

# Standard API for Trace Data Formats

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# Trace storage requirements

What should a trace storage format be able to do?

- **Versatile**  
store various formats, like descriptors, meta data, crypto data, samples
- **Fast**  
achieve high performance processing
- **Compact**  
use little space, support compression, allowing big data sets
- **Resilient**  
dynamically increase file size and recover from interrupted sessions
- **Extendible**  
ready for the future
- **Open**  
exchange data amongst side channel systems

Existing formats, like Matlab or HDF5 could not meet these requirements.  
Therefore, Riscure developed the **TRS format**

# Design choices

TRS files start with a variable size Header (TLV coding), followed by a fixed size TraceBlock

## Variable size Header (TLV)

- Versatile: define different type of fields, e.g.
  - Number of Traces
  - Number of Samples
  - Length of title
  - Length of data
  - Sample coding
  - ...
  - Start of TraceBlock
- Extendible: can add new fields
- Resilient: can recover after abort

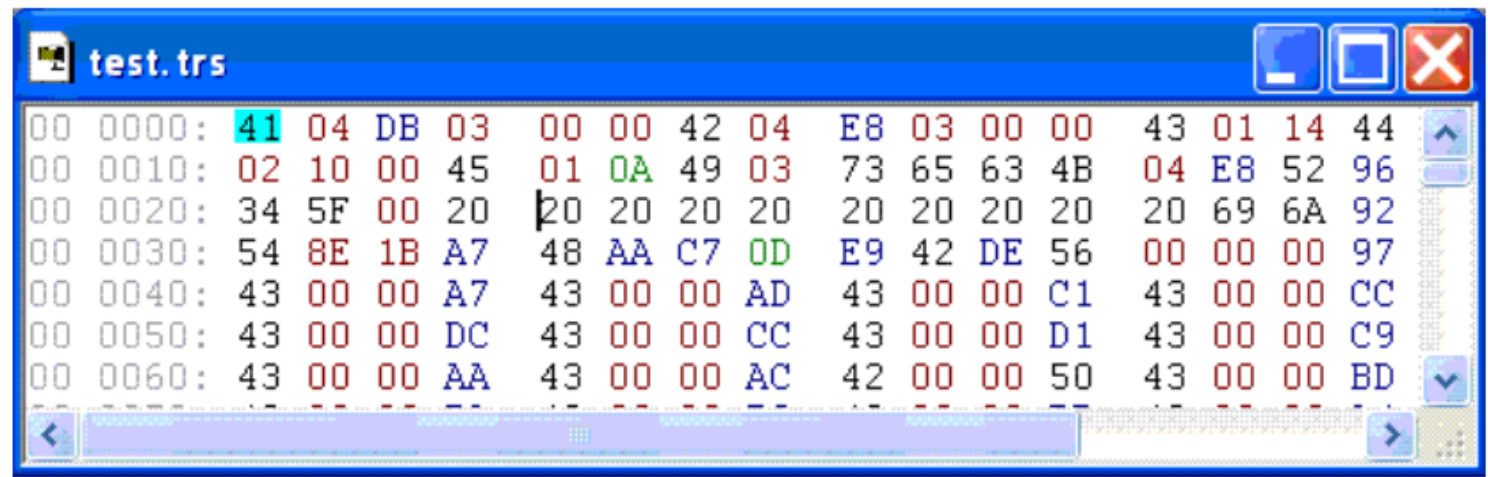
## Fixed size TraceBlock

- Configurable space per trace
- Fast search and read
- Allows for compact coding, choose any size data types

Trace 1	Title	Data	Samples
Trace 2	Title	Data	Samples
Trace 3	Title	Data	Samples

Tag	Name	M/O	Type	Length	Default	Meaning
0x41	NT	M	int	4		Number of traces

## Example



```
test.trs
00 0000: 41 04 DB 03 00 00 42 04 E8 03 00 00 43 01 14 44
00 0010: 02 10 00 45 01 0A 49 03 73 65 63 4B 04 E8 52 96
00 0020: 34 5F 00 20 20 20 20 20 20 20 20 20 20 69 6A 92
00 0030: 54 8E 1B A7 48 AA C7 0D E9 42 DE 56 00 00 00 97
00 0040: 43 00 00 A7 43 00 00 AD 43 00 00 C1 43 00 00 CC
00 0050: 43 00 00 DC 43 00 00 CC 43 00 00 D1 43 00 00 C9
00 0060: 43 00 00 AA 43 00 00 AC 42 00 00 50 43 00 00 BD
```

We defined the TRS format in 2001  
In 23 years we added a few TLVs  
and are still using it.

The interface code is on GitHub  
Downloaded many times  
Used by many solutions

The test.trs file contains the following objects:

0x41 (NT), length: 4, value: 0x3DB (987) number of traces

0x42 (NS), length: 4, value: 0x3E8 (1000) number of samples

0x43 (SC), length: 1, value: 0x14 (20), float coding, sampleSpace: 4 bytes per sample

0x44 (DS), length: 2, value: 0x10 (16), Data space: number of data bytes included

0x45 (TS), length: 1, value: 0x0A (10), 10 bytes title space per trace

0x49 (XL), length: 3, value: "sec", label X-axis

0x4B (XS), length: 4, value: 0x349652E8 (280E-9), time base of 280ns per sample

0x5F (TB), length: 0, beginning of trace block

987 times: 10 bytes space (title not present) 16 bytes data (e.g. 0x69 0x6A .. 0x56 0x00)  
4000 bytes containing 1000 float samples of 4 bytes (e.g. 0x43970000 = 302)

Note that the header length is flexible, but always ends with the Trace Block Marker: 0x5F00.

More info on:

<https://github.com/Keysight/java-trsfile>

<https://github.com/Keysight/python-trsfile-Riscure-clone>

# Demo

Inspector 2024.2

File Edit Calibration Perturbation Acquisition Compress Align Filter Analysis Crypto Samples Traces User Scripts Tools Window Help Profiles

Project

- data (C:\Users\marcwitt\I...
- AES em transient probe
- SC Perturbation.trs
  - + LowPass
  - + StaticAlign

Parameters

Name	Value
Trace Para...	
INPUT	19C8BE776...
OUTPUT	D82AF8E08...
TIMEOUT	[false]
Trace Set ...	

AES em transient probe 10k.trs

Lines: 1 Traces: 1 Threshold

Channel A 123

Open trace set

Look in: data

- AES em transient probe 10k.trs
- SC Perturbation + LowPass + StaticAlign.trs

Recent Items

Desktop

Documents

This PC

Network

File name: AES em transient probe 10k

Files of type: Trace set files (\*.trs)

Samples

First: 0

Number: 240000

Coding

Sample size:  byte  short  int  float

Sample sign:  Signed  Unsigned

Sample byte order:  Little endian  Big endian

Global strings

Global trace title: trace

Description:

Traces

First: 0

Number: 10000

data space: 33

title space: 128

Y-axis settings

Label: V

Scale: 0.007874016

X-axis settings

Label: s

Scale: 1.0E-9

Offset: 0

Open

Cancel

Open selected file

Status

Ready

Traces

available: 10000 displayed: 123 selected: 123

Samples

available: 240000 (240.00µs) displayed: 240000 (240.00µs) at 0 (0.00s) selected: 0 (0.00s)

Data

19 C8 BE 77 62 65 05 F5 AE D6 26 94 04 8C AD D4 D8 2A F8 E0 85 53 37 17 1D BC 6C D7 ...

Log

Out

Script

# Thank you

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