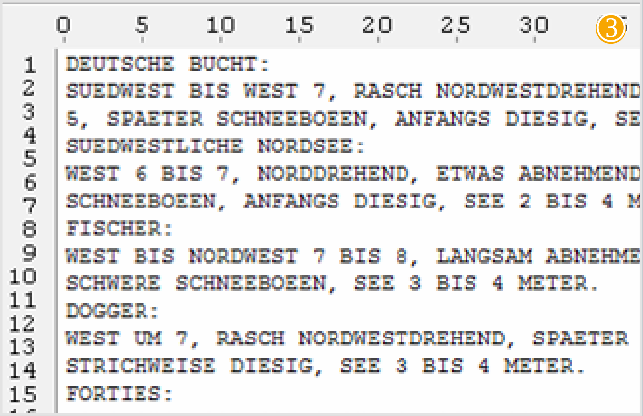
```
X-X--X-XX-XX---XXX-X-XXXX-XX-X--XX--XX
---XX-X-X-X---XX-XXX----XXXXX---XXXXXX
XXX---XXX-X-X--X-XX-X--X--XX-----X-XXX
X-XXX-X-XX-X--X--X-X-XXXXXXXXXXXXXXXXX
X-X-XX-X----X-XX---XXXX-X--XXX--XXXXXX
XXX----XX-XX-X--X-X--X-X--XXX-X-XX-XX-
XXX--X--X-X-XXX------XXX-XX-XXXX-X-XXX
X-X-----X--XXXXX-XXXXX--XXXXX-XX-X--XX
--XX---X---XXX-X-XXXX-XX----XXX-------
X-X--XXX-X----X---X-X--X---X---XX-X-X-
-XX--X--XXX-XXX------XX-XXX----X-X--X-
XXX--XX-XX-X-----X--XXX-XXXX--XXX-XXX-
XX-XX--XX-X-X-XX-XX-XXX-XX---XX---X-X-
---X--XXXX-------XXX-X-XX-X----XX---X-
XXX--X-XXXXXX----XX-XX--X--X--X-X---X-
```



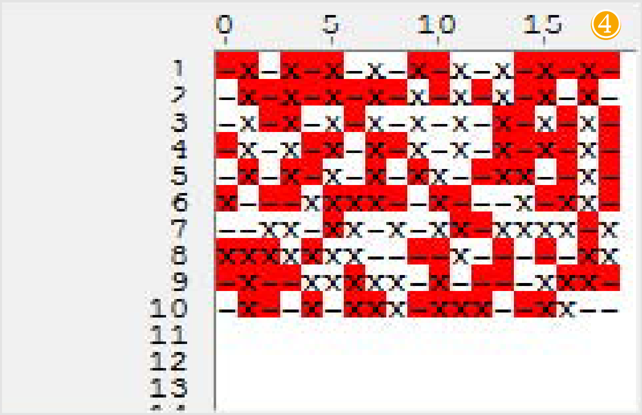
```
X--XX-----X-X--XX-----X-X--XX
X----X-X-XX--X--XX---XXXX----
-----XXX-XX-XX--XX---XXXX----
X--X-X-X-XX-XX--XX----XX---X-
X----X-X-XX--X--XX---XXXX----
-----XXX-XX-XX--XX---XXXX----
X--X-X-X-XX-XX--XXX--XXX---X-
X----X-X-XX--X--XX---XXXX----
-----XXX-XX-XX--XX---XXXX----
X--X-X-X-XX-XX--XX---XXXX--X-
XXXXXX-X-X---X-XX--XXXXX---XX
XXX--X-X-XX----X----X--XX--XX
```



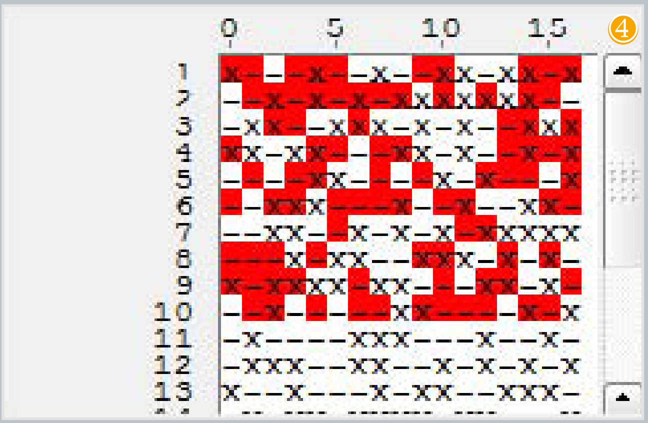
```
--X---X---XXXXXX--X-X----XXX------XX-X
--X--X--XX-XX--X-X----X--XX--XX----X-X
-X-X-X------X-XX------XX-X--X-XX-XX--X
--XX---X--XXXXXX-X---XX-XXX---X-------
--XX--X-XXX-X----X--X--X--XX--X----X-X
--X--XXXXX--XXXX--------XX-----X-X-XX-
X----X----XX-XX-XXX---X---X---XXXXXXX-
-X-X-X------X-XX------XX-X--X-XX-XX--X
-XX-XXX---X--------XX-----X-X-XX-XX-X-
X-X----X--X--X--XX--X----X-X---XX---X-
----XX-----X-X-XX-XX--XXX-X---XXXXXX-X
--X----XX----XX-X-X-X--X-XX--XX----X-X
--X--XX---X--XX--XX-X------X-X--XXXX--
X-----X-X-X------X--X-X---XXX---X-X--X
--X--XX-XX-X-X---X--XXXXX--XXXX-------
X-X------X--X--XXX----XXX--X--XX-XXXXX
```



```
DEUTSCHE BUCHT:
SUEDWEST BIS WEST 7, RASCH NORDWESTDREHEND
5, SPAETER SCHNEEBOEEN, ANFANGS DIESIG, SE
SUEDWESTLICHE NORDSEE:
WEST 6 BIS 7, NORDDREHEND, ETWAS ABNEHMEND
SCHNEEBOEEN, ANFANGS DIESIG, SEE 2 BIS 4 M
FISCHER:
WEST BIS NORDWEST 7 BIS 8, LANGSAM ABNEHME
SCHWERE SCHNEEBOEEN, SEE 3 BIS 4 METER.
DOGGER:
WEST UM 7, RASCH NORDWESTDREHEND, SPAETER
STRICHWEISE DIESIG, SEE 3 BIS 4 METER.
FORTIES:
```



```
-X-X-X-X-X-X-X-X-X-
-X-X-X-X-X-X-X-X-X-
-X-X-X-X-X-X-X-X-X-
-X-X-X-X-X-X-X-X-X-
-X-X-X-X-XX--XX--X-
X---XXXX--X---X-XX-
--XX-XX-X-XX-XXXX-X
XXXXXXX----X-----XX
-X--XXXXX-X----XXX-
-X--X-XXX-XXX--XX--
```



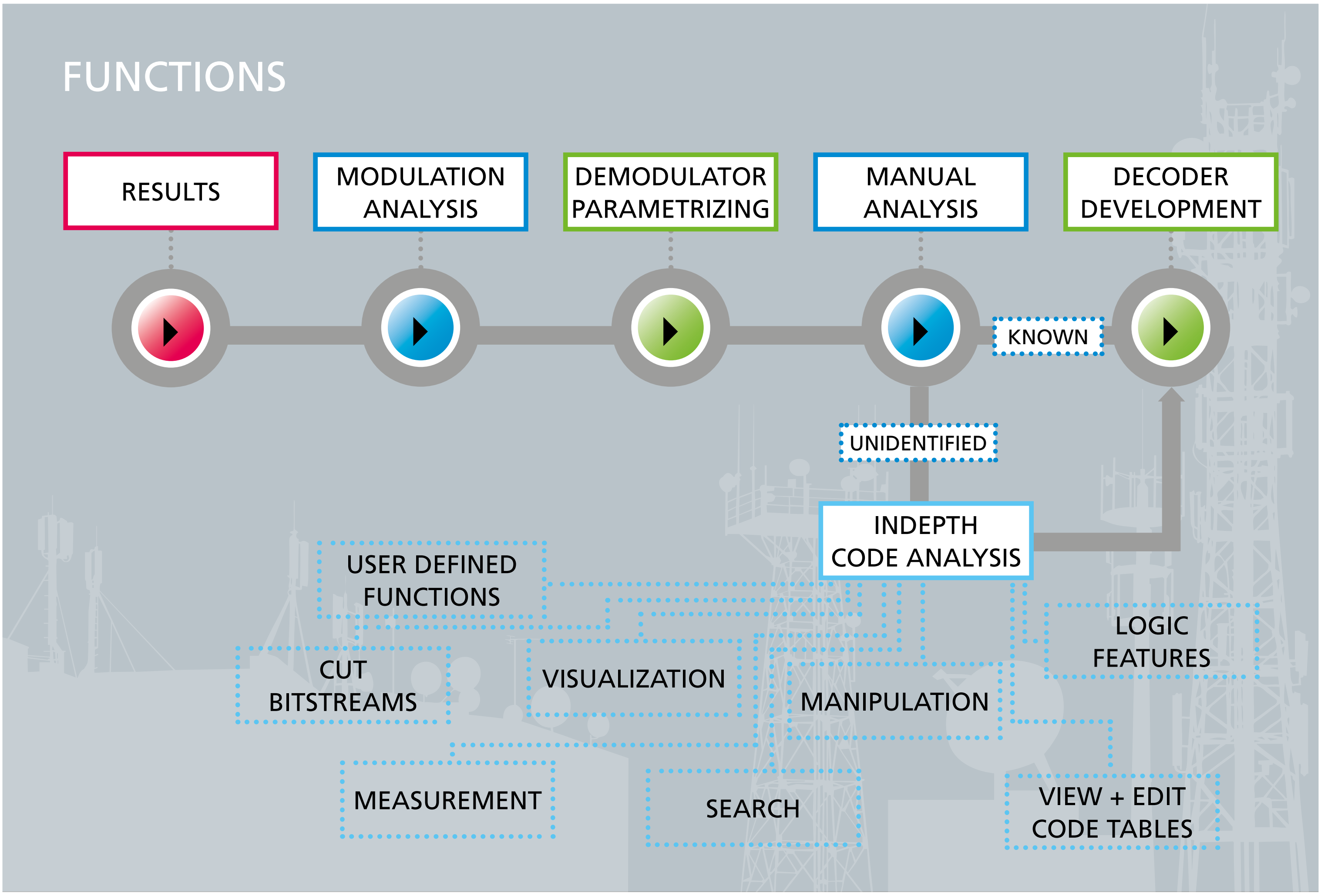
```
X---X--X--XX-XX-X
--X-X-X-XXXXXXX--
-XX--XXX-X-X--XXX
XX-XX---XX-X--X-X
----XX----X-X---X
--XXX---X--X--XX-
--XX--X-X-X-XXXXX
---X-XX--XXX-X-X-
X-XXXX-XX---XX-X-
--X-----XX----X-X
-X----XXX---X--X-
-XXX--XX--X-X-X-X
X--X---X-XX--XXX-
```

① Bitstream visualization with symbol quality enables focus to sections of low bit-error rate

② Highlighting dissimilar but repeating sections

③ Applying a user-selected alphabet to decode the bitstream to alphanumeric text

④ Bitwise Exclusive OR (XOR) operation applied to two bitstream files – dissimilar bits being highlighted



Functions:

Bitstream visualization and navigation

Our go2ANALYSE software package provides the analyst with all the necessary capabilities to successfully visualise, evaluate and process the bitstream. A large number of measurement, search, manipulation and logic features aid the user's analysis processes.

User-defined functions

Even challenges encountered during complex bitstream analysis techniques can be solved, as go2ANALYSE is an open tool – existing functions can be modified and enhanced in the go2ANALYSE 'Decoder Editor' using Decoder Description Language (DDL).

Many existing go2ANALYSE functions and capabilities were developed using DDL. The DDL source-code provides the basis for decoder development, and is supplied as part of the deliverable go2ANALYSE package to aid the Customer's signal & protocol-specific research and development initiatives.

Enhanced and customer/task-specific elements can be user-defined and created using simple syntax in the supplied XML-schema format. A comprehensive user-manual is supplied to aid the user's analysis and decoder development initiatives.

Standard programming interface

The integrated programming interface (C++ etc) offers additional expandability. In this way, customer-sourced & developed algorithms and decoders can be embedded; logfiles and even speech outputs are possible. External libraries and programs can be integrated with ease.

Command and analysis history

The entire analysis and development workflow is captured step-by-step. Each step can be reproduced or reversed at any time – interim analysis results are displayed at every step.

Specifications overview

Data acquisition	Text-based bitstream file Packed binary file Bitstream recording from go2DECODE and go2MONITOR
Localization	English; Others on request
Documentation	PDF User manual / PDF Online-Help
Recommended PC hardware	Min. Intel I5 2 Core, 2 GHz, min. 4 GB RAM, 16 GB recommended HDD: min. 50 GB recommended (depends on binary file input) Screen Resolution: min. 1280 x 1024 pixels
OS	Windows 7 SP1 (with Microsoft Windows patch KB2999226) / 10 de/en, 64 bit; Linux (CentOS 7.5) 64 bit
License	USB-Dongle (codemeter)

Features

Software Feature	Remarks	
Bitstream Visualization	x/-, L/H, ./1 1/0 Font size changeable Graphical bit display Circulation length Bit offset Tag bits with different colors Show difference of two bitstreams	Alignment: Burst/Circulation length Cut/Copy/Paste Undo/Redo Bits with quality Symbols of bits
Analysis	Autocorrelation Crosscorrelation Bit length analysis 0/1 ratio Automatic search for periodic sequences	Automatic search for non-periodic sequences Repeated patterns Mark start, stop and parity bits Testing against codes: Hamming, Reed-Solomon, BCH, Golay, CRC
Manipulation / Transformation	Deinterleaving Decimation Demultiplexing Logic: AND, OR, NOT, XOR selected bits, XOR two bistreams	Inversion: Mirror / NOT Cutting Viterbi correction Descrambling Destuffing
Tools for LFSR	Analysis and handling of linear feedback shift registers Berlekamp-Massey Linear complexities	
Binary Modulation	NRZ-M NRZ-S BIPH-L Manchester	BIPH-M BIPH-S
Map Bits to Text	MSB/LSB Normal/Inverse	predefined code tables: e.g. ASCII8, Baudot, Baudot-3Shift-CYR, HEX, Morse, ITA2P User defined code tables
Workflow Management	Complete workflow recorded Displayed as tree of commands and results Undo/Redo (several steps) Save/Load workflow	Replay saved workflow with different bitstreams Change command parameters in workflow delete individual commands
Integrate External Tools	Open selected bits in external tool (configurable)	

User Functions

Decoder Development	Item	
Basic functions	Apply compiled software decoders to a loaded bitstream Use of DDL decoders (the Decoder Description Language is a programming language for the implementation of software decoders) Decoder can supply different output types such as bitstream output, graphic output, marker output, progress bar and text output	
Function library	Pre-processing Symbol conversions Descrambling procedures Channel selections Pattern search Burst detection Forward/backward time jumps Deinterleaving	Check and correction procedures: CRC, Hamming, Viterbi, BCH, Reed-Solomon Elementary arithmetic and bit manipulations Table handling Branches and sub-routines (special functions on request)
Decoder Editor	Automatic command completion Content related help Syntax highlighting	
Compiler	Generation of binary decoder files Detailed code check and error messages	

The performance of our software products depends on the hardware used.
Technical parameters can differ under real operational conditions. Specifications subject to change.

20.1 I 07/2019 (Subject to modification)

go2SIGNALS
PROCITEC® SOFTWARE

go2MONITOR

go2ANALYSE

go2DECODE

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