

## Trazer User Manual

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- [Introduction](#)
- [Command-Line Parameters](#)
- [Configuration file](#)
- [Human Readable Output](#)
- [Sequence Diagram Generator](#)
- [Trazer revision history](#)

## Introduction

Trazer is a visualization tool that works in conjunction with the RKH Framework built in trace facility. Trazer gives the possibility to display selectively the recording of all events of your system, state machines, queues, timers etc. Trazer helps you to faster troubleshooting especially on complex problems where a debugger is not sufficient, by providing a simple consolidated, human-readable textual output.

Given the RKH cross platform portability, trace data may come from 8, 16, or 32 bit machines. In order to that Trazer need to be configured to support this diversity of platform and the wide range of RKH framework configurations.

Trazer require these setups:

- [Command-Line Parameters](#) to configure communication link and general options.
- [Configuration file](#) (trazer.cfg) to setup all target dependencies, such as pointer sizes, signal sizes, etc.

## Command-Line Parameters

Option	Example	Description
-h	-h	Help. Prints the summary of options
-q	-q	Quiet mode (no stdout output)
-v	-v	Visualize Traze version and compatibility with RKH framework
-o	-o trazer.txt	Produce output to the specified file
-c	-c COM1 115200 8N1	COM port and baudrate selection. Not compatible with -t, -f
-t	-t 6602	TCP/IP server and port number. Not compatible with -c, -f
-f	-f trace.bin	File input selection. Not compatible with -c, -t

# Configuration file

Trazer is designed to work with all possible target CPU, which requires a wide range of configurability. For example, for any given target CPU, Trazer must "know" the size of object pointers, event size, timestamp size and so on. You can provide this information by two ways:

- including "trazer.cfg" configuration file in the same trazer.exe directory.
- setup the target application to call to RKH\_TR\_FWK\_TCFG and perform the streaming the RKH configuration at startup.

If config file is not found, assuming default settings, any configuration streaming received overwrite settings.

the following table summarizes the "trazer.cfg" content.

Parameter	Valid Values	Must match RKH config (rkhcfg.h)	Description
TRAZER_EN_SENDER	0, 1	#RKH_SMA_EN_TRC_SENDER	Enable/Disable pointer to sender object insertion when posting event.
TRAZER_RUNTIME_FILTER	0, 1	#RKH_TRC_RUNTIME_FILTER	Enable/Disable runtime filter facility.
TRAZER_EN_USER_TRACE	0, 1	#RKH_TRC_EN_USER_TRACE	Enable/Disable user trace facility.
TRAZER_ALL	0, 1	#RKH_TRC_ALL	If 1 enables all RKH trace records.
TRAZER_EN_MP	0, 1	#RKH_TRC_EN_MP	If 1 enables RKH trace records related to native fixed-size memory block.
TRAZER_EN_RQ	0, 1	#RKH_TRC_EN_RQ	If 1 enables RKH trace records related to native native queues.
TRAZER_EN_SMA	0, 1	#RKH_TRC_EN_SMA	If 1 enables RKH trace records related to the state machine applications.
TRAZER_EN_TIM	0, 1	#RKH_TRC_EN_TIM	If 1 enables RKH trace records related to the native software timer.
TRAZER_EN_SM	0, 1	#RKH_TRC_EN_SM	If 1 enables RKH trace records related to the state machine (hierarchical and "flat").
TRAZER_EN_FWK	0, 1	#RKH_TRC_EN_FWK	If 1 enables RKH trace records related to the native native event framework.
TRAZER_EN_ASSERT	0, 1	#RKH_TRC_EN_ASSERT	If 1 enables RKH "assertion" trace record.
TRAZER_SIZEOF_SIG	1, 2, 4	#RKH_SIZEOF_EVENT	Event Signal size in bytes.
TRAZER_SIZEOF_TSTAMP	1, 2, 4	#RKH_TRC_SIZEOF_TSTAMP	Bytes quantity used by the trace record timestamp.
TRAZER_SIZEOF_POINTER	1, 2, 4	#RKH_TRC_SIZEOF_POINTER	Size in bytes of void pointer.
TRAZER_SIZEOF_NTIMER	1, 2, 4	#RKH_TIM_SIZEOF_NTIMER	Dynamic range of time delays measured in ticks and expressed in bytes.
TRAZER_SIZEOF_NBLOCK	1, 2, 4	#RKH_MP_SIZEOF_NBLOCK	Size in bytes of number of memory block size.
TRAZER_SIZEOF_NELEM	1, 2, 4	#RKH_RQ_SIZEOF_NELEM	Maximum number of elements in bytes that any queue can contain.
TRAZER_SIZEOF_ESIZE	1, 2, 4	#RKH_SIZEOF_ESIZE	Data type of event size, in bytes.
TRAZER_EN_NSEQ	0, 1	#RKH_TRC_EN_NSEQ	Enable/Disable Number of Sequence use in trace stream.
			Enable/Disable Checksum use in trace stream.

TRAZER_EN_CHK	0, 1	#RKH_TRC_EN_CHK	
TRAZER_EN_TSTAMP	0, 1	#RKH_TRC_EN_TSTAMP	Enable/Disable Time stamp use in trace stream.

Your must ensure that Trazer configuration, match exactly with the target system under test, otherwise will be unable to parse the trace stream, and these errors would be shown:

```
***** Stream Checksum Error
***** May be have lost trace info, sequence are not correlatives
```

A set of particular trace event can be used to better trace visualization.

**RKH\_TE\_FWK\_OBJ:** Associate any object allocated in a memory address to a user defined name.

**RKH\_TE\_FWK\_AO:** Associate an active object memeory address with its symbolic name.

**RKH\_TE\_FWK\_STATE:** Associate an state memory address with its symbolic name.

**RKH\_TE\_FWK\_PSTATE:** Associate an pseudo state memory address with its symbolic name.

**RKH\_TE\_FWK\_TIMER:** Associate an timer memory address with its symbolic name.

**RKH\_TE\_FWK\_EPOOL:** Associate an even pool memory address with its symbolic name.

**RKH\_TE\_FWK\_QUEUE:** Associate an queue memory address with its symbolic name.

**RKH\_TRCE\_SIG:** Associate a any framework signal that generate trace events to a user defined name.

RKH user must generate this particulars trace events as described in RKHTRACE and Trazer will take care of reemplacing the numeric values by the user definition.

## Human Readable Output

Trazer is a console program that converts the trace stream data in a human-readable format. Following is shown how its output looks like.

Trazer start showing version and compatibility with RKH framework, below are displayed the current Trazer configuration.

Each identified trace show:

- Time stamp, in cpu ticks.
- Sequence Number, correlative number that identify trace event.
- System service group name.
- Trace event alias.
- Args, data asociated with the event.

At startup, RKH configuration is loaded from trazer.cfg file and dumped to screen.

As shown in sequence 0, if target is configurated to sent RKH configuration, when RKH\_TE\_FWK\_TCFG trace event is received, Trazer parameters are updated.

Sequences 1 to 21 are examples of symbolic names declarations sent by target board and used by Trazer for identify object address and signal number replacing them by its symbolic representation.

Sequence 23 is and example of RKH\_TE\_USER.

```
--- TRAZER V2.2 --- RKH trace event interpreter ---
```

```
    build date:   Jul  2 2013
    tested with:  RKH V2.4.03
```

```
Using local RKH configuration
```

```
RKH_SMA_EN_TRC_SENDER = 0
RKH_TRC_RUNTIME_FILTER = 1
RKH_TRC_EN_USER_TRACE = 1
RKH_TRC_ALL            = 1
RKH_TRC_EN_MP          = 0
RKH_TRC_EN_RQ          = 0
RKH_TRC_EN_SMA         = 0
RKH_TRC_EN_TIM         = 0
RKH_TRC_EN_SM          = 0
RKH_TRC_EN_FWK         = 1
```

```

RKH_TRC_EN_ASSERT      = 1
RKH_RQ_EN_GET_LWMARK   = 0
RKH_MP_EN_GET_LWM      = 0
RKH_SIZEOF_EVENT       = 8
RKH_TRC_SIZEOF_TSTAMP  = 32
RKH_TRC_SIZEOF_POINTER = 32
RKH_TIM_SIZEOF_NTIMER  = 16
RKH_MP_SIZEOF_NBLOCK   = 8
RKH_RQ_SIZEOF_NELEM    = 8
RKH_SIZEOF_ESIZE       = 16
RKH_TRC_EN_NSEQ        = 1
RKH_TRC_EN_CHK         = 1
RKH_TRC_EN_TSTAMP      = 1
RKH_MP_SIZEOF_BSIZE    = 1
RKH_MAX_EPOOL          = 4

```

----- Parsing trace stream from TCP Port 6602 -----

Accepted connection from 127.0.0.1, port 61574

```

121 [ 0] FWK | TCFG      : Update RKH Configuration from client
                          | RKH_VERSION          = 2.4.03
                          | RKH_SMA_EN_TRC_SENDER = 1
                          | RKH_TRC_RUNTIME_FILTER = 1
                          | RKH_TRC_EN_USER_TRACE = 1
                          | RKH_TRC_ALL           = 1
                          | RKH_TRC_EN_MP         = 0
                          | RKH_TRC_EN_RQ         = 0
                          | RKH_TRC_EN_SMA        = 0
                          | RKH_TRC_EN_TIM        = 0
                          | RKH_TRC_EN_SM         = 0
                          | RKH_TRC_EN_FWK        = 1
                          | RKH_TRC_EN_ASSERT       = 1
                          | RKH_RQ_EN_GET_LWMARK   = 1
                          | RKH_MP_EN_GET_LWM      = 1
                          | RKH_SIZEOF_EVENT       = 8
                          | RKH_TRC_SIZEOF_TSTAMP  = 32
                          | RKH_TRC_SIZEOF_POINTER = 32
                          | RKH_TIM_SIZEOF_NTIMER  = 16
                          | RKH_MP_SIZEOF_NBLOCK   = 8
                          | RKH_RQ_SIZEOF_NELEM    = 8
                          | RKH_SIZEOF_ESIZE       = 16
                          | RKH_TRC_EN_NSEQ        = 1
                          | RKH_TRC_EN_CHK         = 1
                          | RKH_TRC_EN_TSTAMP      = 1
                          | RKH_MP_SIZEOF_BSIZE    = 1
                          | RKH_MAX_EPOOL          = 4

123 [ 1] FWK | OBJ      : obj=0x00180B01, nm=l_isr_kbd
126 [ 2] FWK | OBJ      : obj=0x00180B00, nm=l_isr_tick
129 [ 3] FWK | AO       : obj=0x0018019C, nm=svr
131 [ 4] FWK | AO       : obj=0x00180008, nm=CLI0
134 [ 5] FWK | AO       : obj=0x00180058, nm=CLI1
136 [ 6] FWK | AO       : obj=0x001800A8, nm=CLI2
138 [ 7] FWK | AO       : obj=0x001800F8, nm=CLI3
140 [ 8] FWK | STATE    : ao=svr, obj=0x0017E238, nm=svr_idle
143 [ 9] FWK | STATE    : ao=svr, obj=0x0017E194, nm=svr_busy
146 [10] FWK | STATE    : ao=svr, obj=0x0017E180, nm=svr_paused
149 [11] FWK | STATE    : ao=CLI0, obj=0x0017DF18, nm=cli_idle
152 [12] FWK | STATE    : ao=CLI0, obj=0x0017DED4, nm=cli_waiting
155 [13] FWK | STATE    : ao=CLI0, obj=0x0017DEA0, nm=cli_using
158 [14] FWK | STATE    : ao=CLI0, obj=0x0017DE5C, nm=cli_paused
161 [15] FWK | SIG      : sig=0, nm=REQ
162 [16] FWK | SIG      : sig=1, nm=START
164 [17] FWK | SIG      : sig=2, nm=DONE
166 [18] FWK | SIG      : sig=4, nm=TOUT_USING
168 [19] FWK | SIG      : sig=3, nm=TOUT_REQ
169 [20] FWK | SIG      : sig=5, nm=PAUSE

```

```

171 [ 21] FWK | SIG      : sig=6, nm=TERM
172 [ 22] FWK | TUSR     : ut=0, nm=MY_TRACE
174 [ 23] USR | MY_TRACE : User trace information
                          | -01
                          | 255
                          | -001
                          | 65535
                          | 65535
                          | 65535
                          | 0xFFFF
                          | hello
                          | [ FF FF 00 00 ]
                          | obj=CLIO
                          | func=0X1712DA
                          | event=REQ
4167 [ 24] SMA | FIFO    : ao=CLIO2, sig=TOUT_REQ, snr=l_isr_tick, pid=0, rc=0
4167 [ 25] RQ  | FIFO    : q=0X180060, nelem=1, nmin=0
4167 [ 26] SMA | FIFO    : ao=CLIO1, sig=TOUT_REQ, snr=l_isr_tick, pid=0, rc=0
4167 [ 27] RQ  | FIFO    : q=0X1801A4, nelem=1, nmin=0
4167 [ 28] SMA | FIFO    : ao=svr, sig=REQ, snr=CLIO1, pid=1, rc=1
4167 [ 29] RQ  | FIFO    : q=0X180060, nelem=1, nmin=0
4167 [ 30] SMA | FIFO    : ao=CLIO1, sig=START, snr=svr, pid=1, rc=1
4167 [ 31] MP  | PUT      : mp=0X180B80, nfree=7
4167 [ 32] TIM | START    : t=0X180080, ao=CLIO1, nt=200, per=0
4168 [ 33] MP  | PUT      : mp=0X180B80, nfree=8
4168 [ 34] RQ  | FIFO    : q=0X1801A4, nelem=1, nmin=0
4168 [ 35] SMA | FIFO    : ao=svr, sig=REQ, snr=CLIO2, pid=1, rc=1
4169 [ 36] RQ  | FIFO    : q=0X180470, nelem=1, nmin=0

```

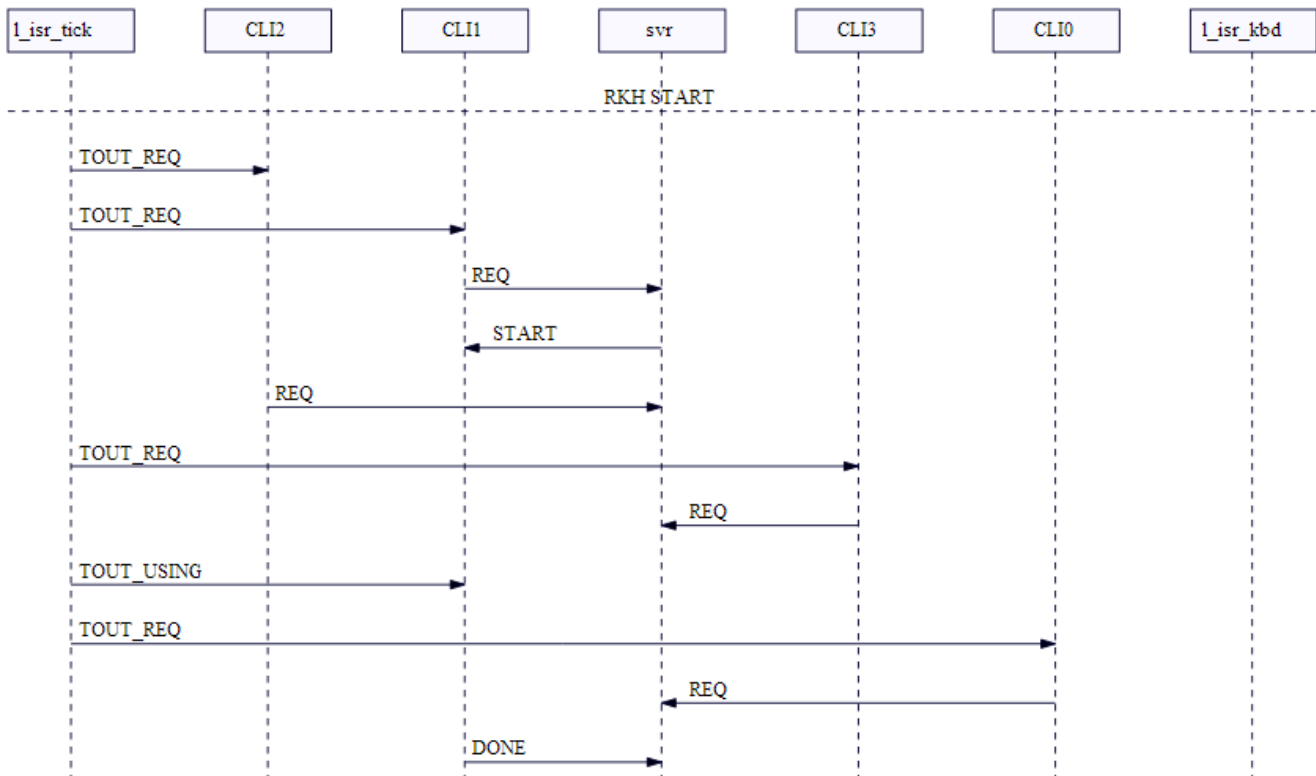
## Sequence Diagram Generator

In order to enhancing the capacity of the system behavior analysis, Trazzer can recreate a sequence diagram that shown chronologically the interaction between active objects.

To enable this capability, RKH configuration must enable to send the pointer to the sender object when posting an event (RKH\_SMA\_EN\_TRC\_SENDER = 1). If so, for each RKH\_TE\_SMA\_FIFO / RKH\_TE\_SMA\_LIFO trace event received, Trazzer catch the arguments ao (destination), sig (event), snr (sender) to add to the diagram. Trazzer generates two files types as output:

- **"YYMMDDHHMMSS.diag"**: require post process with seqdiag Python Package that generates sequence-diagram image file from .diag file. Consult <http://blockdiag.com/en/seqdiag/> for detailed information.
- **"sdYYMMDDHHMMSS.html"**: require SVG seqdiag.js and parser.js scripts located at /seqdiag directory. Web browser supported are IE and Chrome, not yet working on Firefox.

TRAZER SEQUENCE DIAGRAM



Licensing Trazer

Trazer application is licensed the same way as all other components of the RKH framework. See section licensing.

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