

## wolfSentry Embedded Firewall/IDPS v1.5.0 API Reference

WolfSSL Inc., Fri Oct 20 2023



<b>1 wolfSentry – The Wolfssl Embedded Firewall/IDPS</b>	<b>1</b>
<b>2 Building and Initializing wolfSentry for an application on FreeRTOS/IWIP</b>	<b>7</b>
<b>3 Configuring wolfSentry using a JSON document</b>	<b>11</b>
<b>4 wolfSentry Release History and Change Log</b>	<b>21</b>
<b>5 Topic Index</b>	<b>41</b>
5.1 Topics . . . . .	41
<b>6 Data Structure Index</b>	<b>43</b>
6.1 Data Structures . . . . .	43
<b>7 File Index</b>	<b>45</b>
7.1 File List . . . . .	45
<b>8 Topic Documentation</b>	<b>47</b>
8.1 Core Types and Macros . . . . .	47
8.1.1 Detailed Description . . . . .	48
8.2 Startup/Configuration/Shutdown Subsystem . . . . .	48
8.2.1 Detailed Description . . . . .	52
8.2.2 Enumeration Type Documentation . . . . .	52
8.2.2.1 wolfsentry_clone_flags_t . . . . .	53
8.2.2.2 wolfsentry_config_load_flags . . . . .	53
8.2.2.3 wolfsentry_init_flags_t . . . . .	54
8.2.3 Function Documentation . . . . .	54
8.2.3.1 wolfsentry_context_clone() . . . . .	54
8.2.3.2 wolfsentry_context_enable_actions() . . . . .	54
8.2.3.3 wolfsentry_context_exchange() . . . . .	55
8.2.3.4 wolfsentry_context_flush() . . . . .	55
8.2.3.5 wolfsentry_context_free() . . . . .	55
8.2.3.6 wolfsentry_context_inhibit_actions() . . . . .	56
8.2.3.7 wolfsentry_defaultconfig_get() . . . . .	56
8.2.3.8 wolfsentry_defaultconfig_update() . . . . .	56
8.2.3.9 wolfsentry_init() . . . . .	57
8.2.3.10 wolfsentry_shutdown() . . . . .	57
8.3 Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers . . . . .	58
8.3.1 Detailed Description . . . . .	62
8.3.2 Macro Definition Documentation . . . . .	62
8.3.2.1 WOLFSENTRY_DEBUG_CALL_TRACE . . . . .	62
8.3.2.2 WOLFSENTRY_ERROR_UNLOCK_AND_RETURN . . . . .	62
8.3.2.3 WOLFSENTRY_MUTEX_OR_RETURN . . . . .	63
8.3.2.4 WOLFSENTRY_PROMOTABLE_EX . . . . .	63
8.3.2.5 WOLFSENTRY_PROMOTABLE_OR_RETURN . . . . .	63

8.3.2.6 WOLFSENTRY_SHARED_EX . . . . .	63
8.3.2.7 WOLFSENTRY_SHARED_OR_RETURN . . . . .	63
8.3.2.8 WOLFSENTRY_UNLOCK_AND_RETURN . . . . .	64
8.3.2.9 WOLFSENTRY_UNLOCK_AND_UNRESERVE_FOR_RETURN . . . . .	64
8.3.2.10 WOLFSENTRY_UNLOCK_AND_UNRESERVE_FOR_RETURN_EX . . . . .	64
8.3.2.11 WOLFSENTRY_UNLOCK_FOR_RETURN . . . . .	64
8.3.2.12 WOLFSENTRY_UNLOCK_FOR_RETURN_EX . . . . .	64
8.4 Route/Rule Subsystem . . . . .	65
8.4.1 Detailed Description . . . . .	71
8.4.2 Macro Definition Documentation . . . . .	71
8.4.2.1 WOLFSENTRY_SOCKADDR . . . . .	71
8.4.3 Enumeration Type Documentation . . . . .	71
8.4.3.1 wolfsentry_format_flags_t . . . . .	71
8.4.3.2 wolfsentry_route_flags_t . . . . .	72
8.4.4 Function Documentation . . . . .	73
8.4.4.1 wolfsentry_route_bulk_clear_insert_action_status() . . . . .	73
8.4.4.2 wolfsentry_route_bulk_insert_actions() . . . . .	73
8.4.4.3 wolfsentry_route_delete() . . . . .	74
8.4.4.4 wolfsentry_route_delete_by_id() . . . . .	74
8.4.4.5 wolfsentry_route_drop_reference() . . . . .	75
8.4.4.6 wolfsentry_route_event_dispatch() . . . . .	75
8.4.4.7 wolfsentry_route_export() . . . . .	76
8.4.4.8 wolfsentry_route_exports_render() . . . . .	77
8.4.4.9 wolfsentry_route_flush_table() . . . . .	77
8.4.4.10 wolfsentry_route_get_addrs() . . . . .	77
8.4.4.11 wolfsentry_route_get_flags() . . . . .	78
8.4.4.12 wolfsentry_route_get_main_table() . . . . .	78
8.4.4.13 wolfsentry_route_get_metadata() . . . . .	79
8.4.4.14 wolfsentry_route_get_private_data() . . . . .	79
8.4.4.15 wolfsentry_route_get_reference() . . . . .	79
8.4.4.16 wolfsentry_route_insert() . . . . .	80
8.4.4.17 wolfsentry_route_parent_event() . . . . .	81
8.4.4.18 wolfsentry_route_render() . . . . .	81
8.4.4.19 wolfsentry_route_set_wildcard() . . . . .	82
8.4.4.20 wolfsentry_route_stale_purge() . . . . .	82
8.4.4.21 wolfsentry_route_table_default_policy_get() . . . . .	82
8.4.4.22 wolfsentry_route_table_default_policy_set() . . . . .	83
8.4.4.23 wolfsentry_route_table_fallthrough_route_get() . . . . .	83
8.4.4.24 wolfsentry_route_table_iterate_current() . . . . .	84
8.4.4.25 wolfsentry_route_table_iterate_end() . . . . .	84
8.4.4.26 wolfsentry_route_table_iterate_next() . . . . .	85
8.4.4.27 wolfsentry_route_table_iterate_prev() . . . . .	85

---

8.4.4.28 wolfsentry_route_table_iterate_seek_to_head()	85
8.4.4.29 wolfsentry_route_table_iterate_seek_to_tail()	86
8.4.4.30 wolfsentry_route_table_iterate_start()	86
8.4.4.31 wolfsentry_route_update_flags()	87
8.5 Action Subsystem	87
8.5.1 Detailed Description	89
8.5.2 Typedef Documentation	89
8.5.2.1 wolfsentry_action_callback_t	89
8.5.3 Enumeration Type Documentation	90
8.5.3.1 wolfsentry_action_flags_t	90
8.5.3.2 wolfsentry_action_res_t	90
8.5.3.3 wolfsentry_action_type_t	91
8.5.4 Function Documentation	92
8.5.4.1 wolfsentry_action_delete()	92
8.5.4.2 wolfsentry_action_drop_reference()	92
8.5.4.3 wolfsentry_action_flush_all()	93
8.5.4.4 wolfsentry_action_get_flags()	93
8.5.4.5 wolfsentry_action_get_label()	93
8.5.4.6 wolfsentry_action_get_reference()	94
8.5.4.7 wolfsentry_action_insert()	94
8.5.4.8 wolfsentry_action_update_flags()	95
8.6 Event Subsystem	95
8.6.1 Detailed Description	97
8.6.2 Enumeration Type Documentation	97
8.6.2.1 wolfsentry_event_flags_t	97
8.6.2.2 wolfsentry_eventconfig_flags_t	97
8.6.3 Function Documentation	98
8.6.3.1 wolfsentry_event_action_append()	98
8.6.3.2 wolfsentry_event_action_delete()	98
8.6.3.3 wolfsentry_event_action_insert_after()	99
8.6.3.4 wolfsentry_event_action_list_done()	99
8.6.3.5 wolfsentry_event_action_list_next()	100
8.6.3.6 wolfsentry_event_action_list_start()	100
8.6.3.7 wolfsentry_event_action_prepend()	101
8.6.3.8 wolfsentry_event_delete()	102
8.6.3.9 wolfsentry_event_drop_reference()	102
8.6.3.10 wolfsentry_event_flush_all()	102
8.6.3.11 wolfsentry_event_get_config()	103
8.6.3.12 wolfsentry_event_get_flags()	103
8.6.3.13 wolfsentry_event_get_label()	104
8.6.3.14 wolfsentry_event_get_reference()	104
8.6.3.15 wolfsentry_event_insert()	104

8.6.3.16 wolfsentry_event_set_aux_event()	105
8.6.3.17 wolfsentry_event_update_config()	105
8.6.3.18 wolfsentry_eventconfig_check()	107
8.6.3.19 wolfsentry_eventconfig_init()	107
8.7 Address Family Subsystem	108
8.7.1 Detailed Description	111
8.8 User-Defined Value Subsystem	111
8.8.1 Detailed Description	115
8.8.2 Typedef Documentation	115
8.8.2.1 wolfsentry_kv_validator_t	115
8.8.3 Function Documentation	115
8.8.3.1 wolfsentry_user_value_get_bytes()	115
8.8.3.2 wolfsentry_user_value_get_json()	115
8.8.3.3 wolfsentry_user_value_get_string()	115
8.9 Object Subsystem	116
8.9.1 Detailed Description	116
8.9.2 Enumeration Type Documentation	116
8.9.2.1 wolfsentry_object_type_t	116
8.9.3 Function Documentation	117
8.9.3.1 wolfsentry_get_object_id()	117
8.9.3.2 wolfsentry_get_object_type()	117
8.9.3.3 wolfsentry_table_n_deletes()	118
8.9.3.4 wolfsentry_table_n_inserts()	118
8.10 Thread Synchronization Subsystem	118
8.10.1 Detailed Description	123
8.10.2 Macro Definition Documentation	123
8.10.2.1 WOLFSENTRY_THREAD_HEADER	123
8.10.2.2 WOLFSENTRY_THREAD_HEADER_CHECK	123
8.10.2.3 WOLFSENTRY_THREAD_HEADER_CHECKED	124
8.10.2.4 WOLFSENTRY_THREAD_HEADER_DECLS	124
8.10.2.5 WOLFSENTRY_THREAD_HEADER_INIT	124
8.10.2.6 WOLFSENTRY_THREAD_HEADER_INIT_CHECKED	124
8.10.2.7 WOLFSENTRY_THREAD_TAILER	124
8.10.3 Enumeration Type Documentation	124
8.10.3.1 wolfsentry_lock_flags_t	124
8.10.3.2 wolfsentry_thread_flags_t	125
8.10.4 Function Documentation	125
8.10.4.1 wolfsentry_lock_alloc()	125
8.10.4.2 wolfsentry_lock_destroy()	127
8.10.4.3 wolfsentry_lock_free()	127
8.10.4.4 wolfsentry_lock_get_flags()	128
8.10.4.5 wolfsentry_lock_have_either()	128

8.10.4.6 wolfentry_lock_have_mutex()	129
8.10.4.7 wolfentry_lock_have_shared()	129
8.10.4.8 wolfentry_lock_have_shared2mutex_reservation()	130
8.10.4.9 wolfentry_lock_init()	130
8.10.4.10 wolfentry_lock_mutex()	131
8.10.4.11 wolfentry_lock_mutex2shared()	131
8.10.4.12 wolfentry_lock_mutex_abstimed()	132
8.10.4.13 wolfentry_lock_mutex_timed()	132
8.10.4.14 wolfentry_lock_shared()	133
8.10.4.15 wolfentry_lock_shared2mutex()	133
8.10.4.16 wolfentry_lock_shared2mutex_abandon()	134
8.10.4.17 wolfentry_lock_shared2mutex_abstimed()	134
8.10.4.18 wolfentry_lock_shared2mutex_redeem()	135
8.10.4.19 wolfentry_lock_shared2mutex_redeem_abstimed()	135
8.10.4.20 wolfentry_lock_shared2mutex_redeem_timed()	136
8.10.4.21 wolfentry_lock_shared2mutex_reserve()	136
8.10.4.22 wolfentry_lock_shared2mutex_timed()	137
8.10.4.23 wolfentry_lock_shared_abstimed()	137
8.10.4.24 wolfentry_lock_shared_timed()	138
8.10.4.25 wolfentry_lock_unlock()	139
8.11 Allocator (Heap) Functions and Callbacks	139
8.11.1 Detailed Description	140
8.12 Time Functions and Callbacks	140
8.12.1 Detailed Description	141
8.13 Semaphore Function Callbacks	141
8.13.1 Detailed Description	142
8.13.2 Typedef Documentation	142
8.13.2.1 sem_destroy_cb_t	142
8.13.2.2 sem_init_cb_t	142
8.13.2.3 sem_post_cb_t	142
8.13.2.4 sem_timedwait_cb_t	142
8.13.2.5 sem_trywait_cb_t	142
8.13.2.6 sem_wait_cb_t	143
8.14 lwIP Callback Activation Functions	143
8.14.1 Detailed Description	143
<b>9 Data Structure Documentation</b>	<b>145</b>
9.1 JSON_CALLBACKS Struct Reference	145
9.2 JSON_CONFIG Struct Reference	145
9.3 JSON_DOM_PARSER Struct Reference	145
9.4 JSON_INPUT_POS Struct Reference	146
9.5 JSON_PARSER Struct Reference	146

9.6 JSON_VALUE Struct Reference . . . . .	146
9.7 wolfsentry_allocator Struct Reference . . . . .	147
9.7.1 Detailed Description . . . . .	147
9.8 wolfsentry_build_settings Struct Reference . . . . .	147
9.8.1 Detailed Description . . . . .	147
9.8.2 Field Documentation . . . . .	147
9.8.2.1 config . . . . .	147
9.8.2.2 version . . . . .	148
9.9 wolfsentry_data Struct Reference . . . . .	148
9.10 wolfsentry_eventconfig Struct Reference . . . . .	148
9.10.1 Detailed Description . . . . .	149
9.11 wolfsentry_host_platform_interface Struct Reference . . . . .	149
9.11.1 Detailed Description . . . . .	149
9.11.2 Field Documentation . . . . .	149
9.11.2.1 allocator . . . . .	149
9.11.2.2 caller_build_settings . . . . .	149
9.11.2.3 semcbcs . . . . .	149
9.11.2.4 timecbcs . . . . .	149
9.12 wolfsentry_kv_pair Struct Reference . . . . .	150
9.12.1 Detailed Description . . . . .	150
9.12.2 Field Documentation . . . . .	150
9.12.2.1 b . . . . .	150
9.13 wolfsentry_route_endpoint Struct Reference . . . . .	150
9.13.1 Detailed Description . . . . .	151
9.14 wolfsentry_route_exports Struct Reference . . . . .	151
9.14.1 Detailed Description . . . . .	152
9.15 wolfsentry_route_metadata_exports Struct Reference . . . . .	152
9.15.1 Detailed Description . . . . .	152
9.16 wolfsentry_semcbcs Struct Reference . . . . .	152
9.16.1 Detailed Description . . . . .	153
9.17 wolfsentry_sockaddr Struct Reference . . . . .	153
9.17.1 Detailed Description . . . . .	153
9.18 wolfsentry_thread_context_public Struct Reference . . . . .	154
9.18.1 Detailed Description . . . . .	154
9.19 wolfsentry_timecbcs Struct Reference . . . . .	154
9.19.1 Detailed Description . . . . .	154
<b>10 File Documentation . . . . .</b>	<b>155</b>
10.1 centijson_dom.h . . . . .	155
10.2 centijson_sax.h . . . . .	157
10.3 centijson_value.h . . . . .	161
10.4 wolfsentry/wolfsentry.h File Reference . . . . .	168



10.4.1 Detailed Description . . . . .	190
10.5 wolfsentry.h . . . . .	190
10.6 wolfsentry/wolfsentry_af.h File Reference . . . . .	209
10.6.1 Detailed Description . . . . .	212
10.7 wolfsentry_af.h . . . . .	212
10.8 wolfsentry/wolfsentry_errcodes.h File Reference . . . . .	213
10.8.1 Detailed Description . . . . .	218
10.9 wolfsentry_errcodes.h . . . . .	218
10.10 wolfsentry/wolfsentry_json.h File Reference . . . . .	223
10.10.1 Detailed Description . . . . .	224
10.11 wolfsentry_json.h . . . . .	225
10.12 wolfsentry/wolfsentry_lwip.h File Reference . . . . .	226
10.12.1 Detailed Description . . . . .	226
10.13 wolfsentry_lwip.h . . . . .	227
10.14 wolfsentry/wolfsentry_settings.h File Reference . . . . .	228
10.14.1 Detailed Description . . . . .	231
10.15 wolfsentry_settings.h . . . . .	231
10.16 wolfsentry/wolfsentry_util.h File Reference . . . . .	239
10.16.1 Detailed Description . . . . .	241
10.16.2 Macro Definition Documentation . . . . .	241
10.16.2.1 WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY . . . . .	241
10.16.2.2 WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY_BY_ONE . . . . .	242
10.16.2.3 WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY . . . . .	242
10.16.2.4 WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY_BY_ONE . . . . .	242
10.16.2.5 WOLFSENTRY_ATOMIC_RESET . . . . .	242
10.16.2.6 WOLFSENTRY_ATOMIC_TEST_AND_SET . . . . .	242
10.16.2.7 WOLFSENTRY_ATOMIC_UPDATE_FLAGS . . . . .	243
10.17 wolfsentry_util.h . . . . .	243
10.18 wolfsentry/wolfssl_test.h File Reference . . . . .	246
10.18.1 Detailed Description . . . . .	246
10.19 wolfssl_test.h . . . . .	247
<b>Index</b>	<b>255</b>



## Chapter 1

# wolfSentry – The Wolfssl Embedded Firewall/IDPS

### Description

wolfSentry is the wolfSSL embedded IDPS (Intrusion Detection and Prevention System). In simple terms, wolfSentry is an embedded firewall engine (both static and fully dynamic), with prefix-based and wildcard-capable lookup of known hosts/netblocks qualified by interface, address family, protocol, port, and other traffic parameters. Additionally, wolfSentry can be used as a dynamically configurable logic hub, arbitrarily associating user-defined events with user-defined actions, contextualized by connection attributes. The evolution of client-server relationships can thus be tracked in detail, freely passing traffic matching expected usage patterns, while efficiently rejecting abusive traffic.

wolfSentry is fully integrated with the lwIP stack, through a patchset in the `lwip/` subdirectory of the source tree, and has basic integration with the wolfSSL library for application-level filtering of inbound and outbound connections.

The wolfSentry engine is dynamically configurable programmatically through an API, or from a textual input file in JSON supplied to the engine, or dynamically and incrementally with JSON fragments, or any combination of these methods. Reconfiguration is protected by transactional semantics, and advanced internal locks on threaded targets assure seamless service availability with atomic policy transition. Callbacks allow for transport-agnostic remote logging, e.g. through MQTT, syslog, or DDS message buses.

wolfSentry is designed from the ground up to function well in resource-constrained, bare-metal, and realtime environments, with algorithms to stay within designated maximum memory footprints and maintain deterministic throughput. This allows full firewall and IDPS functionality on embedded targets such as FreeRTOS, Nucleus, NUTTX, Zephyr, VxWorks, and Green Hills Integrity, and on ARM and other common embedded CPUs and MCUs. wolfSentry with dynamic firewalling can add as little as 64k to the code footprint, and 32k to the volatile state footprint, and can fully leverage the existing logic and state of applications and sibling libraries.

### Documentation

With `doxygen` installed, the HTML version of the full API reference manual can be generated from the top of the wolfSentry source tree with `make doc-html`. This, and the source code itself, are the recommended API references.

The PDF version of the API reference manual is pregenerated and included with source distributions in the `doc/` subdirectory. The latest version is always available [on GitHub](#).

## Dependencies

In its default build, wolfSentry depends on a POSIX runtime, specifically the heap allocator, `clock_gettime`, `stdio`, `semaphore`, `pthread`s, and string APIs. However, these dependencies can be avoided with various build-time options. The recipe

```
make STATIC=1 SINGLETHREADED=1 NO_STDIO=1 EXTRA_CFLAGS='-DWOLFSENTRY_NO_CLOCK_BUILTIN
-DWOLFSENTRY_NO_MALLOC_BUILTIN'
```

builds a `libwolfentry.a` that depends on only a handful of basic string functions and the `inet_ntop()` library function (from POSIX.1-2001, and also implemented by lwIP). Allocator and time callbacks must then be set in a struct `wolfentry_host_platform_interface` supplied to `wolfentry_init()`.

The wolfSentry Makefile depends on a modern (v4.0+) Gnu make. The library itself can be built outside make, within another project/framework, by creating a user settings macro file and passing its path to the compiler with the `WOLFSENTRY_USER_SETTINGS_FILE` macro.

## Building

wolfSentry was written with portability in mind, with provisions for non-POSIX and C89 targets. For example, all its dependencies can be met with the FreeRTOS/newlib-nano/lwIP runtime. If you have difficulty building wolfSentry, please don't hesitate to seek support through our [support forums](#) or contact us directly at [support@wolfssl.com](mailto:support@wolfssl.com).

The current wolfSentry release can be downloaded from [the wolfSSL website as a ZIP file](#), and developers can [browse the release history](#) and clone [the wolfSentry Git repository](#) for the latest pre-release updates.

There are several flags that can be passed to make to control the build parameters. make will store them at build time in `wolfentry/wolfentry_options.h` in the build tree. If you are not using make, then the C macro `WOLFSENTRY_USER_SETTINGS_FILE` should be defined to the path to a file containing settings, both when building wolfSentry and when building the application.

The following feature control variables are recognized. True/false features (LWIP, NO\_STDIO, NO\_JSON, etc.) are undefined by default, and activated when defined. Macros can be supplied using the `EXTRA_CFLAGS` option, or by placing them in a `USER_SETTINGS_FILE`. More detailed documentation for macros is available in the reference manual "Startup/Configuration/Shutdown Subsystem" topic.

make Option	Macro Option	Description
V		Verbose make output e.g. <code>make V=1 -j test</code>
USER_MAKE_CONF		User-defined make clauses to include at the top of the main Makefile e.g. <code>make -j USER_MAKE_CONF=Makefile.settings</code>
EXTRA_CFLAGS		Additional arguments to be passed verbatim to the compiler
EXTRA_LDFLAGS		Additional arguments to be passed verbatim to the linker
SRC_TOP		The source code top level directory (default <code>pwd -P</code> )

make Option	Macro Option	Description
BUILD_TOP		Build with artifacts in an alternate location (outside or in a subdirectory of the source tree) e.g. <code>make BUILD_TOP=./build -j test</code>
DEBUG		Compiler debugging flag to use (default <code>-ggdb</code> )
OPTIM		The optimizer flag to use (default <code>-O3</code> )
HOST		The target host tuple, for cross-compilation (default unset, i.e. native targeting)
RUNTIME		The target runtime ecosystem – default unset, <code>FreeRTOS-lwIP</code> and <code>Linux-lwIP</code> are recognized
C_WARNFLAGS		The warning flags to use (overriding the generally applicable defaults)
STATIC		Build statically linked unit tests
STRIPPED		Strip binaries of debugging symbols
BUILD_DYNAMIC		Build dynamically linked library
VERY_QUIET		Inhibit all non-error output during build
TAR		Path to GNU tar binary for <code>make dist</code> , should be set to <code>gtar</code> for macOS
VERSION		The version to package for <code>make dist</code>
LWIP	WOLFSENTRY_LWIP	True/false – Activates appropriate build settings for lwIP
NO_STDIO_STREAMS	WOLFSENTRY_NO_STDIO_STREAMS	Define to omit functionality that depends on <code>stdio</code> stream I/O
	WOLFSENTRY_NO_STDIO_H	Define to inhibit inclusion of <code>stdio.h</code>
NO_ADDR_BITMASK_MATCHING	WOLFSENTRY_NO_ADDR_BITMASK_MATCHING	Define to omit support for bitmask matching of addresses, i.e. support only prefix matching.
NO_IPV6	WOLFSENTRY_NO_IPV6	Define to omit support for the IPv6 address family.
NO_JSON	WOLFSENTRY_NO_JSON	Define to omit JSON configuration support
NO_JSON_DOM	WOLFSENTRY_NO_JSON_DOM	Define to omit JSON DOM API
CALL_TRACE	WOLFSENTRY_DEBUG_CALL_TRACE	Define to activate runtime call stack logging (profusely verbose)
USER_SETTINGS_FILE	WOLFSENTRY_USER_SETTINGS_FILE	A substitute settings file, replacing autogenerated <a href="#">wolfentry_settings.h</a>
SINGLETHREADED	WOLFSENTRY_SINGLETHREADED	Define to omit thread safety logic, and replace thread safety functions and macros with no-op macros.

make Option	Macro Option	Description
	WOLFSENTRY_NO_PROTOCOL_NAMES	If defined, omit APIs for rendering error codes and source code files in human readable form. They will be rendered numerically.
	WOLFSENTRY_NO_GETPROTOBY	Define to disable lookup and rendering of protocols and services by name.
	WOLFSENTRY_NO_ERROR_STRINGS	If defined, omit APIs for rendering error codes and source code files in human readable form. They will be rendered numerically.
	WOLFSENTRY_NO_MALLOC_BUILTINS	If defined, omit built-in heap allocator primitives; the <a href="#">wolfentry_host_platform_interface</a> supplied to wolfSentry APIs must include implementations of all functions in struct <a href="#">wolfentry_allocator</a> .
	WOLFSENTRY_HAVE_NONGNU_ATOMICS	Define if gnu-style atomic intrinsics are not available. WOLFSENTRY_ATOMIC_*() macro definitions for intrinsics will need to be supplied in WOLFSENTRY_USER_SETTINGS_FILE (see <a href="#">wolfentry_util.h</a> ).
	WOLFSENTRY_NO_CLOCK_BUILTIN	If defined, omit built-in time primitives; the <a href="#">wolfentry_host_platform_interface</a> supplied to wolfSentry APIs must include implementations of all functions in struct <a href="#">wolfentry_timecb</a> s.

|| WOLFSENTRY\_NO\_SEM\_BUILTIN || If defined, omit built-in semaphore primitives; the [wolfentry\\_host\\_platform\\_int](#) supplied to wolfSentry APIs must include implementations of all functions in struct [wolfentry\\_semcbs](#). |  
 || WOLFSENTRY\_USE\_NONPOSIX\_SEMAPHORES | Define if POSIX semaphore API is not available. If no non-POSIX builtin implementation is present in [wolfentry\\_util.c](#), then [WOLFSENTRY\\_NO\\_SEM\\_BUILTIN](#) must be set, and the [wolfentry\\_host\\_platform\\_interface](#) supplied to wolfSentry APIs must include a full semaphore implementation (shim set) in its [wolfentry\\_semcbs](#) slot. | || WOLFSENTRY\_SEMAPHORE\_INCLUDE | Define to the path of a header file declaring a semaphore API. | || WOLFSENTRY\_USE\_NONPOSIX\_THREADS | Define if POSIX thread API is not available. WOLFSENTRY\_THREAD\_INCLUDE, WOLFSENTRY\_THREAD\_ID\_T, and WOLFSENTRY\_THREAD\_GET\_ID\_HANDLER will need to be defined. | || WOLFSENTRY\_THREAD\_INCLUDE | Define to the path of a header file declaring a threading API. | || WOLFSENTRY\_THREAD\_ID\_T | Define to the appropriate type analogous to POSIX pthread\_t. | || WOLFSENTRY\_THREAD\_GET\_ID\_HANDLER | Define to the name of a void function analogous to POSIX pthread\_self, returning a value of type WOLFSENTRY\_THREAD\_ID\_T. | || FREERTOS | Build for FreeRTOS |

## Build and Self-Test Examples

Building and testing libwolfentry.a on Linux:

```
make -j test
```

Build verbosely:

```
make V=1 -j test
```

Build with artifacts in an alternate location (outside or in a subdirectory of the source tree):

```
make BUILD_TOP=./build -j test
```

Install from an alternate build location to a non-standard destination:

```
make BUILD_TOP=./build INSTALL_DIR=/usr INSTALL_LIBDIR=/usr/lib64 install
```

Build libwolfentry.a and test it in various configurations:

```
make -j check
```

Build and test libwolfentry.a without support for multithreading:

```
make -j SINGLETHREADED=1 test
```

Other available make flags are `STATIC=1`, `STRIPPED=1`, `NO_JSON=1`, and `NO_JSON_DOM=1`, and the defaults values for `DEBUG`, `OPTIM`, and `C_WARNFLAGS` can also be usefully overridden.

Build with a user-supplied makefile preamble to override defaults:

```
make -j USER_MAKE_CONF=Makefile.settings
```

(`Makefile.settings` can contain simple settings like `OPTIM := -Os`, or elaborate makefile code including additional rules and dependency mechanisms.)

Build the smallest simplest possible library:

```
'make -j SINGLETHREADED=1 NO_STDIO=1 DEBUG= OPTIM=-Os EXTRA_CFLAGS='-DWOLFSENTRY_NO_CLOCK_BUILTIN -DWOLFSENTRY_NO_MALLOC_BUILTIN -DWOLFSENTRY_NO_ERROR_STRINGS -Wno-error=inline -Wno-inline'
```

Build and test with user settings:

```
make -j USER_SETTINGS_FILE=user_settings.h test
```

Build for FreeRTOS on ARM32, assuming FreeRTOS and lwIP source trees are located as shown:

```
'make -j HOST=arm-none-eabi RUNTIME=FreeRTOS-lwIP FREERTOS_TOP=../third/FreeRTOSv202212.00 LWIP_TOP=../third/lwip EXTRA_CFLAGS='-mcpu=cortex-m7'
```

## Project Examples

In the `wolfentry/examples/` subdirectory are a set of example ports and applications, including a demo pop-up notification system implementing a toy TLS-enabled embedded web server, integrating with the Linux D-Bus facility.

More comprehensive examples of API usage are in `tests/unittests.c`, particularly `test_static_routes()`, `test_dynamic_rules()`, and `test_json()`, and the JSON configuration files at `tests/test-config*.json`.

In the [wolfSSL repository](#), see code in `wolfssl/test.h` gated on `WOLFSSL_WOLFSENTRY_HOOKS`, including `wolfentry_store_endpoints()`, `wolfSentry_NetworkFilterCallback()`, `wolfentry_setup()`, and `tcp_connect_with_wolfSentry()`. See also code in `examples/server/server.c` and `examples/client/client.c` gated on `WOLFSSL_WOLFSENTRY_HOOKS`. Configure `wolfssl` with `--enable-wolfentry` to build with `wolfSentry` integration, and use `--with-wolfentry=/the/install/path` if `wolfSentry` is installed in a nonstandard location. The `wolfSSL` test client/server can be loaded with user-supplied `wolfSentry` JSON configurations from the command line, using `--wolfentry-config <file>`.





## Chapter 2

# Building and Initializing wolfSentry for an application on FreeRTOS/lwIP

Building the wolfSentry library for FreeRTOS with lwIP and newlib-nano is supported directly by the top level Makefile. E.g., for an ARM Cortex M7, `libwolfsentry.a` can be built with

```
make HOST=arm-none-eabi EXTRA_CFLAGS='-mcpu=cortex-m7' RUNTIME=FreeRTOS-lwIP FREERTOS_TOP="$FREERTOS_TOP"
LWIP_TOP="$LWIP_TOP"
```

`FREERTOS_TOP` is the path to the top of the FreeRTOS distribution, with `FreeRTOS/Source` directly under it, and `LWIP_TOP` is the path to the top of the lwIP distribution, with `src` directly under it.

The below code fragments can be added to a FreeRTOS application to enable wolfSentry with dynamically loaded policies (JSON). Many of the demonstrated code patterns are optional. The only calls that are indispensable are `wolfsentry_init()`, `wolfsentry_config_json_one-shot()`, and `wolfsentry_install_lwip_filter_callbacks()`. Each of these also has API variants that give the user more control.

```
#define WOLFSENTRY_SOURCE_ID WOLFSENTRY_SOURCE_ID_USER_BASE
#define WOLFSENTRY_ERROR_ID_USER_APP_ERR0 (WOLFSENTRY_ERROR_ID_USER_BASE-1)
/* user-defined error IDs count down starting at WOLFSENTRY_ERROR_ID_USER_BASE (which is negative). */

#include <wolfsentry/wolfsentry_json.h>
#include <wolfsentry/wolfsentry_lwip.h>

static struct wolfsentry_context *wolfsentry_lwip_ctx = NULL;

static const struct wolfsentry_eventconfig demo_config = {
#ifdef WOLFSENTRY_HAVE_DESIGNATED_INITIALIZERS
    .route_private_data_size = 64,
    .route_private_data_alignment = 0,
    .max_connection_count = 10,
    .derogatory_threshold_for_penaltybox = 4,
    .penaltybox_duration = 300,
    .route_idle_time_for_purge = 0,
    .flags = WOLFSENTRY_EVENTCONFIG_FLAG_COMMENDABLE_CLEAR_DEROGATORY,
    .route_flags_to_add_on_insert = 0,
    .route_flags_to_clear_on_insert = 0,
    .action_res_filter_bits_set = 0,
    .action_res_filter_bits_unset = 0,
    .action_res_bits_to_add = 0,
    .action_res_bits_to_clear = 0,
    /* default alignment -- same as sizeof(void *). */
    /* by default, don't allow more than 10 simultaneous
     * connections that match the same route.
     */
    /* after 4 derogatory events matching the same route,
     * put the route in penalty box status.
     */
    /* keep routes in penalty box status for 5 minutes.
     * denominated in seconds when passing to
     * wolfsentry_init().
     */
    /* 0 to disable -- autopurge doesn't usually make
     * much sense as a default config.
     */
    /* automatically clear
     * derogatory count for a route when a commendable
     * event matches the route.
     */

```

```

#else
    64,
    0,
    10,
    4,
    300,
    0,
    WOLFSENTRY_EVENTCONFIG_FLAG_COMMENDABLE_CLEARS_DEROGATORY,
    0,
    0,
    0,
    0,
    0,
    0
#endif
};

/* This routine is to be called once by the application before any direct calls
 * to lwIP -- i.e., before lwip_init() or tcpip_init().
 */
wolf_sentry_errcode_t activate_wolf_sentry_lwip(const char *json_config, int json_config_len)
{
    wolf_sentry_errcode_t ret;
    char err_buf[512]; /* buffer for detailed error messages from
     * wolf_sentry_config_json_one_shot().
     */

    /* Allocate a thread state struct on the stack. Note that the final
     * semicolon is supplied by the macro definition, so that in single-threaded
     * application builds this expands to nothing at all.
     */
    WOLFSENTRY_THREAD_HEADER_DECLS

    if (wolf_sentry_lwip_ctx != NULL) {
        printf("activate_wolf_sentry_lwip() called multiple times.\n");
        WOLFSENTRY_ERROR_RETURN(ALREADY);
    }

#ifdef WOLFSENTRY_ERROR_STRINGS
    /* Enable pretty-printing of the app source code filename for
     * WOLFSENTRY_ERROR_FMT/WOLFSENTRY_ERROR_FMT_ARGS().
     */
    ret = WOLFSENTRY_REGISTER_SOURCE();
    WOLFSENTRY_RERETURN_IF_ERROR(ret);

    /* Enable pretty-printing of an app-specific error code. */
    ret = WOLFSENTRY_REGISTER_ERROR(USER_APP_ERR0, "failure in application code");
    WOLFSENTRY_RERETURN_IF_ERROR(ret);
#endif

    /* Initialize the thread state struct -- this sets the thread ID. */
    WOLFSENTRY_THREAD_HEADER_INIT_CHECKED(WOLFSENTRY_THREAD_FLAG_NONE);

    /* Call the main wolfSentry initialization routine.
     *
     * WOLFSENTRY_CONTEXT_ARGS_OUT() is a macro that abstracts away
     * conditionally passing the thread struct pointer to APIs that need it. If
     * this is a single-threaded build (!defined(WOLFSENTRY_THREADSAFE)), then
     * the thread arg is omitted entirely.
     *
     * WOLFSENTRY_CONTEXT_ARGS_OUT_EX() is a variant that allows the caller to
     * supply the first arg explicitly, when "wolf_sentry" is not the correct arg
     * to pass. This is used here to pass a null pointer for the host platform
     * interface ("hpi").
     */
    ret = wolf_sentry_init(
        wolf_sentry_build_settings,
        WOLFSENTRY_CONTEXT_ARGS_OUT_EX(NULL /* hpi */),
        &demo_config,
        &wolf_sentry_lwip_ctx);
    if (ret < 0) {
        printf("wolf_sentry_init() failed: " WOLFSENTRY_ERROR_FMT "\n",
            WOLFSENTRY_ERROR_FMT_ARGS(ret));
        goto out;
    }

    /* Insert user-defined actions here, if any. */
    ret = wolf_sentry_action_insert(
        WOLFSENTRY_CONTEXT_ARGS_OUT_EX(wolf_sentry_lwip_ctx),
        "my-action",
        WOLFSENTRY_LENGTH_NULL_TERMINATED,
        WOLFSENTRY_ACTION_FLAG_NONE,
        my_action_handler,
        NULL,
        NULL);
    if (ret < 0) {
        printf("wolf_sentry_action_insert() failed: " WOLFSENTRY_ERROR_FMT "\n",

```

```

        WOLFSENTRY_ERROR_FMT_ARGS(ret));
    goto out;
}

if (json_config) {
    if (json_config_len < 0)
        json_config_len = (int)strlen(json_config);

    /* Do the initial load of the policy. */
    ret = wolfentry_config_json_oneshot(
        WOLFSENTRY_CONTEXT_ARGS_OUT_EX(wolfentry_lwip_ctx),
        (unsigned char *)json_config,
        (size_t)json_config_len,
        WOLFSENTRY_CONFIG_LOAD_FLAG_NONE,
        err_buf,
        sizeof err_buf);
    if (ret < 0) {
        printf("wolfentry_config_json_oneshot() failed: %s\n", err_buf);
        goto out;
    }
} /* else the application will need to set up the policy programmatically,
 * or itself call wolfentry_config_json_oneshot() or sibling APIs.
 */

/* Install lwIP callbacks. Once this call returns with success, all lwIP
 * traffic designated for filtration by the mask arguments shown below will
 * be subject to filtering (or other supplementary processing) according to
 * the policy loaded above.
 *
 * Note that if a given protocol is gated out of LWIP, its mask argument
 * must be passed as zero here, else the call will return
 * IMPLEMENTATION_MISSING error will occur.
 *
 * The callback installation also registers a cleanup routine that will be
 * called automatically by wolfentry_shutdown().
 */

#define LWIP_ALL_EVENTS (
    (1U < FILT_BINDING) |
    (1U < FILT DISSOCIATE) |
    (1U < FILT_LISTENING) |
    (1U < FILT_STOP_LISTENING) |
    (1U < FILT_CONNECTING) |
    (1U < FILT_ACCEPTING) |
    (1U < FILT_CLOSED) |
    (1U < FILT_REMOTE_RESET) |
    (1U < FILT_RECEIVING) |
    (1U < FILT_SENDING) |
    (1U < FILT_ADDR_UNREACHABLE) |
    (1U < FILT_PORT_UNREACHABLE) |
    (1U < FILT_INBOUND_ERR) |
    (1U < FILT_OUTBOUND_ERR))

ret = wolfentry_install_lwip_filter_callbacks(
    WOLFSENTRY_CONTEXT_ARGS_OUT_EX(wolfentry_lwip_ctx),

#if LWIP_ARP || LWIP_ETHERNET
    LWIP_ALL_EVENTS, /* ethernet_mask */
#else
    0,
#endif
#if LWIP_IPV4 || LWIP_IPV6
    LWIP_ALL_EVENTS, /* ip_mask */
#else
    0,
#endif
#if LWIP_ICMP || LWIP_ICMP6
    LWIP_ALL_EVENTS, /* icmp_mask */
#else
    0,
#endif
#if LWIP_TCP
    LWIP_ALL_EVENTS, /* tcp_mask */
#else
    0,
#endif
#if LWIP_UDP
    LWIP_ALL_EVENTS /* udp_mask */
#else
    0
#endif
);
if (ret < 0) {
    printf("wolfentry_install_lwip_filter_callbacks: "
        WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(ret));
}

```

```

    }
out:
    if (ret < 0) {
        /* Clean up if initialization failed. */
        wolfsentry_errcode_t shutdown_ret =
            wolfsentry_shutdown(WOLFSENTRY_CONTEXT_ARGS_OUT_EX(&wolfsentry_lwip_ctx));
        if (shutdown_ret < 0)
            printf("wolfsentry_shutdown: "
                WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(shutdown_ret));
    }

    WOLFSENTRY_THREAD_TAILER_CHECKED(WOLFSENTRY_THREAD_FLAG_NONE);

    WOLFSENTRY_ERROR_RERETURN(ret);
}

/* to be called once by the application after any final calls to lwIP. */
wolfsentry_errcode_t shutdown_wolfsentry_lwip(void)
{
    wolfsentry_errcode_t ret;
    if (wolfsentry_lwip_ctx == NULL) {
        printf("shutdown_wolfsentry_lwip() called before successful activation.\n");
        return -1;
    }

    /* after successful shutdown, wolfsentry_lwip_ctx will once again be a null
     * pointer as it was before init.
     */
    ret = wolfsentry_shutdown(WOLFSENTRY_CONTEXT_ARGS_OUT_EX4(&wolfsentry_lwip_ctx, NULL));
    if (ret < 0) {
        printf("wolfsentry_shutdown: "
            WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(ret));
    }

    return ret;
}

```

## Chapter 3

# Configuring wolfSentry using a JSON document

Most of the capabilities of wolfSentry can be configured, and dynamically reconfigured, by supplying JSON documents to the library. To use this capability, add the following to wolfSentry initialization in the application:

```
#include <wolfsentry/wolfsentry_json.h>
```

After initialization and installation of application-supplied callbacks (if any), call one of the APIs to load the config:

- `wolfsentry_config_json_oneshot()`
- `wolfsentry_config_json_oneshot_ex()`, with an additional `json_config` arg for fine control of JSON parsing (see `struct JSON_CONFIG` in `wolfsentry/centijson_sax.h`)
- streaming API:
  - `wolfsentry_config_json_init()` or `wolfsentry_config_json_init_ex()`
  - `wolfsentry_config_json_feed()`
  - `wolfsentry_config_json_fini()`

See `wolfsentry/wolfsentry_json.h` for details on arguments.

## JSON Basics

wolfSentry configuration uses standard JSON syntax as defined in RFC 8259, as restricted by RFC 7493, with certain additional requirements. In particular, certain sections in the JSON document are restricted in their sequence of appearance.

- "wolf-sentry-config-version" shall appear first, and each event definition shall appear before any definitions for events, routes, or default policies that refer to it through "aux-parent-event", "parent-event", or "default-event" clauses.
- Within event definitions, the "label", "priority", and "config" elements shall appear before any other elements.

These sequence constraints are necessary to allow for high efficiency SAX-style (sequential-incremental) loading of the configuration.

All wildcard flags are implicitly set on routes, and are cleared for fields with explicit assignments in the configuration. For example, if a route designates a particular "family", then `WOLFSENTRY_ROUTE_FLAG_SA_FAMILY_WILDCARD` will be implicitly cleared. Thus, wildcard flags need not be explicitly set or cleared in route definitions.

Note that certain element variants may be unavailable due to build settings:

- `address_family_name`: available if defined (`WOLFSENTRY_PROTOCOL_NAMES`)
- `route_protocol_name`: available if !defined (`WOLFSENTRY_NO_GETPROTOBY`)
- `address_port_name`: available if !defined (`WOLFSENTRY_NO_GETPROTOBY`)
- `json_value_clause`: available if defined (`WOLFSENTRY_HAVE_JSON_DOM`)

Caller-supplied event and action labels shall not begin with `WOLFSENTRY_BUILTIN_LABEL_PREFIX` (by default "%"), as these are reserved for built-ins.

"config-update" allows the default configuration to be updated. It is termed an "update" because wolfSentry is initially configured by the `config` argument to `wolfentry_init()` (which can be passed in `NULL`, signifying built-in defaults). Note that times (`config.penaltybox_duration` and `config.route_idle_time_for_purge`) shall be passed to `wolfentry_init()` denominated in seconds, notwithstanding the `wolfentry_time_t` type of the members.

## JSON load flags

The `flags` argument to `wolfentry_config_json_init()` and `wolfentry_config_json_one_shot()`, constructed by bitwise-or, changes the way the JSON is processed, as follows:

- `WOLFSENTRY_CONFIG_LOAD_FLAG_NONE` – Not a flag, but all-zeros, signifying default behavior: The wolfSentry core is locked, the current configuration is flushed, and the new configuration is loaded incrementally. Any error during load leaves wolfSentry in an undefined state that can be recovered with a subsequent flush and load that succeeds.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_NO_FLUSH` – Inhibit initial flush of configuration, to allow incremental load. Error during load leaves wolfSentry in an undefined state that can only be recovered with a subsequent flush and load that succeeds, unless `WOLFSENTRY_CONFIG_LOAD_FLAG_DRY_RUN` or `WOLFSENTRY_CONFIG_LOAD_FLAG_LOAD_THEN_COMMIT` was also supplied.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_DRY_RUN` – Load into a temporary configuration, and deallocate before return. Running configuration is unchanged.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_LOAD_THEN_COMMIT` – Load into a newly allocated configuration, and install it only if load completes successfully. On error, running configuration is unchanged. On success, the old configuration is deallocated.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_NO_ROUTES_OR_EVENTS` – Inhibit loading of "routes" and "events" sections in the supplied JSON.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_FLUSH_ONLY_ROUTES` – At beginning of load process, retain all current configuration except for routes, which are flushed. This is convenient in combination with `wolfentry_route_table_dump_json_*` for save/restore of dynamically added routes.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_ABORT` – When processing user-defined JSON values, abort load on duplicate keys.

- `WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USEFIRST` – When processing user-defined JSON values, for any given key in an object use the first occurrence encountered.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USELAST` – When processing user-defined JSON values, for any given key in an object use the last occurrence encountered.
- `WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_MAINTAIN_DICT_ORDER` – When processing user-defined JSON values, store sequence information so that subsequent calls to `wolfentry_kv_render_value()` or `json_dom_dump(..., JSON_DOM_DUMP_PREFER_DICT_ORDER)` render objects in their supplied sequence, rather than lexically sorted.

Note that `WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_*` flags are allowed only if `WOLFSENTRY_HAVE_JSON_DOM` is defined in the build, as it is with default settings.

## Overview of JSON syntax

Below is a JSON “lint” pseudodocument demonstrating all available configuration nodes, with value specifiers that refer to the ABNF definitions below. The allowed values are as in the ABNF formal syntax later in this document.

```
{
  "wolfentry-config-version" : 1,
  "config-update" : {
    "max-connection-count" : uint32,
    "penalty-box-duration" : duration,
    "route-idle-time-for-purge" : duration,
    "derog-thresh-for-penalty-boxing" : uint16,
    "derog-thresh-ignore-commendable" : boolean,
    "commendable-clears-derogatory" : boolean,
    "route-flags-to-add-on-insert" : route_flag_list,
    "route-flags-to-clear-on-insert" : route_flag_list,
    "action-res-filter-bits-set" : action_res_flag_list,
    "action-res-filter-bits-unset" : action_res_flag_list,
    "action-res-bits-to-add" : action_res_flag_list,
    "action-res-bits-to-clear" : action_res_flag_list,
    "max-purgeable-routes" : uint32
  },
  "events" : [
    {
      "label" : label,
      "priority" : uint16,
      "config" : {
        "max-connection-count" : uint32,
        "penalty-box-duration" : duration,
        "route-idle-time-for-purge" : duration,
        "derog-thresh-for-penalty-boxing" : uint16,
        "derog-thresh-ignore-commendable" : boolean,
        "commendable-clears-derogatory" : boolean,
        "route-flags-to-add-on-insert" : route_flag_list,
        "route-flags-to-clear-on-insert" : route_flag_list,
        "action-res-filter-bits-set" : action_res_flag_list,
        "action-res-filter-bits-unset" : action_res_flag_list,
        "action-res-bits-to-add" : action_res_flag_list,
        "action-res-bits-to-clear" : action_res_flag_list
      },
      "aux-parent-event" : label,
      "post-actions" : action_list,
      "insert-actions" : action_list,
      "match-actions" : action_list,
      "update-actions" : action_list,
      "delete-actions" : action_list,
      "decision-actions" : action_list
    }
  ],
  "default-policies" : {
    "default-policy" : default_policy_value,
    "default-event" : "label"
  },
  "routes" : [
    {
      "parent-event" : label,
      "af-wild" : boolean,
      "raddr-wild" : boolean,
      "rport-wild" : boolean,
      "laddr-wild" : boolean,
      "lport-wild" : boolean,

```

```

    "riface-wild" : boolean,
    "liface-wild" : boolean,
    "tcplike-port-numbers" : boolean,
    "direction-in" : boolean,
    "direction-out" : boolean,
    "penalty-boxed" : boolean,
    "green-listed" : boolean,
    "dont-count-hits" : boolean,
    "dont-count-current-connections" : boolean,
    "port-reset" : boolean,

    "family" : address_family,
    "protocol" : route_protocol,
    "remote" : {
        "interface" : uint8,
        "address" : route_address,
        "prefix-bits" : uint16,
        "bitmask" : route_address,
        "port" : endpoint_port
    },
    "local" : {
        "interface" : uint8,
        "address" : route_address,
        "prefix-bits" : uint16,
        "bitmask" : route_address,
        "port" : endpoint_port
    }
}
},
"user-values" : {
    label : null,
    label : true,
    label : false,
    label : number_sint64,
    label : number_float,
    label : string,
    label : { "uint" : number_uint64 },
    label : { "sint" : number_sint64 },
    label : { "float" : number_float },
    label : { "string" : string_value },
    label : { "base64" : base64_value },
    label : { "json" : json_value }
}
}

```

## Descriptions of elements

**wolfentry-config-version** – Shall appear first, with the value 1.

**config-update** – Sets default and global parameters. The default parameters apply to routes that have no parent event, or a parent event with no config of its own.

- **max-connection-count** – If nonzero, the concurrent connection limit, beyond which additional connection requests are rejected.
- **penalty-box-duration** – If nonzero, the duration that a route stays in penalty box status before automatic release.
- **derog-thresh-for-penalty-boxing** – If nonzero, the threshold at which accumulated derogatory counts (from WOLFSENTRY\_ACTION\_RES\_DEROGATORY incidents) automatically penalty boxes a route.
- **derog-thresh-ignore-commendable** – If true, then counts from WOLFSENTRY\_ACTION\_RES←\_COMMENDABLE are not subtracted from the derogatory count when checking for automatic penalty boxing.
- **commendable-clears-derogatory** – If true, then each count from WOLFSENTRY\_ACTION\_RES←\_COMMENDABLE zeroes the derogatory count.
- **max-purgeable-routes** – Global limit on the number of ephemeral routes to allow in the route table, beyond which the least recently matched ephemeral route is forced out early. Not allowed in **config** clauses of events.



- **route-idle-time-for-purge** – If nonzero, the time after the most recent dispatch match for a route to be garbage-collected. Useful primarily in **config** clauses of events (see **events** below).
- **route-flags-to-add-on-insert** – List of route flags to set on new routes upon insertion. Useful primarily in **config** clauses of events (see **events** below).
- **route-flags-to-clear-on-insert** – List of route flags to clear on new routes upon insertion. Useful primarily in **config** clauses of events (see **events** below).
- **action-res-filter-bits-set** – List of `action_res` flags that must be set at lookup time (dispatch) for referring routes to match. Useful primarily in **config** clauses of events (see **events** below).
- **action-res-filter-bits-unset** – List of `action_res` flags that must be clear at lookup time (dispatch) for referring routes to match. Useful primarily in **config** clauses of events (see **events** below).
- **action-res-bits-to-add** – List of `action_res` flags to be set upon match.
- **action-res-bits-to-clear** – List of `action_res` flags to be cleared upon match.

**events** – The list of events with their respective definitions. This section can appear more than once, but any given event definition shall precede any definitions that refer to it.

Each event is composed of the following elements, all of which are optional except for **label**. **label**, **priority**, and **config** shall appear before the other elements.

- **label** – The name by which the event is identified. See the definition of `label` in the ABNF grammar below for permissible values.
- **priority** – The priority of routes that have this event as their **parent-event** (see **routes** below). Lower number means higher priority.
- **config** – The configuration to associate with routes with this **parent-event**, as above for **config-update**.
- **aux-parent-event** – An event reference for use by action handlers, e.g. built-in `"%track-peer-v1"` creates routes with **aux-parent-event** as the new route's **parent-event**.
- **post-actions** – List of actions to take when this event is passed via `event_label` to a dispatch routine such as `wolfentry_route_event_dispatch()`.
- **insert-actions** – List of actions to take when a route is inserted with this event as **parent-event**.
- **match-actions** – List of actions to take when a route is matched by a dispatch routine, and the route has this event as its **parent-event**.
- **update-actions** – List of actions to take when a route has a status update, such as a change of penalty box status, and has this event as its **parent-event**.
- **delete-actions** – List of actions to take when a route is deleted, and has this event as its **parent-event**.
- **decision-actions** – List of actions to take when dispatch final decision (final value of `action_↵results`) is determined, and the matched route has this event as its **parent-event**.

**default-policies** – The global fallback default policies for dispatch routines such as `wolfentry_route_event_dispatcher`.

- **default-policy** – A simple `action_result` flag to set by default, either **accept**, **reject**, or **reset**, the latter of which causes generation of TCP reset and ICMP unreachable reply packets where relevant.
- **default-event** – An event to use when a dispatch routine is called with a null `event_label`.

**routes** – The list of routes with their respective definitions. This section can appear more than once.

Each route is composed of the following elements, all of which are optional.

- **parent-event** – The event whose attributes determine the dynamics of the route.
- **family** – The address family to match. See `address_family` definition in the ABNF grammar below for permissible values.
- **protocol** – The protocol to match. See `route_protocol` definition in the ABNF grammar below for permissible values.
- **remote** – The attributes to match for the remote endpoint of the traffic.
  - **interface** – Network interface ID, as an arbitrary integer chosen and used consistently by the caller or IP stack integration.
  - **address** – The network address, in idiomatic form. IPv4, IPv6, and MAC addresses shall enumerate all octets. See `route_address` definition in the ABNF grammar below for permissible values.
  - **prefix-bits** – The number of bits in the **address** that traffic must match (mutually exclusive with **bitmask**).
  - **bitmask** – A bitmask to be applied to the traffic address before matching with the route **address** (mutually exclusive with **prefix-bits**).
  - **port** – The port number that traffic must match.
- **local** – The attributes to match for the local endpoint of the traffic. The same nodes are available as for **remote**.
- **direction-in** – If true, match inbound traffic.
- **direction-out** – If true, match outbound traffic.
- **penalty-boxed** – If true, traffic matching the route is penalty boxed (rejected or reset).
- **green-listed** – If true, traffic matching the route is accepted.
- **dont-count-hits** – If true, inhibit statistical bookkeeping (no effect on dynamics).
- **dont-count-current-connections** – If true, inhibit tracking of concurrent connections, so that **max-connection-count** has no effect on traffic matching this route.
- **port-reset** – If true, set the `WOLFSENTRY_ACTION_RES_PORT_RESET` flag in the **action\_results** when this route is matched, causing TCP reset or ICMP unreachable reply packet to be generated if IP stack integration is activated (e.g. `wolfentry_install_lwip_filter_callbacks()`).

**user-values** – One or more sections of fully user-defined data available to application code for any use. Each key is a label as defined in the ABNF grammar below. The value can be any of:

- **null**
- **true**
- **false**
- an integral number, implicitly a signed 64 bit integer
- a floating point number, as defined in the ABNF grammar below for `number_float`
- a quoted string allowing standard JSON escapes
- any of several explicitly typed constructs, with values as defined in the ABNF grammar below.
  - { "uint" : number\_uint64 }
  - { "sint" : number\_sint64 }
  - { "float" : number\_float }
  - { "string" : string\_value }
  - { "base64" : base64\_value }
  - { "json" : json\_value }

## Formal ABNF grammar

Below is the formal ABNF definition of the configuration syntax and permitted values.

This definition uses ABNF syntax as prescribed in RFC 5234 and 7405, except:

- Whitespace is ignored, as provided in RFC 8259.
- a – operator is added, accepting a quoted literal string or a group of literal characters, to provide for omitted character(s) in the target text (here, trailing comma separators) by performing all notional matching operations of the containing group up to that point with the target text notionally extended with the argument to the operator.

The length limits used in the definition assume the default values in [wolfsentry\\_settings.h](#), 32 octets for labels (WOLFSENTRY\_MAX\_LABEL\_BYTES), and 16384 octets for user-defined values (WOLFSENTRY\_KV\_MAX\_VALUE\_BYTES). These values can be overridden at build time with user-supplied values.

```
{
  DQUOTE %s"wolfsentry-config-version" DQUOTE ":" uint32
  [ "," DQUOTE %s"config-update" DQUOTE ":" top_config_list "," ]
  *( "," DQUOTE %s"events" ":" "["
    event *( "," event)
  "]" )
  [ "," DQUOTE %s"default-policies" DQUOTE ":" "{"
    default_policy_item *( "," default_policy_item)
  "]" ]
  *( "," DQUOTE %s"routes" DQUOTE ":" "["
    route *( "," route)
  "]" )
  *( "," DQUOTE %s"user-values" DQUOTE ":" "{"
    user_item *( "," user_item)
  "]" )
}

event = "{" label_clause
  [ "," priority_clause ]
  [ "," event_config_clause ]
  [ "," aux_parent_event_clause ]
  *( "," action_list_clause ) "}"

default_policy_item =
  (DQUOTE %s"default-policy" DQUOTE ":" default_policy_value) /
  (DQUOTE %s"default-event" DQUOTE ":" label)

default_policy_value = (%s"accept" / %s"reject" / %s"reset")

label_clause = DQUOTE %s"label" DQUOTE ":" label

priority_clause = DQUOTE %s"priority" DQUOTE ":" uint16

event_config_clause = DQUOTE %s"config" DQUOTE ":" event_config_list

aux_parent_event_clause = DQUOTE %s"aux-parent-event" DQUOTE ":" label

action_list_clause = DQUOTE (%s"post-actions" / %s"insert-actions" / %s"match-actions"
  / %s"update-actions" / %s"delete-actions" / %s"decision-actions") DQUOTE
  ":" action_list

action_list = "[" label *( "," label) "]"

event_config_list = "{" event_config_item *( "," event_config_item) "}"

top_config_list = "{" top_config_item *( "," top_config_item) "}"

top_config_item = event_config_item / max_purgeable_routes_clause

event_config_item =
  (DQUOTE %s"max-connection-count" DQUOTE ":" uint32) /
  (DQUOTE %s"penalty-box-duration" DQUOTE ":" duration) /
  (DQUOTE %s"route-idle-time-for-purge" DQUOTE ":" duration) /
  (DQUOTE %s"derog-thresh-for-penalty-boxing" DQUOTE ":" uint16 /
  (DQUOTE %s"derog-thresh-ignore-commendable" DQUOTE ":" boolean /
  (DQUOTE %s"commendable-clears-derogatory" DQUOTE ":" boolean /
  (DQUOTE (%s"route-flags-to-add-on-insert" / %s"route-flags-to-clear-on-insert") DQUOTE ":"
    route_flag_list) /
```

```

(DQUOTE (%s"action-res-filter-bits-set" / %s"action-res-filter-bits-unset" / %s"action-res-bits-to-add" /
%s"action-res-bits-to-clear") DQUOTE ":" action_res_flag_list)

duration = number_sint64 / (DQUOTE number_sint64 [ %s"d" / %s"h" / %s"m" / %s"s" ] DQUOTE)

max_purgeable_routes_clause = DQUOTE %s"max-purgeable-routes" DQUOTE ":" uint32

route_flag_list = "[" route_flag *("," route_flag) "]"

action_res_flag_list = "[" action_res_flag *("," action_res_flag) "]"

route = "{"
  [ parent_event_clause "," ]
  *(route_flag_clause ",")
  [ family_clause ","
    [ route_protocol_clause "," ]
  ]
  [ route_remote_endpoint_clause "," ]
  [ route_local_endpoint_clause "," ]
  -","
"}"

parent_event_clause = DQUOTE %s"parent-event" DQUOTE ":" label
route_flag_clause = route_flag ":" boolean
family_clause = DQUOTE %s"family" DQUOTE ":" address_family
route_protocol_clause = DQUOTE %s"protocol" DQUOTE ":" route_protocol

route_remote_endpoint_clause = DQUOTE %s"remote" DQUOTE ":" route_endpoint
route_local_endpoint_clause = DQUOTE %s"local" DQUOTE ":" route_endpoint

route_endpoint = "{"
  [ route_interface_clause "," ]
  [ route_address_clause ","
    [ (route_address_prefix_bits_clause / route_address_bitmask_clause) "," ]
  ]
  [ route_port_clause "," ]
  -","
"}"

route_interface_clause = DQUOTE %s"interface" DQUOTE ":" uint8

route_address_clause = DQUOTE %s"address" DQUOTE ":" route_address

route_address_bitmask_clause = DQUOTE %s"bitmask" DQUOTE ":" route_address

route_address = DQUOTE (route_address_ipv4 / route_address_ipv6 / route_address_mac / route_address_user)
DQUOTE

route_address_ipv4 = uint8 3*3("." uint8)

route_address_ipv6 = < IPv6address from RFC 5954 section 4.1 >

route_address_mac = 1*2HEXDIG ( 5*5(":" 1*2HEXDIG) / 7*7(":" 1*2HEXDIG) )

route_address_user = < an address in a form recognized by a parser
installed with `wolfsentry_addr_family_handler_install()` >

address_family = uint16 / address_family_name

address_family_name = DQUOTE ( "inet" / "inet6" / "link" / < a value recognized by
wolfsentry_addr_family_pton() > ) DQUOTE

route_address_prefix_bits_clause = DQUOTE %s"prefix-bits" DQUOTE ":" uint16

route_protocol = uint16 / route_protocol_name

route_protocol_name = DQUOTE < a value recognized by getprotobyname_r(), requiring address family inet or
inet6 >

route_port_clause = DQUOTE %s"port" DQUOTE ":" endpoint_port

endpoint_port = uint16 / endpoint_port_name

endpoint_port_name = DQUOTE < a value recognized by getservbyname_r() for the previously designated protocol
> DQUOTE

route_flag = DQUOTE (
%s"af-wild" /
%s"raddr-wild" /
%s"rport-wild" /
%s"laddr-wild" /
%s"lport-wild" /
%s"riface-wild" /
%s"liface-wild" /
%s"tcplike-port-numbers" /
%s"direction-in" /

```

---

```

    %s"direction-out" /
    %s"penalty-boxed" /
    %s"green-listed" /
    %s"dont-count-hits" /
    %s"dont-count-current-connections" /
    %s"port-reset"
) DQUOTE

action_res_flag = DQUOTE (
    %s"none" /
    %s"accept" /
    %s"reject" /
    %s"connect" /
    %s"disconnect" /
    %s"derogatory" /
    %s"commendable" /
    %s"stop" /
    %s"deallocated" /
    %s"inserted" /
    %s"error" /
    %s"fallthrough" /
    %s"update" /
    %s"port-reset" /
    %s"sending" /
    %s"received" /
    %s"binding" /
    %s"listening" /
    %s"stopped-listening" /
    %s"connecting-out" /
    %s"closed" /
    %s"unreachable" /
    %s"sock-error" /
    %s"user+0" /
    %s"user+1" /
    %s"user+2" /
    %s"user+3" /
    %s"user+4" /
    %s"user+5" /
    %s"user+6" /
    %s"user+7"
) DQUOTE

user_item = label ":" ( null / true / false / number_sint64_decimal / number_float / string /
    strongly_typed_user_item )

strongly_typed_user_item =
    ( "{" DQUOTE %s"uint" DQUOTE ":" number_uint64 "}" ) /
    ( "{" DQUOTE %s"sint" DQUOTE ":" number_sint64 "}" ) /
    ( "{" DQUOTE %s"float" DQUOTE ":" number_float "}" ) /
    ( "{" DQUOTE %s"string" DQUOTE ":" string_value "}" ) /
    ( "{" DQUOTE %s"base64" DQUOTE ":" base64_value "}" ) /
    json_value_clause

json_value_clause = "{" DQUOTE %s"json" DQUOTE ":" json_value "}"

null = %s"null"

true = %s"true"

false = %s"false"

boolean = true / false

number_uint64 = < decimal number in the range 0...18446744073709551615 > /
    ( DQUOTE < hexadecimal number in the range 0x0...0xffffffffffffffff > DQUOTE ) /
    ( DQUOTE < octal number in the range 00...0177777777777777777777 > DQUOTE )

number_sint64_decimal = < decimal number in the range -9223372036854775808...9223372036854775807 >

number_sint64 = number_sint64_decimal /
    ( DQUOTE < hexadecimal number in the range -0x8000000000000000...0x7fffffffffffffff > DQUOTE
    ) /
    ( DQUOTE < octal number in the range -0100000000000000000000...0777777777777777777777 >
    DQUOTE )

number_float = < floating point value in a form and range recognized by the linked strtod() implementation >

string_value = DQUOTE < any RFC 8259 JSON-valid string that decodes to at most 16384 octets > DQUOTE

base64_value = DQUOTE < any valid RFC 4648 base64 encoding that decodes to at most 16384 octets > DQUOTE

json_value = < any valid, complete and balanced RFC 8259 JSON expression, with
    keys limited to WOLFSENTRY_MAX_LABEL_BYTES (default 32 bytes),
    overall input length limited to WOLFSENTRY_JSON_VALUE_MAX_BYTES
    if set (default unset), and overall depth limited to
    WOLFSENTRY_MAX_JSON_NESTING (default 16) including the 4 parent
    levels

```

---

```
>  
label = DQUOTE < any RFC 8259 JSON-valid string that decodes to at at least 1 and at most 32 octets > DQUOTE  
uint32 = < decimal integral number in the range 0...4294967295 >  
uint16 = < decimal integral number in the range 0...65535 >  
uint8 = < decimal integral number in the range 0...255 >
```

## Chapter 4

# wolfSentry Release History and Change Log

### wolfSentry Release 1.5.0 (September 13, 2023)

Release 1.5.0 of the wolfSentry embedded firewall/IDPS has enhancements, additions, and improvements including:

#### Noteworthy Changes and Additions

In JSON configuration, recognize "events" as equivalent to legacy "events-insert", and "routes" as equivalent to legacy "static-routes-insert". Legacy keys will continue to be recognized.

In the Makefile, FREERTOS\_TOP and LWIP\_TOP now refer to actual distribution top – previously, FREERTOS\_TOP expected a path to the FreeRTOS/Source subdirectory, and LWIP\_TOP expected a path to the src subdirectory.

Added public functions `wolfentry_route_default_policy_set()` and `wolfentry_route_default_policy_get()` implicitly accessing the main route table.

Added public functions `wolfentry_get_object_type()` and `wolfentry_object_release()`, companions to existing `wolfentry_object_checkout()` and `wolfentry_get_object_id()`.

Added `wolfentry_lock_size()` to facilitate caller-allocated `wolfentry_rwlock`s.

WOLFENTRY\_CONTEXT\_ARGS\_OUT is now the first argument to utility routines `wolfentry_object_checkout()`, `wolfentry_defaultconfig_get()`, and `wolfentry_defaultconfig_update()`, rather than a bare `wolfentry` context pointer.

ports/Linux-lwIP/include/lwipopts.h: Add core locking code.

Removed unneeded routine `wolfentry_config_json_set_default_config()`.

Improved `wolfentry_kv_render_value()` to use `json_dump_string()` for `_KV_STRING` rendering, if available, to get JSON-style escapes in output.

Implemented support for user-supplied semaphore callbacks.

## Performance Improvements

The critical paths for traffic evaluation have been streamlined by eliminating ephemeral heap allocations, eliminating redundant internal initializations, adding early shortcircuit paths to avoid frivolous processing, and eliminating redundant time lookups and context locking. This results in a 33%-49% reduction in cycles per `wolfSentry_route_event_dispatch()` on `benchmark-test`, and a 29%-61% reduction on `benchmark-singlethreaded-test`, at under 100 cycles for a simple default-policy scenario on a 64 bit target.

## Documentation

Added `doc/freertos-lwip-app.md`, "Building and Initializing wolfSentry for an application on FreeRTOS/LwIP".

Added `doc/json_configuration.md`, "Configuring wolfSentry using a JSON document".

Doxygen-based annotations are now included in all wolfSentry header files, covering all functions, macros, types, enums, and structures.

The PDF version of the reference manual is now included in the repository and releases at `doc/wolfSentry_refman.pdf`.

The Makefile now has targets `doc-html`, `doc-pdf`, and related targets for generating and cleaning the documentation artifacts.

## Bug Fixes and Cleanups

`lwip/LWIP_PACKET_FILTER_API.patch` has fixes for `-Wconversion` and `-Wshadow` warnings.

`src/json/centijson_sax.c`: Fix bug in `json_dump_double()` such that floating point numbers were rendered with an extra decimal place.

In `wolfSentry_config_json_init_ex()`, error if `json_config.max_key_len` is greater than `WOLFSENTRY_MAX_LABEL_BYTES` (required for memory safety).

In `wolfSentry_config_json_init_ex()`, call `wolfSentry_defaultconfig_get()` to initialize `jps->default_config` with settings previously passed to `wolfSentry_init()`.

`src/kv.c`: Fixed `_KV_STRING` and `_KV_BYTES` cases in `wolfSentry_kv_value_eq_1()` (inadvertently inverted `memcmp()`), and fixed `_KV_NONE` case to return true.

Fixed `wolfSentry_kv_render_value()` for `_KV_JSON` case to pass `JSON_DOM_DUMP_PREFERDICTORDER` to `json_dom_dump()`.

`src/lwip/packet_filter_glue.c`: In `wolfSentry_install_lwip_filter_callbacks()`, if error encountered, disable all callbacks to assure known state on return.

In `wolfSentry_init_ex()`, correctly convert user-supplied `route_idle_time_for_purge` from seconds to `wolfSentry_time_t`.

Pass `route_table->default_event` to `wolfSentry_route_event_dispatch_0()` if caller-supplied trigger event is null (changed in `wolfSentry_route_event_dispatch_1()`, `wolfSentry_route_event_dispatch_by_id_1()`, and `wolfSentry_route_event_dispatch_by_route_1()`).



In `wolfentry_route_lookup_0()`, fixed scoping of `WOLFENTRY_ACTION_RES_EXCLUDE_↵`  
`REJECT_ROUTES` to only check `WOLFENTRY_ROUTE_FLAG_PENALTYBOXED`, not `WOLFENTRY_↵`  
`ROUTE_FLAG_PORT_RESET`.

In `wolfentry_route_delete_0()`, properly set `WOLFENTRY_ROUTE_FLAG_PENDING_DELETE`.

In `wolfentry_route_event_dispatch_0()` and `wolfentry_route_event_dispatch_1()`, properly set `WOLFENTRY_ACTION_RES_ERROR` at end if `ret < 0`.

In `wolfentry_route_event_dispatch_1()`, properly set `WOLFENTRY_ACTION_RES_↵`  
`FALLTHROUGH` when `route_table->default_policy` is used.

Added missing `action_results` reset to `wolfentry_route_delete_for_filter()`.

In `wolfentry_lock_init()`, properly forbid all inapplicable flags.

Fixed `wolfentry_eventconfig_update_1()` to copy over all relevant elements.

Fixed and updated expression for `WOLFENTRY_USER_DEFINED_TYPES`.

## Self-Test Enhancements

`Makefile.analyzers`: Added targets `test_lwip`, `minimal-threaded-build-test`, `pahole-test`,  
`route-holes-test`, `benchmark-test`, `benchmark-singlethreaded-test`, and `doc-check`.

Implemented tripwires in `benchmark-test` and `benchmark-singlethreaded-test` for unexpectedly high cycles/call.

Enlarged coverage of target `notification-demo-build-test` to run the applications and check for expected and unexpected output.

`tests/unittests.c`:

- Add `test_lwip()` with associated helper functions;
- Add `WOLFENTRY_UNITTEST_BENCHMARKS` sections in `test_static_routes()` and `test_↵`  
`json()`;
- Add to `test_init()` tests of `wolfentry_errcode_source_string()` and `wolfentry_errcode_error_s`
- Add to `test_static_routes()` tests of `wolfentry_route_default_policy_set()` and  
`wolfentry_get_object_type()`, `wolfentry_object_checkout()`, and `wolfentry_object_relea`

## wolfSentry Release 1.4.1 (July 20, 2023)

Release 1.4.1 of the wolfSentry embedded firewall/IDPS has bug fixes including:

## Bug Fixes and Cleanups

Add inline implementations of `WOLFSENTRY_ERROR_DECODE_{ERROR_CODE, SOURCE_ID, LINE_NUMBER}()` for portable protection from multiple argument evaluation, and refactor `WOLFSENTRY_ERROR_ENCODE()` and `WOLFSENTRY_SUCCESS_ENCODE()` to avoid unnecessary dependence on non-portable (gnu-specific) construct.

Use a local stack variable in `WOLFSENTRY_ERROR_ENCODE_1()` to assure a single evaluation of the argument.

Add `-Wno-inline` to `CALL_TRACE_CFLAGS`.

Correct the release date of 1.4.0 in `ChangeLog`.

## Self-Test Enhancements

Add `CALL_TRACE-test` to `Makefile.analyzers`, and include it in the `check-extra` dep list.

## wolfSentry Release 1.4.0 (July 19, 2023)

Release 1.4.0 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### New Features

Routes can now be configured to match traffic with designated `action_results` bit constraints, and can be configured to update `action_results` bits, by inserting the route with a parent event that has the desired configuration. Parent events can now also be configured to add or clear route flags for all routes inserted with that parent event.

Added new `aux_event` mechanism to facilitate distinct configurations for a static generator route and the narrower ephemeral routes dynamically created when it is matched.

Added a new built-in action, `"%track-peer-v1"`, that can be used in combination with the above new facilities to dynamically spawn ephemeral routes, allowing for automatic pinhole routes, automatic adversary tracking, and easy implementation of dynamic blocks and/or notifications for port scanning adversaries.

## Noteworthy Changes and Additions

Added new APIs `wolfentry_event_set_aux_event()` and `wolfentry_event_get_aux_event()`.

Added flag filters and controls to struct `wolfentry_eventconfig`, and added corresponding clauses to JSON "config" sections:

- `.action_res_filter_bits_set, "action-res-filter-bits-set"`
- `.action_res_filter_bits_unset, "action-res-filter-bits-unset"`
- `.action_res_bits_to_add, "action-res-bits-to-add"`
- `.action_res_bits_to_clear, "action-res-bits-to-clear"`
- `.route_flags_to_add_on_insert, "route-flags-to-add-on-insert"`
- `.route_flags_to_clear_on_insert, "route-flags-to-clear-on-insert"`

Added new `WOLFENTRY_ACTION_RES_*` (action result) flags to support filtering matches by generic traffic type:

- `WOLFENTRY_ACTION_RES_SENDING`
- `WOLFENTRY_ACTION_RES_RECEIVED`
- `WOLFENTRY_ACTION_RES_BINDING`
- `WOLFENTRY_ACTION_RES_LISTENING`
- `WOLFENTRY_ACTION_RES_STOPPED_LISTENING`
- `WOLFENTRY_ACTION_RES_CONNECTING_OUT`
- `WOLFENTRY_ACTION_RES_CLOSED`
- `WOLFENTRY_ACTION_RES_UNREACHABLE`
- `WOLFENTRY_ACTION_RES_SOCK_ERROR`

These flags are now passed by the lwIP integration code in `src/lwip/packet_filter_glue.c`. Detailed descriptions of these and other `_ACTION_RES_` bits are in `wolfentry/wolfentry.h`.

Added `wolfentry_addr_family_max_addr_bits()`, to allow programmatic determination of whether a given address is a prefix or fully specified.

Added a family of functions to let routes be inserted directly from a prepared struct `wolfentry_route_exports`, and related helper functions to prepare it:

- `wolfentry_route_insert_by_exports_into_table()`
- `wolfentry_route_insert_by_exports()`
- `wolfentry_route_insert_by_exports_into_table_and_check_out()`
- `wolfentry_route_insert_by_exports_and_check_out()`
- `wolfentry_route_reset_metadata_exports()`

Added convenience accessor/validator functions for routes:

- `wolfentry_route_get_addrs()`
- `wolfentry_route_check_flags_sensical()`

Refactored the event action list implementation so that the various action lists (`WOLFSENTRY_ACTION_↵_TYPE_POST`, `_INSERT`, `_MATCH`, `_UPDATE`, `_DELETE`, and `_DECISION`) are represented directly in the struct `wolfentry_event`, rather than through a "subevent". The related APIs (`wolfentry_event_action_prepend()`, `wolfentry_event_action_append()`, `wolfentry_event_acti↵wolfentry_event_action_delete()`, `wolfentry_event_action_list_start()`) each gain an additional argument, `which_action_list`. The old JSON grammar is still supported via internal emulation (still tested by `test-config.json`). The JSON configuration for the new facility is "post-actions", "insert-actions", "match-actions", "update-actions", "delete-actions", and "decision-actions", each optional, and each expecting an array of zero or more actions.

Added a restriction that user-defined action and event labels can't start with "%", and correspondingly, all built-in actions and events have labels that start with "%". This can be overridden by predefining `WOLFSENTRY_↵BUILTIN_LABEL_PREFIX` in user settings.

Removed unused flag `WOLFSENTRY_ACTION_RES_CONTINUE`, as it was semantically redundant relative to `WOLFSENTRY_ACTION_RES_STOP`.

Removed flags `WOLFSENTRY_ACTION_RES_INSERT` and `WOLFSENTRY_ACTION_RES_DELETE`, as the former is superseded by the new builtin action facility, and the latter will be implemented later with another builtin action.

Added flag `WOLFSENTRY_ACTION_RES_INSERTED`, to indicate when a side-effect route insertion was performed. This flag is now always set by the route insert routines when they succeed. Action plugins must copy this flag as shown in the new `wolfentry_builtin_action_track_peer()` to assure proper internal accounting.

Reduced number of available user-defined `_ACTION_RESULT_` bits from 16 to 8, to accommodate new generic traffic bits (see above).

In struct `wolfentry_route_metadata_exports`, changed `.connection_count`, `.derogatory_↵_count`, and `.commendable_count`, from `wolfentry_hitcount_t` to `uint16_t`, to match internal representations. Similarly, in struct `wolfentry_route_exports`, changed `.parent_event_↵label_len` from `size_t` to `int` to match `label_len` arg type.

Added `wolfentry_table_ent_get_by_id()` to the public API.

Renamed public API `wolfentry_action_res_decode()` as `wolfentry_action_res_assoc_by_flag()` for clarity and consistency.

## Bug Fixes and Cleanups

Consistently set the `WOLFSENTRY_ACTION_RES_FALLTHROUGH` flag in `action_results` when dispatch classification (`_ACCEPT/_REJECT`) was by fallthrough policy.

Refactored internal code to avoid function pointer casts, previously used to allow implementations with struct pointers where a handler pointer has a type that expects `void *`. The refactored code has shim implementations with fully conformant signatures, that cast the arguments to pass them to the actual implementations. This works around over-eager analysis by the `clang` UB sanitizer.

Fix missing default cases in non-enum `switch()` constructs.

## Self-Test Enhancements

Added new clauses to `test-config*.json` for `wolfentry_builtin_action_track_peer()` (events "ephemeral-pinhole-parent", "pinhole-generator-parent", "ephemeral-port-scanner-parent", "port-scanner-generator-parent", and related routes), and added full dynamic workout for them to `test_json()`.

Add unit test coverage:

- `wolfentry_event_set_aux_event()`
- `wolfentry_event_get_aux_event()`
- `wolfentry_event_get_label()`
- `wolfentry_addr_family_max_addr_bits()`

## wolfSentry Release 1.3.1 (July 5, 2023)

Release 1.3.1 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### Bug Fixes and Cleanups

Updated lwIP patches to fix `packet_filter_event_t` checking on short-enum targets.

Fixed copying of route table header fields (table config) when cloning or rebuilding (preserve default policy etc when loading with `WOLFSENTRY_CONFIG_LOAD_FLAG_LOAD_THEN_COMMIT` | `WOLFSENTRY_CONFIG_LOAD_FLAG_NO_FLUSH` or `WOLFSENTRY_CONFIG_LOAD_FLAG_FLUSH_ONLY_ROUTES`).

Implemented proper locking in `wolfentry_route_get_reference()`, and corresponding lock assertion in `wolfentry_table_cursor_init()`.

Fixed logic in address matching to properly match zero-length addresses when performing subnet matching, even if the corresponding `_ADDR_WILDCARD` flag bit is clear.

## Self-Test Enhancements

`Makefile.analyzers`: add `-fshort-enums` variants to `sanitize-all` and `sanitize-all-gcc` recipes, and add `short-enums-test` recipe.

Added `wolfentry_route_event_dispatch()` cases to `test_json()`.

Added unit test coverage to confirm correct copying of route table header fields when cloning.

## wolfSentry Release 1.3 (May 19, 2023)

Release 1.3 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### New Features

#### Route dump to JSON

The route (rule) table can now be dumped in conformant JSON format to a byte stream, using wolfSentry intrinsics (no `stdio` dependencies), and subsequently reloaded.

- `wolfentry_route_table_dump_json_start()`, `_next()`, `_end()`
- Byte streams using new `WOLFSENTRY_BYTE_STREAM_*` macros, with stack and heap options.
- Retryable rendering on `_BUFFER_TOO_SMALL` error, by flushing the byte stream, calling `WOLFSENTRY_BYTE_STREAM_RENDER_FLUSH()` and retrying the `wolfentry_route_table_dump_json_*()` call.
- New flag `WOLFSENTRY_CONFIG_LOAD_FLAG_FLUSH_ONLY_ROUTES`, to allow reloads that leave all event and key-value configuration intact, and only replace the routes.

### Bug Fixes and Cleanups

- Non-threadsafe `get{proto,serv}by{name.number}()` calls (already configuration-gated) have been replaced by their `_r()` counterparts, and gated on compatible glibc.
- Fixed an underread bug in `convert_hex_byte()` that affected parsing of MAC addresses.

### Self-Test Enhancements

- Added `__wolfentry_wur` to `WOLFSENTRY_LOCAL`.
- Added new clauses in `test_json()` to verify bitwise idempotency of route table export-ingest cycles to/from JSON.
- Added new target `notification-demo-build-test`.

## wolfSentry Release 1.2.2 (May 4, 2023)

Release 1.2.2 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### Noteworthy Changes and Additions

Added C89 pedantic compatibility in core codebase, including unit tests, via `-DWOLFSENTRY_C89`.

Added error code `IO_FAILED`, returned for various stdio failures that previously returned `SYS_OP_FAILED` or went undetected.

Refined `wolfentry_lock_unlock()` so that final unlock while holding a promotion reservation is not an error and implicitly drops the reservation.

## Bug Fixes and Cleanups

Cleanups guided by `clang-tidy` and `cppcheck`: fixed a misused retval from `posix_memalign()`, fixed overwritten retvals in `wolfentry_lock_unlock()`, and effected myriad cleanups to improve clarity and portability.

Fixed missing assignment of `new->prev` in `wolfentry_table_clone()`.

Fixed route metadata coherency in transactional configuration updates: add `wolfentry_route_copy_↵ metadata()`, and call it from `wolfentry_context_exchange()`.

When `wolfentry_route_event_dispatch*()` results in a default policy fallback, return `USED_↵ FALLBACK` success code.

Properly release lock promotion reservation in `wolfentry_config_json_init_ex()` if obtained.

Fixed several accounting bugs in the lock kernel related to promotion reservations.

Copy `fallthrough_route` pointer in `wolfentry_route_table_clone_header()`, rather than improperly trying to clone the fallthrough route.

## Self-Test Enhancements

Added new global compiler warnings to `Makefile`:

- `-Wmissing-prototypes`
- `-Wdeclaration-after-statement`
- `-Wnested-externs`
- `-Wlogical-not-parentheses`
- `-Wpacked-not-aligned`

Added new targets to `Makefile.analyzers`:

- `clang-tidy-build-test`
- `cppcheck-analyze`
- `c89-test`
- `m32-c89-test`
- `freertos-arm32-c89-build-test`
- `freertos-arm32-singlethreaded-build-test`
- `sanitize-aarch64-be-test`
- `sanitize-all-no-inline-gcc`
- `no-inline-test`
- `no-alloca-test`
- `release-check`

Added `WOLFENTRY_CONFIG_LOAD_FLAG_NO_FLUSH` coverage and an array of should-fail JSON objects to `unittests.c:test_json()`.

Added more `arg-not-null` and `thread-init` checks to thread/lock routines in `src/wolfentry_util.c`, and corresponding unit test coverage for all null/uninit arg permutations.

Added assert in release recipe to assure that [wolfentry.h](#) has a version that matches the tagged version.

## wolfSentry Release 1.2.1 (Apr 5, 2023)

Release 1.2.1 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### Noteworthy Changes and Additions

Added API `wolfentry_route_render_flags()`, now used in `wolfentry_route_render()` and `wolfentry_route_exports_render()`.

Refactored `wolfentry_route_lookup_0()` to consistently return the highest-priority matching route, breaking ties using `compare_match_exactness()`.

Added `DEBUG_ROUTE_LOOKUP` code paths in `wolfentry_route_lookup_0()`, for verbose troubleshooting of configurations and internal logic.

Added to `convert_hex_byte()` (and therefore to MAC address parsing) tolerance for single-hex-digit byte values, as in `a:b:c:1:2:3`.

### Bug Fixes

Removed several inappropriate wildcard flags on queries in lwIP event handlers, particularly `_SA_LOCAL_PORT↵_WILDCARD` for `FILT_PORT_UNREACHABLE` and `*_INTERFACE_WILDCARD` for `FILT_BINDING/FILT↵_LISTENING/FILT_STOP_LISTENING` and when `event->netif` is null.

Added nullness checks for `laddr` and `raddr` in lwIP event handlers, and if null, set all-zeros address.

Refactored wildcard handling in `wolfentry_route_init()`, `wolfentry_route_new()`, and `wolfentry_route_insert_1()`, to zero out wildcard fields at insert time, rather than at init time, so that routes used as targets contain accurate information for `compare_match_exactness()`, regardless of wildcard bits.

Fixed `WOLFSENTRY_VERSION_*` values, which were inadvertently swapped in release 1.2.0.

## wolfSentry Release 1.2.0 (Mar 24, 2023)

Production Release 1.2.0 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### New Features

#### lwIP full firewall integration

When wolfSentry is built with make options `LWIP=1 LWIP_TOP=<path-to-lwIP-source>`, the library is built with new APIs `wolfentry_install_lwip_filter_ethernet_callback()`, `wolfentry_install_lwip_filter_ip_callbacks()`, `wolfentry_install_lwip_filter_icmp_callbacks()`, `wolfentry_install_lwip_filter_tcp_callback()`, `wolfentry_install_lwip_filter_udp_callbacks()` and the all-on-one `wolfentry_install_lwip_filter_callbacks()`. For each layer/protocol, a simple bitmask, of type `packet_filter_event_mask_t`, allows events to be selectively filtered, with other traffic passed with negligible overhead. For example, TCP connection requests can be fully evaluated by wolfSentry, while traffic within established TCP connections can pass freely.

wolfSentry `LWIP=1` relies on a patchset to lwIP, gated on the macro `LWIP_PACKET_FILTER_API`, that adds generic filter callback APIs to each layer and protocol. See `lwip/README.md` for details.

In addition to `LWIP_DEBUG` instrumentation, the new integration supports `WOLFSENTRY_DEBUG_PACKET_↵FILTER`, which renders the key attributes and outcome for all callout events.



## Noteworthy Changes and Additions

Routes and default actions can now be annotated to return `WOLFSENTRY_ACTION_RES_PORT_RESET` in their `action_results`. This is used in the new lwIP integration to control whether TCP reset and ICMP port-unreachable packets are sent (versus dropping the rejected packet unacknowledged).

A new `ports/` tree is added, and the former `FreeRTOS/` tree is moved to `ports/FreeRTOS-lwIP`.

New helper macros are added for managing thread state: `WOLFSENTRY_THREAD_HEADER_DECLS`, `WOLFSENTRY_THREAD_HEADER_INIT()`, `WOLFSENTRY_THREAD_HEADER_INIT_CHECKED()`.

New flags `WOLFSENTRY_ROUTE_FLAG_PORT_RESET` and `WOLFSENTRY_ACTION_RES_EXCLUDE_↵` `REJECT_ROUTES` to support firewall functionalities.

## Bug Fixes

Wildcard matching in the routes/rules table now works correctly even for non-contiguous wildcard matching.

struct `wolfentry_sockaddr` now aligns its `addr` member to a 4 byte boundary, for safe casting to `(int *)`, using a new `attr_align_to()` macro.

The route lookup algorithm has been improved for correct results with non-contiguous wildcards, to correctly break ties using the new `compare_match_exactness()`, and to correctly give priority to routes with a matching event.

When matching target routes (e.g. with `wolfentry_route_event_dispatch()`), ignore failure in `wolfentry_event_get_reference()` if `WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_↵` `WILDCARD` is set in the `flags`.

## wolfSentry Release 1.1.0 (Feb 23, 2023)

Production Release 1.1.0 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### New Features

Internal settings, types, alignments, constants, a complete set of internal shims, and Makefile clauses, for portability to native FreeRTOS with threads on 32 bit gcc targets.

## Noteworthy Changes and Additions

rwlock control contexts can now be allocated inside interrupt handlers, and `WOLFSENTRY_LOCK_FLAG_RETAIN_SEMAPHORE` can be supplied to the new `wolfentry_context_lock_mutex_timed_ex()`, allowing safe trylock followed by automatic lock recursion.

API routines are now marked `warn-unused-return` by default, subject to user-defined override. This new default warns on untrapped errors, to aid preventing undefined behavior.

API arguments previously accepting "long" ints for counts of seconds now expect `time_t`, for portability to ARM32 and FreeRTOS.

New unit test: `test_json_corpus`, for highly configurable bulk trial runs of the JSON processing subsystem.

New tests in `Makefile.analyzers`: `no-getprotoby-test`, `freertos-arm32-build-test`.

A new guard macro, `WOLFSENTRY_NO_GETPROTOBY`, allows narrow elimination of dependencies on `getprotobyname()` and `getprotobynumber()`.

Recursive JSON DOM tree processing logic was refactored to greatly reduce stack burden.

Substantial enlargement of code coverage by unit tests, guided by `gcov`.

New convenience macros for typical threaded state tracking wrappers: `WOLFSENTRY_THREAD_HEADER_CHECKED()` and `WOLFSENTRY_THREAD_TAILER_CHECKED()`.

## Bug Fixes

Cloning of user-defined deep JSON objects is now implemented, as needed for configuration load dry runs and load-then-commit semantics.

JSON processing of UTF-8 surrogate pairs is now fixed.

Fixed retval testing in `wolfentry_action_list_{append,prepend,insert}_1()`, and added missing `point_action` lookup in `wolfentry_action_list_insert_after()`.

Fixed potential use-after-free defect in `wolfentry_event_delete()`.

## wolfSentry Release 1.0.0 (Jan 18, 2023)

Production Release 1.0.0 of the wolfSentry embedded firewall/IDPS has bug fixes and improvements including:

### Noteworthy Changes and Additions

- Makefile improvements around `wolfentry_options.h`, and a new `com-bundle` rule.
- A new macro `WOLFSENTRY_USE_NONPOSIX_THREADS`, separated from `WOLFSENTRY_USE_NONPOSIX_SEMAPHORES`, supporting mixed-model targets, e.g. Mac OS X.

## Bug Fixes

- In `examples/notification-demo/log_server/log_server.c`, in `main()`, properly reset `transaction_successful` at top of the accept loop.

## wolfSentry Release 0.8.0 (Jan 6, 2023)

Preview Release 0.8.0 of the wolfSentry embedded firewall/IDPS has bug fixes and new features including:

### New Features

#### Multithreaded application support

- Automatic locking on API entry, using a high performance, highly portable semaphore-based readwrite lock facility, with error checking and opportunistic lock sharing.
- Thread-specific deadlines set by the caller, limiting waits for lock acquisition as needed for realtime applications.
- A mechanism for per-thread private data, accessible to user plugins.
- No dependencies on platform-supplied thread-local storage.

### Updated Examples

#### examples/notification-demo

- Add interrupt handling for clean error-checked shutdown in `log_server`.
- Add `/kill-server` admin command to `log_server`.
- Reduce `penalty-box-duration` in `notify-config.{json,h}` to 10s for demo convenience.

### Noteworthy Changes and Additions

- A new first argument to `wolfentry_init_ex()` and `wolfentry_init()`, `caller_build->_settings`, for runtime error-checking of application/library compatibility. This mechanism will also allow future library changes to be conditionalized on caller version and/or configuration expectations as needed, often avoiding the need for application recompilation.
- `src/util.c` was renamed to `src/wolfentry_util.c`.
- `wolfentry/wolfentry_settings.h` was added, containing setup code previously in `wolfentry/wolfentry.h`.
- Error IDs in `enum wolfentry_error_id` are all now negative, and a new `WOLFENTRY_<-SUCCESS_ID_*` namespace was added, with positive values and supporting macros.

**New public utility APIs, macros, types, etc.**

- `WOLFSENTRY_VERSION_*` macros, for version testing
- `wolfentry_init_thread_context()`, `wolfentry_alloc_thread_context()`, `wolfentry_get_thread_id()`, `wolfentry_get_thread_user_context()`, `wolfentry_get_thread_flags()`, `wolfentry_destroy_thread_context()`, `wolfentry_free_thread_context()`, `wolfentry_set_deadline_rel_usecs()`, `wolfentry_set_deadline_abs()`, `wolfentry_clear_deadline()`, `wolfentry_set_thread_readonly()`, `wolfentry_set_thread_readwrite()`
- `WOLFSENTRY_DEADLINE_NEVER` and `WOLFSENTRY_DEADLINE_NOW`, used internally and for testing values returned by `wolfentry_get_thread_deadline()`
- Many new values in the `WOLFSENTRY_LOCK_FLAG_*` set.
- `wolfentry_lock_*` APIs now firmed, and new `wolfentry_context_lock_shared_with_reservation_*`
- `WOLFSENTRY_CONTEXT_*` helper macros.
- `WOLFSENTRY_UNLOCK_*`, `WOLFSENTRY_SHARED_*`, `WOLFSENTRY_MUTEX_*`, and `WOLFSENTRY_PROMOTABLE_*` helper macros
- `WOLFSENTRY_ERROR_UNLOCK_AND_RETURN()`, `WOLFSENTRY_SUCCESS_UNLOCK_AND_RETURN()`, and related helper macros.

**Bug Fixes**

- Various fixes, and additional hardening and cleanup, in the readwrite lock kernel.
- Various fixes in `Makefile`, for proper handling and installation of `wolfentry_options.h`.

**wolfSentry Release 0.7.0 (Nov 7, 2022)**

Preview Release 0.7.0 of the wolfSentry embedded firewall/IDPS has bug fixes and new features including:

**New Features**

**Support for freeform user-defined JSON objects in the "user-values" (key-value pair) section of the config package.**

- Uses syntax `"key" : { "json" : x }` where `x` is any valid standalone JSON expression.
- Key length limited to `WOLFSENTRY_MAX_LABEL_BYTES` by default.
- String length limited to `WOLFSENTRY_KV_MAX_VALUE_BYTES` by default.
- JSON tree depth limited to `WOLFSENTRY_MAX_JSON_NESTING` by default.
- All default limits subject to caller runtime override using the `json_config` arg to the new APIs `wolfentry_config_json_init_ex()` and `wolfentry_config_json_oneshot_ex()`, accepting a `JSON_CONFIG *` (accepted as `const`).

## New APIs for JSON KVs

- `wolfentry_user_value_store_json()`
- `wolfentry_user_value_get_json()`
- `WOLFENTRY_KV_V_JSON()`
- `wolfentry_config_json_init_ex()`
- `wolfentry_config_json_one_shot_ex()`

## New config load flags controlling JSON KV parsing

- `WOLFENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_ABORT`
- `WOLFENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USEFIRST`
- `WOLFENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USELAST`
- `WOLFENTRY_CONFIG_LOAD_FLAG_JSON_DOM_MAINTAIN_DICT_ORDER`

## Support for setting a user KV as read-only.

- Read-only KVs can't be deleted or overwritten without first setting them read-write.
- Mechanism can be used to protect user-configured data from dynamic changes by JSON configuration package – JSON cannot change or override the read-only bit.

## KV mutability APIs:

- `wolfentry_user_value_set_mutability()`
- `wolfentry_user_value_get_mutability()`

## Updated Examples

### examples/notification-demo

- Update and clean up `udp_to_dbus`, and add `--kv-string` and `--kv-int` command line args for runtime ad hoc config overrides.
- Rename config node controlling the `udp_to_dbus` listen address from "notification-dest-addr" to "notification-listen-addr".

### Added examples/notification-demo/log\_server

- Toy embedded web server demonstrating HTTPS with dynamic insertion of limited-lifespan wolfSentry rules blocking (penalty boxing) abusive peers.
- Demonstrates mutual authentication using TLS, and role-based authorizations pivoting on client certificate issuer (certificate authority).

## Noteworthy Changes and Additions

- JSON strings (natively UTF-8) are now consistently passed in and out with `unsigned char` pointers.
- `wolfentry_kv_render_value()` now has a `struct wolfentry_context *` as its first argument (necessitated by addition of freeform JSON rendering).
- Added new API routine `wolfentry_centijson_errcode_translate()`, allowing conversion of all CentiJSON return codes (e.g. from `json_dom_parse()`, `json_value_path()`, and `json_value_build_path()`) from native CentiJSON to roughly-corresponding native wolfSentry codes.

## Cleanup of JSON DOM implementation

- Added `json_` prefix to all JSON functions and types.
- CentiJSON now uses wolfSentry configured allocator for all heap operations.

## New utility APIs

- `wolfentry_get_allocator()`
- `wolfentry_get_timecbs()`

## Bug Fixes

- Fix error-path memory leak in JSON KV handling.
- Fix "echo: write error: Broken pipe" condition in recipe for rule "force"
- Various minor portability fixes.
- Enlarged scope for build-time pedantic warnings – now includes all of CentiJSON.

## wolfSentry Release 0.6.0 (Sep 30, 2022)

Preview Release 0.6.0 of the wolfSentry embedded firewall/IDPS has bug fixes and new features including:

### New Features

**Core support for automatic penalty boxing, with configurable threshold when derogatory count reaches threshold**

**New APIs for manipulating route derogatory/commendable counts from application/plugin code:**

- `wolfentry_route_increment_derogatory_count()`
- `wolfentry_route_increment_commendable_count()`
- `wolfentry_route_reset_derogatory_count()`
- `wolfentry_route_reset_commendable_count()`

**New JSON config nodes:**

- `derog-thresh-for-penalty-boxing`
- `derog-thresh-ignore-commendable`
- `commendable-clears-derogatory`

**Automatic purging of expired routes:**

- constant time garbage collection
- `wolfentry_route_table_max_purgeable_routes_get()`
- `wolfentry_route_table_max_purgeable_routes_set()`
- `wolfentry_route_stale_purge_one()`

**Noteworthy Changes and Additions**

- New API `wolfentry_route_insert_and_check_out()`, allowing efficient update of route state after insert; also related new API `wolfentry_object_checkout()`.
- New APIs `wolfentry_route_event_dispatch_by_route()` and `wolfentry_route_event_dispatch_by_id()` analogous to the `_by_id()` variants, but accepting a struct `wolfentry_route` pointer directly.
- `wolfentry_route_init()` and `wolfentry_route_new()` now allow (and ignore) nonzero supplied values in wildcarded `wolfentry_sockaddr` members.
- New debugging aid, make `CALL_TRACE=1`, gives full call stack trace with codepoints and error codes, to aid debugging of library, plugins, and configurations.

**Bug Fixes**

- `src/internal.c`: fix wrong constant of iteration in `wolfentry_table_ent_get_by_id()`.

**wolfSentry Release 0.5.0 (Aug 1, 2022)**

Preview Release 0.5.0 of the wolfSentry embedded firewall/IDPS has bug fixes and new features including:

**New Example****examples/notification-demo**

Added `examples/notification-demo`, demonstrating plugin actions, JSON event representation, and pop-up messages using the D-Bus notification facility and a middleware translation daemon.

## Noteworthy Changes

- Added new API `wolfentry_init_ex()` with `wolfentry_init_flags_t` argument.
- Added runtime error-checking on lock facility.

## Bug Fixes

Fix missing assignment in `wolfentry_list_ent_insert_after()`.

## wolfSentry Release 0.4.0 (May 27, 2022)

Preview Release 0.4.0 of the wolfSentry embedded firewall/IDPS has bug fixes and new features including:

### New Features

- User-defined key-value pairs in JSON configuration: allows user plugins to access custom config parameters in the wolfSentry config using the new `wolfentry_user_value_*` family of API functions. Binary configuration data can be supplied in the configuration using base64 encoding, and are decoded at parse time and directly available to user plugins in the original raw binary form. The key-value facility also supports a custom validator callback to enforce constraints on user-defined config params in the JSON.
- User-defined address families: allows user plugins for custom address families and formats, using new `wolfentry_addr_family_*` API routines. This allows idiomatic formats for non-Internet addresses in the JSON config, useful for various buses and device namespaces.
- Formalization of the concepts of default events and falthrough rules in the route tables.
- A new subevent action list facility to support logging and notifications around the final decisions of the rule engine, alongside the existing subevents for rule insertions, matches, and deletions.
- The main plugin interface (`wolfentry_action_callback_t`) now passes two separate routes, a "trigger\_route" with full attributes of the instant traffic, and a "rule\_route" that matches that traffic. In dynamic rule scenarios, plugins can manipulate the passed `rule_route` and set the `WOLFENTRY_ACTION_RES_INSERT` bit in the to define a new rule that will match the traffic thereafter. All actions in the chain retain readonly access to the unmodified trigger route for informational purposes.
- The JSON DOM facility from CentiJSON is now included in the library by default (disabled by `make NO_JSON_DOM=1`), layered on the SAX facility used directly by the wolfSentry core to process the JSON config package. The DOM facility can be used as a helper in user plugins and applications, for convenient JSON parsing, random access, and production.

## Noteworthy Changes

- In the JSON config, non-event-specific members of top level node "config-update" node have been moved to the new top level node "default-policies", which must appear after "event-insert". "default-policies" members are "default-policy-static", "default-policy-dynamic", "default-event-static", and "default-event-dynamic".



## Bug Fixes

- In `wolfentry_config_json_init()`, properly copy the `load_flags` from the caller into the `_json↵_process_state`.
- The JSON SAX API routines (`wolfentry/centijson_sax.h`) are now properly exported.

## wolfSentry Release 0.3.0 (Dec 30, 2021)

Preview Release 0.3.0 of the wolfSentry embedded firewall/IDPS has bug fixes and new features including:

### New Ports and Examples

#### examples/Linux-LWIP

This demo uses Linux-hosted LWIP in Docker containers to show packet-level and connection-level filtering using wolfSentry. Filtering can be by MAC, IPv4, or IPv6 address. Demos include pre-accept TCP filtering, and filtering of ICMP packets.

See `examples/Linux-LWIP/README.md` for the installation and usage guide, and `examples/Linux-LWIP/echo-config.json` for the associated wolfSentry configuration.

#### FreeRTOS with LWIP on STM32

This demo is similar to Linux-LWIP, but targets the STM32 ARM core and the STM32CubeMX or STM32Cube↵ IDE toolchain, with a FreeRTOS+LWIP runtime. It shows wolfSentry functionality in a fully embedded (bare metal) application.

See `examples/STM32/README.md` for the installation and usage guide, and `examples/STM32/Src/sentry.c` for the compiled-in wolfSentry configuration.

## New Features

- Autogeneration and inclusion of `wolfentry_options.h`, synchronizing applications with wolfSentry library options as built.
- New APIs `wolfentry_route_event_dispatch_[by_id]with_initiated_result()`, for easy caller designation of known traffic attributes, e.g. `WOLFSENTRY_ACTION_RES_CONNECT` or `WOLFSENTRY_ACTION_RES_DISCONNECT`.
- Efficient support for aligned heap allocations on targets that don't have a native aligned allocation API: `wolfentry_free_aligned_cb_t`, `wolfentry_allocator.free_aligned`, `wolfentry_builtin_free_aligned()`, `wolfentry_free_aligned()`, and `WOLFSENTRY↵_FREE_ALIGNED()`.
- Semaphore wrappers for FreeRTOS, for use by the `wolfentry_lock_*`() shareable-upgradeable lock facility.

## Bug Fixes

- `wolfentry_route_event_dispatch_1()`: don't impose `config.penaltybox_duration` on routes with `route->meta.last_penaltybox_time == 0`.
- trivial fixes for backward compat with gcc-5.4.0, re `-Wconversion` and `-Winline`.

Please send questions or comments to [douzzier@wolfssl.com](mailto:douzzier@wolfssl.com)



# Chapter 5

## Topic Index

### 5.1 Topics

Here is a list of all topics with brief descriptions:

Core Types and Macros . . . . .	47
Startup/Configuration/Shutdown Subsystem . . . . .	48
Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers . . . . .	58
Route/Rule Subsystem . . . . .	65
Action Subsystem . . . . .	87
Event Subsystem . . . . .	95
Address Family Subsystem . . . . .	108
User-Defined Value Subsystem . . . . .	111
Object Subsystem . . . . .	116
Thread Synchronization Subsystem . . . . .	118
Allocator (Heap) Functions and Callbacks . . . . .	139
Time Functions and Callbacks . . . . .	140
Semaphore Function Callbacks . . . . .	141
lwIP Callback Activation Functions . . . . .	143



## Chapter 6

# Data Structure Index

### 6.1 Data Structures

Here are the data structures with brief descriptions:

<a href="#">JSON_CALLBACKS</a>	145
<a href="#">JSON_CONFIG</a>	145
<a href="#">JSON_DOM_PARSER</a>	145
<a href="#">JSON_INPUT_POS</a>	146
<a href="#">JSON_PARSER</a>	146
<a href="#">JSON_VALUE</a>	146
<a href="#">wolfsentry_allocator</a>	
Struct for passing shims that abstract the native implementation of the heap allocator	147
<a href="#">wolfsentry_build_settings</a>	
Struct for passing the build version and configuration	147
<a href="#">wolfsentry_data</a>	148
<a href="#">wolfsentry_eventconfig</a>	
Struct for representing event configuration	148
<a href="#">wolfsentry_host_platform_interface</a>	
Struct for passing shims that abstract native implementations of the heap allocator, time functions, and semaphores	149
<a href="#">wolfsentry_kv_pair</a>	
Public structure for passing user-defined values in/out of wolfSentry	150
<a href="#">wolfsentry_route_endpoint</a>	
Struct for exporting socket addresses, with fixed-length fields	150
<a href="#">wolfsentry_route_exports</a>	
Struct for exporting a route for access by applications	151
<a href="#">wolfsentry_route_metadata_exports</a>	
Struct for exporting route metadata for access by applications	152
<a href="#">wolfsentry_semcbs</a>	
Struct for passing shims that abstract the native implementation of counting semaphores	152
<a href="#">wolfsentry_sockaddr</a>	
Struct for passing socket addresses into <code>wolfsentry_route_*</code> () API routines	153
<a href="#">wolfsentry_thread_context_public</a>	
Right-sized, right-aligned opaque container for thread state	154
<a href="#">wolfsentry_timecbs</a>	
Struct for passing shims that abstract the native implementation of time functions	154



# Chapter 7

## File Index

### 7.1 File List

Here is a list of all documented files with brief descriptions:

wolfentry/ <a href="#">centijson_dom.h</a>	155
wolfentry/ <a href="#">centijson_sax.h</a>	157
wolfentry/ <a href="#">centijson_value.h</a>	161
wolfentry/ <a href="#">wolfentry.h</a>	
The main include file for wolfSentry applications	168
wolfentry/ <a href="#">wolfentry_af.h</a>	
Definitions for address families	209
wolfentry/ <a href="#">wolfentry_errcodes.h</a>	
Definitions for diagnostics	213
wolfentry/ <a href="#">wolfentry_json.h</a>	
Types and prototypes for loading/reloading configuration using JSON	223
wolfentry/ <a href="#">wolfentry_lwip.h</a>	
Prototypes for lwIP callback installation functions, for use in lwIP applications	226
wolfentry/ <a href="#">wolfentry_settings.h</a>	
Target- and config-specific settings and abstractions for wolfSentry	228
wolfentry/ <a href="#">wolfentry_util.h</a>	
Utility and convenience macros for both internal and application use	239
wolfentry/ <a href="#">wolfssl_test.h</a>	
Macros and helper functions for wolfSSL --enable-wolfentry	246





# Chapter 8

## Topic Documentation

### 8.1 Core Types and Macros

#### Macros

- **#define WOLFSENTRY\_NO\_ALLOCA**  
*Build flag to use only implementations that avoid `alloca()`.*
- **#define WOLFSENTRY\_C89**  
*Build flag to use only constructs that are pedantically legal in C89.*
- **#define \_\_attribute\_maybe\_unused\_\_**  
*Attribute abstraction to mark a function or variable (typically a `static`) as possibly unused.*
- **#define DO\_NOTHING**  
*Statement-type abstracted construct that executes no code.*
- **#define WOLFSENTRY\_NO\_POSIX\_MEMALIGN**  
*Define if `posix_memalign()` is not available.*
- **#define WOLFSENTRY\_FLEXIBLE\_ARRAY\_SIZE**  
*Value appropriate as a size for an array that will be allocated to a variable size. Built-in value usually works.*
- **#define SZET\_FMT**  
*printf-style format string appropriate for pairing with `size_t`*
- **#define WOLFSENTRY\_ENT\_ID\_FMT**  
*printf-style format string appropriate for pairing with `wolfentry_ent_id_t`*
- **#define WOLFSENTRY\_ENT\_ID\_NONE**  
*always-invalid object ID*
- **#define WOLFSENTRY\_HITCOUNT\_FMT**  
*printf-style format string appropriate for pairing with `wolfentry_hitcount_t`*
- **#define \_\_wolfentry\_wur**  
*abstracted attribute designating that the return value must be checked to avoid a compiler warning*
- **#define wolfentry\_static\_assert(c)**  
*abstracted static assert – `c` must be true, else `c` is printed*
- **#define wolfentry\_static\_assert2(c, m)**  
*abstracted static assert – `c` must be true, else `m` is printed*
- **#define WOLFSENTRY\_API\_VOID**  
*Function attribute for declaring/defining public void API functions.*
- **#define WOLFSENTRY\_API**  
*Function attribute for declaring/defining public API functions with return values.*
- **#define WOLFSENTRY\_LOCAL\_VOID**

Function attribute for declaring/defining private void functions.

- #define **WOLFSENTRY\_LOCAL**

Function attribute for declaring/defining private functions with return values.

- #define **WOLFSENTRY\_MAX\_ADDR\_BYTES** 16

The maximum size allowed for an address, in bytes. Can be overridden. Note that support for bitmask matching for an address family depends on [WOLFSENTRY\\_MAX\\_ADDR\\_BYTES](#) at least twice the max size of a bare address in that family, as the address and mask are internally stored as a single double-length byte vector. Note also that [WOLFSENTRY\\_MAX\\_ADDR\\_BYTES](#) entails proportional overhead if wolfSentry is built [WOLFSENTRY\\_NO\\_ALLOCA](#) or [WOLFSENTRY\\_C89](#).

- #define **WOLFSENTRY\_MAX\_ADDR\_BITS** ([WOLFSENTRY\\_MAX\\_ADDR\\_BYTES](#)\*8)

The maximum size allowed for an address, in bits. Can be overridden.

- #define **WOLFSENTRY\_MAX\_LABEL\_BYTES** 32

The maximum size allowed for a label, in bytes. Can be overridden.

- #define **WOLFSENTRY\_BUILTIN\_LABEL\_PREFIX** "%"

The prefix string reserved for use in names of built-in actions and events.

- #define **WOLFSENTRY\_KV\_MAX\_VALUE\_BYTES** 16384

The maximum size allowed for scalar user-defined values. Can be overridden.

## Typedefs

- typedef unsigned char **byte**

8 bits unsigned

- typedef uint16\_t **wolfentry\_addr\_family\_t**

integer type for holding address family number

- typedef uint16\_t **wolfentry\_proto\_t**

integer type for holding protocol number

- typedef uint16\_t **wolfentry\_port\_t**

integer type for holding port number

- typedef uint32\_t **wolfentry\_ent\_id\_t**

integer type for holding table entry ID

- typedef uint16\_t **wolfentry\_addr\_bits\_t**

integer type for address prefix lengths (in bits)

- typedef uint32\_t **wolfentry\_hitcount\_t**

integer type for holding hit count statistics

- typedef int64\_t **wolfentry\_time\_t**

integer type for holding absolute and relative times, using microseconds in built-in implementations.

- typedef uint16\_t **wolfentry\_priority\_t**

integer type for holding event priority (smaller number is higher priority)

### 8.1.1 Detailed Description

## 8.2 Startup/Configuration/Shutdown Subsystem

### Data Structures

- struct [wolfentry\\_host\\_platform\\_interface](#)

struct for passing shims that abstract native implementations of the heap allocator, time functions, and semaphores

- struct [wolfentry\\_build\\_settings](#)

struct for passing the build version and configuration

## Macros

- **#define WOLFSENTRY\_VERSION\_MAJOR**  
Macro for major version number of installed headers.
- **#define WOLFSENTRY\_VERSION\_MINOR**  
Macro for minor version number of installed headers.
- **#define WOLFSENTRY\_VERSION\_TINY**  
Macro for tiny version number of installed headers.
- **#define WOLFSENTRY\_VERSION\_ENCODE(major, minor, tiny)**  
Macro to convert a wolfSentry version to a single integer, for comparison to other similarly converted versions.
- **#define WOLFSENTRY\_VERSION**  
The version recorded in [wolfentry.h](#), encoded as an integer.
- **#define WOLFSENTRY\_VERSION\_GT(major, minor, tiny)**  
Helper macro that is true if the given version is greater than that in [wolfentry.h](#).
- **#define WOLFSENTRY\_VERSION\_GE(major, minor, tiny)**  
Helper macro that is true if the given version is greater than or equal to that in [wolfentry.h](#).
- **#define WOLFSENTRY\_VERSION\_EQ(major, minor, tiny)**  
Helper macro that is true if the given version equals that in [wolfentry.h](#).
- **#define WOLFSENTRY\_VERSION\_LT(major, minor, tiny)**  
Helper macro that is true if the given version is less than that in [wolfentry.h](#).
- **#define WOLFSENTRY\_VERSION\_LE(major, minor, tiny)**  
Helper macro that is true if the given version is less than or equal to that in [wolfentry.h](#).
- **#define WOLFSENTRY\_MAX\_JSON\_NESTING 16**  
Can be overridden.
- **#define WOLFSENTRY\_USER\_SETTINGS\_FILE "the\_path"**  
Define to the path of a user settings file to be included, containing extra and override definitions and directives. Can be an absolute or a relative path, subject to a `-I` path supplied to `make` using `EXTRA_CFLAGS`. Include quotes or `<>` around the path.
- **#define WOLFSENTRY\_NO\_INTTYPES\_H**  
Define to inhibit inclusion of `inttypes.h` (alternative typedefs or include must be supplied with [WOLFSENTRY\\_USER\\_SETTINGS\\_FILE](#)).
- **#define WOLFSENTRY\_NO\_STDINT\_H**  
Define to inhibit inclusion of `stdint.h` (alternative typedefs or include must be supplied with [WOLFSENTRY\\_USER\\_SETTINGS\\_FILE](#)).
- **#define WOLFSENTRY\_SINGLETHREADED**  
Define to disable all thread handling and safety in wolfSentry.
- **#define WOLFSENTRY\_USE\_NONPOSIX\_SEMAPHORES**  
Define if POSIX semaphore API is not available. If no non-POSIX builtin implementation is present in `wolfentry_util.c`, then [WOLFSENTRY\\_NO\\_SEM\\_BUILTIN](#) must be set, and the [wolfentry\\_host\\_platform\\_interface](#) supplied to wolfSentry APIs must include a full semaphore implementation (shim set) in its [wolfentry\\_semcbcs](#) slot.
- **#define WOLFSENTRY\_USE\_NONPOSIX\_THREADS**  
Define if POSIX thread API is not available. `WOLFSENTRY_THREAD_INCLUDE`, `WOLFSENTRY_THREAD_ID_T`, and `WOLFSENTRY_THREAD_GET_ID_HANDLER` will need to be supplied in [WOLFSENTRY\\_USER\\_SETTINGS\\_FILE](#).
- **#define WOLFSENTRY\_NO\_GNU\_ATOMICS**  
Define if `gnu`-style atomic intrinsics are not available. `WOLFSENTRY_ATOMIC_*()` macro definitions for intrinsics will need to be supplied in [WOLFSENTRY\\_USER\\_SETTINGS\\_FILE](#) (see [wolfentry\\_util.h](#)).
- **#define WOLFSENTRY\_NO\_CLOCK\_BUILTIN**  
If defined, omit built-in time primitives; the [wolfentry\\_host\\_platform\\_interface](#) supplied to wolfSentry APIs must include implementations of all functions in [wolfentry\\_timecbcs](#).
- **#define WOLFSENTRY\_NO\_SEM\_BUILTIN**  
If defined, omit built-in semaphore primitives; the [wolfentry\\_host\\_platform\\_interface](#) supplied to wolfSentry APIs must include implementations of all functions in [wolfentry\\_semcbcs](#).
- **#define WOLFSENTRY\_NO\_MALLOC\_BUILTIN**

If defined, omit built-in heap allocator primitives; the [wolfSentry\\_host\\_platform\\_interface](#) supplied to wolfSentry APIs must include implementations of all functions in [wolfSentry\\_allocator](#).

- **#define WOLFSENTRY\_NO\_ERROR\_STRINGS**  
If defined, omit APIs for rendering error codes and source code files in human readable form. They will be rendered numerically.
- **#define WOLFSENTRY\_NO\_PROTOCOL\_NAMES**  
If defined, omit APIs for rendering error codes and source code files in human readable form. They will be rendered numerically.
- **#define WOLFSENTRY\_NO\_ADDR\_BITMASK\_MATCHING**  
If defined, omit support for bitmask matching of addresses, and support only prefix matching.
- **#define WOLFSENTRY\_NO\_IPV6**  
If defined, omit support for IPv6.
- **#define WOLFSENTRY\_MAX\_BITMASK\_MATCHED\_AFS**  
The maximum number of distinct address families that can use bitmask matching in routes. Default value is 4.
- **#define WOLFSENTRY\_NO\_GETPROTOBY**  
Define this to gate out calls to [getprotobyname\\_r\(\)](#) and [getservbyname\\_r\(\)](#), necessitating numeric identification of protocols (e.g. 6 for TCP) and services (e.g. 25 for SMTP) in configuration JSON documents.
- **#define WOLFSENTRY\_SEMAPHORE\_INCLUDE** "the\_path"  
Define to the path of a header file declaring a semaphore API. Can be an absolute or a relative path, subject to a -I path supplied to make using EXTRA\_CFLAGS. Include quotes or <> around the path.
- **#define WOLFSENTRY\_THREAD\_INCLUDE** "the\_path"  
Define to the path of a header file declaring a threading API. Can be an absolute or a relative path, subject to a -I path supplied to make using EXTRA\_CFLAGS. Include quotes or <> around the path.
- **#define WOLFSENTRY\_THREAD\_ID\_T** thread\_id\_type  
Define to the appropriate type analogous to POSIX [pthread\\_t](#).
- **#define WOLFSENTRY\_THREAD\_GET\_ID\_HANDLER** pthread\_self\_ish\_function  
Define to the name of a void function analogous to POSIX [pthread\\_self](#), returning a value of type [WOLFSENTRY\\_THREAD\\_ID\\_T](#).
- **#define WOLFSENTRY\_CONFIG\_SIGNATURE**  
Macro to use as the initializer for [wolfSentry\\_build\\_settings.config](#) and [wolfSentry\\_host\\_platform\\_interface.caller\\_build\\_settings](#).

## Typedefs

- typedef void(\* **wolfSentry\_cleanup\_callback\_t**) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*cleanup\_↔ arg)  
Function type to pass to [wolfSentry\\_cleanup\\_push\(\)](#)
- typedef uint32\_t **wolfSentry\_config\_load\_flags\_t**  
Type for holding flag bits from [wolfSentry\\_config\\_load\\_flags](#).

## Enumerations

- enum [wolfSentry\\_init\\_flags\\_t](#) {  
    [WOLFSENTRY\\_INIT\\_FLAG\\_NONE](#) ,  
    [WOLFSENTRY\\_INIT\\_FLAG\\_LOCK\\_SHARED\\_ERROR\\_CHECKING](#) }  
    flags to pass to [wolfSentry\\_init\\_ex\(\)](#), to be OR'd together.
- enum [wolfSentry\\_clone\\_flags\\_t](#) {  
    [WOLFSENTRY\\_CLONE\\_FLAG\\_NONE](#) ,  
    [WOLFSENTRY\\_CLONE\\_FLAG\\_AS\\_AT\\_CREATION](#) ,  
    [WOLFSENTRY\\_CLONE\\_FLAG\\_NO\\_ROUTES](#) }  
    Flags to be OR'd together to control the dynamics of [wolfSentry\\_context\\_clone\(\)](#) and other cloning functions.

- enum `wolfentry_config_load_flags` {  
`WOLFSENTRY_CONFIG_LOAD_FLAG_NONE` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_NO_FLUSH` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_DRY_RUN` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_LOAD_THEN_COMMIT` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_NO_ROUTES_OR_EVENTS` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_ABORT` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USEFIRST` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USELAST` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_MAINTAININDICTORDER` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_FLUSH_ONLY_ROUTES` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_FINI` }

Flags to be OR'd together to communicate options to `wolfentry_config_json_init()`

## Functions

- WOLFSENTRY\_API struct `wolfentry_build_settings` `wolfentry_get_build_settings` (void)  
Return the `wolfentry_build_settings` of the library as built.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_build_settings_compatible` (struct `wolfentry_build_settings` caller\_build\_settings)  
Return success if the application and library were built with mutually compatible wolfSentry version and configuration.
- WOLFSENTRY\_API struct `wolfentry_host_platform_interface` \* `wolfentry_get_hpi` (struct `wolfentry_context` \*wolfentry)  
Return a pointer to the `wolfentry_host_platform_interface` associated with the supplied `wolfentry_context`, mainly for passing to `wolfentry_alloc_thread_context()`, `wolfentry_free_thread_context()`, `wolfentry_lock_init()`, and `wolfentry_lock_alloc()`.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_cleanup_push` (WOLFSENTRY\_CONTEXT\_ARGS\_IN, `wolfentry_cleanup_callback_t` handler, void \*arg)  
Register handler to be called at shutdown with arg arg.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_cleanup_pop` (WOLFSENTRY\_CONTEXT\_ARGS\_IN, int execute\_p)  
Remove the most recently registered and unpopped handler from the cleanup stack, and if execute\_p is nonzero, call it with the arg with which it was registered.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_cleanup_all` (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
Iteratively call `wolfentry_cleanup_pop()`, executing each handler as it is popped, passing it the arg with which it was registered.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_init_ex` (struct `wolfentry_build_settings` caller\_build\_settings, WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX(const struct `wolfentry_host_platform_interface` \*hpi), const struct `wolfentry_eventconfig` \*config, struct `wolfentry_context` \*\*wolfentry, `wolfentry_init_flags_t` flags)  
Variant of `wolfentry_init()` that accepts a flags argument, for additional control over configuration.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_init` (struct `wolfentry_build_settings` caller\_build\_settings, WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX(const struct `wolfentry_host_platform_interface` \*hpi), const struct `wolfentry_eventconfig` \*config, struct `wolfentry_context` \*\*wolfentry)  
Allocates and initializes the wolfentry context.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_defaultconfig_get` (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_eventconfig` \*config)  
Get the default config from a wolfentry context.
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_defaultconfig_update` (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct `wolfentry_eventconfig` \*config)  
Updates mutable fields of the default config (all but `wolfentry_eventconfig::route_private_data_size` and `wolfentry_eventconfig::route_private_data_alignment`)
- WOLFSENTRY\_API `wolfentry_errcode_t` `wolfentry_context_flush` (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
Flushes the route, event, and user value tables from the wolfentry context.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_free](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX(struct wolfentry\_context \*\*wolfentry))  
*Frees the wolfentry context and the tables within it. The wolfentry context will be a pointer to NULL upon success.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_shutdown](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX(struct wolfentry\_context \*\*wolfentry))  
*Shut down wolfSentry, freeing all resources. Gets an exclusive lock on the context, then calls [wolfentry\\_context\\_free\(\)](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_inhibit\\_actions](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Disable automatic dispatch of actions on the wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_enable\\_actions](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Re-enable automatic dispatch of actions on the wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_clone](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_context \*\*clone, [wolfentry\\_clone\\_flags\\_t](#) flags)  
*Clones a wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_exchange](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_context \*wolfentry2)  
*Swaps information between two wolfentry contexts.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_centijson\\_errcode\\_translate](#) (wolfentry\_errcode\_t centijson\_errcode)  
*Convert CentiJSON numeric error code to closest-corresponding wolfSentry error code.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_config\\_json\\_init](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_config\\_load\\_flags\\_t](#) load\_flags, struct wolfentry\_json\_process\_state \*\*jps)  
*Allocate and initialize a struct wolfentry\_json\_process\_state with the designated load\_flags, to subsequently pass to [wolfentry\\_config\\_json\\_feed\(\)](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_config\\_json\\_init\\_ex](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_config\\_load\\_flags\\_t](#) load\_flags, const JSON\_CONFIG \*json\_config, struct wolfentry\_json↵\_process\_state \*\*jps)  
*Variant of [wolfentry\\_config\\_json\\_init\(\)](#) with an additional JSON\_CONFIG argument, json↵\_config, for tailoring of JSON parsing dynamics.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_config\\_json\\_feed](#) (struct wolfentry\_json\_process↵\_state \*jps, const unsigned char \*json\_in, size\_t json\_in\_len, char \*err\_buf, size\_t err\_buf\_size)  
*Pass a segment of JSON configuration into the parsing engine. Segments can be as short or as long as desired, to facilitate incremental read-in.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_config\\_centijson\\_errcode](#) (struct wolfentry\_json↵\_process\_state \*jps, int \*json\_errcode, const char \*\*json\_errmsg)  
*Copy the current error code and/or human-readable error message from a struct wolfentry\_json↵\_process\_state allocated by [wolfentry\\_config\\_json\\_init\(\)](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_config\\_json\\_fini](#) (struct wolfentry\_json\_process↵\_state \*\*jps, char \*err\_buf, size\_t err\_buf\_size)  
*To be called when done iterating [wolfentry\\_config\\_json\\_feed\(\)](#), completing the configuration load.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_config\\_json\\_oneshot](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const unsigned char \*json\_in, size\_t json\_in\_len, [wolfentry\\_config\\_load\\_flags\\_t](#) load\_flags, char \*err\_buf, size\_t err\_buf\_size)  
*Load a complete JSON configuration from an in-memory buffer.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_config\\_json\\_oneshot\\_ex](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const unsigned char \*json\_in, size\_t json\_in\_len, [wolfentry\\_config\\_load\\_flags\\_t](#) load\_flags, const JSON\_CONFIG \*json\_config, char \*err\_buf, size\_t err\_buf\_size)  
*Variant of [wolfentry\\_config\\_json\\_oneshot\(\)](#) with an additional JSON\_CONFIG argument, json↵\_config, for tailoring of JSON parsing dynamics.*

## 8.2.1 Detailed Description

## 8.2.2 Enumeration Type Documentation

**8.2.2.1 wolfsentry\_clone\_flags\_t**

```
enum wolfsentry_clone_flags_t
```

Flags to be OR'd together to control the dynamics of `wolfsentry_context_clone()` and other cloning functions.

**Enumerator**

WOLFSENTRY_CLONE_FLAG_NONE	Default behavior.
WOLFSENTRY_CLONE_FLAG_AS_AT_CREATION	Don't copy routes, events, or user values, and copy default config as it existed upon return from <code>wolfsentry_init()</code> . Action and address family tables are copied as usual.
WOLFSENTRY_CLONE_FLAG_NO_ROUTES	Don't copy route table entries. Route table config, default config, and all other tables, are copied as usual.

**8.2.2.2 wolfsentry\_config\_load\_flags**

```
enum wolfsentry_config_load_flags
```

Flags to be OR'd together to communicate options to `wolfsentry_config_json_init()`

**Enumerator**

WOLFSENTRY_CONFIG_LOAD_FLAG_NONE	Default behavior.
WOLFSENTRY_CONFIG_LOAD_FLAG_NO_FLUSH	Add to current configuration, rather than replacing it.
WOLFSENTRY_CONFIG_LOAD_FLAG_DRY_RUN	Test the load operation, as modified by other flags, without updating current configuration.
WOLFSENTRY_CONFIG_LOAD_FLAG_LOAD ↵ THEN_COMMIT	Test the load operation before replacing the current configuration.
WOLFSENTRY_CONFIG_LOAD_FLAG_NO ↵ ROUTES_OR_EVENTS	Skip routes and events in the supplied configuration.
WOLFSENTRY_CONFIG_LOAD_FLAG_JSON ↵ DOM_DUPKEY_ABORT	When loading JSON user values, treat as an error when duplicate keys are found.
WOLFSENTRY_CONFIG_LOAD_FLAG_JSON ↵ DOM_DUPKEY_USEFIRST	When loading JSON user values, when duplicate keys are found, keep the first one.
WOLFSENTRY_CONFIG_LOAD_FLAG_JSON ↵ DOM_DUPKEY_USELAST	When loading JSON user values, when duplicate keys are found, keep the last one.
WOLFSENTRY_CONFIG_LOAD_FLAG_JSON ↵ DOM_MAINTAINDICTIONARYORDER	When loading JSON user values, store extra sequence information so that dictionaries are rendered in same sequence by <code>json_dom_dump()</code> and <code>wolfsentry_kv_render_value()</code> .
WOLFSENTRY_CONFIG_LOAD_FLAG_FLUSH ↵ ONLY_ROUTES	Don't flush the events or user values, just flush the routes, before loading incremental configuration JSON.
WOLFSENTRY_CONFIG_LOAD_FLAG_FINI	Internal use.



### 8.2.2.3 wolfentry\_init\_flags\_t

enum `wolfentry_init_flags_t`

flags to pass to `wolfentry_init_ex()`, to be OR'd together.

Enumerator

<code>WOLFENTRY_INIT_FLAG_NONE</code>	Default behavior.
<code>WOLFENTRY_INIT_FLAG_LOCK_SHARED ↔ ERROR_CHECKING</code>	Enables supplementary error checking on shared lock usage (not currently implemented)

## 8.2.3 Function Documentation

### 8.2.3.1 wolfentry\_context\_clone()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_context_clone (
    WOLFENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_context ** clone,
    wolfentry_clone_flags_t flags )
```

Clones a wolfentry context.

Parameters

<i>clone</i>	the destination wolfentry context, should be a pointer to a NULL pointer as this function will malloc
<i>flags</i>	set to <code>WOLFENTRY_CLONE_FLAG_AT_CREATION</code> to use the config at the creation of the original wolfentry context instead of the current configuration

Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

See also

`WOLFENTRY_CONTEXT_ARGS_IN`

### 8.2.3.2 wolfentry\_context\_enable\_actions()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_context_enable_actions (
    WOLFENTRY_CONTEXT_ARGS_IN )
```

Re-enable automatic dispatch of actions on the wolfentry context.

Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

See also

`WOLFENTRY_CONTEXT_ARGS_IN`



### 8.2.3.3 wolfsentry\_context\_exchange()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_exchange (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfsentry_context * wolfsentry2 )
```

Swaps information between two wolfsentry contexts.

#### Parameters

<i>wolfsentry2</i>	the new context to swap into the primary context
--------------------	--

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.2.3.4 wolfsentry\_context\_flush()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_flush (
    WOLFSENTRY_CONTEXT_ARGS_IN )
```

Flushes the route, event, and user value tables from the wolfsentry context.

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.2.3.5 wolfsentry\_context\_free()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_free (
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfsentry_context **wolfsentry) )
```

Frees the wolfsentry context and the tables within it. The wolfsentry context will be a pointer to NULL upon success.

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true, and *wolfsentry* is NULL, on success.

#### See also

[wolfsentry\\_context\\_shutdown](#)

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN\\_EX](#)

### 8.2.3.6 wolfsentry\_context\_inhibit\_actions()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_inhibit_actions (
    WOLFSENTRY_CONTEXT_ARGS_IN )
```

Disable automatic dispatch of actions on the wolfsentry context.

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.2.3.7 wolfsentry\_defaultconfig\_get()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_defaultconfig_get (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfsentry_eventconfig * config )
```

Get the default config from a wolfsentry context.

#### Parameters

<i>config</i>	a config struct to be loaded with a copy of the config
---------------	--

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

### 8.2.3.8 wolfsentry\_defaultconfig\_update()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_defaultconfig_update (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const struct wolfsentry_eventconfig * config )
```

Updates mutable fields of the default config (all but [wolfsentry\\_eventconfig::route\\_private\\_data\\_size](#) and [wolfsentry\\_eventconfig::route\\_private\\_data\\_alignment](#))

#### Parameters

<i>config</i>	the config struct to load from
---------------	--------------------------------

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.2.3.9 wolfentry\_init()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_init (
    struct wolfentry_build_settings caller_build_settings,
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(const struct wolfentry_host_platform_interface
    *hpi) ,
    const struct wolfentry_eventconfig * config,
    struct wolfentry_context ** wolfentry )
```

Allocates and initializes the wolfentry context.

#### Parameters

<i>caller_build_settings</i>	Pass <a href="#">wolfentry_build_settings</a> here (definition is in <a href="#">wolfentry_settings.h</a> )
<i>config</i>	a pointer to a <a href="#">wolfentry_eventconfig</a> to use (can be NULL)
<i>wolfentry</i>	a pointer to the <a href="#">wolfentry_context</a> to initialize

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

See also

[struct wolfentry\\_host\\_platform\\_interface](#)  
[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN\\_EX](#)

### 8.2.3.10 wolfentry\_shutdown()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_shutdown (
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_context **wolfentry) )
```

Shut down wolfSentry, freeing all resources. Gets an exclusive lock on the context, then calls [wolfentry\\_context\\_free\(\)](#).

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true, and *wolfentry* is NULL, on success.

See also

[wolfentry\\_context\\_free](#)  
[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN\\_EX](#)

## 8.3 Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers

### Macros

- **#define WOLFSENTRY\_SOURCE\_ID**  
*In each source file in the wolfSentry library, WOLFSENTRY\_SOURCE\_ID is defined to a number that is decoded using `enum wolfentry_source_id`. Application source files that use the below error encoding and rendering macros must also define WOLFSENTRY\_SOURCE\_ID to a number, starting with WOLFSENTRY\_SOURCE\_ID\_USER\_BASE, and can use `wolfentry_user_source_string_set()` or `WOLFSENTRY_REGISTER_SOURCE()` to arrange for error and warning messages that render the source code file by name.*
- **#define WOLFSENTRY\_ERRCODE\_FMT**  
*String-literal macro for formatting `wolfentry_errcode_t` using `printf()`-type functions.*
- **#define WOLFSENTRY\_SOURCE\_ID\_MAX** 127
- **#define WOLFSENTRY\_ERROR\_ID\_MAX** 255
- **#define WOLFSENTRY\_LINE\_NUMBER\_MAX** 65535
- **#define WOLFSENTRY\_ERROR\_DECODE\_ERROR\_CODE(x)**  
*Extract the bare error (negative) or success (zero/positive) code from an encoded `wolfentry_errcode_t`*
- **#define WOLFSENTRY\_ERROR\_DECODE\_SOURCE\_ID(x)**  
*Extract the bare source file ID from an encoded `wolfentry_errcode_t`*
- **#define WOLFSENTRY\_ERROR\_DECODE\_LINE\_NUMBER(x)**  
*Extract the bare source line number from an encoded `wolfentry_errcode_t`*
- **#define WOLFSENTRY\_ERROR\_RECODE(x)**  
*Take an encoded `wolfentry_errcode_t` and recode it with the current source ID and line number.*
- **#define WOLFSENTRY\_ERROR\_CODE\_IS(x, name)**  
*Take an encoded `wolfentry_errcode_t` x and test if its error code matches short-form error name (e.g. `INVALID_ARG`).*
- **#define WOLFSENTRY\_SUCCESS\_CODE\_IS(x, name)**  
*Take an encoded `wolfentry_errcode_t` x and test if its error code matches short-form success name (e.g. `OK`).*
- **#define WOLFSENTRY\_IS\_FAILURE(x)**  
*Evaluates to true if x is a `wolfentry_errcode_t` that encodes a failure.*
- **#define WOLFSENTRY\_IS\_SUCCESS(x)**  
*Evaluates to true if x is a `wolfentry_errcode_t` that encodes a success.*
- **#define WOLFSENTRY\_ERROR\_FMT**  
*Convenience string-constant macro for formatting a `wolfentry_errcode_t` for rendering by a `printf`-type function.*
- **#define WOLFSENTRY\_ERROR\_FMT\_ARGS(x)**  
*Convenience macro supplying args to match the format directives in WOLFSENTRY\_ERROR\_FMT.*
- **#define WOLFSENTRY\_ERROR\_ENCODE(name)**  
*Compute a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form error name (e.g. `INVALID_ARG`).*
- **#define WOLFSENTRY\_SUCCESS\_ENCODE(x)**  
*Compute a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form success name (e.g. `OK`).*
- **#define WOLFSENTRY\_DEBUG\_CALL\_TRACE**  
*Define to build the library or application to output codepoint and error code info at each return point.*
- **#define WOLFSENTRY\_ERROR\_RETURN(x)**  
*Return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form error name (e.g. `INVALID_ARG`).*
- **#define WOLFSENTRY\_SUCCESS\_RETURN(x)**  
*Return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form success name (e.g. `OK`).*

- **#define WOLFSENTRY\_ERROR\_RETURN\_RECODED(x)**  
Take an encoded `wolfentry_errcode_t`, recode it with the current source ID and line number, and return it.
- **#define WOLFSENTRY\_ERROR\_REReturn(x)**  
Return an encoded `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_RETURN\_VALUE(x)**  
Return an arbitrary value.
- **#define WOLFSENTRY\_RETURN\_VOID**  
Return from a void function.
- **#define WOLFSENTRY\_SUCCESS\_RETURN\_RECODED(x)**  
Take an encoded `wolfentry_errcode_t`, recode it with the current source ID and line number, and return it.
- **#define WOLFSENTRY\_SUCCESS\_REReturn(x)**  
Return an encoded `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_UNLOCK\_FOR\_RETURN\_EX(ctx)**
- **#define WOLFSENTRY\_UNLOCK\_FOR\_RETURN()**  
Unlock a previously locked `wolfentry_context`, and if the unlock fails, return the error.
- **#define WOLFSENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN\_EX(ctx)**
- **#define WOLFSENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN()**  
Unlock a previously locked `wolfentry_context`, and abandon a held promotion reservation if any (see `wolfentry_lock_unlock()`), and if the operation fails, return the error.
- **#define WOLFSENTRY\_MUTEX\_EX(ctx)**  
Get a mutex on a `wolfentry_context`, evaluating to the resulting `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_MUTEX\_OR\_RETURN()**
- **#define WOLFSENTRY\_SHARED\_EX(ctx)**  
Get a mutex on the current context, and on failure, return the `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_SHARED\_OR\_RETURN()**
- **#define WOLFSENTRY\_PROMOTABLE\_EX(ctx)**  
Get a shared lock on the current context, and on failure, return the `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_PROMOTABLE\_OR\_RETURN()**
- **#define WOLFSENTRY\_UNLOCK\_AND\_RETURN(ret)**  
Get a shared lock with mutex promotion reservation on the current context, and on failure, return the `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_ERROR\_UNLOCK\_AND\_RETURN(name)**  
Unlock the current context, and return the supplied `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_ERROR\_UNLOCK\_AND\_RETURN\_RECODED(x)**  
Unlock the current context, then take an encoded `wolfentry_errcode_t x`, recode it with the current source ID and line number, and return it.
- **#define WOLFSENTRY\_ERROR\_UNLOCK\_AND\_RETURN\_EX(ctx, name)**  
Unlock a previously locked `wolfentry_context ctx`, and return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form error name (e.g. `INVALID_ARG`).
- **#define WOLFSENTRY\_ERROR\_UNLOCK\_AND\_RETURN\_RECODED\_EX(ctx, x)**  
Unlock a previously locked `wolfentry_context ctx`, then take an encoded `wolfentry_errcode_t x`, recode it with the current source ID and line number, and return it.
- **#define WOLFSENTRY\_ERROR\_UNLOCK\_AND\_REReturn(x)**  
Unlock the current context, and return an encoded `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_ERROR\_REReturn\_AND\_UNLOCK(y)**  
Calculate the `wolfentry_errcode_t` return value for an expression `y`, then unlock the current context, and finally, return the encoded `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_SUCCESS\_UNLOCK\_AND\_RETURN(name)**  
Unlock the current context, and return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form success name (e.g. `INVALID_ARG`).
- **#define WOLFSENTRY\_SUCCESS\_UNLOCK\_AND\_RETURN\_RECODED(x)**  
Unlock the current context, then take an encoded `wolfentry_errcode_t x`, recode it with the current source ID and line number, and return it.

- **#define WOLFSENTRY\_SUCCESS\_UNLOCK\_AND\_RERETURN(x)**  
*Unlock the current context, and return an encoded `wolfentry_errcode_t`.*
- **#define WOLFSENTRY\_SUCCESS\_RERETURN\_AND\_UNLOCK(y)**  
*Calculate the `wolfentry_errcode_t` return value for an expression `y`, then unlock the current context, and finally, return the encoded `wolfentry_errcode_t`.*
- **#define WOLFSENTRY\_UNLOCK\_AND\_RETURN\_VALUE(x)**  
*Unlock the current context, and return a value `x`.*
- **#define WOLFSENTRY\_UNLOCK\_AND\_RETURN\_VOID**  
*Unlock the current context, and return void.*
- **#define WOLFSENTRY\_RETURN\_OK**  
*Return a `wolfentry_errcode_t` encoding the current source ID and line number, and the success code `OK`.*
- **#define WOLFSENTRY\_UNLOCK\_AND\_RETURN\_OK**  
*Unlock the current context, and return a `wolfentry_errcode_t` encoding the current source ID and line number, and the success code `OK`.*
- **#define WOLFSENTRY\_RERETURN\_IF\_ERROR(y)**  
*If `wolfentry_errcode_t y` is a failure code, return it.*
- **#define WOLFSENTRY\_UNLOCK\_AND\_RERETURN\_IF\_ERROR(y)**  
*If `wolfentry_errcode_t y` is a failure code, unlock the current context and return the code.*
- **#define WOLFSENTRY\_WARN(fmt, ...)**  
*Render a warning message using `WOLFSENTRY_PRINTF_ERR()`, or if `WOLFSENTRY_NO_STDIO_STREAMS` or `WOLFSENTRY_NO_DIAG_MSGS` is set, `DO_NOTHING`.*
- **#define WOLFSENTRY\_WARN\_ON\_FAILURE(...)**  
*Evaluate the supplied expression, and if the resulting `wolfentry_errcode_t` encodes an error, render the expression and the decoded error using `WOLFSENTRY_PRINTF_ERR()`, but if `WOLFSENTRY_NO_STDIO_STREAMS` or `WOLFSENTRY_NO_DIAG_MSGS` is set, don't render a warning.*
- **#define WOLFSENTRY\_WARN\_ON\_FAILURE\_LIBC(...)**  
*Evaluate the supplied expression, and if it evaluates to a negative value, render the expression and the decoded `errno` using `WOLFSENTRY_PRINTF_ERR()`, but if `WOLFSENTRY_NO_STDIO_STREAMS` or `WOLFSENTRY_NO_DIAG_MSGS` is set, don't render a warning.*
- **#define WOLFSENTRY\_REGISTER\_SOURCE()**  
*Helper macro to call `wolfentry_user_source_string_set()` with appropriate arguments.*
- **#define WOLFSENTRY\_REGISTER\_ERROR(name, msg)**  
*Helper macro to call `wolfentry_user_error_string_set()` with appropriate arguments, given a short-form `name` and freeform string `msg`.*
- **#define WOLFSENTRY\_PRINTF\_ERR(...)**  
*printf-like macro, expecting a format as first arg, used for rendering warning and error messages. Can be overridden in `WOLFSENTRY_USER_SETTINGS_FILE`.*

## Typedefs

- **typedef int32\_t wolfentry\_errcode\_t**  
*The structured result code type for `wolfSentry`. It encodes a failure or success code, a source code file ID, and a line number.*

## Enumerations

- **enum wolfentry\_source\_id {**  
**WOLFSENTRY\_SOURCE\_ID\_UNSET = 0 ,**  
**WOLFSENTRY\_SOURCE\_ID\_ACTIONS\_C = 1 ,**  
**WOLFSENTRY\_SOURCE\_ID\_EVENTS\_C = 2 ,**  
**WOLFSENTRY\_SOURCE\_ID\_WOLFSENTRY\_INTERNAL\_C = 3 ,**  
**WOLFSENTRY\_SOURCE\_ID\_ROUTES\_C = 4 ,**  
**}**

```

WOLFSENTRY_SOURCE_ID_WOLFSENTRY_UTIL_C = 5 ,
WOLFSENTRY_SOURCE_ID_KV_C = 6 ,
WOLFSENTRY_SOURCE_ID_ADDR_FAMILIES_C = 7 ,
WOLFSENTRY_SOURCE_ID_JSON_LOAD_CONFIG_C = 8 ,
WOLFSENTRY_SOURCE_ID_JSON_JSON_UTIL_C = 9 ,
WOLFSENTRY_SOURCE_ID_LWIP_PACKET_FILTER_GLUE_C = 10 ,
WOLFSENTRY_SOURCE_ID_ACTION_BUILTINS_C = 11 ,
WOLFSENTRY_SOURCE_ID_USER_BASE = 112 }
• enum wolfentry_error_id {
WOLFSENTRY_ERROR_ID_OK = 0 ,
WOLFSENTRY_ERROR_ID_NOT_OK = -1 ,
WOLFSENTRY_ERROR_ID_INTERNAL_CHECK_FATAL = -2 ,
WOLFSENTRY_ERROR_ID_SYS_OP_FATAL = -3 ,
WOLFSENTRY_ERROR_ID_SYS_OP_FAILED = -4 ,
WOLFSENTRY_ERROR_ID_SYS_RESOURCE_FAILED = -5 ,
WOLFSENTRY_ERROR_ID_INCOMPATIBLE_STATE = -6 ,
WOLFSENTRY_ERROR_ID_TIMED_OUT = -7 ,
WOLFSENTRY_ERROR_ID_INVALID_ARG = -8 ,
WOLFSENTRY_ERROR_ID_BUSY = -9 ,
WOLFSENTRY_ERROR_ID_INTERRUPTED = -10 ,
WOLFSENTRY_ERROR_ID_NUMERIC_ARG_TOO_BIG = -11 ,
WOLFSENTRY_ERROR_ID_NUMERIC_ARG_TOO_SMALL = -12 ,
WOLFSENTRY_ERROR_ID_STRING_ARG_TOO_LONG = -13 ,
WOLFSENTRY_ERROR_ID_BUFFER_TOO_SMALL = -14 ,
WOLFSENTRY_ERROR_ID_IMPLEMENTATION_MISSING = -15 ,
WOLFSENTRY_ERROR_ID_ITEM_NOT_FOUND = -16 ,
WOLFSENTRY_ERROR_ID_ITEM_ALREADY_PRESENT = -17 ,
WOLFSENTRY_ERROR_ID_ALREADY_STOPPED = -18 ,
WOLFSENTRY_ERROR_ID_WRONG_OBJECT = -19 ,
WOLFSENTRY_ERROR_ID_DATA_MISSING = -20 ,
WOLFSENTRY_ERROR_ID_NOT_PERMITTED = -21 ,
WOLFSENTRY_ERROR_ID_ALREADY = -22 ,
WOLFSENTRY_ERROR_ID_CONFIG_INVALID_KEY = -23 ,
WOLFSENTRY_ERROR_ID_CONFIG_INVALID_VALUE = -24 ,
WOLFSENTRY_ERROR_ID_CONFIG_OUT_OF_SEQUENCE = -25 ,
WOLFSENTRY_ERROR_ID_CONFIG_UNEXPECTED = -26 ,
WOLFSENTRY_ERROR_ID_CONFIG_MISPLACED_KEY = -27 ,
WOLFSENTRY_ERROR_ID_CONFIG_PARSER = -28 ,
WOLFSENTRY_ERROR_ID_CONFIG_MISSING_HANDLER = -29 ,
WOLFSENTRY_ERROR_ID_CONFIG_JSON_VALUE_SIZE = -30 ,
WOLFSENTRY_ERROR_ID_OP_NOT_SUPP_FOR_PROTO = -31 ,
WOLFSENTRY_ERROR_ID_WRONG_TYPE = -32 ,
WOLFSENTRY_ERROR_ID_BAD_VALUE = -33 ,
WOLFSENTRY_ERROR_ID_DEADLOCK_AVERTED = -34 ,
WOLFSENTRY_ERROR_ID_OVERFLOW_AVERTED = -35 ,
WOLFSENTRY_ERROR_ID_LACKING_MUTEX = -36 ,
WOLFSENTRY_ERROR_ID_LACKING_READ_LOCK = -37 ,
WOLFSENTRY_ERROR_ID_LIB_MISMATCH = -38 ,
WOLFSENTRY_ERROR_ID_LIBCONFIG_MISMATCH = -39 ,
WOLFSENTRY_ERROR_ID_IO_FAILED = -40 ,
WOLFSENTRY_ERROR_ID_WRONG_ATTRIBUTES = -41 ,
WOLFSENTRY_ERROR_ID_USER_BASE = -128 ,
WOLFSENTRY_SUCCESS_ID_OK = 0 ,
WOLFSENTRY_SUCCESS_ID_LOCK_OK_AND_GOT_RESV = 1 ,
WOLFSENTRY_SUCCESS_ID_HAVE_MUTEX = 2 ,
WOLFSENTRY_SUCCESS_ID_HAVE_READ_LOCK = 3 ,
WOLFSENTRY_SUCCESS_ID_USED_FALLBACK = 4 ,
WOLFSENTRY_SUCCESS_ID_YES = 5 ,

```

```
WOLFSENTRY_SUCCESS_ID_NO = 6 ,
WOLFSENTRY_SUCCESS_ID_ALREADY_OK = 7 ,
WOLFSENTRY_SUCCESS_ID_USER_BASE = 128 }
```

## Functions

- WOLFSENTRY\_API const char \* **wolfentry\_errcode\_source\_string** ([wolfentry\\_errcode\\_t](#) e)  
Return the name of the source code file associated with `wolfentry_errcode_t` e, or "unknown user defined source", or "unknown source".
- WOLFSENTRY\_API const char \* **wolfentry\_errcode\_error\_string** ([wolfentry\\_errcode\\_t](#) e)  
Return a description of the failure or success code associated with `wolfentry_errcode_t` e, or various "unknown" strings if not known.
- WOLFSENTRY\_API const char \* **wolfentry\_errcode\_error\_name** ([wolfentry\\_errcode\\_t](#) e)  
Return the short name of the failure or success code associated with `wolfentry_errcode_t` e, or `wolfentry_errcode_error_string(e)` if not known.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_source\_string\_set** (enum `wolfentry_errcode_t` source\_id, `wolfentry_errcode_t` source\_id, const char \*source\_string)  
Register a source code file so that `wolfentry_errcode_source_string()`, and therefore `WOLFSENTRY_ERROR_FMT_ARGS()` and `WOLFSENTRY_WARN_ON_FAILURE()`, can render it. Note that `source_string` must be a string constant or otherwise remain valid for the duration of runtime.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_error\_string\_set** (enum `wolfentry_errcode_t` error\_id, `wolfentry_errcode_t` error\_id, const char \*message\_string)  
Register an error (negative) or success (positive) code, and corresponding message, so that `wolfentry_errcode_error_string()` and therefore `WOLFSENTRY_ERROR_FMT_ARGS()` and `WOLFSENTRY_WARN_ON_FAILURE()`, can render it in human-readable form. Note that `error_string` must be a string constant or otherwise remain valid for the duration of runtime.

### 8.3.1 Detailed Description

### 8.3.2 Macro Definition Documentation

#### 8.3.2.1 WOLFSENTRY\_DEBUG\_CALL\_TRACE

```
#define WOLFSENTRY_DEBUG_CALL_TRACE
```

Define to build the library or application to output codepoint and error code info at each return point.

In the wolfSentry library, and optionally in applications, all returns from functions are through macros, typically `WOLFSENTRY_ERROR_RETURN()`. In normal builds, these macros just return as usual. But if `WOLFSENTRY_DEBUG_CALL_TRACE` is defined, then alternative implementations are used that print trace info, using the `WOLFSENTRY_PRINTF_ERR()` macro, which has platform-specific default definitions in `wolfentry_settings.h`, subject to override.

#### 8.3.2.2 WOLFSENTRY\_ERROR\_UNLOCK\_AND\_RETURN

```
#define WOLFSENTRY_ERROR_UNLOCK_AND_RETURN(  
    name )
```

Unlock the current context, and return the supplied `wolfentry_errcode_t`.

<

Unlock the current context, and return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form error name (e.g. `INVALID_ARG`).



### 8.3.2.3 WOLFSENTRY\_MUTEX\_OR\_RETURN

```
#define WOLFSENTRY_MUTEX_OR_RETURN( )
```

**Value:**

```
do {
    wolfentry_errcode_t _lock_ret;
    if ((_lock_ret = WOLFSENTRY_MUTEX_EX(wolfentry)) < 0)
        WOLFSENTRY_ERROR_RERETURN(_lock_ret);
} while (0)
```

### 8.3.2.4 WOLFSENTRY\_PROMOTABLE\_EX

```
#define WOLFSENTRY_PROMOTABLE_EX(
    ctx )
```

Get a shared lock on the current context, and on failure, return the `wolfentry_errcode_t`.

<

Get a mutex on a `wolfentry_context`, evaluating to the resulting `wolfentry_errcode_t`.

### 8.3.2.5 WOLFSENTRY\_PROMOTABLE\_OR\_RETURN

```
#define WOLFSENTRY_PROMOTABLE_OR_RETURN( )
```

**Value:**

```
do {
    wolfentry_errcode_t _lock_ret;
    if (thread == NULL)
        _lock_ret = WOLFSENTRY_MUTEX_EX(wolfentry);
    else
        _lock_ret = WOLFSENTRY_PROMOTABLE_EX(wolfentry);
    WOLFSENTRY_RERETURN_IF_ERROR(_lock_ret);
} while (0)
```

### 8.3.2.6 WOLFSENTRY\_SHARED\_EX

```
#define WOLFSENTRY_SHARED_EX(
    ctx )
```

Get a mutex on the current context, and on failure, return the `wolfentry_errcode_t`.

<

Get a shared lock on a `wolfentry_context`, evaluating to the resulting `wolfentry_errcode_t`.

### 8.3.2.7 WOLFSENTRY\_SHARED\_OR\_RETURN

```
#define WOLFSENTRY_SHARED_OR_RETURN( )
```

**Value:**

```
do {
    wolfentry_errcode_t _lock_ret;
    if (thread == NULL)
        _lock_ret = WOLFSENTRY_MUTEX_EX(wolfentry);
    else
        _lock_ret = WOLFSENTRY_SHARED_EX(wolfentry);
    WOLFSENTRY_RERETURN_IF_ERROR(_lock_ret);
} while (0)
```

### 8.3.2.8 WOLFSENTRY\_UNLOCK\_AND\_RETURN

```
#define WOLFSENTRY_UNLOCK_AND_RETURN(  
    ret )
```

Get a shared lock with mutex promotion reservation on the current context, and on failure, return the `wolfentry_errcode_t`.

<

### 8.3.2.9 WOLFSENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN

```
#define WOLFSENTRY_UNLOCK_AND_UNRESERVE_FOR_RETURN( )
```

Unlock a previously locked `wolfentry_context`, and abandon a held promotion reservation if any (see [wolfentry\\_lock\\_unlock\(\)](#)), and if the operation fails, return the error.

<

Unlock the current context, and abandon a held promotion reservation if any (see [wolfentry\\_lock\\_unlock\(\)](#)), and if the operation fails, return the error.

### 8.3.2.10 WOLFSENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN\_EX

```
#define WOLFSENTRY_UNLOCK_AND_UNRESERVE_FOR_RETURN_EX(  
    ctx )
```

**Value:**

```
do { \
    wolfentry_errcode_t _lock_ret;
    if ((_lock_ret = wolfentry_context_unlock_and_abandon_reservation(ctx, thread)) < 0) { \
        WOLFSENTRY_ERROR_RERETURN(_lock_ret);
    }
} while (0)
```

### 8.3.2.11 WOLFSENTRY\_UNLOCK\_FOR\_RETURN

```
#define WOLFSENTRY_UNLOCK_FOR_RETURN( )
```

Unlock a previously locked `wolfentry_context`, and if the unlock fails, return the error.

<

Unlock the current context, and if the unlock fails, return the error.

### 8.3.2.12 WOLFSENTRY\_UNLOCK\_FOR\_RETURN\_EX

```
#define WOLFSENTRY_UNLOCK_FOR_RETURN_EX(  
    ctx )
```

**Value:**

```
do { \
    wolfentry_errcode_t _lock_ret;
    if ((_lock_ret = wolfentry_context_unlock(ctx, thread)) < 0) { \
        WOLFSENTRY_ERROR_RERETURN(_lock_ret);
    }
} while (0)
```

## 8.4 Route/Rule Subsystem

### Data Structures

- struct [wolfentry\\_route\\_endpoint](#)  
*struct for exporting socket addresses, with fixed-length fields*
- struct [wolfentry\\_route\\_metadata\\_exports](#)  
*struct for exporting route metadata for access by applications*
- struct [wolfentry\\_route\\_exports](#)  
*struct for exporting a route for access by applications*
- struct [wolfentry\\_sockaddr](#)  
*struct for passing socket addresses into `wolfentry_route_*()` API routines*

### Macros

- #define **WOLFENTRY\_ROUTE\_DEFAULT\_POLICY\_MASK** ([WOLFENTRY\\_ACTION\\_RES\\_ACCEPT](#) | [WOLFENTRY\\_ACTION\\_RES\\_REJECT](#) | [WOLFENTRY\\_ACTION\\_RES\\_STOP](#) | [WOLFENTRY\\_ACTION\\_RES\\_ERROR](#))  
*Bit mask spanning the bits allowed by `wolfentry_route_table_default_policy_set()`*
- #define **WOLFENTRY\_ROUTE\_WILDCARD\_FLAGS**  
*Bit mask for the wildcard bits in a `wolfentry_route_flags_t`.*
- #define **WOLFENTRY\_ROUTE\_IMMUTABLE\_FLAGS**  
*Bit mask for the bits in a `wolfentry_route_flags_t` that can't change after the implicated route has been inserted in the route table.*
- #define [WOLFENTRY\\_SOCKADDR](#)(n)

### Enumerations

- enum [wolfentry\\_route\\_flags\\_t](#) {  
[WOLFENTRY\\_ROUTE\\_FLAG\\_NONE](#) = 0U ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_SA\\_FAMILY\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_SA\\_REMOTE\\_ADDR\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_SA\\_PROTO\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_SA\\_LOCAL\\_PORT\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_SA\\_LOCAL\\_ADDR\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_SA\\_REMOTE\\_PORT\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_REMOTE\\_INTERFACE\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_LOCAL\\_INTERFACE\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_PARENT\\_EVENT\\_WILDCARD](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_TCPLIKE\\_PORT\\_NUMBERS](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_DIRECTION\\_IN](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_DIRECTION\\_OUT](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_REMOTE\\_ADDR\\_BITMASK](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_LOCAL\\_ADDR\\_BITMASK](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_IN\\_TABLE](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_PENDING\\_DELETE](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_INSERT\\_ACTIONS\\_CALLED](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_DELETE\\_ACTIONS\\_CALLED](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_PENALTYBOXED](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_GREENLISTED](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_DONT\\_COUNT\\_HITS](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_DONT\\_COUNT\\_CURRENT\\_CONNECTIONS](#) ,  
[WOLFENTRY\\_ROUTE\\_FLAG\\_PORT\\_RESET](#) }  
*bit field specifying attributes of a route/rule*

- enum `wolfentry_format_flags_t` {  
`WOLFENTRY_FORMAT_FLAG_NONE` ,  
`WOLFENTRY_FORMAT_FLAG_ALWAYS_NUMERIC` }

Macro to instantiate a `wolfentry_sockaddr` with an `addr` field sized to hold `n` bits of address data. Cast to `struct wolfentry_sockaddr` to pass as API argument.

## Functions

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_check_flags_sensical` (`wolfentry_route_flags_t` flags)

Check the self-consistency of `flags`.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert_into_table` (`WOLFENTRY_CONTEXT_ARGS_IN`, `struct wolfentry_route_table *route_table`, `void *caller_arg`, `const struct wolfentry_sockaddr *remote`, `const struct wolfentry_sockaddr *local`, `wolfentry_route_flags_t` flags, `const char *event_label`, `int event_label_len`, `wolfentry_ent_id_t *id`, `wolfentry_action_res_t *action_results`)

Variant of `wolfentry_route_insert()` that takes an explicit `route_table`.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert_by_exports_into_table` (`WOLFENTRY_CONTEXT_ARGS_IN`, `struct wolfentry_route_table *route_table`, `void *caller_arg`, `const struct wolfentry_route_exports *route_exports`, `wolfentry_ent_id_t *id`, `wolfentry_action_res_t *action_results`)

Variant of `wolfentry_route_insert()` that accepts the new route as `wolfentry_route_exports`, and takes an explicit `route_table`.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert` (`WOLFENTRY_CONTEXT_ARGS_IN`, `void *caller_arg`, `const struct wolfentry_sockaddr *remote`, `const struct wolfentry_sockaddr *local`, `wolfentry_route_flags_t` flags, `const char *event_label`, `int event_label_len`, `wolfentry_ent_id_t *id`, `wolfentry_action_res_t *action_results`)

Insert a route into the route table.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert_by_exports` (`WOLFENTRY_CONTEXT_ARGS_IN`, `void *caller_arg`, `const struct wolfentry_route_exports *route_exports`, `wolfentry_ent_id_t *id`, `wolfentry_action_res_t *action_results`)

Variant of `wolfentry_route_insert()` that accepts the new route as `wolfentry_route_exports`.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert_into_table_and_check_out` (`WOLFENTRY_CONTEXT_ARGS_IN`, `struct wolfentry_route_table *route_table`, `void *caller_arg`, `const struct wolfentry_sockaddr *remote`, `const struct wolfentry_sockaddr *local`, `wolfentry_route_flags_t` flags, `const char *event_label`, `int event_label_len`, `struct wolfentry_route **route`, `wolfentry_action_res_t *action_results`)

Variant of `wolfentry_route_insert()` that takes an explicit `route_table`, and returns the inserted route, which the caller must eventually drop using `wolfentry_route_drop_reference()` or `wolfentry_object_release()`

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert_by_exports_into_table_and_check_out` (`WOLFENTRY_CONTEXT_ARGS_IN`, `struct wolfentry_route_table *route_table`, `void *caller_arg`, `const struct wolfentry_route_exports *route_exports`, `struct wolfentry_route **route`, `wolfentry_action_res_t *action_results`)

Variant of `wolfentry_route_insert()` that accepts the new route as `wolfentry_route_exports`, takes an explicit `route_table`, and returns the inserted route, which the caller must eventually drop using `wolfentry_route_drop_reference()` or `wolfentry_object_release()`

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert_and_check_out` (`WOLFENTRY_CONTEXT_ARGS_IN`, `void *caller_arg`, `const struct wolfentry_sockaddr *remote`, `const struct wolfentry_sockaddr *local`, `wolfentry_route_flags_t` flags, `const char *event_label`, `int event_label_len`, `struct wolfentry_route **route`, `wolfentry_action_res_t *action_results`)

Variant of `wolfentry_route_insert()` that returns the inserted route, which the caller must eventually drop using `wolfentry_route_drop_reference()` or `wolfentry_object_release()`

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_insert_by_exports_and_check_out` (`WOLFENTRY_CONTEXT_ARGS_IN`, `void *caller_arg`, `const struct wolfentry_route_exports *route_exports`, `struct wolfentry_route **route`, `wolfentry_action_res_t *action_results`)

Variant of `wolfentry_route_insert()` that accepts the new route as `wolfentry_route_exports` and returns the inserted route, which the caller must eventually drop using `wolfentry_route_drop_reference()` or `wolfentry_object_release()`

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_delete\\_from\\_table](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route\_table \*route\_table, void \*caller\_arg, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results, int \*n\_deleted)  
*Variant of [wolfentry\\_route\\_delete\(\)](#) that takes an explicit route\_table.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*caller\_arg, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*trigger\_label, int trigger\_label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results, int \*n\_deleted)  
*Delete route from the route table. The supplied parameters, including the flags, must match the route exactly, else ITEM\_NOT\_FOUND will result. To avoid fidgety parameter matching, use [wolfentry\\_route\\_delete\\_by\\_id\(\)](#). The supplied trigger event, if any, is passed to action handlers, and has no bearing on route matching.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_delete\\_by\\_id](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*caller\_arg, [wolfentry\\_ent\\_id\\_t](#) id, const char \*trigger\_label, int trigger\_label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Delete a route from its route table using its ID. The supplied trigger event, if any, is passed to action handlers, and has no bearing on route matching.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_get\\_main\\_table](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route\_table \*\*table)  
*Get a pointer to the internal route table. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_iterate\\_start](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*\*cursor)  
*Open a cursor to iterate through a routes table. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_iterate\\_seek\\_to\\_head](#) (const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*cursor)  
*Reset the cursor to the beginning of a table.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_iterate\\_seek\\_to\\_tail](#) (const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*cursor)  
*Move the cursor to the end of a table.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_iterate\\_current](#) (const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*cursor, struct wolfentry\_route \*\*route)  
*Get the current position for the table cursor.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_iterate\\_prev](#) (const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*cursor, struct wolfentry\_route \*\*route)  
*Get the previous position for the table cursor.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_iterate\\_next](#) (const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*cursor, struct wolfentry\_route \*\*route)  
*Get the next position for the table cursor.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_iterate\\_end](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*\*cursor)  
*Frees the table cursor. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_default\\_policy\\_set](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route\_table \*table, [wolfentry\\_action\\_res\\_t](#) default\_policy)  
*Set a table's default policy.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_default\\_policy\\_set](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_action\\_res\\_t](#) default\_policy)  
*variant of [wolfentry\\_route\\_table\\_default\\_policy\\_set\(\)](#) that uses the main route table implicitly, and takes care of context locking.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_default\\_policy\\_get](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route\_table \*table, [wolfentry\\_action\\_res\\_t](#) \*default\_policy)  
*Get a table's default policy. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_default\\_policy\\_get](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_action\\_res\\_t](#) \*default\_policy)  
*variant of [wolfentry\\_route\\_table\\_default\\_policy\\_get\(\)](#) that uses the main route table implicitly. Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_get\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct [wolfentry\\_route\\_table](#) \*table, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, int exact\_p, [wolfentry\\_route\\_flags\\_t](#) \*inexact\_matches, struct [wolfentry\\_route](#) \*\*route)  
*Increments a reference counter for a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_drop\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_route](#) \*route, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Decrease a reference counter for a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_clear\\_default\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_route\\_table](#) \*table)  
*Clear an event previously set by [wolfentry\\_route\\_table\\_set\\_default\\_event\(\)](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_set\\_default\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_route\\_table](#) \*table, const char \*event\_label, int event\_label\_len)  
*Set an event to be used as a foster parent event for routes with no parent event of their own.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_get\\_default\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_route\\_table](#) \*table, char \*event\_label, int \*event\_label\_len)  
*Get the event, if any, set by [wolfentry\\_route\\_table\\_set\\_default\\_event\(\)](#)*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_fallthrough\\_route\\_get](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_route\\_table](#) \*route\_table, const struct [wolfentry\\_route](#) \*\*fallthrough\_route)  
*Retrieve the default route in a route table, chiefly to pass to [wolfentry\\_route\\_update\\_flags\(\)](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_get\\_addrs](#) (const struct [wolfentry\\_route](#) \*route, [wolfentry\\_addr\\_family\\_t](#) \*af, [wolfentry\\_addr\\_bits\\_t](#) \*local\_addr\_len, const [byte](#) \*\*local\_addr, [wolfentry\\_addr\\_bits\\_t](#) \*remote\_addr\_len, const [byte](#) \*\*remote\_addr)  
*Extract numeric address family and binary address pointers from a [wolfentry\\_route](#)*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_export](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct [wolfentry\\_route](#) \*route, struct [wolfentry\\_route\\_exports](#) \*route\_exports)  
*Exports a route.*
- WOLFSENTRY\_API const struct [wolfentry\\_event](#) \* [wolfentry\\_route\\_parent\\_event](#) (const struct [wolfentry\\_route](#) \*route)  
*Get a parent event from a given route. Typically used in the [wolfentry\\_action\\_callback\\_t](#) callback. Note: returned [wolfentry\\_event](#) remains valid only as long as the [wolfentry](#) lock is held (shared or exclusive).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_event\\_dispatch\\_with\\_table](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_route\\_table](#) \*route\_table, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, [wolfentry\\_ent\\_id\\_t](#) \*id, [wolfentry\\_route\\_flags\\_t](#) \*inexact\_matches, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Variant of [wolfentry\\_route\\_event\\_dispatch\(\)](#) that accepts an explicit [route\\_table](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_event\\_dispatch](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, [wolfentry\\_ent\\_id\\_t](#) \*id, [wolfentry\\_route\\_flags\\_t](#) \*inexact\_matches, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Submit an event into [wolfentry](#) and pass it through the filters. The [action\\_results](#) are cleared on entry, and can be checked to see what actions [wolfentry](#) took, and what actions the caller should take (most saliently, [WOLFSENTRY\\_ACTION\\_RES\\_ACCEPT](#) or [WOLFSENTRY\\_ACTION\\_RES\\_REJECT](#)). [action\\_results](#) can be filtered with constructs like [WOLFSENTRY\\_MASKIN\\_BITS\(action\\_results, WOLFSENTRY\\_ACTION\\_RES\\_REJECT\)](#)*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_event\\_dispatch\\_with\\_table\\_with\\_initiated\\_result](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_route\\_table](#) \*route\_table, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, [wolfentry\\_ent\\_id\\_t](#) \*id, [wolfentry\\_route\\_flags\\_t](#) \*inexact\_matches, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Variant of [wolfentry\\_route\\_event\\_dispatch\(\)](#) that accepts an explicit [route\\_table](#), and doesn't clear [action\\_results](#) on entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_event\\_dispatch\\_with\\_initiated\\_result](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, [wolfentry\\_ent\\_id\\_t](#) \*id, [wolfentry\\_route\\_flags\\_t](#) \*inexact\_matches, [wolfentry\\_action\\_res\\_t](#) \*action\_results)



Variant of `wolfentry_route_event_dispatch()` that doesn't clear `action_results` on entry.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_id` (`WOLFENTRY_CONTEXT_ARGS_IN`, `wolfentry_ent_id_t` id, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, mainly for use by application code that tracks ID/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_id_with_initiated_result` (`WOLFENTRY_CONTEXT_ARGS_IN`, `wolfentry_ent_id_t` id, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, and doesn't clear `action_results` on entry, mainly for use by application code that tracks ID/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_route` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route` \*route, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, mainly for use by application code that tracks route/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_route_with_initiated_result` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route` \*route, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, and doesn't clear `action_results` on entry, mainly for use by application code that tracks route/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_table_max_purgeable_routes_get` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_hitcount_t` \*max\_purgeable\_routes)

Retrieve the current limit for ephemeral routes in `table`. Caller must have a lock on the context at entry.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_table_max_purgeable_routes_set` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_hitcount_t` max\_purgeable\_routes)

Set the limit for ephemeral routes in `table`. Caller must have a mutex on the context at entry.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_stale_purge` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_action_res_t` \*action\_results)

Purges stale (expired) routes from `table`.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_stale_purge_one` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_stale_purge()` that purges at most one stale route, to limit time spent working.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_stale_purge_one_opportunistically` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_stale_purge()` that purges at most one stale route, and only if the context lock is uncontended.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_flush_table` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_action_res_t` \*action\_results)

Flush routes from a given table.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_bulk_clear_insert_action_status` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_action_res_t` \*action\_results)

Clears the `WOLFENTRY_ROUTE_FLAG_INSERT_ACTIONS_CALLED` flag on all routes in the table.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_bulk_insert_actions` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route_table` \*table, `wolfentry_action_res_t` \*action\_results)

Executes the insert actions for all routes in the table that don't have `WOLFENTRY_ROUTE_FLAG_INSERT_ACTIONS_CALLED` set.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_get_private_data` (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_route` \*route, void \*\*private\_data, size\_t \*private\_data\_size)

Gets the private data for a given route.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_get_flags` (const struct `wolfentry_route` \*route, `wolfentry_route_flags_t` \*flags)

Gets the flags for a route.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_get\\_metadata](#) (const struct wolfentry\_route \*route, struct [wolfentry\\_route\\_metadata\\_exports](#) \*metadata)  
*Gets the metadata for a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_reset\\_metadata\\_exports](#) (struct [wolfentry\\_route\\_exports](#) \*route\_exports)  
*clear metadata counts ([wolfentry\\_route\\_metadata\\_exports::purge\\_after](#), [wolfentry\\_route\\_metadata\\_exports::connection\\_count](#), [wolfentry\\_route\\_metadata\\_exports::derogatory\\_count](#), and [wolfentry\\_route\\_metadata\\_exports::commendable\\_count](#)) in [wolfentry\\_route\\_exports](#) to prepare for use with [wolfentry\\_route\\_insert\\_by\\_exports\(\)](#)*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_update\\_flags](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route \*route, [wolfentry\\_route\\_flags\\_t](#) flags\_to\_set, [wolfentry\\_route\\_flags\\_t](#) flags\_to\_clear, [wolfentry\\_route\\_flags\\_t](#) \*flags\_before, [wolfentry\\_route\\_flags\\_t](#) \*flags\_after, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Update the route flags.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_increment\\_derogatory\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route \*route, int count\_to\_add, int \*new\_derogatory\_count\_ptr)  
*Increase the derogatory event count of a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_increment\\_commendable\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route \*route, int count\_to\_add, int \*new\_commendable\_count)  
*Increase the commendable event count of a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_reset\\_derogatory\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route \*route, int \*old\_derogatory\_count\_ptr)  
*Reset the derogatory event count of a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_reset\\_commendable\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_route \*route, int \*old\_commendable\_count\_ptr)  
*Reset the commendable event count of a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_set\\_wildcard](#) (struct wolfentry\_route \*route, [wolfentry\\_route\\_flags\\_t](#) wildcards\_to\_set)  
*Set wildcard flags for a route.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_format\\_address](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) sa\_family, const byte \*addr, unsigned int addr\_bits, char \*buf, int \*buflen)  
*Render a binary address in human-readable form to a buffer.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_flag\\_assoc\\_by\\_flag](#) ([wolfentry\\_route\\_flags\\_t](#) flag, const char \*\*name)  
*Retrieve the name of a route flag, given its numeric value. Note that `flag` must have exactly one bit set, else `ITEM_NOT_FOUND` will be returned.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_flag\\_assoc\\_by\\_name](#) (const char \*name, int len, [wolfentry\\_route\\_flags\\_t](#) \*flag)  
*Retrieve the numeric value of a route flag, given its name.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_format\\_json](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route \*r, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Render a route to an output buffer, in JSON format, advancing the output buffer pointer by the length of the rendered output.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_dump\\_json\\_start](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*\*cursor, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Start a rendering loop to export the route table contents as a JSON document that is valid input for [wolfentry\\_config\\_json\\_feed\(\)](#) or [wolfentry\\_config\\_json\\_oneshot\(\)](#), advancing the output buffer pointer by the length of the rendered output, and decrementing `json_out_len` by the same amount. Caller must have a shared or exclusive lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_route\\_table\\_dump\\_json\\_next](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*cursor, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Render a route within a loop started with [wolfentry\\_route\\_table\\_dump\\_json\\_start\(\)](#), advancing the output buffer pointer by the length of the rendered output, and decrementing `json_out_len` by the same amount.*



- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_dump\\_json\\_end](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*\*cursor, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Finish a rendering loop started with [wolfentry\\_route\\_table\\_dump\\_json\\_start\(\)](#), advancing the output buffer pointer by the length of the rendered output, and decrementing `json_out_len` by the same amount.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_render\\_flags](#) ([wolfentry\\_route\\_flags\\_t](#) flags, FILE \*f)  
*Render route flags in human-readable form to a stream.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_render](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const struct wolfentry\_route \*r, FILE \*f)  
*Renders route information to a file pointer.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_exports\\_render](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const struct [wolfentry\\_route\\_exports](#) \*r, FILE \*f)  
*Renders route exports information to a file pointer.*

## 8.4.1 Detailed Description

## 8.4.2 Macro Definition Documentation

### 8.4.2.1 WOLFSENTRY\_SOCKADDR

```
#define WOLFSENTRY_SOCKADDR(  
    n )
```

Value:

```
struct {  
    wolfentry_addr_family_t sa_family;  
    wolfentry_proto_t sa_proto;  
    wolfentry_port_t sa_port;  
    wolfentry_addr_bits_t addr_len;  
    byte interface;  
    attr_align_to(4) byte addr[WOLFSENTRY_BITS_TO_BYTES(n)];  
}
```

## 8.4.3 Enumeration Type Documentation

### 8.4.3.1 wolfentry\_format\_flags\_t

```
enum wolfentry_format_flags_t
```

Macro to instantiate a [wolfentry\\_sockaddr](#) with an `addr` field sized to hold `n` bits of address data. Cast to `struct wolfentry_sockaddr` to pass as API argument.

<

bit field with options for rendering

Enumerator

WOLFSENTRY_FORMAT_FLAG_NONE	Default rendering behavior.
WOLFSENTRY_FORMAT_FLAG_ALWAYS_NUMERIC	When rendering address families and protocols, always render as bare integers. Currently honored by <a href="#">wolfentry_route_format_json()</a> .

### 8.4.3.2 wolfsentry\_route\_flags\_t

enum wolfsentry\_route\_flags\_t

bit field specifying attributes of a route/rule

Enumerator

WOLFSENTRY_ROUTE_FLAG_NONE	No attributes
WOLFSENTRY_ROUTE_FLAG_SA_FAMILY_↔ WILDCARD	Address family is wildcard – match all traffic in specified direction(s), optionally with specified interfaces.
WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_↔ ADDR_WILDCARD	Remote address is wildcard – match any remote address.
WOLFSENTRY_ROUTE_FLAG_SA_PROTO_↔ WILDCARD	Protocol is wildcard – match any protocol.
WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_↔ PORT_WILDCARD	Local port is wildcard – match any local port.
WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_↔ ADDR_WILDCARD	Local address is wildcard – match any local address.
WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_↔ PORT_WILDCARD	Remote port is wildcard – match any remote port.
WOLFSENTRY_ROUTE_FLAG_REMOTE_↔ INTERFACE_WILDCARD	Ingestion interface is wildcard – match any ingestion interface.
WOLFSENTRY_ROUTE_FLAG_LOCAL_↔ INTERFACE_WILDCARD	Local interface (usually same as remote interface) is wildcard – match any local interface.
WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_↔ _WILDCARD	Match regardless of parent event mismatch.
WOLFSENTRY_ROUTE_FLAG_TCPLIKE_PORT_↔ _NUMBERS	Interpret port names using TCP/UDP mappings (available unless build option <a href="#">WOLFSENTRY_NO_GETPROTOBY</a> is defined)
WOLFSENTRY_ROUTE_FLAG_DIRECTION_IN	Match inbound traffic.
WOLFSENTRY_ROUTE_FLAG_DIRECTION_OUT	Match outbound traffic (if <a href="#">WOLFSENTRY_ROUTE_FLAG_DIRECTION_IN</a> and <a href="#">WOLFSENTRY_ROUTE_FLAG_DIRECTION_OUT</a> are both set, traffic in both directions is matched)
WOLFSENTRY_ROUTE_FLAG_REMOTE_ADDR_↔ _BITMASK	Supplied remote address consists of an address followed by a bitmask, and its addr_len is the total bit count for the address and mask. Matching will be performed by checking that masked addresses are equal.
WOLFSENTRY_ROUTE_FLAG_LOCAL_ADDR_↔ BITMASK	Supplied local address consists of an address followed by a bitmask, and its addr_len is the total bit count for the address and mask. Matching will be performed by checking that masked addresses are equal.
WOLFSENTRY_ROUTE_FLAG_IN_TABLE	Internal use – marks route as resident in table.
WOLFSENTRY_ROUTE_FLAG_PENDING_DELETE	Internal use – marks route as deleted.
WOLFSENTRY_ROUTE_FLAG_INSERT_↔ ACTIONS_CALLED	Internal use – records that route insertion actions have been completed.
WOLFSENTRY_ROUTE_FLAG_DELETE_↔ ACTIONS_CALLED	Internal use – records that route deletion actions have been completed.
WOLFSENTRY_ROUTE_FLAG_PENALTYBOXED	Traffic that matches a route with this flag set will be rejected.

## Enumerator

WOLFSENTRY_ROUTE_FLAG_GREENLISTED	Traffic that matches a route with this flag set will be accepted.
WOLFSENTRY_ROUTE_FLAG_DONT_COUNT_↔ HITS	Don't keep traffic statistics for this rule (avoid counting overhead)
WOLFSENTRY_ROUTE_FLAG_DONT_COUNT_↔ CURRENT_CONNECTIONS	Don't keep concurrent connection count for this rule (don't impose connection limit, even if set in the applicable <a href="#">wolfentry_eventconfig</a> )
WOLFSENTRY_ROUTE_FLAG_PORT_RESET	If traffic is rejected by this rule, set <a href="#">WOLFSENTRY_ACTION_RES_PORT_RESET</a> in the returned <a href="#">wolfentry_action_res_t</a> , prompting generation by the network stack of a TCP reset, ICMP unreachable, or other applicable reply packet.

## 8.4.4 Function Documentation

8.4.4.1 [wolfentry\\_route\\_bulk\\_clear\\_insert\\_action\\_status\(\)](#)

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_bulk_clear_insert_action_status (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    wolfentry_action_res_t * action_results )
```

Clears the [WOLFSENTRY\\_ROUTE\\_FLAG\\_INSERT\\_ACTIONS\\_CALLED](#) flag on all routes in the table.

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[wolfentry\\_route\\_bulk\\_insert\\_actions\(\)](#)  
[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

8.4.4.2 [wolfentry\\_route\\_bulk\\_insert\\_actions\(\)](#)

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_bulk_insert_actions (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    wolfentry_action_res_t * action_results )
```

Executes the insert actions for all routes in the table that don't have [WOLFSENTRY\\_ROUTE\\_FLAG\\_INSERT\\_ACTIONS\\_CALLED](#) set.

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[wolfentry\\_route\\_bulk\\_clear\\_insert\\_action\\_status\(\)](#)  
[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.3 wolfsentry\_route\_delete()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_delete (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    void * caller_arg,
    const struct wolfsentry_sockaddr * remote,
    const struct wolfsentry_sockaddr * local,
    wolfsentry_route_flags_t flags,
    const char * trigger_label,
    int trigger_label_len,
    wolfsentry_action_res_t * action_results,
    int * n_deleted )
```

Delete route from the route table. The supplied parameters, including the flags, must match the route exactly, else `ITEM_NOT_FOUND` will result. To avoid fidgety parameter matching, use [wolfsentry\\_route\\_delete\\_by\\_id\(\)](#). The supplied trigger event, if any, is passed to action handlers, and has no bearing on route matching.

##### Parameters

<i>caller_arg</i>	an arbitrary pointer to be passed to callbacks
<i>remote</i>	the remote sockaddr for the route
<i>local</i>	the local sockaddr for the route
<i>flags</i>	flags for the route
<i>trigger_label</i>	a label for the trigger event (or null)
<i>trigger_label_len</i>	the length of the trigger_label parameter
<i>action_results</i>	a pointer to results of the insert action – all bits are cleared on entry.
<i>n_deleted</i>	a counter for the number of entries deleted

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.4 wolfsentry\_route\_delete\_by\_id()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_delete_by_id (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    void * caller_arg,
    wolfsentry_ent_id_t id,
    const char * trigger_label,
    int trigger_label_len,
    wolfsentry_action_res_t * action_results )
```

Delete a route from its route table using its ID. The supplied trigger event, if any, is passed to action handlers, and has no bearing on route matching.

##### Parameters

<i>caller_arg</i>	an arbitrary pointer to be passed to callbacks
<i>id</i>	the object ID, as returned by <a href="#">wolfsentry_route_insert()</a> or <a href="#">wolfsentry_get_object_id()</a>
<i>trigger_label</i>	a label for a trigger event (or null)
<i>trigger_label_len</i>	the length of the trigger_label parameter
<i>action_results</i>	a pointer to results of the insert action – all bits are cleared on entry.

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

8.4.4.5 `wolfentry_route_drop_reference()`

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_drop_reference (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_route * route,
    wolfentry_action_res_t * action_results )
```

Decrease a reference counter for a route.

## Parameters

<i>route</i>	the route to drop the reference for
<i>action_results</i>	a pointer to results of the action

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

8.4.4.6 `wolfentry_route_event_dispatch()`

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_event_dispatch (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const struct wolfentry_sockaddr * remote,
    const struct wolfentry_sockaddr * local,
    wolfentry_route_flags_t flags,
    const char * event_label,
    int event_label_len,
    void * caller_arg,
    wolfentry_ent_id_t * id,
    wolfentry_route_flags_t * inexact_matches,
    wolfentry_action_res_t * action_results )
```

Submit an event into wolfentry and pass it through the filters. The `action_results` are cleared on entry, and can be checked to see what actions wolfentry took, and what actions the caller should take (most saliently, [WOLFSENTRY\\_ACTION\\_RES\\_ACCEPT](#) or [WOLFSENTRY\\_ACTION\\_RES\\_REJECT](#)). `action_results` can be filtered with constructs like [WOLFSENTRY\\_MASKIN\\_BITS\(action\\_results, WOLFSENTRY\\_ACTION\\_RES\\_REJECT\)](#)

## Parameters

<i>remote</i>	the remote sockaddr details
<i>local</i>	the local sockaddr details
<i>flags</i>	the flags for the event, set to <a href="#">WOLFSENTRY_ROUTE_FLAG_DIRECTION_IN</a> for an incoming event
<i>event_label</i>	an optional label for a trigger event
<i>event_label_len</i>	the length of event_label
<i>caller_arg</i>	an arbitrary pointer to be passed to action callbacks
<i>id</i>	an optional pointer to a <a href="#">wolfentry_ent_id_t</a> that will be set to the ID of the matched route, if any
<i>inexact_matches</i>	details for inexact matches
<i>action_results</i>	a pointer to a <a href="#">wolfentry_action_res_t</a> , which will be used to record actions taken and to be taken

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

## 8.4.4.7 wolfentry\_route\_export()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_export (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const struct wolfentry_route * route,
    struct wolfentry_route_exports * route_exports )
```

Exports a route.

`route_exports` remains valid only as long as the wolfentry lock is held (shared or exclusive), unless the route was obtained via [wolfentry\\_route\\_get\\_reference\(\)](#), in which case it's valid until [wolfentry\\_route\\_drop\\_reference\(\)](#).

## Parameters

<i>route</i>	the route to export
<i>route_exports</i>	the struct to export into

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.8 wolfsentry\_route\_exports\_render()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_exports_render (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const struct wolfsentry_route_exports * r,
    FILE * f )
```

Renders route exports information to a file pointer.

##### Parameters

<i>r</i>	the route exports to render
<i>f</i>	the pointer to render to

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.9 wolfsentry\_route\_flush\_table()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_flush_table (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfsentry_route_table * table,
    wolfsentry_action_res_t * action_results )
```

Flush routes from a given table.

##### Parameters

<i>table</i>	the table to purge
<i>action_results</i>	the result bit field, pooling results from all constituent operations

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.10 wolfsentry\_route\_get\_addrs()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_addrs (
    const struct wolfsentry_route * route,
```

```

wolfentry_addr_family_t * af,
wolfentry_addr_bits_t * local_addr_len,
const byte ** local_addr,
wolfentry_addr_bits_t * remote_addr_len,
const byte ** remote_addr )

```

Extract numeric address family and binary address pointers from a `wolfentry_route`

`local_addr` and `remote_addr` remain valid only as long as the `wolfentry` lock is held (shared or exclusive), unless the route was obtained via [wolfentry\\_route\\_get\\_reference\(\)](#), in which case it's valid until [wolfentry\\_route\\_drop\\_reference\(\)](#).

#### 8.4.4.11 wolfentry\_route\_get\_flags()

```

WOLFENTRY_API wolfentry_errcode_t wolfentry_route_get_flags (
    const struct wolfentry_route * route,
    wolfentry_route_flags_t * flags )

```

Gets the flags for a route.

##### Parameters

<i>route</i>	the route to get the flags for
<i>flags</i>	a pointer to receive the flags

##### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### 8.4.4.12 wolfentry\_route\_get\_main\_table()

```

WOLFENTRY_API wolfentry_errcode_t wolfentry_route_get_main_table (
    WOLFENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_route_table ** table )

```

Get a pointer to the internal route table. Caller must have a lock on the context at entry.

##### Parameters

<i>table</i>	a pointer to a pointer to a table which will be filled
--------------	--

##### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)  
[WOLFENTRY\\_UNLOCK\\_AND\\_RETURN\(\)](#)  
[WOLFENTRY\\_CONTEXT\\_ARGS\\_IN](#)



#### 8.4.4.13 wolfsentry\_route\_get\_metadata()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_metadata (
    const struct wolfsentry_route * route,
    struct wolfsentry_route_metadata_exports * metadata )
```

Gets the metadata for a route.

##### Parameters

<i>route</i>	the route to get the metadata for
<i>metadata</i>	a pointer to a pointer to receive the metadata

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### 8.4.4.14 wolfsentry\_route\_get\_private\_data()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_private_data (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfsentry_route * route,
    void ** private_data,
    size_t * private_data_size )
```

Gets the private data for a given route.

##### Parameters

<i>route</i>	the route to get the data from
<i>private_data</i>	a pointer to a pointer that will receive the data
<i>private_data_size</i>	a pointer that will receive the size of the data

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.15 wolfsentry\_route\_get\_reference()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_reference (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const struct wolfsentry_route_table * table,
    const struct wolfsentry_sockaddr * remote,
    const struct wolfsentry_sockaddr * local,
```

```

wolfentry_route_flags_t flags,
const char * event_label,
int event_label_len,
int exact_p,
wolfentry_route_flags_t * inexact_matches,
struct wolfentry_route ** route )

```

Increments a reference counter for a route.

#### Parameters

<i>table</i>	the table to get the route from
<i>remote</i>	the remote sockaddr
<i>local</i>	the local sockaddr
<i>flags</i>	flags for the route
<i>event_label</i>	a label for the event
<i>event_label_len</i>	the length of the event_label parameter
<i>exact_p</i>	set to 1 for exact matches only
<i>inexact_matches</i>	wildcard flags hit
<i>route</i>	the route returned

#### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.4.4.16 wolfentry\_route\_insert()

```

WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert (
    WOLFENTRY_CONTEXT_ARGS_IN ,
    void * caller_arg,
    const struct wolfentry_sockaddr * remote,
    const struct wolfentry_sockaddr * local,
    wolfentry_route_flags_t flags,
    const char * event_label,
    int event_label_len,
    wolfentry_ent_id_t * id,
    wolfentry_action_res_t * action_results )

```

Insert a route into the route table.

#### Parameters

<i>caller_arg</i>	an arbitrary pointer to be passed to callbacks
<i>remote</i>	the remote sockaddr for the route
<i>local</i>	the local sockaddr for the route
<i>flags</i>	flags for the route
<i>event_label</i>	a label for the route
<i>event_label_len</i>	the length of the event_label parameter
<i>id</i>	the object ID
<i>action_results</i>	a pointer to results of the insert action

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.4.4.17 wolfentry\_route\_parent\_event()**

```
WOLFSENTRY_API const struct wolfentry_event * wolfentry_route_parent_event (
    const struct wolfentry_route * route )
```

Get a parent event from a given route. Typically used in the `wolfentry_action_callback_t` callback. Note: returned `wolfentry_event` remains valid only as long as the wolfentry lock is held (shared or exclusive).

## Parameters

<i>route</i>	a pointer to the route
--------------	------------------------

## Returns

a pointer to the parent event

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.4.4.18 wolfentry\_route\_render()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_render (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const struct wolfentry_route * r,
    FILE * f )
```

Renders route information to a file pointer.

## Parameters

<i>r</i>	the route to render
<i>f</i>	the pointer to render to

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.19 wolfentry\_route\_set\_wildcard()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_route_set_wildcard (
    struct wolfentry_route * route,
    wolfentry_route_flags_t wildcards_to_set )
```

Set wildcard flags for a route.

##### Parameters

<i>route</i>	the route to set the flags for
<i>wildcards_to_set</i>	the wildcards to be set

##### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### 8.4.4.20 wolfentry\_route\_stale\_purge()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_route_stale_purge (
    WOLFENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_route_table * table,
    wolfentry_action_res_t * action_results )
```

Purges stale (expired) routes from *table*.

##### Parameters

<i>table</i>	the table to purge from
<i>action_results</i>	the result bit field, pooling results from all constituent operations

##### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.21 wolfentry\_route\_table\_default\_policy\_get()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_route_table_default_policy_get (
    WOLFENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_route_table * table,
    wolfentry_action_res_t * default_policy )
```

Get a table's default policy. Caller must have a lock on the context at entry.

## Parameters

<i>table</i>	the table to set the policy for
<i>default_policy</i>	the policy retrieved

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[wolfentry\\_defaultconfig\\_update\(\)](#)  
[WOLFSENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)  
[WOLFSENTRY\\_UNLOCK\\_AND\\_RETURN\(\)](#)  
[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.4.4.22 wolfentry\_route\_table\_default\_policy\_set()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_table_default_policy_set (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_route_table * table,
    wolfentry_action_res_t default_policy )
```

Set a table's default policy.

## Parameters

<i>table</i>	the table to set the policy for
<i>default_policy</i>	the policy to set

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.4.4.23 wolfentry\_route\_table\_fallthrough\_route\_get()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_route_table_fallthrough_route_get (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_route_table * route_table,
    const struct wolfentry_route ** fallthrough_route )
```

Retrieve the default route in a route table, chiefly to pass to [wolfentry\\_route\\_update\\_flags\(\)](#).

Caller must have a shared or mutex lock on the context at entry, but can release the lock on return and safely continue to access or update the route. Caller must drop the route when done, using [wolfentry\\_route\\_drop\\_reference\(\)](#) or [wolfentry\\_object\\_release\(\)](#).

See also

[WOLFSENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)  
[WOLFSENTRY\\_UNLOCK\\_FOR\\_RETURN\(\)](#)

#### 8.4.4.24 `wolfentry_route_table_iterate_current()`

```
WOLFSENTRY_API wolfentry\_errcode\_t wolfentry_route_table_iterate_current (
    const struct wolfentry_route_table * table,
    struct wolfentry_cursor * cursor,
    struct wolfentry_route ** route )
```

Get the current position for the table cursor.

Parameters

<i>table</i>	the table for the cursor
<i>cursor</i>	a pointer for the cursor
<i>route</i>	a pointer to a pointer for the returned route

Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### 8.4.4.25 `wolfentry_route_table_iterate_end()`

```
WOLFSENTRY_API wolfentry\_errcode\_t wolfentry_route_table_iterate_end (
    WOLFSENTRY\_CONTEXT\_ARGS\_IN ,
    const struct wolfentry_route_table * table,
    struct wolfentry_cursor ** cursor )
```

Frees the table cursor. Caller must have a lock on the context at entry.

Parameters

<i>table</i>	the table for the cursor
<i>cursor</i>	a pointer to a pointer for the cursor to free

Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

See also

[WOLFSENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)  
[WOLFSENTRY\\_UNLOCK\\_AND\\_RETURN\(\)](#)  
[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.4.4.26 wolfentry\_route\_table\_iterate\_next()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_route_table_iterate_next (
    const struct wolfentry_route_table * table,
    struct wolfentry_cursor * cursor,
    struct wolfentry_route ** route )
```

Get the next position for the table cursor.

##### Parameters

<i>table</i>	the table for the cursor
<i>cursor</i>	a pointer for the cursor
<i>route</i>	a pointer to a pointer for the returned route

##### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### 8.4.4.27 wolfentry\_route\_table\_iterate\_prev()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_route_table_iterate_prev (
    const struct wolfentry_route_table * table,
    struct wolfentry_cursor * cursor,
    struct wolfentry_route ** route )
```

Get the previous position for the table cursor.

##### Parameters

<i>table</i>	the table for the cursor
<i>cursor</i>	a pointer for the cursor
<i>route</i>	a pointer to a pointer for the returned route

##### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### 8.4.4.28 wolfentry\_route\_table\_iterate\_seek\_to\_head()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_route_table_iterate_seek_to_head (
    const struct wolfentry_route_table * table,
    struct wolfentry_cursor * cursor )
```

Reset the cursor to the beginning of a table.

##### Parameters

<i>table</i>	the table for the cursor
<i>cursor</i>	a pointer for the cursor

**Returns**

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

**8.4.4.29 wolfentry\_route\_table\_iterate\_seek\_to\_tail()**

```
WOLFSENTRY_API wolfentry\_errcode\_t wolfentry_route_table_iterate_seek_to_tail (
    const struct wolfentry_route_table * table,
    struct wolfentry_cursor * cursor )
```

Move the cursor to the end of a table.

**Parameters**

<i>table</i>	the table for the cursor
<i>cursor</i>	a pointer for the cursor

**Returns**

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

**8.4.4.30 wolfentry\_route\_table\_iterate\_start()**

```
WOLFSENTRY_API wolfentry\_errcode\_t wolfentry_route_table_iterate_start (
    WOLFSENTRY\_CONTEXT\_ARGS\_IN ,
    const struct wolfentry_route_table * table,
    struct wolfentry_cursor ** cursor )
```

Open a cursor to iterate through a routes table. Caller must have a lock on the context at entry.

**Parameters**

<i>table</i>	a pointer to the table to open the cursor on
<i>cursor</i>	a pointer to a pointer for the cursor

**Returns**

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

**See also**

[WOLFSENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)  
[WOLFSENTRY\\_UNLOCK\\_AND\\_RETURN\(\)](#)  
[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)



#### 8.4.4.31 wolfsentry\_route\_update\_flags()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_update_flags (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfsentry_route * route,
    wolfsentry_route_flags_t flags_to_set,
    wolfsentry_route_flags_t flags_to_clear,
    wolfsentry_route_flags_t * flags_before,
    wolfsentry_route_flags_t * flags_after,
    wolfsentry_action_res_t * action_results )
```

Update the route flags.

##### Parameters

<i>route</i>	the route to update the flags for
<i>flags_to_set</i>	new flags to set
<i>flags_to_clear</i>	old flags to clear
<i>flags_before</i>	a pointer that will be filled with the flags before the change
<i>flags_after</i>	a pointer that will be filled with flags after the change
<i>action_results</i>	the results bit field

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

## 8.5 Action Subsystem

### Macros

- `#define WOLFSENTRY_ACTION_RES_USER_SHIFT 24U`  
*Bit shift for user-defined bit span in [wolfsentry\\_action\\_res\\_t](#).*
- `#define WOLFSENTRY_ACTION_RES_USER7 (1U << 31U)`  
*user-defined result bit #8 of 8. Defined with a macro to retain ISO C compliance on enum range.*

### Typedefs

- typedef `wolfsentry_errcode_t(* wolfsentry_action_callback_t) (WOLFSENTRY_CONTEXT_ARGS_IN, const struct wolfsentry_action *action, void *handler_arg, void *caller_arg, const struct wolfsentry_event *trigger_event, wolfsentry_action_type_t action_type, const struct wolfsentry_route *trigger_route, struct wolfsentry_route_table *route_table, struct wolfsentry_route *rule_route, wolfsentry_action_res_t *action_results)`

*A callback that is triggered when an action is taken.*

## Enumerations

- enum `wolfentry_action_flags_t` {  
`WOLFENTRY_ACTION_FLAG_NONE` ,  
`WOLFENTRY_ACTION_FLAG_DISABLED` }  
*enum for communicating attributes of an action object*
- enum `wolfentry_action_type_t` {  
`WOLFENTRY_ACTION_TYPE_NONE` ,  
`WOLFENTRY_ACTION_TYPE_POST` ,  
`WOLFENTRY_ACTION_TYPE_INSERT` ,  
`WOLFENTRY_ACTION_TYPE_MATCH` ,  
`WOLFENTRY_ACTION_TYPE_UPDATE` ,  
`WOLFENTRY_ACTION_TYPE_DELETE` ,  
`WOLFENTRY_ACTION_TYPE_DECISION` }  
*enum communicating (to action handlers and internal logic) what type of action is being evaluated*
- enum `wolfentry_action_res_t` {  
`WOLFENTRY_ACTION_RES_NONE` ,  
`WOLFENTRY_ACTION_RES_ACCEPT` ,  
`WOLFENTRY_ACTION_RES_REJECT` ,  
`WOLFENTRY_ACTION_RES_CONNECT` ,  
`WOLFENTRY_ACTION_RES_DISCONNECT` ,  
`WOLFENTRY_ACTION_RES_DEROGATORY` ,  
`WOLFENTRY_ACTION_RES_COMMENDABLE` ,  
`WOLFENTRY_ACTION_RES_STOP` ,  
`WOLFENTRY_ACTION_RES_DEALLOCATED` ,  
`WOLFENTRY_ACTION_RES_INSERTED` ,  
`WOLFENTRY_ACTION_RES_ERROR` ,  
`WOLFENTRY_ACTION_RES_FALLTHROUGH` ,  
`WOLFENTRY_ACTION_RES_UPDATE` ,  
`WOLFENTRY_ACTION_RES_PORT_RESET` ,  
`WOLFENTRY_ACTION_RES_SENDING` ,  
`WOLFENTRY_ACTION_RES_RECEIVED` ,  
`WOLFENTRY_ACTION_RES_BINDING` ,  
`WOLFENTRY_ACTION_RES_LISTENING` ,  
`WOLFENTRY_ACTION_RES_STOPPED_LISTENING` ,  
`WOLFENTRY_ACTION_RES_CONNECTING_OUT` ,  
`WOLFENTRY_ACTION_RES_CLOSED` ,  
`WOLFENTRY_ACTION_RES_UNREACHABLE` ,  
`WOLFENTRY_ACTION_RES_SOCK_ERROR` ,  
`WOLFENTRY_ACTION_RES_USER0` ,  
`WOLFENTRY_ACTION_RES_USER1` ,  
`WOLFENTRY_ACTION_RES_USER2` ,  
`WOLFENTRY_ACTION_RES_USER3` ,  
`WOLFENTRY_ACTION_RES_USER4` ,  
`WOLFENTRY_ACTION_RES_USERS5` ,  
`WOLFENTRY_ACTION_RES_USER6` }  
*bit field used to communicate states and attributes through the evaluation pipeline.*

## Functions

- `WOLFENTRY_API` const char \* **wolfentry\_action\_res\_assoc\_by\_flag** (`wolfentry_action_res_t` res, unsigned int bit)  
*Given a bit number (from 0 to 31), return the name of that bit if set in res, else return a null pointer.*
- `WOLFENTRY_API` `wolfentry_errcode_t` **wolfentry\_action\_res\_assoc\_by\_name** (const char \*bit\_name, size\_t bit\_name\_len, `wolfentry_action_res_t` \*res)  
*Given a bit\_name, set \*res to the corresponding bit number if known, failing which, return ITEM\_NOT\_FOUND.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_insert](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfentry\\_action\\_flags\\_t](#) flags, [wolfentry\\_action\\_callback\\_t](#) handler, void \*handler\_arg, [wolfentry\\_ent\\_id\\_t](#) \*id)  
*Insert a new action into wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Delete an action from wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_flush\\_all](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Flush all actions from wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_get\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, struct wolfentry\_action \*\*action)  
*Get a reference to an action.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_drop\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_action \*action, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Drop a reference to an action.*
- WOLFSENTRY\_API const char \* [wolfentry\\_action\\_get\\_label](#) (const struct wolfentry\_action \*action)  
*Get the label for an action. This is the internal pointer to the label so should not be freed by the application.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_get\\_flags](#) (struct wolfentry\_action \*action, [wolfentry\\_action\\_flags\\_t](#) \*flags)  
*Get the flags for an action.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_update\\_flags](#) (struct wolfentry\_action \*action, [wolfentry\\_action\\_flags\\_t](#) flags\_to\_set, [wolfentry\\_action\\_flags\\_t](#) flags\_to\_clear, [wolfentry\\_action\\_flags\\_t](#) \*flags\_before, [wolfentry\\_action\\_flags\\_t](#) \*flags\_after)  
*Update the flags for an action.*

## 8.5.1 Detailed Description

## 8.5.2 Typedef Documentation

### 8.5.2.1 wolfentry\_action\_callback\_t

```
typedef wolfentry\_errcode\_t(* wolfentry_action_callback_t) (WOLFSENTRY_CONTEXT_ARGS_IN,
const struct wolfentry_action *action, void *handler_arg, void *caller_arg, const struct wolfentry_↵
_event *trigger_event, wolfentry\_action\_type\_t action_type, const struct wolfentry_route
*trigger_route, struct wolfentry_route_table *route_table, struct wolfentry_route *rule_↵
route, wolfentry\_action\_res\_t *action_results)
```

A callback that is triggered when an action is taken.

#### Parameters

<i>action</i>	a pointer to action details
<i>handler_arg</i>	an opaque pointer registered with <a href="#">wolfentry_action_insert()</a> , passed to every invocation of the handler
<i>caller_arg</i>	an opaque pointer supplied by the caller to the dispatching <a href="#">wolfentry_route_*</a> () API
<i>trigger_event</i>	the event which triggered the action, if any
<i>action_type</i>	the action type
<i>trigger_route</i>	a pointer to the subject route, reflecting instantaneous traffic attributes and contents
<i>route_table</i>	a pointer to the implicated route table
<i>rule_route</i>	a pointer to the matched route, reflecting rule logic
<i>action_results</i>	a pointer to the action results, to be read and/or updated by the handler

**Returns**

[WOLFSENTRY\\_RETURN\\_OK](#) if there is no error

**See also**

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

## 8.5.3 Enumeration Type Documentation

### 8.5.3.1 wolfentry\_action\_flags\_t

enum [wolfentry\\_action\\_flags\\_t](#)

enum for communicating attributes of an action object

**Enumerator**

WOLFSENTRY_ACTION_FLAG_NONE	Default attributes.
WOLFSENTRY_ACTION_FLAG_DISABLED	Disable this action – while this bit is set, dispatches will not call this action.

### 8.5.3.2 wolfentry\_action\_res\_t

enum [wolfentry\\_action\\_res\\_t](#)

bit field used to communicate states and attributes through the evaluation pipeline.

**Enumerator**

WOLFSENTRY_ACTION_RES_NONE	initializer for wolfentry_action_res_t.
WOLFSENTRY_ACTION_RES_ACCEPT	the route state or an action determined the event should be allowed.
WOLFSENTRY_ACTION_RES_REJECT	the route state or an action determined the event should be forbidden.
WOLFSENTRY_ACTION_RES_CONNECT	caller-preinitiated bit signaling that a connection was established.
WOLFSENTRY_ACTION_RES_DISCONNECT	caller-preinitiated bit signaling that a connection was dissolved.
WOLFSENTRY_ACTION_RES_DEROGATORY	the caller or an action designated this event derogatory for the peer.
WOLFSENTRY_ACTION_RES_COMMENDABLE	the caller or an action designated this event commendable for the peer.
WOLFSENTRY_ACTION_RES_STOP	when an action returns this, don't evaluate any more actions in the current action list.
WOLFSENTRY_ACTION_RES_DEALLOCATED	when an API call returns this, an object and its associated ID were deallocated from the system.
WOLFSENTRY_ACTION_RES_INSERTED	a side-effect route insertion was performed.
WOLFSENTRY_ACTION_RES_ERROR	an error occurred while processing actions.
WOLFSENTRY_ACTION_RES_FALLTHROUGH	dispatch classification (ACCEPT/REJECT) was by fallthrough policy.

## Enumerator

WOLFSENTRY_ACTION_RES_UPDATE	signals to subsequent actions and the caller that the route state was updated (e.g. penaltyboxed).
WOLFSENTRY_ACTION_RES_PORT_RESET	when an action returns this, send a TCP reset or ICMP port unreachable packet.
WOLFSENTRY_ACTION_RES_SENDING	caller-preinitiated bit signaling outbound traffic.
WOLFSENTRY_ACTION_RES_RECEIVED	caller-preinitiated bit signaling inbound traffic.
WOLFSENTRY_ACTION_RES_BINDING	caller-preinitiated bit signaling that a socket will be bound.
WOLFSENTRY_ACTION_RES_LISTENING	caller-preinitiated bit signaling that a socket will be listened.
WOLFSENTRY_ACTION_RES_STOPPED_↔ LISTENING	caller-preinitiated bit signaling that a socket will stop being listened.
WOLFSENTRY_ACTION_RES_CONNECTING_OUT	caller-preinitiated bit signaling that an outbound connection will be attempted.
WOLFSENTRY_ACTION_RES_CLOSED	caller-preinitiated bit signaling that an association has closed/ended that wasn't created with _CONNECT.
WOLFSENTRY_ACTION_RES_UNREACHABLE	caller-preinitiated bit signaling that traffic destination was unreachable (unbound/unlistened).
WOLFSENTRY_ACTION_RES SOCK_ERROR	caller-preinitiated bit signaling that a transport error occurred.
WOLFSENTRY_ACTION_RES_USER0	user-defined result bit #1 of 8.
WOLFSENTRY_ACTION_RES_USER1	user-defined result bit #2 of 8.
WOLFSENTRY_ACTION_RES_USER2	user-defined result bit #3 of 8.
WOLFSENTRY_ACTION_RES_USER3	user-defined result bit #4 of 8.
WOLFSENTRY_ACTION_RES_USER4	user-defined result bit #5 of 8.
WOLFSENTRY_ACTION_RES_USER5	user-defined result bit #6 of 8.
WOLFSENTRY_ACTION_RES_USER6	user-defined result bit #7 of 8. start of user-defined results, with user-defined scheme (bit field, sequential, or other). 8 bits are available.

## 8.5.3.3 wolfentry\_action\_type\_t

```
enum wolfentry_action_type_t
```

enum communicating (to action handlers and internal logic) what type of action is being evaluated

## Enumerator

WOLFSENTRY_ACTION_TYPE_NONE	no action
WOLFSENTRY_ACTION_TYPE_POST	called when an event is posted.
WOLFSENTRY_ACTION_TYPE_INSERT	called when a route is added to the route table for this event.
WOLFSENTRY_ACTION_TYPE_MATCH	called by wolfentry_route_dispatch() for a route match.
WOLFSENTRY_ACTION_TYPE_UPDATE	called by wolfentry_route_dispatch() when the logical state (currently, flags) of an existing route changes.
WOLFSENTRY_ACTION_TYPE_DELETE	called when a route associated with this event expires or is otherwise deleted.
WOLFSENTRY_ACTION_TYPE_DECISION	called after final decision has been made by wolfentry_route_event_dispatch*().

## 8.5.4 Function Documentation

### 8.5.4.1 wolfsentry\_action\_delete()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_delete (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * label,
    int label_len,
    wolfsentry_action_res_t * action_results )
```

Delete an action from wolfsentry.

#### Parameters

<i>label</i>	the label of the action to delete
<i>label_len</i>	the length of the label, use WOLFSENTRY_LENGTH_NULL_TERMINATED for a NUL terminated string
<i>action_results</i>	the returned result of the delete

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.5.4.2 wolfsentry\_action\_drop\_reference()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_drop_reference (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfsentry_action * action,
    wolfsentry_action_res_t * action_results )
```

Drop a reference to an action.

#### Parameters

<i>action</i>	the action to drop the reference for
<i>action_results</i>	a pointer to the result of the function

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.5.4.3 wolfsentry\_action\_flush\_all()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_flush_all (
    WOLFSENTRY_CONTEXT_ARGS_IN )
```

Flush all actions from wolfsentry.

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.5.4.4 wolfsentry\_action\_get\_flags()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_get_flags (
    struct wolfsentry_action * action,
    wolfsentry_action_flags_t * flags )
```

Get the flags for an action.

##### Parameters

<i>action</i>	the action to get the flags for
<i>flags</i>	the flags to be returned

##### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### 8.5.4.5 wolfsentry\_action\_get\_label()

```
WOLFSENTRY_API const char * wolfsentry_action_get_label (
    const struct wolfsentry_action * action )
```

Get the label for an action. This is the internal pointer to the label so should not be freed by the application.

##### Parameters

<i>action</i>	the action to get the label for
---------------	---------------------------------

##### Returns

the label for the action

#### 8.5.4.6 wolfentry\_action\_get\_reference()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_action_get_reference (
    WOLFENTRY_CONTEXT_ARGS_IN ,
    const char * label,
    int label_len,
    struct wolfentry_action ** action )
```

Get a reference to an action.

##### Parameters

<i>label</i>	the label of the action to get the reference for
<i>label_len</i>	the length of the label, use WOLFENTRY_LENGTH_NULL_TERMINATED for a NUL terminated string
<i>action</i>	a pointer to a pointer for the action returned

##### Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

##### See also

[WOLFENTRY\\_CONTEXT\\_ARGS\\_IN](#)

#### 8.5.4.7 wolfentry\_action\_insert()

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_action_insert (
    WOLFENTRY_CONTEXT_ARGS_IN ,
    const char * label,
    int label_len,
    wolfentry_action_flags_t flags,
    wolfentry_action_callback_t handler,
    void * handler_arg,
    wolfentry_ent_id_t * id )
```

Insert a new action into wolfentry.

##### Parameters

<i>label</i>	the label for the action
<i>label_len</i>	the length of the label, use WOLFENTRY_LENGTH_NULL_TERMINATED for a NUL terminated string
<i>flags</i>	set flags for the action
<i>handler</i>	a callback handler when the action commences
<i>handler_arg</i>	an arbitrary pointer for the handler callback
<i>id</i>	the returned ID for the inserted action



## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

## 8.5.4.8 wolfentry\_action\_update\_flags()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_action_update_flags (
    struct wolfentry_action * action,
    wolfentry_action_flags_t flags_to_set,
    wolfentry_action_flags_t flags_to_clear,
    wolfentry_action_flags_t * flags_before,
    wolfentry_action_flags_t * flags_after )
```

Update the flags for an action.

## Parameters

<i>action</i>	the action to update
<i>flags_to_set</i>	new flags to set
<i>flags_to_clear</i>	old flags to clear
<i>flags_before</i>	the flags before the change
<i>flags_after</i>	the flags after the change

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## 8.6 Event Subsystem

## Data Structures

- struct [wolfentry\\_eventconfig](#)  
*struct for representing event configuration*

## Enumerations

- enum [wolfentry\\_event\\_flags\\_t](#) {  
[WOLFSENTRY\\_EVENT\\_FLAG\\_NONE](#) ,  
[WOLFSENTRY\\_EVENT\\_FLAG\\_IS\\_PARENT\\_EVENT](#) ,  
[WOLFSENTRY\\_EVENT\\_FLAG\\_IS\\_SUBEVENT](#) }  
*bit field with attribute flags for events*
- enum [wolfentry\\_eventconfig\\_flags\\_t](#) {  
[WOLFSENTRY\\_EVENTCONFIG\\_FLAG\\_NONE](#) ,  
[WOLFSENTRY\\_EVENTCONFIG\\_FLAG\\_DEROGATORY\\_THRESHOLD\\_IGNORE\\_COMMENDABLE](#) ,  
[WOLFSENTRY\\_EVENTCONFIG\\_FLAG\\_COMMENDABLE\\_CLEARS\\_DEROGATORY](#) ,  
[WOLFSENTRY\\_EVENTCONFIG\\_FLAG\\_INHIBIT\\_ACTIONS](#) }  
*bit field with config flags for events*

## Functions

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_eventconfig\\_init](#) (struct [wolfentry\\_context](#) \*wolfentry, struct [wolfentry\\_eventconfig](#) \*config)  
*Initializes a [wolfentry\\_eventconfig](#) struct with the defaults from the wolfentry context. If no wolfentry context is provided this will initialize to zero.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_eventconfig\\_check](#) (const struct [wolfentry\\_eventconfig](#) \*config)  
*Checks the config for self-consistency and validity.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_insert](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfentry\\_priority\\_t](#) priority, const struct [wolfentry\\_eventconfig](#) \*config, [wolfentry\\_event\\_flags\\_t](#) flags, [wolfentry\\_ent\\_id\\_t](#) \*id)  
*Insert an event into wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Delete an event from wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_flush\\_all](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Flush all events from wolfentry.*
- WOLFSENTRY\_API const char \* [wolfentry\\_event\\_get\\_label](#) (const struct [wolfentry\\_event](#) \*event)  
*Get the label for an event. This is the internal pointer to the label so should not be freed by the application.*
- WOLFSENTRY\_API [wolfentry\\_event\\_flags\\_t](#) [wolfentry\\_event\\_get\\_flags](#) (const struct [wolfentry\\_event](#) \*event)  
*Get the flags for an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_get\\_config](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, struct [wolfentry\\_eventconfig](#) \*config)  
*Get the configuration for an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_update\\_config](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, const struct [wolfentry\\_eventconfig](#) \*config)  
*Update the configuration for an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_get\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, struct [wolfentry\\_event](#) \*\*event)  
*Get a reference to an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_drop\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_event](#) \*event, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Drop a reference to an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_action\\_prepend](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len)  
*Prepend an action into an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_action\\_append](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len)  
*Append an action into an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_action\\_insert\\_after](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len, const char \*point\_action\_label, int point\_action\_label\_len)  
*Insert an action into an event after another action.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_action\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len)  
*Delete an action from an event.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_event\\_set\\_aux\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, const char \*aux\_event\_label, int aux\_event\_label\_len)  
*Set an auxiliary event for an event.*

- WOLFSENTRY\_API const struct wolfsentry\_event \* **wolfsentry\_event\_get\_aux\_event** (const struct wolfsentry\_event \*event)  
*Retrieve an auxiliary event previously set with [wolfsentry\\_event\\_set\\_aux\\_event\(\)](#).*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) **wolfsentry\_event\_action\_list\_start** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfsentry\\_action\\_type\\_t](#) which\_action\_list, struct wolfsentry↵\_action\_list\_ent \*\*cursor)  
*Open a cursor for the actions in an event. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) **wolfsentry\_event\_action\_list\_next** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_action\_list\_ent \*\*cursor, const char \*\*action\_label, int \*action\_label\_len)  
*Get the next action in an event cursor. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) **wolfsentry\_event\_action\_list\_done** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_action\_list\_ent \*\*cursor)  
*End iteration started with [wolfsentry\\_event\\_action\\_list\\_start\(\)](#). Caller must have a lock on the context at entry.*

### 8.6.1 Detailed Description

### 8.6.2 Enumeration Type Documentation

#### 8.6.2.1 wolfsentry\_event\_flags\_t

enum [wolfsentry\\_event\\_flags\\_t](#)

bit field with attribute flags for events

Enumerator

WOLFSENTRY_EVENT_FLAG_NONE	Default attributes.
WOLFSENTRY_EVENT_FLAG_IS_PARENT_EVENT	Internally set – Event is parent of one or more routes.
WOLFSENTRY_EVENT_FLAG_IS_SUBEVENT	Internally set – Event is subevent of another event.

#### 8.6.2.2 wolfsentry\_eventconfig\_flags\_t

enum [wolfsentry\\_eventconfig\\_flags\\_t](#)

bit field with config flags for events

Enumerator

WOLFSENTRY_EVENTCONFIG_FLAG_NONE	Default config.
WOLFSENTRY_EVENTCONFIG_FLAG_↵ DEROGATORY_THRESHOLD_IGNORE_↵ COMMENDABLE	If set, then counts from WOLFSENTRY_ACTION_RES_COMMENDABLE are not subtracted from the derogatory count when checking for automatic penalty boxing.
WOLFSENTRY_EVENTCONFIG_FLAG_↵ COMMENDABLE_CLEARS_DEROGATORY	If set, then each count from WOLFSENTRY_ACTION_RES_COMMENDABLE zeroes the derogatory count.
WOLFSENTRY_EVENTCONFIG_FLAG_INHIBIT_↵ ACTIONS	Internal use – Inhibits dispatch of actions listed in this event.

## 8.6.3 Function Documentation

### 8.6.3.1 wolfsentry\_event\_action\_append()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_action_append (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * event_label,
    int event_label_len,
    wolfsentry_action_type_t which_action_list,
    const char * action_label,
    int action_label_len )
```

Append an action into an event.

#### Parameters

<i>event_label</i>	the label of the event to append the action into
<i>event_label_len</i>	the length of the event_label
<i>which_action_list</i>	the action list of the event to update
<i>action_label</i>	the label of the action to insert
<i>action_label_len</i>	the length of the action_label

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.2 wolfsentry\_event\_action\_delete()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_action_delete (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * event_label,
    int event_label_len,
    wolfsentry_action_type_t which_action_list,
    const char * action_label,
    int action_label_len )
```

Delete an action from an event.

#### Parameters

<i>event_label</i>	the label of the event to delete the action from
<i>event_label_len</i>	the length of the event_label
<i>which_action_list</i>	the action list of the event to update
<i>action_label</i>	the label of the action to delete
<i>action_label_len</i>	the length of the action_label

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.3 wolfentry\_event\_action\_insert\_after()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_insert_after (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * event_label,
    int event_label_len,
    wolfentry_action_type_t which_action_list,
    const char * action_label,
    int action_label_len,
    const char * point_action_label,
    int point_action_label_len )
```

Insert an action into an event after another action.

## Parameters

<i>event_label</i>	the label of the event to insert the action into
<i>event_label_len</i>	the length of the event_label
<i>which_action_list</i>	the action list of the event to update
<i>action_label</i>	the label of the action to insert
<i>action_label_len</i>	the length of the action_label
<i>point_action_label</i>	the label of the action to insert after
<i>point_action_label_len</i>	the length of the point_action_label

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.4 wolfentry\_event\_action\_list\_done()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_list_done (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_action_list_ent ** cursor )
```

End iteration started with [wolfentry\\_event\\_action\\_list\\_start\(\)](#). Caller must have a lock on the context at entry.

## Parameters

<i>cursor</i>	a pointer to a pointer for the cursor
---------------	---------------------------------------

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)

[WOLFSENTRY\\_UNLOCK\\_AND\\_RETURN\(\)](#)

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.5 wolfentry\_event\_action\_list\_next()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_list_next (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfentry_action_list_ent ** cursor,
    const char ** action_label,
    int * action_label_len )
```

Get the next action in an event cursor. Caller must have a lock on the context at entry.

## Parameters

<i>cursor</i>	a pointer to a pointer for the cursor
<i>action_label</i>	a pointer to a pointer to the returned action_label
<i>action_label_len</i>	the length of action_label

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)

[WOLFSENTRY\\_UNLOCK\\_AND\\_RETURN\(\)](#)

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.6 wolfentry\_event\_action\_list\_start()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_list_start (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * event_label,
    int event_label_len,
    wolfentry_action_type_t which_action_list,
    struct wolfentry_action_list_ent ** cursor )
```

Open a cursor for the actions in an event. Caller must have a lock on the context at entry.

## Parameters

<i>event_label</i>	the event label to open the iterator for
<i>event_label_len</i>	the length of the event_label
<i>which_action_list</i>	the action list of the event to list
<i>cursor</i>	a pointer to a pointer for the cursor to open

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_SHARED\\_OR\\_RETURN\(\)](#)

[WOLFSENTRY\\_UNLOCK\\_AND\\_RETURN\(\)](#)

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.7 wolfentry\_event\_action\_prepend()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_prepend (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * event_label,
    int event_label_len,
    wolfentry_action_type_t which_action_list,
    const char * action_label,
    int action_label_len )
```

Prepend an action into an event.

## Parameters

<i>event_label</i>	the label of the event to prepend the action into
<i>event_label_len</i>	the length of the event_label
<i>which_action_list</i>	the action list of the event to update
<i>action_label</i>	the label of the action to insert
<i>action_label_len</i>	the length of the action_label

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.8 wolfsentry\_event\_delete()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_delete (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * label,
    int label_len,
    wolfsentry_action_res_t * action_results )
```

Delete an event from wolfsentry.

#### Parameters

<i>label</i>	the label of the even to delete
<i>label_len</i>	the length of the label
<i>action_results</i>	the result of the delete action

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

### 8.6.3.9 wolfsentry\_event\_drop\_reference()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_drop_reference (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    struct wolfsentry_event * event,
    wolfsentry_action_res_t * action_results )
```

Drop a reference to an event.

#### Parameters

<i>event</i>	the event to drop the reference for
<i>action_results</i>	a pointer to the result of the function

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.10 wolfsentry\_event\_flush\_all()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_flush_all (
    WOLFSENTRY_CONTEXT_ARGS_IN )
```

Flush all events from wolfsentry.



**Returns**

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

**See also**

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.6.3.11 wolfentry\_event\_get\_config()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_get_config (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * label,
    int label_len,
    struct wolfentry_eventconfig * config )
```

Get the configuration for an event.

**Parameters**

<i>label</i>	the label for the event to get the config for
<i>label_len</i>	the length of the label
<i>config</i>	the configuration returned

**Returns**

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

**See also**

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.6.3.12 wolfentry\_event\_get\_flags()**

```
WOLFSENTRY_API wolfentry_event_flags_t wolfentry_event_get_flags (
    const struct wolfentry_event * event )
```

Get the flags for an event.

**Parameters**

<i>event</i>	the event to get the flags for
--------------	--------------------------------

**Returns**

the current flags of the event

### 8.6.3.13 wolfsentry\_event\_get\_label()

```
WOLFSENTRY_API const char * wolfsentry_event_get_label (
    const struct wolfsentry_event * event )
```

Get the label for an event. This is the internal pointer to the label so should not be freed by the application.

#### Parameters

<i>event</i>	the event to get the label for
--------------	--------------------------------

#### Returns

the label for the event

### 8.6.3.14 wolfsentry\_event\_get\_reference()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_get_reference (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * label,
    int label_len,
    struct wolfsentry_event ** event )
```

Get a reference to an event.

#### Parameters

<i>label</i>	the label of the event to get the reference for
<i>label_len</i>	the length of the label, use WOLFSENTRY_LENGTH_NULL_TERMINATED for a NUL terminated string
<i>event</i>	a pointer to a pointer for the event returned

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

### 8.6.3.15 wolfsentry\_event\_insert()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_insert (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * label,
    int label_len,
    wolfsentry_priority_t priority,
    const struct wolfsentry_eventconfig * config,
    wolfsentry_event_flags_t flags,
    wolfsentry_ent_id_t * id )
```

Insert an event into wolfsentry.

## Parameters

<i>label</i>	the label for the event
<i>label_len</i>	the length of the label
<i>priority</i>	the priority of the event
<i>config</i>	event configuration details
<i>flags</i>	the flags for the event
<i>id</i>	the returned ID for the event

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.6.3.16 wolfentry\_event\_set\_aux\_event()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_set_aux_event (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * event_label,
    int event_label_len,
    const char * aux_event_label,
    int aux_event_label_len )
```

Set an auxiliary event for an event.

## Parameters

<i>event_label</i>	the parent event label
<i>event_label_len</i>	the length of the event_label
<i>aux_event_label</i>	the aux event label
<i>aux_event_label_len</i>	the length of the aux event_label

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.6.3.17 wolfentry\_event\_update\_config()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_update_config (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
```

```
const char * label,  
int label_len,  
const struct wolfentry_eventconfig * config )
```

Update the configuration for an event.

## Parameters

<i>label</i>	the label for the event to get the config for
<i>label_len</i>	the length of the label
<i>config</i>	the updated configuration

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#)

**8.6.3.18 wolfentry\_eventconfig\_check()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_eventconfig_check (
    const struct wolfentry_eventconfig * config )
```

Checks the config for self-consistency and validity.

## Parameters

<i>config</i>	the pointer to the config to check
---------------	------------------------------------

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

**8.6.3.19 wolfentry\_eventconfig\_init()**

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_eventconfig_init (
    struct wolfentry_context * wolfentry,
    struct wolfentry_eventconfig * config )
```

Initializes a [wolfentry\\_eventconfig](#) struct with the defaults from the wolfentry context. If no wolfentry context is provided this will initialize to zero.

## Parameters

<i>wolfentry</i>	the wolfentry context
<i>config</i>	the pointer to the config to initialize

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## 8.7 Address Family Subsystem

### Macros

- `#define WOLFSENTRY_AF_UNSPEC 0`
- `#define WOLFSENTRY_AF_UNIX 1`  
*Unix domain sockets.*
- `#define WOLFSENTRY_AF_LOCAL 1`  
*POSIX name for WOLFSENTRY\_AF\_UNIX.*
- `#define WOLFSENTRY_AF_INET 2`  
*Internet IP Protocol.*
- `#define WOLFSENTRY_AF_AX25 3`  
*Amateur Radio AX.25.*
- `#define WOLFSENTRY_AF_IPX 4`  
*Novell IPX.*
- `#define WOLFSENTRY_AF_APPLETALK 5`  
*AppleTalk DDP.*
- `#define WOLFSENTRY_AF_NETROM 6`  
*Amateur Radio NET/ROM.*
- `#define WOLFSENTRY_AF_BRIDGE 7`  
*Multiprotocol bridge.*
- `#define WOLFSENTRY_AF_ATMPVC 8`  
*ATM PVCs.*
- `#define WOLFSENTRY_AF_X25 9`  
*Reserved for X.25 project.*
- `#define WOLFSENTRY_AF_INET6 10`  
*IP version 6.*
- `#define WOLFSENTRY_AF_ROSE 11`  
*Amateur Radio X.25 PLP.*
- `#define WOLFSENTRY_AF_DECnet 12`  
*Reserved for DECnet project.*
- `#define WOLFSENTRY_AF_NETBEUI 13`  
*Reserved for 802.2LLC project.*
- `#define WOLFSENTRY_AF_SECURITY 14`  
*Security callback pseudo AF.*
- `#define WOLFSENTRY_AF_KEY 15`  
*PF\_KEY key management API.*
- `#define WOLFSENTRY_AF_NETLINK 16`
- `#define WOLFSENTRY_AF_ROUTE WOLFSENTRY_AF_NETLINK`  
*Alias to emulate 4.4BSD.*
- `#define WOLFSENTRY_AF_PACKET 17`  
*Packet family.*
- `#define WOLFSENTRY_AF_ASH 18`  
*Ash.*
- `#define WOLFSENTRY_AF_ECONET 19`  
*Acorn Econet.*
- `#define WOLFSENTRY_AF_ATMSVC 20`  
*ATM SVCs.*
- `#define WOLFSENTRY_AF_RDS 21`  
*RDS sockets.*
- `#define WOLFSENTRY_AF_SNA 22`

- Linux SNA Project (nutters!)*
- #define **WOLFSENTRY\_AF\_IRDA** 23  
*IRDA sockets.*
  - #define **WOLFSENTRY\_AF\_PPPOX** 24  
*PPPoX sockets.*
  - #define **WOLFSENTRY\_AF\_WANPIPE** 25  
*Wanpipe API Sockets.*
  - #define **WOLFSENTRY\_AF\_LLC** 26  
*Linux LLC.*
  - #define **WOLFSENTRY\_AF\_IB** 27  
*Native InfiniBand address.*
  - #define **WOLFSENTRY\_AF\_MPLS** 28  
*MPLS.*
  - #define **WOLFSENTRY\_AF\_CAN** 29  
*Controller Area Network.*
  - #define **WOLFSENTRY\_AF\_TIPC** 30  
*TIPC sockets.*
  - #define **WOLFSENTRY\_AF\_BLUETOOTH** 31  
*Bluetooth sockets.*
  - #define **WOLFSENTRY\_AF\_IUCV** 32  
*IUCV sockets.*
  - #define **WOLFSENTRY\_AF\_RXRPC** 33  
*RxRPC sockets.*
  - #define **WOLFSENTRY\_AF\_ISDN** 34  
*mISDN sockets*
  - #define **WOLFSENTRY\_AF\_PHONET** 35  
*Phonet sockets.*
  - #define **WOLFSENTRY\_AF\_IEEE802154** 36  
*IEEE802154 sockets.*
  - #define **WOLFSENTRY\_AF\_CAIF** 37  
*CAIF sockets.*
  - #define **WOLFSENTRY\_AF\_ALG** 38  
*Algorithm sockets.*
  - #define **WOLFSENTRY\_AF\_NFC** 39  
*NFC sockets.*
  - #define **WOLFSENTRY\_AF\_VSOCK** 40  
*vSockets*
  - #define **WOLFSENTRY\_AF\_KCM** 41  
*Kernel Connection Multiplexor.*
  - #define **WOLFSENTRY\_AF\_QIPCRTR** 42  
*Qualcomm IPC Router.*
  - #define **WOLFSENTRY\_AF\_SMC** 43  
*smc sockets: reserve number for PF\_SMC protocol family that reuses WOLFSENTRY\_AF\_INET address family*
  - #define **WOLFSENTRY\_AF\_XDP** 44  
*XDP sockets.*
  - #define **WOLFSENTRY\_AF\_BSD\_OFFSET** 100  
*from FreeBSD at commit a56e5ad6, except WOLFSENTRY\_AF\_LINK64, added here.*
  - #define **WOLFSENTRY\_AF\_IMPLINK** (**WOLFSENTRY\_AF\_BSD\_OFFSET** + 3)  
*arpanet imp addresses*
  - #define **WOLFSENTRY\_AF\_PUP** (**WOLFSENTRY\_AF\_BSD\_OFFSET** + 4)  
*pup protocols: e.g. BSP*

- #define **WOLFSENTRY\_AF\_CHAOS** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 5)  
*mit CHAOS protocols*
- #define **WOLFSENTRY\_AF\_NETBIOS** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 6)  
*SMB protocols.*
- #define **WOLFSENTRY\_AF\_ISO** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 7)  
*ISO protocols.*
- #define **WOLFSENTRY\_AF\_OSI** [WOLFSENTRY\\_AF\\_ISO](#)
- #define **WOLFSENTRY\_AF\_ECMA** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 8)  
*European computer manufacturers.*
- #define **WOLFSENTRY\_AF\_DATAKIT** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 9)  
*datakit protocols*
- #define **WOLFSENTRY\_AF\_DLI** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 13)  
*DEC Direct data link interface.*
- #define **WOLFSENTRY\_AF\_LAT** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 14)  
*LAT.*
- #define **WOLFSENTRY\_AF\_HYLINK** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 15)  
*NSC Hyperchannel.*
- #define **WOLFSENTRY\_AF\_LINK48** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 18)  
*Link layer interface, explicit EUI-48.*
- #define **WOLFSENTRY\_AF\_LINK** [WOLFSENTRY\\_AF\\_LINK48](#)  
*Link layer interface, implicit EUI-48.*
- #define **WOLFSENTRY\_AF\_LINK64** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 19)  
*Link layer interface, explicit EUI-64.*
- #define **WOLFSENTRY\_AF\_COIP** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 20)  
*connection-oriented IP, aka ST II*
- #define **WOLFSENTRY\_AF\_CNT** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 21)  
*Computer Network Technology.*
- #define **WOLFSENTRY\_AF\_SIP** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 24)  
*Simple Internet Protocol.*
- #define **WOLFSENTRY\_AF\_SLOW** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 33)  
*802.3ad slow protocol*
- #define **WOLFSENTRY\_AF\_SCLUSTER** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 34)  
*Sitara cluster protocol.*
- #define **WOLFSENTRY\_AF\_ARP** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 35)
- #define **WOLFSENTRY\_AF\_IEEE80211** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 37)  
*IEEE 802.11 protocol.*
- #define **WOLFSENTRY\_AF\_INET\_SDP** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 40)  
*OFED Socket Direct Protocol ipv4.*
- #define **WOLFSENTRY\_AF\_INET6\_SDP** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 42)  
*OFED Socket Direct Protocol ipv6.*
- #define **WOLFSENTRY\_AF\_HYPERV** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 43)  
*HyperV sockets.*
- #define **WOLFSENTRY\_AF\_USER\_OFFSET** 256

## Typedefs

- typedef [wolfentry\\_errcode\\_t](#)(\* [wolfentry\\_addr\\_family\\_parser\\_t](#)) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const char \*addr\_text, int addr\_text\_len, [byte](#) \*addr\_internal, [wolfentry\\_addr\\_bits\\_t](#) \*addr\_internal\_bits)  
*Function type for parsing handler, to pass to [wolfentry\\_addr\\_family\\_handler\\_install\(\)](#)*
- typedef [wolfentry\\_errcode\\_t](#)(\* [wolfentry\\_addr\\_family\\_formatter\\_t](#)) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const [byte](#) \*addr\_internal, unsigned int addr\_internal\_bits, char \*addr\_text, int \*addr\_text\_len)  
*Function type for formatting handler, to pass to [wolfentry\\_addr\\_family\\_handler\\_install\(\)](#)*



## Functions

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_handler\\_install](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) family\_bynumber, const char \*family\_byname, int family\_byname\_len, [wolfentry\\_addr\\_family\\_parser\\_t](#) parser, [wolfentry\\_addr\\_family\\_formatter\\_t](#) formatter, int max\_addr\_bits)  
*Install handlers for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_get\\_parser](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) family, [wolfentry\\_addr\\_family\\_parser\\_t](#) \*parser)  
*Retrieve the parsing handler for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_get\\_formatter](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) family, [wolfentry\\_addr\\_family\\_formatter\\_t](#) \*formatter)  
*Retrieve the formatting handler for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_handler\\_remove\\_bynumber](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) family\_bynumber, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Remove the handlers for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_drop\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_addr\\_family\\_bynumber](#) \*family\_bynumber, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Release an address family record previously returned by [wolfentry\\_addr\\_family\\_ntop\(\)](#)*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_handler\\_remove\\_byname](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*family\_byname, int family\_byname\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Remove the handlers for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_pton](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*family\_name, int family\_name\_len, [wolfentry\\_addr\\_family\\_t](#) \*family\_number)  
*Look up an address family by name, returning its number.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_ntop](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) family, struct [wolfentry\\_addr\\_family\\_bynumber](#) \*\*addr\_family, const char \*\*family\_name)  
*Look up an address family by number, returning a pointer to its name. The caller must release *addr\_family*, using [wolfentry\\_addr\\_family\\_drop\\_reference\(\)](#), when done accessing *family\_name*.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_addr\\_family\\_max\\_addr\\_bits](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) family, [wolfentry\\_addr\\_bits\\_t](#) \*bits)  
*Look up the max address size for an address family identified by number.*

### 8.7.1 Detailed Description

## 8.8 User-Defined Value Subsystem

### Data Structures

- struct [wolfentry\\_kv\\_pair](#)  
*public structure for passing user-defined values in/out of wolfSentry*

### Macros

- #define WOLFSENTRY\_KV\_FLAG\_MASK  
*A bit mask to retain only the flag bits in a [wolfentry\\_kv\\_type\\_t](#).*
- #define WOLFSENTRY\_KV\_KEY\_LEN(kv)  
*Evaluates to the length of the key of a [wolfentry\\_kv\\_pair](#).*
- #define WOLFSENTRY\_KV\_KEY(kv)  
*Evaluates to the key of a [wolfentry\\_kv\\_pair](#).*

- **#define WOLFSENTRY\_KV\_TYPE(kv)**  
*Evaluates to the type of a [wolfentry\\_kv\\_pair](#), with flag bits masked out.*
- **#define WOLFSENTRY\_KV\_V\_UINT(kv)**  
*Evaluates to the `uint64_t` value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_UINT`.*
- **#define WOLFSENTRY\_KV\_V\_SINT(kv)**  
*Evaluates to the `int64_t` value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_INT`.*
- **#define WOLFSENTRY\_KV\_V\_FLOAT(kv)**  
*Evaluates to the `double` value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_FLOAT`.*
- **#define WOLFSENTRY\_KV\_V\_STRING\_LEN(kv)**  
*Evaluates to the `size_t` length of the value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_STRING`.*
- **#define WOLFSENTRY\_KV\_V\_STRING(kv)**  
*Evaluates to the `char *` value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_STRING`.*
- **#define WOLFSENTRY\_KV\_V\_BYTES\_LEN(kv)**  
*Evaluates to the `size_t` length of the value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_BYTES`.*
- **#define WOLFSENTRY\_KV\_V\_BYTES(kv)**  
*Evaluates to the `byte *` value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_BYTES`.*
- **#define WOLFSENTRY\_KV\_V\_JSON(kv)**  
*Evaluates to the `JSON_VALUE *` value of a [wolfentry\\_kv\\_pair](#) of type `WOLFSENTRY_KV_JSON`.*
- **#define WOLFSENTRY\_BASE64\_DECODED\_BUFSPC(buf, len)**  
*Given valid base64 string `buf` of length `len`, evaluates to the exact decoded length.*

## Typedefs

- typedef [wolfentry\\_errcode\\_t](#)(\* [wolfentry\\_kv\\_validator\\_t](#)) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct [wolfentry\\_kv\\_pair](#) \*kv)

## Enumerations

- enum [wolfentry\\_kv\\_type\\_t](#) {  
**WOLFSENTRY\_KV\_NONE** = 0 ,  
**WOLFSENTRY\_KV\_NULL** ,  
**WOLFSENTRY\_KV\_TRUE** ,  
**WOLFSENTRY\_KV\_FALSE** ,  
**WOLFSENTRY\_KV\_UINT** ,  
**WOLFSENTRY\_KV\_SINT** ,  
**WOLFSENTRY\_KV\_FLOAT** ,  
**WOLFSENTRY\_KV\_STRING** ,  
**WOLFSENTRY\_KV\_BYTES** ,  
**WOLFSENTRY\_KV\_JSON** ,  
**WOLFSENTRY\_KV\_FLAG\_READONLY** = 1<<30 }  
*enum to represent the type of a user-defined value*

## Functions

- [WOLFSENTRY\\_API](#) [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_set\\_validator](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_kv\\_validator\\_t](#) validator, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Install a supplied [wolfentry\\_kv\\_validator\\_t](#) to validate all user values before inserting them into the value table.*
- [WOLFSENTRY\\_API](#) [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_set\\_mutability](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const char \*key, int key\_len, int mutable)

Set the user-defined value with the designated key as readwrite (*mutable=1*) or readonly (*mutable=0*). A read-only value cannot be changed or deleted.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_get\\_mutability](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int \*mutable)

Query the mutability of the user-defined value with the designated key. Readonly value cannot be changed or deleted.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_get\\_type](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, [wolfentry\\_kv\\_type\\_t](#) \*type)

Returns the type of the value with the designated key, using [WOLFSENTRY\\_KV\\_TYPE\(\)](#).

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len)

Deletes the value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_null](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_NULL](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_bool](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, [wolfentry\\_kv\\_type\\_t](#) value, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_TRUE](#) or [WOLFSENTRY\\_KV\\_FALSE](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_get\\_bool](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, [wolfentry\\_kv\\_type\\_t](#) \*value)

Gets a [WOLFSENTRY\\_KV\\_TRUE](#) or [WOLFSENTRY\\_KV\\_FALSE](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_uint](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, uint64\_t value, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_UINT](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_get\\_uint](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, uint64\_t \*value)

Gets a [WOLFSENTRY\\_KV\\_UINT](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_sint](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int64\_t value, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_SINT](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_get\\_sint](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int64\_t \*value)

Gets a [WOLFSENTRY\\_KV\\_UINT](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_double](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, double value, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_FLOAT](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_get\\_float](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, double \*value)

Gets a [WOLFSENTRY\\_KV\\_UINT](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_string](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const char \*value, int value\_len, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_STRING](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_get\\_string](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const char \*\*value, int \*value\_len, struct wolfentry\_kv\_pair\_internal \*\*user↔\_value\_record)

Gets a [WOLFSENTRY\\_KV\\_STRING](#) value with the designated key.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_bytes](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const byte \*value, int value\_len, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_BYTES](#) value with the designated key and a binary-clean value.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_value\\_store\\_bytes\\_base64](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const char \*value, int value\_len, int overwrite\_p)

Inserts or overwrites a [WOLFSENTRY\\_KV\\_BYTES](#) value with the designated key and a base64-encoded value.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_value\\_get\\_bytes](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const byte \*\*value, int \*value\_len, struct wolfentry\_kv\_pair\_internal \*\*user\_value\_record)  
*Gets a WOLFSENTRY\_KV\_BYTES value with the designated key.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_value\\_store\\_json](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, JSON\_VALUE \*value, int overwrite\_p)  
*Inserts or overwrites a WOLFSENTRY\_KV\_JSON value with the designated key and a value from json\_dom\_parse() (or built up programmatically with the centijson\_value.h API).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_value\\_get\\_json](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, JSON\_VALUE \*\*value, struct wolfentry\_kv\_pair\_internal \*\*user\_value\_record)  
*Gets a WOLFSENTRY\_KV\_JSON value with the designated key.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_value\\_release\\_record](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_kv\_pair\_internal \*\*user\_value\_record)  
*Release a user\_value\_record from wolfentry\_user\_value\_get\_string(), wolfentry\_user\_value\_get\_bytes() or wolfentry\_user\_value\_get\_json().*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_kv\\_pair\\_export](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_kv\_pair\_internal \*kv, const struct wolfentry\_kv\_pair \*\*kv\_exports)  
*Extract the struct wolfentry\_kv\_pair from a struct wolfentry\_kv\_pair\_internal. Caller must have a shared or exclusive lock on the context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_kv\\_type\\_to\\_string](#) (wolfentry\_kv\_type\_t type, const char \*\*out)  
*Return a human-readable rendering of a wolfentry\_kv\_type\_t.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_kv\\_render\\_value](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_kv\_pair \*kv, char \*out, int \*out\_len)  
*Render kv in human-readable form to caller-preallocated buffer out.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_values\\_iterate\\_start](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*\*cursor)  
*Start an iteration loop on the user values table of this context. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_values\\_iterate\\_seek\\_to\\_head](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor)  
*Move the cursor to point to the start of the user values table. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_values\\_iterate\\_seek\\_to\\_tail](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor)  
*Move the cursor to point to the end of the user values table. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_values\\_iterate\\_current](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor, struct wolfentry\_kv\_pair\_internal \*\*kv)  
*Return the item to which the cursor currently points, without moving the cursor. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_values\\_iterate\\_prev](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor, struct wolfentry\_kv\_pair\_internal \*\*kv)  
*Move the cursor to the previous item, and return it. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_values\\_iterate\\_next](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor, struct wolfentry\_kv\_pair\_internal \*\*kv)  
*Move the cursor to the next item, and return it. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_user\\_values\\_iterate\\_end](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*\*cursor)  
*End an iteration loop started with wolfentry\_user\_values\_iterate\_start(). Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_base64\\_decode](#) (const char \*src, size\_t src\_len, byte \*dest, size\_t \*dest\_spc, int ignore\_junk\_p)  
*Convert base64-encoded input src to binary output dest, optionally ignoring (with nonzero ignore\_junk\_p) non-base64 characters in src.*

### 8.8.1 Detailed Description

### 8.8.2 Typedef Documentation

#### 8.8.2.1 wolfsentry\_kv\_validator\_t

```
typedef wolfsentry_errcode_t (* wolfsentry_kv_validator_t) (WOLFSENTRY_CONTEXT_ARGS_IN, struct wolfsentry_kv_pair *kv)
```

Function type for user-supplied value validators.

### 8.8.3 Function Documentation

#### 8.8.3.1 wolfsentry\_user\_value\_get\_bytes()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_bytes (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * key,
    int key_len,
    const byte ** value,
    int * value_len,
    struct wolfsentry_kv_pair_internal ** user_value_record )
```

Gets a WOLFSENTRY\_KV\_BYTES value with the designated key.

The `user_value_record` will be used to store a pointer to an internal structure, which acts as a lease on the value. This must be released with `wolfsentry_user_value_release_record()` when done.

#### 8.8.3.2 wolfsentry\_user\_value\_get\_json()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_json (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * key,
    int key_len,
    JSON_VALUE ** value,
    struct wolfsentry_kv_pair_internal ** user_value_record )
```

Gets a WOLFSENTRY\_KV\_JSON value with the designated key.

The `user_value_record` will be used to store a pointer to an internal structure, which acts as a lease on the value. This must be released with `wolfsentry_user_value_release_record()` when done.

#### 8.8.3.3 wolfsentry\_user\_value\_get\_string()

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_string (
    WOLFSENTRY_CONTEXT_ARGS_IN ,
    const char * key,
    int key_len,
    const char ** value,
    int * value_len,
    struct wolfsentry_kv_pair_internal ** user_value_record )
```

Gets a WOLFSENTRY\_KV\_STRING value with the designated key.

The `user_value_record` will be used to store a pointer to an internal structure, which acts as a lease on the value. This must be released with `wolfsentry_user_value_release_record()` when done.

## 8.9 Object Subsystem

### Typedefs

- typedef [wolfentry\\_errcode\\_t](#)(\* [wolfentry\\_make\\_id\\_cb\\_t](#)) (void \*context, [wolfentry\\_ent\\_id\\_t](#) \*id)

### Enumerations

- enum [wolfentry\\_object\\_type\\_t](#) {  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_UNINITED](#) ,  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_TABLE](#) ,  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_ACTION](#) ,  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_EVENT](#) ,  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_ROUTE](#) ,  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_KV](#) ,  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_ADDR\\_FAMILY\\_BYNUMBER](#) ,  
[WOLFSENTRY\\_OBJECT\\_TYPE\\_ADDR\\_FAMILY\\_BYNAME](#) }  
*enum for communicating the type of an object.*

### Functions

- WOLFSENTRY\_API [wolfentry\\_object\\_type\\_t](#) [wolfentry\\_get\\_object\\_type](#) (const void \*object)  
*Get the object type from a wolfentry object pointer.*
- WOLFSENTRY\_API [wolfentry\\_ent\\_id\\_t](#) [wolfentry\\_get\\_object\\_id](#) (const void \*object)  
*Get the ID from a wolfentry object pointer.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_table\\_ent\\_get\\_by\\_id](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_ent\\_id\\_t](#) id, struct [wolfentry\\_table\\_ent\\_header](#) \*\*ent)  
*Retrieve an object pointer given its ID. Lock must be obtained before entry, and ent is only valid while lock is held, or if [wolfentry\\_object\\_checkout\(\)](#) is called for the object.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_object\\_checkout](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*object)  
*Increment the refcount for an object, making it safe from deallocation until [wolfentry\\_object\\_release\(\)](#). Caller must have a context lock on entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_object\\_release](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*object, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Decrement the refcount for an object, deallocating it if no references remain. Caller does not need to have a context lock on entry.*
- WOLFSENTRY\_API [wolfentry\\_hitcount\\_t](#) [wolfentry\\_table\\_n\\_inserts](#) (struct [wolfentry\\_table\\_header](#) \*table)  
*Get the number of inserts into a table.*
- WOLFSENTRY\_API [wolfentry\\_hitcount\\_t](#) [wolfentry\\_table\\_n\\_deletes](#) (struct [wolfentry\\_table\\_header](#) \*table)  
*Get the number of deletes from a table.*

### 8.9.1 Detailed Description

### 8.9.2 Enumeration Type Documentation

#### 8.9.2.1 [wolfentry\\_object\\_type\\_t](#)

enum [wolfentry\\_object\\_type\\_t](#)

enum for communicating the type of an object.

## Enumerator

WOLFSENTRY_OBJECT_TYPE_UNINITED	Object is null or uninitialized.
WOLFSENTRY_OBJECT_TYPE_TABLE	Not currently used.
WOLFSENTRY_OBJECT_TYPE_ACTION	Object is a <code>struct wolfentry_action</code> .
WOLFSENTRY_OBJECT_TYPE_EVENT	Object is a <code>struct wolfentry_event</code> .
WOLFSENTRY_OBJECT_TYPE_ROUTE	Object is a <code>struct wolfentry_route</code> .
WOLFSENTRY_OBJECT_TYPE_KV	Object is a <code>struct wolfentry_kv_pair_internal</code> .
WOLFSENTRY_OBJECT_TYPE_ADDR_FAMILY_↔ BYNUMBER	Object is a <code>struct wolfentry_addr_family_bynumber</code> .
WOLFSENTRY_OBJECT_TYPE_ADDR_FAMILY_↔ BYNAME	Object is a <code>struct wolfentry_addr_family_byname</code> .

## 8.9.3 Function Documentation

8.9.3.1 `wolfentry_get_object_id()`

```
WOLFSENTRY_API wolfentry_ent_id_t wolfentry_get_object_id (
    const void * object )
```

Get the ID from a wolfentry object pointer.

## Parameters

<i>object</i>	a pointer to the object
---------------	-------------------------

## Returns

the object ID, or WOLFSENTRY\_OBJECT\_TYPE\_UNINITED on error.

8.9.3.2 `wolfentry_get_object_type()`

```
WOLFSENTRY_API wolfentry_object_type_t wolfentry_get_object_type (
    const void * object )
```

Get the object type from a wolfentry object pointer.

## Parameters

<i>object</i>	a pointer to the object
---------------	-------------------------

## Returns

the object type, or WOLFSENTRY\_OBJECT\_TYPE\_UNINITED on error.



### 8.9.3.3 wolfsentry\_table\_n\_deletes()

```
WOLFSENTRY_API wolfsentry_hitcount_t wolfsentry_table_n_deletes (
    struct wolfsentry_table_header * table )
```

Get the number of deletes from a table.

#### Parameters

<i>table</i>	the table to get the deletes for
--------------	----------------------------------

#### Returns

the total delete count

### 8.9.3.4 wolfsentry\_table\_n\_inserts()

```
WOLFSENTRY_API wolfsentry_hitcount_t wolfsentry_table_n_inserts (
    struct wolfsentry_table_header * table )
```

Get the number of inserts into a table.

#### Parameters

<i>table</i>	the table to get the inserts for
--------------	----------------------------------

#### Returns

the total insert count

## 8.10 Thread Synchronization Subsystem

### Data Structures

- struct [wolfsentry\\_thread\\_context\\_public](#)  
*Right-sized, right-aligned opaque container for thread state.*

### Macros

- #define **WOLFSENTRY\_CONTEXT\_ARGS\_IN**  
*Common context argument generator for use at the beginning of arg lists in function prototypes and definitions. Pair with **WOLFSENTRY\_CONTEXT\_ARGS\_OUT** in the caller argument list.*
- #define **WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX**(ctx)  
*Variant of **WOLFSENTRY\_CONTEXT\_ARGS\_IN** that allows a fully type-qualified context to be supplied explicitly (allowing contexts other than struct wolfsentry\_context)*
- #define **WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX4**(ctx, thr)  
*Variant of **WOLFSENTRY\_CONTEXT\_ARGS\_IN** that allows the identifiers for context and thread pointers to be supplied explicitly.*



- **#define WOLFSENTRY\_CONTEXT\_ELEMENTS**  
Variant of `WOLFSENTRY_CONTEXT_ARGS_IN` for constructing structs.
- **#define WOLFSENTRY\_CONTEXT\_SET\_ELEMENTS(s)**  
Counterpart to `WOLFSENTRY_CONTEXT_ELEMENTS` to access the `wolfentry` context.
- **#define WOLFSENTRY\_CONTEXT\_GET\_ELEMENTS(s)**  
Counterpart to `WOLFSENTRY_CONTEXT_ELEMENTS` to access the thread context (exists only if defined (`WOLFSENTRY_THREADSAFE`))
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT**  
Common context argument generator to use in calls to functions taking `WOLFSENTRY_CONTEXT_ARGS_IN`
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX(ctx)**  
Variant of `WOLFSENTRY_CONTEXT_ARGS_OUT` that allows passing an explicitly identified context argument generator to use in calls to functions taking `WOLFSENTRY_CONTEXT_ARGS_IN_EX`
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX2(x)**  
Variant of `WOLFSENTRY_CONTEXT_ARGS_OUT` corresponding to `WOLFSENTRY_CONTEXT_ELEMENTS`
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX3(x, y)**  
Special-purpose variant of `WOLFSENTRY_CONTEXT_ARGS_OUT_EX` for accessing context element `y` in structure pointer `x`
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX4(x, y)**  
Special-purpose variant of `WOLFSENTRY_CONTEXT_ARGS_OUT` that simply expands to `x` or `x, y` depending on `WOLFSENTRY_THREADSAFE`
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_NOT\_USED**  
Helper macro for function implementations that need to accept `WOLFSENTRY_CONTEXT_ARGS_IN` for API conformance, but don't actually use the arguments.
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_THREAD\_NOT\_USED**  
Helper macro for function implementations that need to accept `WOLFSENTRY_CONTEXT_ARGS_IN` for API conformance, but don't actually use the `thread` argument.
- **#define WOLFSENTRY\_THREAD\_HEADER\_DECLS**
- **#define WOLFSENTRY\_THREAD\_HEADER\_INIT(flags)**  
For `WOLFSENTRY_THREADSAFE` applications, this allocates the required thread context on the stack.
- **#define WOLFSENTRY\_THREAD\_HEADER\_INIT\_CHECKED(flags)**  
For `WOLFSENTRY_THREADSAFE` applications, this performs the required thread context initialization, with options from its `wolfentry_thread_flags_t flags` arg.
- **#define WOLFSENTRY\_THREAD\_HEADER(flags)**  
For `WOLFSENTRY_THREADSAFE` applications, this performs the required thread context initialization, with options from its `wolfentry_thread_flags_t flags` arg, and returns on failure.
- **#define WOLFSENTRY\_THREAD\_HEADER\_CHECK()**  
For `WOLFSENTRY_THREADSAFE` applications, this allocates the required thread context on the stack, and initializes it with options from its `wolfentry_thread_flags_t flags` arg.
- **#define WOLFSENTRY\_THREAD\_HEADER\_CHECKED(flags)**  
For `WOLFSENTRY_THREADSAFE` applications, checks if thread context initialization succeeded, and returns on failure.
- **#define WOLFSENTRY\_THREAD\_TAILER(flags)**  
For `WOLFSENTRY_THREADSAFE` applications, this allocates the required thread context on the stack, and initializes it with options from its `wolfentry_thread_flags_t flags` arg, returning on failure.
- **#define WOLFSENTRY\_THREAD\_TAILER\_CHECKED(flags)**  
For `WOLFSENTRY_THREADSAFE` applications, this cleans up a thread context allocated with `WOLFSENTRY_THREAD_HEADER*`, with options from its `wolfentry_thread_flags_t flags` arg, returning on error.
- **#define WOLFSENTRY\_THREAD\_GET\_ERROR**  
For `WOLFSENTRY_THREADSAFE` applications, this evaluates to the most recent result from `WOLFSENTRY_THREAD_HEADER_INIT` or `WOLFSENTRY_THREAD_TAILER()`
- **#define WOLFSENTRY\_DEADLINE\_NEVER (-1)**  
Value returned in `deadline->tv_sec` and `deadline->tv_nsec` by `wolfentry_get_thread_deadline()` when thread has no deadline set. Not allowed as explicit values passed to `wolfentry_set_deadline_abs()` – use `wolfentry_clear_deadline()` to clear any deadline. Can be overridden with user settings.

- #define **WOLFSENTRY\_DEADLINE\_NOW** (-2)  
*Value returned in `deadline->tv_sec` and `deadline->tv_nsec` by `wolfentry_get_thread_deadline()` when `thread` is in non-blocking mode. Not allowed as explicit values passed to `wolfentry_set_deadline_abs()` – use `wolfentry_set_deadline_rel_usecs(WOLFSENTRY_CONTEXT_ARGS_OUT, 0)` to put thread in non-blocking mode. Can be overridden with user settings.*
- #define **WOLFSENTRY\_THREAD\_NO\_ID** 0
- #define **WOLFSENTRY\_THREAD\_CONTEXT\_PUBLIC\_INITIALIZER** {0}

## Enumerations

- enum `wolfentry_thread_flags_t` {  
**WOLFSENTRY\_THREAD\_FLAG\_NONE** ,  
**WOLFSENTRY\_THREAD\_FLAG\_DEADLINE** ,  
**WOLFSENTRY\_THREAD\_FLAG\_READONLY** }  
*`wolfentry_thread_flags_t` flags are to be ORed together.*
- enum `wolfentry_lock_flags_t` {  
**WOLFSENTRY\_LOCK\_FLAG\_NONE** ,  
**WOLFSENTRY\_LOCK\_FLAG\_PSHARED** ,  
**WOLFSENTRY\_LOCK\_FLAG\_SHARED\_ERROR\_CHECKING** ,  
**WOLFSENTRY\_LOCK\_FLAG\_NONRECURSIVE\_MUTEX** ,  
**WOLFSENTRY\_LOCK\_FLAG\_NONRECURSIVE\_SHARED** ,  
**WOLFSENTRY\_LOCK\_FLAG\_GET\_RESERVATION\_TOO** ,  
**WOLFSENTRY\_LOCK\_FLAG\_TRY\_RESERVATION\_TOO** ,  
**WOLFSENTRY\_LOCK\_FLAG\_ABANDON\_RESERVATION\_TOO** ,  
**WOLFSENTRY\_LOCK\_FLAG\_AUTO\_DOWNGRADE** ,  
**WOLFSENTRY\_LOCK\_FLAG\_RETAIN\_SEMAPHORE** }  
*flags to pass to `wolfentry_lock_*()` functions, to be ORd together*

## Functions

- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_init_thread_context` (struct `wolfentry_thread_↔`  
context \*thread\_context, `wolfentry_thread_flags_t` init\_thread\_flags, void \*user\_context)  
*Initialize `thread_context` according to `init_thread_flags`, storing `user_context` for later retrieval with `wolfentry_get_thread_user_context()`.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_alloc_thread_context` (struct `wolfentry_host_platform_interface`  
\*hpi, struct `wolfentry_thread_context` \*\*thread\_context, `wolfentry_thread_flags_t` init\_thread\_flags, void  
\*user\_context)  
*Allocate space for `thread_context` using the allocator in `hpi`, then call `wolfentry_init_thread_context()`.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_get_thread_id` (struct `wolfentry_thread_context`  
\*thread, `wolfentry_thread_id_t` \*id)  
*Write the `wolfentry_thread_id_t` of `thread` to `id`.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_get_thread_user_context` (struct `wolfentry_↔`  
thread\_context \*thread, void \*\*user\_context)  
*Store to `user_context` the pointer previously passed to `wolfentry_init_thread_context()`.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_get_thread_deadline` (struct `wolfentry_thread_↔`  
context \*thread, struct `timespec` \*deadline)  
*Store the deadline for `thread` to `deadline`, or if the thread has no deadline set, store `WOLFSENTRY_DEADLINE_NEVER`  
to `deadline->tv_sec` and `deadline->tv_nsec`.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_get_thread_flags` (struct `wolfentry_thread_context`  
\*thread, `wolfentry_thread_flags_t` \*thread\_flags)  
*Store the flags of `thread` to `thread_flags`.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_destroy_thread_context` (struct `wolfentry_thread_↔`  
\_context \*thread\_context, `wolfentry_thread_flags_t` thread\_flags)

*Perform final integrity checking on the thread state, and deallocate its ID.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_free\\_thread\\_context](#) (struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi, struct [wolfentry\\_thread\\_context](#) \*\*thread\_context, [wolfentry\\_thread\\_flags\\_t](#) thread\_flags)  
*Call [wolfentry\\_destroy\\_thread\\_context\(\)](#) on \*thread\_context, and if that succeeds, deallocate the thread object previously allocated by [wolfentry\\_alloc\\_thread\\_context\(\)](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_set\\_deadline\\_rel\\_usecs](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, int usecs)  
*Set the thread deadline to usecs in the future. The thread will not wait for a lock beyond that deadline.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_set\\_deadline\\_abs](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, time\_t epoch\_secs, long epoch\_nsecs)  
*Set the thread deadline to the time identified by epoch\_secs and epoch\_nsecs. The thread will not wait for a lock beyond that deadline.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_clear\\_deadline](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Clear any thread deadline previously set. On time-unbounded calls such as [wolfentry\\_lock\\_shared\(\)](#) and [wolfentry\\_lock\\_mutex\(\)](#), the thread will sleep until the lock is available.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_set\\_thread\\_readonly](#) (struct [wolfentry\\_thread\\_context](#) \*thread\_context)  
*Set the thread state to allow only readonly locks to be gotten, allowing multiple shared locks to be concurrently held. If any mutexes or reservations are currently held, the call will fail.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_set\\_thread\\_readwrite](#) (struct [wolfentry\\_thread\\_context](#) \*thread\_context)  
*Set the thread state to allow both readonly and mutex locks to be gotten. If multiple shared locks are currently held, the call will fail.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_init](#) (struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi, struct [wolfentry\\_thread\\_context](#) \*thread, struct [wolfentry\\_rwlock](#) \*lock, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*This initializes a semaphore lock structure created by the user.*
- WOLFSENTRY\_API size\_t [wolfentry\\_lock\\_size](#) (void)
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_alloc](#) (struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi, struct [wolfentry\\_thread\\_context](#) \*thread, struct [wolfentry\\_rwlock](#) \*\*lock, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Allocates and initializes a semaphore lock structure for use with wolfSentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Requests a shared lock.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared\\_abstimed](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, const struct [timespec](#) \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Requests a shared lock with an absolute timeout.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared\\_timed](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Requests a shared lock with a relative timeout.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_mutex](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Requests an exclusive lock.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_mutex\\_abstimed](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, const struct [timespec](#) \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Requests an exclusive lock with an absolute timeout.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_mutex\\_timed](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Requests an exclusive lock with a relative timeout.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_mutex2shared](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*Downgrade an exclusive lock to a shared lock.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex](#) (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Upgrade a shared lock to an exclusive lock.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex\\_abstimed](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, const struct timespec \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Attempt to upgrade a shared lock to an exclusive lock with an absolute timeout.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex\\_timed](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Attempt to upgrade a shared lock to an exclusive lock with a relative timeout.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex\\_reserve](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Attempt to reserve a upgrade of a shared lock to an exclusive lock.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex\\_redeem](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Redeem a reservation of a lock upgrade from shared to exclusive.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex\\_redeem\\_abstimed](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, const struct timespec \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Redeem a reservation of a lock upgrade from shared to exclusive with an absolute timeout.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex\\_redeem\\_timed](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Redeem a reservation of a lock upgrade from shared to exclusive with a relative timeout.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_shared2mutex\\_abandon](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Abandon a reservation of a lock upgrade from shared to exclusive.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_have\\_shared](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Check if the lock is held in shared state.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_have\\_mutex](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Check if the lock is held in exclusive state.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_have\\_either](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Check if the lock is held in either shared or exclusive state.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_have\\_shared2mutex\\_reservation](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Check if an upgrade reservation is held on the lock.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_get\\_flags](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) \*flags)

*Extract the current flags from the lock.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_unlock](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Unlock a lock.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_destroy](#) (struct wolfentry\_rwlock \*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Destroy a lock that was created with [wolfentry\\_lock\\_init\(\)](#)*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_lock\\_free](#) (struct wolfentry\_rwlock \*\*lock, struct wolfentry\_thread\_context \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Destroy and free a lock that was created with [wolfentry\\_lock\\_alloc\(\)](#). The lock's pointer will also be set to NULL.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_context\\_lock\\_mutex](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#))

*Calls [wolfentry\\_lock\\_mutex\(\)](#) on the context.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_context\\_lock\\_mutex\\_abstimed](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const struct timespec \*abs\_timeout)

- Calls `wolfentry_lock_mutex_abstimed()` on the context.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_mutex_abstimed_ex` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `const struct timespec *abs_timeout`, `wolfentry_lock_flags_t flags`)  
*variant of `wolfentry_context_lock_mutex_abstimed()` with a `flags` arg.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_mutex_timed` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `wolfentry_time_t max_wait`)  
*Calls `wolfentry_lock_mutex_timed()` on the context.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_mutex_timed_ex` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `wolfentry_time_t max_wait`, `wolfentry_lock_flags_t flags`)  
*variant of `wolfentry_context_lock_mutex_timed()` with a `flags` arg.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_shared` (`WOLFSENTRY_CONTEXT_ARGS_IN`)  
*Calls `wolfentry_lock_shared()` on the context.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_shared_abstimed` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `const struct timespec *abs_timeout`)  
*Calls `wolfentry_lock_shared_abstimed()` on the context.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_shared_with_reservation_abstimed` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `const struct timespec *abs_timeout`)  
*Calls `wolfentry_lock_shared_abstimed()` on the context, with the `WOLFSENTRY_LOCK_FLAG_GET_RESERVATION_TOO` flag.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_shared_timed` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `wolfentry_time_t max_wait`)  
*Calls `wolfentry_lock_shared_timed()` on the context.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_lock_shared_with_reservation_timed` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `wolfentry_time_t max_wait`)  
*Calls `wolfentry_lock_shared_timed()` on the context, with the `WOLFSENTRY_LOCK_FLAG_GET_RESERVATION_TOO` flag.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_unlock` (`WOLFSENTRY_CONTEXT_ARGS_IN`)  
*Calls `wolfentry_lock_unlock()` on the context.*
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_context_unlock_and_abandon_reservation` (`WOLFSENTRY_CONTEXT_ARGS_IN`)  
*Calls `wolfentry_lock_unlock()` on the context, with the `WOLFSENTRY_LOCK_FLAG_ABANDON_RESERVATION_TOO` flag.*

### 8.10.1 Detailed Description

### 8.10.2 Macro Definition Documentation

#### 8.10.2.1 WOLFSENTRY\_THREAD\_HEADER

```
#define WOLFSENTRY_THREAD_HEADER(  
    flags )
```

For WOLFSENTRY\_THREADSafe applications, this performs the required thread context initialization, with options from its `wolfentry_thread_flags_t flags` arg, and returns on failure.

<

#### 8.10.2.2 WOLFSENTRY\_THREAD\_HEADER\_CHECK

```
#define WOLFSENTRY_THREAD_HEADER_CHECK( )
```

For WOLFSENTRY\_THREADSafe applications, this allocates the required thread context on the stack, and initializes it with options from its `wolfentry_thread_flags_t flags` arg.

<

### 8.10.2.3 WOLFSENTRY\_THREAD\_HEADER\_CHECKED

```
#define WOLFSENTRY_THREAD_HEADER_CHECKED(  
    flags )
```

For WOLFSENTRY\_THREADSafe applications, checks if thread context initialization succeeded, and returns on failure.

<

### 8.10.2.4 WOLFSENTRY\_THREAD\_HEADER\_DECLS

```
#define WOLFSENTRY_THREAD_HEADER_DECLS
```

**Value:**

```
struct wolfentry_thread_context_public thread_buffer =  
    WOLFSENTRY_THREAD_CONTEXT_PUBLIC_INITIALIZER;  
struct wolfentry_thread_context *thread =  
    (struct wolfentry_thread_context *)&thread_buffer;  
wolfentry_errcode_t _thread_context_ret;
```

### 8.10.2.5 WOLFSENTRY\_THREAD\_HEADER\_INIT

```
#define WOLFSENTRY_THREAD_HEADER_INIT(  
    flags )
```

For WOLFSENTRY\_THREADSafe applications, this allocates the required thread context on the stack.

<

### 8.10.2.6 WOLFSENTRY\_THREAD\_HEADER\_INIT\_CHECKED

```
#define WOLFSENTRY_THREAD_HEADER_INIT_CHECKED(  
    flags )
```

For WOLFSENTRY\_THREADSafe applications, this performs the required thread context initialization, with options from its `wolfentry_thread_flags_t` flags arg.

<

### 8.10.2.7 WOLFSENTRY\_THREAD\_TAILER

```
#define WOLFSENTRY_THREAD_TAILER(  
    flags )
```

For WOLFSENTRY\_THREADSafe applications, this allocates the required thread context on the stack, and initializes it with options from its `wolfentry_thread_flags_t` flags arg, returning on failure.

<

For WOLFSENTRY\_THREADSafe applications, this cleans up a thread context allocated with WOLFSENTRY\_THREAD\_HEADER\*, with options from its `wolfentry_thread_flags_t` flags arg, storing the result.

## 8.10.3 Enumeration Type Documentation

### 8.10.3.1 wolfentry\_lock\_flags\_t

```
enum wolfentry_lock_flags_t
```

flags to pass to `wolfentry_lock_*`() functions, to be OR'd together



## Enumerator

WOLFSENTRY_LOCK_FLAG_NONE	Default lock behavior.
WOLFSENTRY_LOCK_FLAG_PSHARED	Initialize lock to be shared between processes (currently not used, only allowed by <a href="#">wolfentry_lock_init()</a> , and only functional on POSIX targets)
WOLFSENTRY_LOCK_FLAG_SHARED_ERROR↔ _CHECKING	Enables supplementary error checking on shared lock usage (not currently implemented)
WOLFSENTRY_LOCK_FLAG_NONRECURSIVE↔ MUTEX	Don't allow recursive mutex locking in this call.
WOLFSENTRY_LOCK_FLAG_NONRECURSIVE↔ SHARED	Don't allow recursive shared locking in this call.
WOLFSENTRY_LOCK_FLAG_GET↔ RESERVATION_TOO	If a shared lock is gotten in this call, require that a mutex upgrade reservation also be gotten.
WOLFSENTRY_LOCK_FLAG_TRY↔ RESERVATION_TOO	If a shared lock is gotten in this call, try to get a mutex upgrade reservation too.
WOLFSENTRY_LOCK_FLAG_ABANDON↔ RESERVATION_TOO	In a call to <a href="#">wolfentry_lock_unlock()</a> , if a shared lock is released and a mutex upgrade reservation is held, drop it too.
WOLFSENTRY_LOCK_FLAG_AUTO_DOWNGRADE	In a call to <a href="#">wolfentry_lock_unlock()</a> , if a held mutex was previously gotten by an upgrade, and this release will restore the recursion depth at which the upgrade was gotten, downgrade to a shared lock.
WOLFSENTRY_LOCK_FLAG_RETAIN↔ SEMAPHORE	For use in an interrupt handler: get an async-signal-safe mutex on the lock. Implicitly has <code>try</code> dynamics (immediate return).

## 8.10.3.2 wolfentry\_thread\_flags\_t

```
enum wolfentry_thread_flags_t
```

wolfentry\_thread\_flags\_t flags are to be ORed together.

## Enumerator

WOLFSENTRY_THREAD_FLAG_NONE	Default and normal thread state.
WOLFSENTRY_THREAD_FLAG_DEADLINE	This thread currently has a deadline associated with it, and will not wait for a lock beyond that deadline.
WOLFSENTRY_THREAD_FLAG_READONLY	This thread can only get and hold shared locks.

## 8.10.4 Function Documentation

## 8.10.4.1 wolfentry\_lock\_alloc()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_alloc (
    struct wolfentry_host_platform_interface * hpi,
    struct wolfentry_thread_context * thread,
```

```
struct wolfsentry_rwlock ** lock,  
    wolfsentry_lock_flags_t flags )
```

Allocates and initializes a semaphore lock structure for use with wolfSentry.



## Parameters

<i>hpi</i>	the <a href="#">wolfentry_host_platform_interface</a>
<i>thread</i>	pointer to the <a href="#">wolfentry_thread_context</a>
<i>lock</i>	a pointer to a pointer to a lock structure to be allocated and initialized
<i>flags</i>	the initial <a href="#">wolfentry_lock_flags_t</a>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[wolfentry\\_lock\\_init](#)

[wolfentry\\_lock\\_free](#)

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE\(\)](#)

8.10.4.2 [wolfentry\\_lock\\_destroy\(\)](#)

```
WOLFENTRY_API wolfentry\_errcode\_t wolfentry_lock_destroy (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry\_lock\_flags\_t flags )
```

Destroy a lock that was created with [wolfentry\\_lock\\_init\(\)](#)

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <a href="#">wolfentry_thread_context</a>
<i>flags</i>	optional <a href="#">wolfentry_lock_flags_t</a>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[wolfentry\\_lock\\_init](#)

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

8.10.4.3 [wolfentry\\_lock\\_free\(\)](#)

```
WOLFENTRY_API wolfentry\_errcode\_t wolfentry_lock_free (
    struct wolfentry_rwlock ** lock,
    struct wolfentry_thread_context * thread,
    wolfentry\_lock\_flags\_t flags )
```

Destroy and free a lock that was created with [wolfentry\\_lock\\_alloc\(\)](#). The lock's pointer will also be set to NULL.

## Parameters

<i>lock</i>	a pointer to a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

## See also

[wolfentry\\_lock\\_alloc](#)

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

#### 8.10.4.4 `wolfentry_lock_get_flags()`

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_get_flags (  
    struct wolfentry_rwlock * lock,  
    struct wolfentry_thread_context * thread,  
    wolfentry_lock_flags_t * flags )
```

Extract the current flags from the lock.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

#### 8.10.4.5 `wolfentry_lock_have_either()`

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_have_either (  
    struct wolfentry_rwlock * lock,  
    struct wolfentry_thread_context * thread,  
    wolfentry_lock_flags_t flags )
```

Check if the lock is held in either shared or exclusive state.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

When decoded using `WOLFENTRY_ERROR_DECODE_ERROR_CODE()`, `WOLFENTRY_SUCCESS_ID_HAVE_MUTEX` if it is a held mutex lock, `WOLFENTRY_SUCCESS_ID_HAVE_READ_LOCK` if it is a held shared lock, `WOLFENTRY_ERROR_ID_LACKING_READ_LOCK` if the lock is valid but not held by the designated thread, or `WOLFENTRY_ERROR_ID_INVALID_ARG` if the lock is not properly initialized.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

8.10.4.6 `wolfentry_lock_have_mutex()`

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_have_mutex (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Check if the lock is held in exclusive state.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

When decoded using `WOLFENTRY_ERROR_DECODE_ERROR_CODE()`, `WOLFENTRY_SUCCESS_ID_HAVE_MUTEX` if it is a held mutex lock, `WOLFENTRY_ERROR_ID_LACKING_MUTEX` if the lock is not in mutex state, `WOLFENTRY_ERROR_ID_NOT_PERMITTED` if the mutex is held by another thread, or `WOLFENTRY_ERROR_ID_INVALID_ARG` if the lock is not properly initialized.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

8.10.4.7 `wolfentry_lock_have_shared()`

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_have_shared (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Check if the lock is held in shared state.

**Parameters**

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

**Returns**

When decoded using [WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE\(\)](#), `WOLFENTRY_SUCCESS_ID_HAVE_READ_LOCK` if it is a held shared lock, `WOLFENTRY_ERROR_ID_LACKING_READ_LOCK` if the lock is valid but not held by the designated thread, or `WOLFENTRY_ERROR_ID_INVALID_ARG` if the lock is not properly initialized.

**See also**

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.8 wolfentry\_lock\_have\_shared2mutex\_reservation()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_have_shared2mutex_reservation (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Check if an upgrade reservation is held on the lock.

**Parameters**

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

**Returns**

When decoded using [WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE\(\)](#), `WOLFENTRY_ERROR_ID_OK` if it is shared lock. Or `WOLFENTRY_ERROR_ID_NOT_OK` if it is not a shared lock.

**See also**

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.9 wolfentry\_lock\_init()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_init (
    struct wolfentry_host_platform_interface * hpi,
    struct wolfentry_thread_context * thread,
    struct wolfentry_rwlock * lock,
    wolfentry_lock_flags_t flags )
```

This initializes a semaphore lock structure created by the user.

## Parameters

<i>hpi</i>	the <a href="#">wolfentry_host_platform_interface</a>
<i>thread</i>	pointer to the <a href="#">wolfentry_thread_context</a>
<i>lock</i>	a pointer to a lock structure to be initialized
<i>flags</i>	the initial <a href="#">wolfentry_lock_flags_t</a>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[wolfentry\\_lock\\_alloc](#)

[wolfentry\\_lock\\_destroy](#)

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.10 wolfentry\_lock\_mutex()**

```
WOLFENTRY_API wolfentry\_errcode\_t wolfentry_lock_mutex (  
    struct wolfentry_rwlock * lock,  
    struct wolfentry_thread_context * thread,  
    wolfentry\_lock\_flags\_t flags )
```

Requests an exclusive lock.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <a href="#">wolfentry_thread_context</a>
<i>flags</i>	optional <a href="#">wolfentry_lock_flags_t</a>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.11 wolfentry\_lock\_mutex2shared()**

```
WOLFENTRY_API wolfentry\_errcode\_t wolfentry_lock_mutex2shared (  
    struct wolfentry_rwlock * lock,  
    struct wolfentry_thread_context * thread,  
    wolfentry\_lock\_flags\_t flags )
```

Downgrade an exclusive lock to a shared lock.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.12 wolfentry\_lock\_mutex\_abstimed()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_mutex_abstimed (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    const struct timespec * abs_timeout,
    wolfentry_lock_flags_t flags )
```

Requests an exclusive lock with an absolute timeout.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>abs_timeout</i>	the absolute timeout for the lock
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.13 wolfentry\_lock\_mutex\_timed()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_mutex_timed (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_time_t max_wait,
    wolfentry_lock_flags_t flags )
```

Requests an exclusive lock with a relative timeout.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>max_wait</i>	how long to wait for the timeout
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.14 wolfentry\_lock\_shared()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Requests a shared lock.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.15 wolfentry\_lock\_shared2mutex()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Upgrade a shared lock to an exclusive lock.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

#### 8.10.4.16 `wolfentry_lock_shared2mutex_abandon()`

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_abandon (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Abandon a reservation of a lock upgrade from shared to exclusive.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

#### 8.10.4.17 `wolfentry_lock_shared2mutex_abstimed()`

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_abstimed (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    const struct timespec * abs_timeout,
    wolfentry_lock_flags_t flags )
```

Attempt to upgrade a shared lock to an exclusive lock with an absolute timeout.



## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>abs_timeout</i>	the absolute timeout for the lock
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

## See also

`WOLFENTRY_ERROR_DECODE_ERROR_CODE`

**8.10.4.18 wolfentry\_lock\_shared2mutex\_redeem()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_redeem (  
    struct wolfentry_rwlock * lock,  
    struct wolfentry_thread_context * thread,  
    wolfentry_lock_flags_t flags )
```

Redeem a reservation of a lock upgrade from shared to exclusive.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

`WOLFENTRY_IS_SUCCESS(ret)` is true on success.

## See also

`WOLFENTRY_ERROR_DECODE_ERROR_CODE`

**8.10.4.19 wolfentry\_lock\_shared2mutex\_redeem\_abstimed()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_redeem_abstimed (  
    struct wolfentry_rwlock * lock,  
    struct wolfentry_thread_context * thread,  
    const struct timespec * abs_timeout,  
    wolfentry_lock_flags_t flags )
```

Redeem a reservation of a lock upgrade from shared to exclusive with an absolute timeout.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>abs_timeout</i>	the absolute timeout for the lock
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.20 wolfentry\_lock\_shared2mutex\_redeem\_timed()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_redeem_timed (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_time_t max_wait,
    wolfentry_lock_flags_t flags )
```

Redeem a reservation of a lock upgrade from shared to exclusive with a relative timeout.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>max_wait</i>	how long to wait for the timeout
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.21 wolfentry\_lock\_shared2mutex\_reserve()**

```
WOLFENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_reserve (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Attempt to reserve a upgrade of a shared lock to an exclusive lock.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[wolfentry\\_lock\\_shared2mutex\\_redeem](#)  
[wolfentry\\_lock\\_shared2mutex\\_redeem\\_abstimed](#)  
[wolfentry\\_lock\\_shared2mutex\\_redeem\\_timed](#)  
[wolfentry\\_lock\\_shared2mutex\\_abandon](#)  
[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.22 wolfentry\_lock\_shared2mutex\_timed()**

```
WOLFENTRY_API wolfentry\_errcode\_t wolfentry_lock_shared2mutex_timed (  
    struct wolfentry_rwlock * lock,  
    struct wolfentry_thread_context * thread,  
    wolfentry\_time\_t max_wait,  
    wolfentry\_lock\_flags\_t flags )
```

Attempt to upgrade a shared lock to an exclusive lock with a relative timeout.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfentry_thread_context</code>
<i>max_wait</i>	how long to wait for the timeout
<i>flags</i>	optional <code>wolfentry_lock_flags_t</code>

## Returns

[WOLFENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

**8.10.4.23 wolfentry\_lock\_shared\_abstimed()**

```
WOLFENTRY_API wolfentry\_errcode\_t wolfentry_lock_shared_abstimed (  
    struct wolfentry_rwlock * lock,
```

```
struct wolfsentry_thread_context * thread,  
const struct timespec * abs_timeout,  
wolfsentry_lock_flags_t flags )
```

Requests a shared lock with an absolute timeout.

#### Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfsentry_thread_context</code>
<i>abs_timeout</i>	the absolute timeout for the lock
<i>flags</i>	optional <code>wolfsentry_lock_flags_t</code>

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

#### 8.10.4.24 `wolfsentry_lock_shared_timed()`

```
WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_lock_shared_timed (  
    struct wolfsentry_rwlock * lock,  
    struct wolfsentry_thread_context * thread,  
    wolfsentry_time_t max_wait,  
    wolfsentry_lock_flags_t flags )
```

Requests a shared lock with a relative timeout.

#### Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the <code>wolfsentry_thread_context</code>
<i>max_wait</i>	how long to wait for the timeout
<i>flags</i>	optional <code>wolfsentry_lock_flags_t</code>

#### Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

#### See also

[WOLFSENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

## 8.10.4.25 wolfentry\_lock\_unlock()

```
WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_unlock (
    struct wolfentry_rwlock * lock,
    struct wolfentry_thread_context * thread,
    wolfentry_lock_flags_t flags )
```

Unlock a lock.

## Parameters

<i>lock</i>	a pointer to the lock
<i>thread</i>	pointer to the wolfentry_thread_context
<i>flags</i>	optional wolfentry_lock_flags_t

## Returns

[WOLFSENTRY\\_IS\\_SUCCESS\(ret\)](#) is true on success.

## See also

[WOLFSENTRY\\_ERROR\\_DECODE\\_ERROR\\_CODE](#)

## 8.11 Allocator (Heap) Functions and Callbacks

## Data Structures

- struct [wolfentry\\_allocator](#)  
Struct for passing shims that abstract the native implementation of the heap allocator.

## Typedefs

- typedef void \*(\* [wolfentry\\_malloc\\_cb\\_t](#)) (void \*context, struct wolfentry\_thread\_context \*thread, size\_t size)  
*Pointer to malloc-like function. Takes extra initial args context and, if !defined(WOLFSENTRY\_SINGLETHREADED), thread arg.*
- typedef void \*(\* [wolfentry\\_free\\_cb\\_t](#)) (void \*context, struct wolfentry\_thread\_context \*thread, void \*ptr)  
*Pointer to free-like function. Takes extra initial args context and, if !defined(WOLFSENTRY\_SINGLETHREADED), thread arg.*
- typedef void \*(\* [wolfentry\\_realloc\\_cb\\_t](#)) (void \*context, struct wolfentry\_thread\_context \*thread, void \*ptr, size\_t size)  
*Pointer to realloc-like function. Takes extra initial args context and, if !defined(WOLFSENTRY\_SINGLETHREADED), thread arg.*
- typedef void \*(\* [wolfentry\\_memalign\\_cb\\_t](#)) (void \*context, struct wolfentry\_thread\_context \*thread, size\_t alignment, size\_t size)  
*Pointer to memalign-like function. Takes extra initial args context and, if !defined(WOLFSENTRY\_SINGLETHREADED), thread arg.*
- typedef void \*(\* [wolfentry\\_free\\_aligned\\_cb\\_t](#)) (void \*context, struct wolfentry\_thread\_context \*thread, void \*ptr)  
*Pointer to special-purpose free-like function, needed only if the memalign pointer in a struct [wolfentry\\_allocator](#) is non-null. Can be same as routine supplied as wolfentry\_free\_cb\_t, or can be a separate routine, e.g. with special handling for pad bytes. Takes extra initial args context and, if !defined(WOLFSENTRY\_SINGLETHREADED), thread arg.*

## Functions

- WOLFSENTRY\_API void \* **wolfentry\_malloc** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, size\_t size)  
*Allocate size bytes using the malloc configured in the wolfSentry context.*
- WOLFSENTRY\_API\_VOID **wolfentry\_free** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*ptr)  
*Free ptr using the free configured in the wolfSentry context.*
- WOLFSENTRY\_API void \* **wolfentry\_realloc** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*ptr, size\_t size)  
*Reallocate ptr to size bytes using the realloc configured in the wolfSentry context.*
- WOLFSENTRY\_API void \* **wolfentry\_memalign** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, size\_t alignment, size\_t size)  
*Allocate size bytes, aligned to alignment, using the memalign configured in the wolfSentry context.*
- WOLFSENTRY\_API\_VOID **wolfentry\_free\_aligned** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*ptr)  
*Free ptr, previously allocated with wolfentry\_memalign(), using the free\_aligned configured in the wolfSentry context.*
- WOLFSENTRY\_API int **\_wolfentry\_get\_n\_mallocs** (void)  
*In library builds with WOLFSENTRY\_MALLOC\_BUILTINS and WOLFSENTRY\_MALLOC\_DEBUG defined, this returns the net number of allocations performed as of time of call. I.e., it returns zero iff all allocations have been freed.*
- WOLFSENTRY\_API struct **wolfentry\_allocator** \* **wolfentry\_get\_allocator** (struct wolfentry\_context \*wolfentry)  
*Return a pointer to the wolfentry\_allocator associated with the supplied wolfentry\_context, mainly for passing to json\_init(), json\_parse(), json\_value\_\*(), and json\_dom\_\*().*

### 8.11.1 Detailed Description

## 8.12 Time Functions and Callbacks

### Data Structures

- struct **wolfentry\_timecbs**  
*Struct for passing shims that abstract the native implementation of time functions.*

### Typedefs

- typedef **wolfentry\_errcode\_t**(\* **wolfentry\_get\_time\_cb\_t**) (void \*context, **wolfentry\_time\_t** \*ts)  
*Pointer to function that returns time denominated in wolfentry\_time\_t. Takes an initial context arg, which can be ignored.*
- typedef **wolfentry\_time\_t**(\* **wolfentry\_diff\_time\_cb\_t**) (**wolfentry\_time\_t** earlier, **wolfentry\_time\_t** later)  
*Pointer to function that subtracts earlier from later, returning the result.*
- typedef **wolfentry\_time\_t**(\* **wolfentry\_add\_time\_cb\_t**) (**wolfentry\_time\_t** start\_time, **wolfentry\_time\_t** time\_interval)  
*Pointer to function that adds two wolfentry\_time\_t times, returning the result.*
- typedef **wolfentry\_errcode\_t**(\* **wolfentry\_to\_epoch\_time\_cb\_t**) (**wolfentry\_time\_t** when, time\_t \*epoch\_secs, long \*epoch\_nsecs)  
*Pointer to function that converts a wolfentry\_time\_t to seconds and nanoseconds since midnight UTC, 1970-Jan-1.*
- typedef **wolfentry\_errcode\_t**(\* **wolfentry\_from\_epoch\_time\_cb\_t**) (time\_t epoch\_secs, long epoch\_nsecs, **wolfentry\_time\_t** \*when)  
*Pointer to function that converts seconds and nanoseconds since midnight UTC, 1970-Jan-1, to a wolfentry\_time\_t.*

- typedef [wolfentry\\_errcode\\_t](#)(\* [wolfentry\\_interval\\_to\\_seconds\\_cb\\_t](#)) ([wolfentry\\_time\\_t](#) howlong, time\_t \*howlong\_secs, long \*howlong\_nsecs)  
*Pointer to function that converts a [wolfentry\\_time\\_t](#) expressing an interval to the corresponding seconds and nanoseconds.*
- typedef [wolfentry\\_errcode\\_t](#)(\* [wolfentry\\_interval\\_from\\_seconds\\_cb\\_t](#)) (time\_t howlong\_secs, long howlong\_nsecs, [wolfentry\\_time\\_t](#) \*howlong)  
*Pointer to function that converts seconds and nanoseconds expressing an interval to the corresponding [wolfentry\\_time\\_t](#).*

## Functions

- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_time\\_now\\_plus\\_delta](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) td, [wolfentry\\_time\\_t](#) \*res)  
*Generate a [wolfentry\\_time\\_t](#) at a given offset from current time.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_time\\_to\\_timespec](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) t, struct [timespec](#) \*ts)  
*Convert a [wolfentry\\_time\\_t](#) to a struct [timespec](#).*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_time\\_now\\_plus\\_delta\\_timespec](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) td, struct [timespec](#) \*ts)  
*Generate a struct [timespec](#) at a given offset, supplied as [wolfentry\\_time\\_t](#), from current time.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_get\\_time](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) \*time\_p)  
*Get current time as [wolfentry\\_time\\_t](#).*
- WOLFENTRY\_API [wolfentry\\_time\\_t](#) [wolfentry\\_diff\\_time](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) later, [wolfentry\\_time\\_t](#) earlier)  
*Compute the interval between *later* and *earlier*, using [wolfentry\\_time\\_t](#).*
- WOLFENTRY\_API [wolfentry\\_time\\_t](#) [wolfentry\\_add\\_time](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) start\_time, [wolfentry\\_time\\_t](#) time\_interval)  
*Compute the time *time\_interval* after *start\_time*, using [wolfentry\\_time\\_t](#).*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_to\\_epoch\\_time](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) when, time\_t \*epoch\_secs, long \*epoch\_nsecs)  
*Convert a [wolfentry\\_time\\_t](#) to seconds and nanoseconds since 1970-Jan-1 0:00 UTC.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_from\\_epoch\\_time](#) (struct [wolfentry\\_context](#) \*wolfentry, time\_t epoch\_secs, long epoch\_nsecs, [wolfentry\\_time\\_t](#) \*when)  
*Convert seconds and nanoseconds since 1970-Jan-1 0:00 UTC to a [wolfentry\\_time\\_t](#).*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_interval\\_to\\_seconds](#) (struct [wolfentry\\_context](#) \*wolfentry, [wolfentry\\_time\\_t](#) howlong, time\_t \*howlong\_secs, long \*howlong\_nsecs)  
*Convert an interval in [wolfentry\\_time\\_t](#) to seconds and nanoseconds.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_interval\\_from\\_seconds](#) (struct [wolfentry\\_context](#) \*wolfentry, time\_t howlong\_secs, long howlong\_nsecs, [wolfentry\\_time\\_t](#) \*howlong)  
*Convert an interval in seconds and nanoseconds to [wolfentry\\_time\\_t](#).*
- WOLFENTRY\_API struct [wolfentry\\_timecbs](#) \* [wolfentry\\_get\\_timecbs](#) (struct [wolfentry\\_context](#) \*wolfentry)  
*Return the active time handlers from the supplied context.*

## 8.12.1 Detailed Description

## 8.13 Semaphore Function Callbacks

### Data Structures

- struct [wolfentry\\_semcbs](#)  
*Struct for passing shims that abstract the native implementation of counting semaphores.*

## Typedefs

- typedef int(\* [sem\\_init\\_cb\\_t](#)) (sem\_t \*sem, int pshared, unsigned int value)
- typedef int(\* [sem\\_post\\_cb\\_t](#)) (sem\_t \*sem)
- typedef int(\* [sem\\_wait\\_cb\\_t](#)) (sem\_t \*sem)
- typedef int(\* [sem\\_timedwait\\_cb\\_t](#)) (sem\_t \*sem, const struct timespec \*abs\_timeout)
- typedef int(\* [sem\\_trywait\\_cb\\_t](#)) (sem\_t \*sem)
- typedef int(\* [sem\\_destroy\\_cb\\_t](#)) (sem\_t \*sem)

### 8.13.1 Detailed Description

### 8.13.2 Typedef Documentation

#### 8.13.2.1 sem\_destroy\_cb\_t

```
typedef int(* sem_destroy_cb_t) (sem_t *sem)
```

Pointer to function with arguments and semantics of POSIX `sem_destroy()`

#### 8.13.2.2 sem\_init\_cb\_t

```
typedef int(* sem_init_cb_t) (sem_t *sem, int pshared, unsigned int value)
```

Pointer to function with arguments and semantics of POSIX `sem_init()`. Currently, `pshared` and `value` are always zero as called by `wolfSentry`, so implementations can ignore them.

#### 8.13.2.3 sem\_post\_cb\_t

```
typedef int(* sem_post_cb_t) (sem_t *sem)
```

Pointer to function with arguments and semantics of POSIX `sem_post()`

#### 8.13.2.4 sem\_timedwait\_cb\_t

```
typedef int(* sem_timedwait_cb_t) (sem_t *sem, const struct timespec *abs_timeout)
```

Pointer to function with arguments and semantics of POSIX `sem_timedwait()`

#### 8.13.2.5 sem\_trywait\_cb\_t

```
typedef int(* sem_trywait_cb_t) (sem_t *sem)
```

Pointer to function with arguments and semantics of POSIX `sem_trywait()`



## 8.13.2.6 sem\_wait\_cb\_t

```
typedef int (* sem_wait_cb_t) (sem_t *sem)
```

Pointer to function with arguments and semantics of POSIX `sem_wait()`

## 8.14 lwIP Callback Activation Functions

## Functions

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_install\_lwip\_filter\_ethernet\_callback** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) ethernet\_mask)  
*Install wolfSentry callbacks into lwIP for ethernet (layer 2) filtering.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_install\_lwip\_filter\_ip\_callbacks** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) ip\_mask)  
*Install wolfSentry callbacks into lwIP for IPv4/IPv6 (layer 3) filtering.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_install\_lwip\_filter\_icmp\_callbacks** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) icmp\_mask)  
*Install wolfSentry callbacks into lwIP for ICMP filtering.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_install\_lwip\_filter\_tcp\_callback** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) tcp\_mask)  
*Install wolfSentry callbacks into lwIP for TCP (layer 4) filtering.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_install\_lwip\_filter\_udp\_callback** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) udp\_mask)  
*Install wolfSentry callbacks into lwIP for UDP (layer 4) filtering.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_install\_lwip\_filter\_callbacks** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) ethernet\_mask, [packet\\_filter\\_event\\_mask\\_t](#) ip\_mask, [packet\\_filter\\_event\\_mask\\_t](#) icmp\_mask, [packet\\_filter\\_event\\_mask\\_t](#) tcp\_mask, [packet\\_filter\\_event\\_mask\\_t](#) udp\_mask)  
*Install wolfSentry callbacks for all layers/protocols enabled by the supplied masks.*
- [WOLFSENTRY\\_API\\_VOID](#) **wolfentry\_cleanup\_lwip\_filter\_callbacks** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*arg)  
*Disables any wolfSentry callbacks previously installed in lwIP.*

## 8.14.1 Detailed Description



## Chapter 9

# Data Structure Documentation

### 9.1 JSON\_CALLBACKS Struct Reference

#### Data Fields

- `int(* process)(JSON_TYPE, const unsigned char *, size_t, void *)`

### 9.2 JSON\_CONFIG Struct Reference

#### Data Fields

- `size_t max_total_len`
- `size_t max_total_values`
- `size_t max_number_len`
- `size_t max_string_len`
- `size_t max_key_len`
- `unsigned max_nesting_level`
- `unsigned flags`

### 9.3 JSON\_DOM\_PARSER Struct Reference

#### Data Fields

- [JSON\\_PARSER](#) `parser`
- [JSON\\_VALUE](#) `** path`
- `size_t path_size`
- `size_t path_alloc`
- [JSON\\_VALUE](#) `root`
- [JSON\\_VALUE](#) `key`
- `unsigned flags`
- `unsigned dict_flags`

## 9.4 JSON\_INPUT\_POS Struct Reference

### Data Fields

- `size_t offset`
- unsigned `line_number`
- unsigned `column_number`

## 9.5 JSON\_PARSER Struct Reference

### Public Types

- enum {  
    **AUTOMATON\_MAIN** = 0 ,  
    **AUTOMATON\_NULL** = 1 ,  
    **AUTOMATON\_FALSE** = 2 ,  
    **AUTOMATON\_TRUE** = 3 ,  
    **AUTOMATON\_NUMBER** = 4 ,  
    **AUTOMATON\_STRING** = 6 ,  
    **AUTOMATON\_KEY** = 7 }

### Data Fields

- [JSON\\_CALLBACKS](#) `callbacks`
- [JSON\\_CONFIG](#) `config`
- `void * user_data`
- [JSON\\_INPUT\\_POS](#) `pos`
- [JSON\\_INPUT\\_POS](#) `value_pos`
- [JSON\\_INPUT\\_POS](#) `err_pos`
- `int errcode`
- `size_t value_counter`
- `unsigned char * nesting_stack`
- `size_t nesting_level`
- `size_t nesting_stack_size`
- enum `JSON_PARSER:: { ... } automaton`
- unsigned `state`
- unsigned `substate`
- `uint32_t codepoint [2]`
- `unsigned char * buf`
- `size_t buf_used`
- `size_t buf_allocated`
- `size_t last_cl_offset`

## 9.6 JSON\_VALUE Struct Reference

### Data Fields

- union {  
    `uint8_t data_bytes [16]`  
    `void * data_ptrs [16/sizeof(void *)]`  
} `data`

## 9.7 wolfentry\_allocator Struct Reference

Struct for passing shims that abstract the native implementation of the heap allocator.

```
#include <wolfentry.h>
```

### Data Fields

- void \* **context**  
*A user-supplied opaque handle to be passed as the first arg to all callbacks. Can be null.*
- [wolfentry\\_malloc\\_cb\\_t](#) **malloc**  
*Required pointer.*
- [wolfentry\\_free\\_cb\\_t](#) **free**  
*Required pointer.*
- [wolfentry\\_realloc\\_cb\\_t](#) **realloc**  
*Required pointer.*
- [wolfentry\\_memalign\\_cb\\_t](#) **memalign**  
*Optional pointer. Required only if a struct [wolfentry\\_eventconfig](#) is passed in (e.g. to [wolfentry\\_init\(\)](#)) with a nonzeroroute\_private\_data\_alignment`.*
- [wolfentry\\_free\\_aligned\\_cb\\_t](#) **free\_aligned**  
*Optional pointer. Required (and allowed) only if memalign pointer is non-null.*

### 9.7.1 Detailed Description

Struct for passing shims that abstract the native implementation of the heap allocator.

## 9.8 wolfentry\_build\_settings Struct Reference

struct for passing the build version and configuration

```
#include <wolfentry_settings.h>
```

### Data Fields

- uint32\_t [version](#)
- uint32\_t [config](#)

### 9.8.1 Detailed Description

struct for passing the build version and configuration

### 9.8.2 Field Documentation

#### 9.8.2.1 config

```
uint32_t wolfentry_build_settings::config
```

Must be initialized to [WOLFENTRY\\_CONFIG\\_SIGNATURE](#).

### 9.8.2.2 version

```
uint32_t wolfentry_build_settings::version
```

Must be initialized to [WOLFSENTRY\\_VERSION](#).

## 9.9 wolfentry\_data Struct Reference

### Public Member Functions

- [WOLFSENTRY\\_SOCKADDR](#) (128) remote
- [WOLFSENTRY\\_SOCKADDR](#) (128) local

### Data Fields

- [wolfentry\\_route\\_flags\\_t](#) flags
- void \* heap
- int alloctype

## 9.10 wolfentry\_eventconfig Struct Reference

struct for representing event configuration

```
#include <wolfentry.h>
```

### Data Fields

- [size\\_t](#) **route\_private\_data\_size**  
*bytes to allocate for private use for application data*
- [size\\_t](#) **route\_private\_data\_alignment**  
*alignment for private data allocation*
- [uint32\\_t](#) **max\_connection\_count**  
*If nonzero, the concurrent connection limit, beyond which additional connection requests are rejected.*
- [wolfentry\\_hitcount\\_t](#) **derogatory\_threshold\_for\_penaltybox**  
*If nonzero, the threshold at which accumulated derogatory counts (from [WOLFSENTRY\\_ACTION\\_RES\\_↔](#) [DEROGATORY](#) incidents) automatically penalty boxes a route.*
- [wolfentry\\_time\\_t](#) **penaltybox\_duration**  
*The duration that a route stays in penalty box status before automatic release. Zero means time-unbounded.*
- [wolfentry\\_time\\_t](#) **route\_idle\_time\_for\_purge**  
*The time after the most recent dispatch match for a route to be garbage-collected. Useful primarily in **config** clauses of events (see **events** below). Zero means no automatic purge.*
- [wolfentry\\_eventconfig\\_flags\\_t](#) **flags**  
*Config flags.*
- [wolfentry\\_route\\_flags\\_t](#) **route\_flags\_to\_add\_on\_insert**  
*List of route flags to set on new routes upon insertion.*
- [wolfentry\\_route\\_flags\\_t](#) **route\_flags\_to\_clear\_on\_insert**  
*List of route flags to clear on new routes upon insertion.*
- [wolfentry\\_action\\_res\\_t](#) **action\_res\_filter\_bits\_set**  
*List of result flags that must be set at lookup time (dispatch) for referring routes to match.*
- [wolfentry\\_action\\_res\\_t](#) **action\_res\_filter\_bits\_unset**  
*List of result flags that must be clear at lookup time (dispatch) for referring routes to match.*
- [wolfentry\\_action\\_res\\_t](#) **action\_res\_bits\_to\_add**  
*List of result flags to be set upon match.*
- [wolfentry\\_action\\_res\\_t](#) **action\_res\_bits\_to\_clear**  
*List of result flags to be cleared upon match.*

### 9.10.1 Detailed Description

struct for representing event configuration

## 9.11 wolfentry\_host\_platform\_interface Struct Reference

struct for passing shims that abstract native implementations of the heap allocator, time functions, and semaphores

```
#include <wolfentry.h>
```

### Data Fields

- struct [wolfentry\\_build\\_settings](#) caller\_build\_settings
- struct [wolfentry\\_allocator](#) allocator
- struct [wolfentry\\_timecbs](#) timecbs
- struct [wolfentry\\_semcbs](#) semcbs

### 9.11.1 Detailed Description

struct for passing shims that abstract native implementations of the heap allocator, time functions, and semaphores

### 9.11.2 Field Documentation

#### 9.11.2.1 allocator

```
struct wolfentry\_allocator wolfentry_host_platform_interface::allocator
```

Either all-null, or initialized as described for [wolfentry\\_allocator](#).

#### 9.11.2.2 caller\_build\_settings

```
struct wolfentry\_build\_settings wolfentry_host_platform_interface::caller_build_settings
```

Must be initialized as described for [wolfentry\\_build\\_settings](#).

#### 9.11.2.3 semcbs

```
struct wolfentry\_semcbs wolfentry_host_platform_interface::semcbs
```

Either all-null, or initialized as described for [wolfentry\\_semcbs](#).

#### 9.11.2.4 timecbs

```
struct wolfentry\_timecbs wolfentry_host_platform_interface::timecbs
```

Either all-null, or initialized as described for [wolfentry\\_timecbs](#).

## 9.12 wolfentry\_kv\_pair Struct Reference

public structure for passing user-defined values in/out of wolfSentry

```
#include <wolfentry.h>
```

### Data Fields

- int **key\_len**  
*the length of the key, not including the terminating null*
- [wolfentry\\_kv\\_type\\_t](#) **v\_type**  
*the type of value*
- union {
  - uint64\_t **v\_uint**  
*The value when v\_type is WOLFSENTRY\_KV\_UINT*
  - int64\_t **v\_sint**  
*The value when v\_type is WOLFSENTRY\_KV\_SINT*
  - double **v\_float**  
*The value when v\_type is WOLFSENTRY\_KV\_FLOAT*
  - size\_t **string\_len**  
*The length of the value when v\_type is WOLFSENTRY\_KV\_STRING*
  - size\_t **bytes\_len**  
*The length of the value when v\_type is WOLFSENTRY\_KV\_BYTES*
  - [JSON\\_VALUE](#) **v\_json**  
*The value when v\_type is WOLFSENTRY\_KV\_JSON*
- [byte](#) **b** []  
*A flexible-length buffer to hold the key, and for strings and bytes, the data.*

### 9.12.1 Detailed Description

public structure for passing user-defined values in/out of wolfSentry

### 9.12.2 Field Documentation

#### 9.12.2.1 b

```
byte wolfentry_kv_pair::b[]
```

A flexible-length buffer to hold the key, and for strings and bytes, the data.

For atomic values and WOLFSENTRY\_KV\_JSON, this is just the key, with a terminating null at the end. For WOLFSENTRY\_KV\_STRING and WOLFSENTRY\_KV\_BYTES, the value itself appears right after the key with its terminating null.

## 9.13 wolfentry\_route\_endpoint Struct Reference

struct for exporting socket addresses, with fixed-length fields

```
#include <wolfentry.h>
```



**Data Fields**

- [wolfsentry\\_port\\_t](#) **sa\_port**  
*The port number – only treated as a TCP/IP port number if the route has the [WOLFSENTRY\\_ROUTE\\_FLAG\\_TCPLIKE\\_PORT\\_NUMBER](#) flag set.*
- [wolfsentry\\_addr\\_bits\\_t](#) **addr\_len**  
*The number of significant bits in the address. The address data itself is in the parent [wolfsentry\\_route\\_exports](#) struct.*
- [byte](#) **extra\_port\_count**  
*The number of extra ports in the route – not currently supported.*
- [byte](#) **interface**  
*The interface ID of the route.*

**9.13.1 Detailed Description**

struct for exporting socket addresses, with fixed-length fields

**9.14 wolfsentry\_route\_exports Struct Reference**

struct for exporting a route for access by applications

```
#include <wolfsentry.h>
```

**Data Fields**

- const char \* **parent\_event\_label**  
*Label of the parent event, or null if none.*
- int **parent\_event\_label\_len**  
*Length (not including terminating null) of label of the parent event, if any.*
- [wolfsentry\\_route\\_flags\\_t](#) **flags**  
*Current route flags (mutable bits are informational/approximate)*
- [wolfsentry\\_addr\\_family\\_t](#) **sa\_family**  
*Address family for this route.*
- [wolfsentry\\_proto\\_t](#) **sa\_proto**  
*Protocol for this route.*
- struct [wolfsentry\\_route\\_endpoint](#) **remote**  
*Remote socket address for this route.*
- struct [wolfsentry\\_route\\_endpoint](#) **local**  
*Local socket address for this route.*
- const [byte](#) \* **remote\_address**  
*Binary address data for the remote end of this route.*
- const [byte](#) \* **local\_address**  
*Binary address data for the local end of this route.*
- const [wolfsentry\\_port\\_t](#) \* **remote\_extra\_ports**  
*array of extra remote ports that match this route – not yet implemented*
- const [wolfsentry\\_port\\_t](#) \* **local\_extra\_ports**  
*array of extra local ports that match this route – not yet implemented*
- struct [wolfsentry\\_route\\_metadata\\_exports](#) **meta**  
*The current route metadata.*
- void \* **private\_data**  
*The private data segment (application-defined), if any.*
- [size\\_t](#) **private\_data\_size**  
*The size of the private data segment, if any, or zero.*

### 9.14.1 Detailed Description

struct for exporting a route for access by applications

## 9.15 wolfentry\_route\_metadata\_exports Struct Reference

struct for exporting route metadata for access by applications

```
#include <wolfentry.h>
```

### Data Fields

- [wolfentry\\_time\\_t insert\\_time](#)  
*The time the route was inserted.*
- [wolfentry\\_time\\_t last\\_hit\\_time](#)  
*The most recent time the route was matched.*
- [wolfentry\\_time\\_t last\\_penaltybox\\_time](#)  
*The most recent time the route had its [WOLFENTRY\\_ROUTE\\_FLAG\\_PENALTYBOXED](#) flag set.*
- [wolfentry\\_time\\_t purge\\_after](#)  
*The expiration time of the route, if any (persistent routes have 0 here)*
- [uint16\\_t connection\\_count](#)  
*The current connection count (informational/approximate)*
- [uint16\\_t derogatory\\_count](#)  
*The current derogatory event count (informational/approximate)*
- [uint16\\_t commendable\\_count](#)  
*The current commendable event count (informational/approximate)*
- [wolfentry\\_hitcount\\_t hit\\_count](#)  
*The lifetime match count (informational/approximate, and only maintained if the [WOLFENTRY\\_ROUTE\\_FLAG\\_DONT\\_COUNT\\_HITS](#) flag is clear)*

### 9.15.1 Detailed Description

struct for exporting route metadata for access by applications

## 9.16 wolfentry\_semcbs Struct Reference

Struct for passing shims that abstract the native implementation of counting semaphores.

```
#include <wolfentry.h>
```

### Data Fields

- [sem\\_init\\_cb\\_t](#) **sem\_init**  
*Required pointer.*
- [sem\\_post\\_cb\\_t](#) **sem\_post**  
*Required pointer.*
- [sem\\_wait\\_cb\\_t](#) **sem\_wait**  
*Required pointer.*
- [sem\\_timedwait\\_cb\\_t](#) **sem\_timedwait**  
*Required pointer.*
- [sem\\_trywait\\_cb\\_t](#) **sem\_trywait**  
*Required pointer.*
- [sem\\_destroy\\_cb\\_t](#) **sem\_destroy**  
*Required pointer.*

#### 9.16.1 Detailed Description

Struct for passing shims that abstract the native implementation of counting semaphores.

## 9.17 wolfsentry\_sockaddr Struct Reference

struct for passing socket addresses into `wolfsentry_route_*`( ) API routines

```
#include <wolfsentry.h>
```

### Data Fields

- [wolfsentry\\_addr\\_family\\_t](#) **sa\_family**  
*Address family number.*
- [wolfsentry\\_proto\\_t](#) **sa\_proto**  
*Protocol number.*
- [wolfsentry\\_port\\_t](#) **sa\_port**  
*Port number.*
- [wolfsentry\\_addr\\_bits\\_t](#) **addr\_len**  
*Significant bits in address.*
- [byte](#) **interface**  
*Interface ID number.*
- [byte](#) **addr []**  
*Binary big-endian address data.*

#### 9.17.1 Detailed Description

struct for passing socket addresses into `wolfsentry_route_*`( ) API routines

## 9.18 wolfentry\_thread\_context\_public Struct Reference

Right-sized, right-aligned opaque container for thread state.

```
#include <wolfentry_settings.h>
```

### Data Fields

- `uint64_t opaque [8]`

### 9.18.1 Detailed Description

Right-sized, right-aligned opaque container for thread state.

## 9.19 wolfentry\_timecbs Struct Reference

Struct for passing shims that abstract the native implementation of time functions.

```
#include <wolfentry.h>
```

### Data Fields

- `void * context`  
*A user-supplied opaque handle to be passed as the first arg to the `get_time` callback. Can be null.*
- `wolfentry_get_time_cb_t get_time`  
*Required pointer.*
- `wolfentry_diff_time_cb_t diff_time`  
*Required pointer.*
- `wolfentry_add_time_cb_t add_time`  
*Required pointer.*
- `wolfentry_to_epoch_time_cb_t to_epoch_time`  
*Required pointer.*
- `wolfentry_from_epoch_time_cb_t from_epoch_time`  
*Required pointer.*
- `wolfentry_interval_to_seconds_cb_t interval_to_seconds`  
*Required pointer.*
- `wolfentry_interval_from_seconds_cb_t interval_from_seconds`  
*Required pointer.*

### 9.19.1 Detailed Description

Struct for passing shims that abstract the native implementation of time functions.

# Chapter 10

## File Documentation

### 10.1 centijson\_dom.h

```
00001 /*
00002  * centijson_dom.h
00003  *
00004  * Copyright (C) 2022-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00023 /*
00024  * CentiJSON
00025  * <http://github.com/mity/centijson>
00026  *
00027  * Copyright (c) 2018 Martin Mitas
00028  *
00029  * Permission is hereby granted, free of charge, to any person obtaining a
00030  * copy of this software and associated documentation files (the "Software"),
00031  * to deal in the Software without restriction, including without limitation
00032  * the rights to use, copy, modify, merge, publish, distribute, sublicense,
00033  * and/or sell copies of the Software, and to permit persons to whom the
00034  * Software is furnished to do so, subject to the following conditions:
00035  *
00036  * The above copyright notice and this permission notice shall be included in
00037  * all copies or substantial portions of the Software.
00038  *
00039  * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
00040  * OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,
00041  * FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE
00042  * AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER
00043  * LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING
00044  * FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS
00045  * IN THE SOFTWARE.
00046  */
00047
00048 #ifndef JSON_DOM_H
00049 #define JSON_DOM_H
00050
00051 #include "wolsentry/centijson_sax.h"
00052 #include "wolsentry/centijson_value.h"
00053
00054 #ifdef __cplusplus
00055 extern "C" {
00056 #endif
00057
00058
```

```

00059 /* DOM-specific error codes
00060 *
00061 * The DOM parsing functions can return any from json.h and additionally these.
00062 */
00063 #define JSON_DOM_ERR_DUPKEY          (-1000)
00064
00065
00066 /* Flags for json_dom_init()
00067 */
00068
00069 /* Policy how to deal if the JSON contains object with duplicate key: */
00070 #define JSON_DOM_DUPKEY_ABORT        0x0000U
00071 #define JSON_DOM_DUPKEY_USEFIRST     0x0001U
00072 #define JSON_DOM_DUPKEY_USELAST     0x0002U
00073
00074 #define JSON_DOM_DUPKEY_MASK        \
00075     (JSON_DOM_DUPKEY_ABORT | JSON_DOM_DUPKEY_USEFIRST | JSON_DOM_DUPKEY_USELAST)
00076
00077 /* When creating JSON_VALUE_DICT (for JSON_OBJECT), use flag JSON_VALUE_DICT_MAINTAINORDER. */
00078 #define JSON_DOM_MAINTAINDICTIONORDER 0x0010U
00079
00080 /* Internal use */
00081 #define JSON_DOM_FLAG_INITED        0x8000U
00082
00083 /* Structure holding parsing state. Do not access it directly.
00084 */
00085 typedef struct JSON_DOM_PARSER {
00086     JSON_PARSER parser;
00087     JSON_VALUE** path;
00088     size_t path_size;
00089     size_t path_alloc;
00090     JSON_VALUE root;
00091     JSON_VALUE key;
00092     unsigned flags;
00093     unsigned dict_flags;
00094 } JSON_DOM_PARSER;
00095
00096
00097 /* Used internally by load_config.c:handle_user_value_clause() */
00098 int json_dom_init_1(
00099     #ifdef WOLFSENTRY
00100     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00101     #endif
00102     JSON_DOM_PARSER* dom_parser, unsigned dom_flags);
00103
00104 /* Used internally by load_config.c:handle_user_value_clause() */
00105 int json_dom_process(JSON_TYPE type, const unsigned char* data, size_t data_size, void* user_data);
00106
00107 /* Used internally by load_config.c:handle_user_value_clause() */
00108 int json_dom_fini_aux(JSON_DOM_PARSER* dom_parser, JSON_VALUE* p_root);
00109
00110 int json_dom_clean(JSON_DOM_PARSER* dom_parser);
00111
00112 /* Initialize the DOM parser structure.
00113 *
00114 * The parameter `config` is propagated into json_init().
00115 */
00116 WOLFSENTRY_API int json_dom_init(
00117     #ifdef WOLFSENTRY
00118     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00119     #endif
00120     JSON_DOM_PARSER* dom_parser, const JSON_CONFIG* config, unsigned dom_flags);
00121
00122 /* Feed the parser with more input.
00123 */
00124 WOLFSENTRY_API int json_dom_feed(JSON_DOM_PARSER* dom_parser, const unsigned char* input, size_t
size);
00125
00126 /* Finish the parsing and free any resources associated with the parser.
00127 *
00128 * On success, zero is returned and the JSON_VALUE pointed by `p_dom` is initialized
00129 * accordingly to the root of the data in the JSON input (typically array or
00130 * object), and it contains all the data from the JSON input.
00131 *
00132 * On failure, the error code is returned; info about position of the issue in
00133 * the input is filled in the structure pointed by `p_pos` (if `p_pos` is not
00134 * NULL and if it is a parsing kind of error); and the value pointed by `p_dom`
00135 * is initialized to JSON_VALUE_NULL.
00136 */
00137 WOLFSENTRY_API int json_dom_fini(JSON_DOM_PARSER* dom_parser, JSON_VALUE* p_dom, JSON_INPUT_POS*
p_pos);
00138
00139
00140 /* Simple wrapper for json_dom_init() + json_dom_feed() + json_dom_fini(),
00141 * usable when the provided input contains complete JSON document.
00142 */
00143 WOLFSENTRY_API int json_dom_parse(

```

```

00144 #ifdef WOLFSENTRY
00145     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00146 #endif
00147     const unsigned char* input, size_t size, const JSON_CONFIG* config,
00148     unsigned dom_flags, JSON_VALUE* p_root, JSON_INPUT_POS* p_pos);
00149
00150
00151 /* Dump recursively all the DOM hierarchy out, via the provided writing
00152  * callback.
00153  *
00154  * The provided writing function must write all the data provided to it
00155  * and return zero to indicate success, or non-zero to indicate an error
00156  * and abort the operation.
00157  *
00158  * Returns zero on success, JSON_ERR_OUTOFMEMORY, or an error the code returned
00159  * from writing callback.
00160  */
00161 #define JSON_DOM_DUMP_MINIMIZE      0x0001 /* Do not indent, do not use no extra whitespace
including new lines. */
00162 #define JSON_DOM_DUMP_FORCECLRF     0x0002 /* Use "\r\n" instead of just "\n". */
00163 #define JSON_DOM_DUMP_INDENTWITHSPACES 0x0004 /* Indent with `tab_width` spaces instead of with
'\t'. */
00164 #define JSON_DOM_DUMP_PREFERDICTORDER 0x0008 /* Prefer original dictionary order, if available. */
00165
00166 WOLFSENTRY_API int json_dom_dump(
00167 #ifdef WOLFSENTRY
00168     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00169 #endif
00170     const JSON_VALUE* root,
00171     JSON_DUMP_CALLBACK write_func, void* user_data,
00172     unsigned tab_width, unsigned flags);
00173
00174 WOLFSENTRY_API const char* json_dom_error_str(int err_code);
00175
00176 #ifdef __cplusplus
00177 } /* extern "C" { */
00178 #endif
00179
00180 #endif /* JSON_DOM_H */

```

## 10.2 centijson\_sax.h

```

00001 /*
00002  * centijson_sax.h
00003  *
00004  * Copyright (C) 2021-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00023 /*
00024  * CentiJSON
00025  * <http://github.com/mity/centijson>
00026  *
00027  * Copyright (c) 2018 Martin Mitás
00028  *
00029  * Permission is hereby granted, free of charge, to any person obtaining a
00030  * copy of this software and associated documentation files (the "Software"),
00031  * to deal in the Software without restriction, including without limitation
00032  * the rights to use, copy, modify, merge, publish, distribute, sublicense,
00033  * and/or sell copies of the Software, and to permit persons to whom the
00034  * Software is furnished to do so, subject to the following conditions:
00035  *
00036  * The above copyright notice and this permission notice shall be included in
00037  * all copies or substantial portions of the Software.
00038  *
00039  * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
00040  * OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,
00041  * FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE

```

```

00042  * AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER
00043  * LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING
00044  * FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS
00045  * IN THE SOFTWARE.
00046  */
00047
00048 #ifndef CENTIJSON_SAX_H
00049 #define CENTIJSON_SAX_H
00050
00051 #if !defined(WOLFSENTRY) && !defined(WOLFSENTRY_API)
00052     #define WOLFSENTRY_API
00053 #endif
00054
00055 #ifndef WOLFSENTRY
00056 #include <stdint.h>
00057 #include <sys/types.h>
00058 #endif
00059
00060 #ifdef __cplusplus
00061 extern "C" {
00062 #endif
00063
00064 /* JSON data types.
00065  *
00066  * Note that we distinguish beginning/end of the arrays and objects for
00067  * the purposes of the processing.
00068  */
00069 typedef enum JSON_TYPE {
00070     JSON_NULL,
00071     JSON_FALSE,
00072     JSON_TRUE,
00073     JSON_NUMBER,
00074     JSON_STRING,
00075     JSON_KEY, /* String in the specific role of an object key. */
00076     JSON_ARRAY_BEG,
00077     JSON_ARRAY_END,
00078     JSON_OBJECT_BEG,
00079     JSON_OBJECT_END
00080 } JSON_TYPE;
00081
00082 /* Error codes.
00083  */
00084 #define JSON_ERR_SUCCESS 0
00085 #define JSON_ERR_INTERNAL (-1) /* This should never happen. If you see it, report bug
00086  */
00087 #define JSON_ERR_OUTOFMEMORY (-2)
00088 #define JSON_ERR_SYNTAX (-4) /* Generic syntax error. (More specific error codes
00089  are preferred.) */
00090 #define JSON_ERR_BADCLOSER (-5) /* Mismatch in brackets (e.g. "{" or "[ ]") */
00091 #define JSON_ERR_BADROOTTYPE (-6) /* Root type not allowed by CONFIG::flags. */
00092 #define JSON_ERR_EXPECTEDVALUE (-7) /* Something unexpected where value has to be. */
00093 #define JSON_ERR_EXPECTEDKEY (-8) /* Something unexpected where key has to be. */
00094 #define JSON_ERR_EXPECTEDVALUEORCLOSER (-9) /* Something unexpected where value or array/object
00095  closer has to be. */
00096 #define JSON_ERR_EXPECTEDKEYORCLOSER (-10) /* Something unexpected where key or array/object
00097  closer has to be. */
00098 #define JSON_ERR_EXPECTEDCOLON (-11) /* Something unexpected where colon has to be. */
00099 #define JSON_ERR_EXPECTEDCOMMAORCLOSER (-12) /* Something unexpected where comma or array/object
00100  has to be. */
00101 #define JSON_ERR_EXPECTEDEOF (-13) /* Something unexpected where end-of-file has to be.
00102  */
00103 #define JSON_ERR_MAXTOTALLEN (-14) /* Reached JSON_CONFIG::max_total_len */
00104 #define JSON_ERR_MAXTOTALVALUES (-15) /* Reached JSON_CONFIG::max_total_values */
00105 #define JSON_ERR_MAXNESTINGLEVEL (-16) /* Reached JSON_CONFIG::max_nesting_level */
00106 #define JSON_ERR_MAXNUMBERLEN (-17) /* Reached JSON_CONFIG::max_number_len */
00107 #define JSON_ERR_MAXSTRINGLEN (-18) /* Reached JSON_CONFIG::max_string_len */
00108 #define JSON_ERR_MAXKEYLEN (-19) /* Reached JSON_CONFIG::max_key_len */
00109 #define JSON_ERR_UNCLOSEDSTRING (-20) /* Unclosed string */
00110 #define JSON_ERR_UNESCAPEDCONTROL (-21) /* Unescaped control character (in a string) */
00111 #define JSON_ERR_INVALIDESCAPE (-22) /* Invalid/unknown escape sequence (in a string) */
00112 #define JSON_ERR_INVALIDUTF8 (-23) /* Invalid UTF-8 (in a string) */
00113 #define JSON_ERR_NOT_INITED (-24) /* Attempt to access an uninit JSON_PARSER or
00114  JSON_DOM_PARSER. */
00115
00116 /* Bits for JSON_CONFIG::flags.
00117  */
00118 #define JSON_NONULLASROOT 0x0001U /* Disallow null to be root value */
00119 #define JSON_NOBOOLASROOT 0x0002U /* Disallow false or true to be root value */
00120 #define JSON_NONUMBERASROOT 0x0004U /* Disallow number to be root value */
00121 #define JSON_NOSTRINGASROOT 0x0008U /* Disallow string to be root value */
00122 #define JSON_NOARRAYASROOT 0x0010U /* Disallow array to be root value */
00123 #define JSON_NOOBJECTASROOT 0x0020U /* Disallow object to be root value */
00124 #define JSON_NOSCALARROOT (JSON_NONULLASROOT | JSON_NOBOOLASROOT | \

```



```

00122                                     JSON_NONUMBERASROOT | JSON_NOSTRINGASROOT)
00123 #define JSON_NOVECTORROOT          (JSON_NOARRAYASROOT | JSON_NOOBJECTASROOT)
00124
00125 #define JSON_IGNOREILLUTF8KEY      0x0100U /* Ignore ill-formed UTF-8 (for keys). */
00126 #define JSON_FIXILLUTF8KEY         0x0200U /* Replace ill-formed UTF-8 char with replacement char
00127 (for keys). */
00127 #define JSON_IGNOREILLUTF8VALUE    0x0400U /* Ignore ill-formed UTF-8 (for string values). */
00128 #define JSON_FIXILLUTF8VALUE       0x0800U /* Replace ill-formed UTF-8 char with replacement char
00129 (for string values). */
00129
00130
00131
00132 /* Parser options, passed into json_init().
00133 *
00134 * If NULL is passed to json_init(), default values are used.
00135 */
00136 typedef struct JSON_CONFIG {
00137     size_t max_total_len;          /* zero means no limit; default: 10 MB */
00138     size_t max_total_values;       /* zero means no limit; default: 0 */
00139     size_t max_number_len;         /* zero means no limit; default: 512 */
00140     size_t max_string_len;        /* zero means no limit; default: 65536 */
00141     size_t max_key_len;           /* zero means no limit; default: 512 */
00142     unsigned max_nesting_level;    /* zero means no limit; default: 512 */
00143     unsigned flags;               /* default: 0 */
00144 } JSON_CONFIG;
00145
00146
00147 /* Helper structure describing position in the input.
00148 *
00149 * It is used to specify where in the input a parsing error occurred for
00150 * better diagnostics.
00151 */
00152 typedef struct JSON_INPUT_POS {
00153     size_t offset;
00154     unsigned line_number;
00155     unsigned column_number;
00156 } JSON_INPUT_POS;
00157
00158
00159 /* Callbacks the application has to implement, to process the parsed data.
00160 */
00161 typedef struct JSON_CALLBACKS {
00162     /* Data processing callback. For now (and maybe forever) the only callback.
00163     *
00164     * Note that `data` and `data_size` are set only for JSON_KEY, JSON_STRING
00165     * and JSON_NUMBER. (For the other types the callback always gets NULL and
00166     * 0).
00167     *
00168     * Inside an object, the application is guaranteed to get keys and their
00169     * corresponding values in the alternating fashion (i.e. in the order
00170     * as they are in the JSON input.).
00171     *
00172     * Application can abort the parsing operation by returning a non-zero.
00173     * Note the non-zero return value of the callback is propagated to
00174     * json_feed() and json_fini().
00175     */
00176     int (*process)(JSON_TYPE /*type*/, const unsigned char* /*data*/,
00177                    size_t /*data_size*/, void* /*user_data*/);
00178 } JSON_CALLBACKS;
00179
00180
00181 /* Internal parser state. Use pointer to this structure as an opaque handle.
00182 */
00183 typedef struct JSON_PARSER {
00184 #ifdef WOLFSENTRY
00185     struct wolfentry_allocator *allocator;
00186 #ifdef WOLFSENTRY_THREADSAFE
00187     struct wolfentry_thread_context *thread;
00188 #endif
00189 #endif
00190     JSON_CALLBACKS callbacks;
00191     JSON_CONFIG config;
00192     void* user_data;
00193
00194     JSON_INPUT_POS pos;
00195     JSON_INPUT_POS value_pos;
00196     JSON_INPUT_POS err_pos;
00197
00198     int errcode;
00199
00200     size_t value_counter;
00201
00202     unsigned char* nesting_stack;
00203     size_t nesting_level;
00204     size_t nesting_stack_size;
00205
00206     enum {

```

```

00207     AUTOMATON_MAIN = 0,
00208     AUTOMATON_NULL = 1,
00209     AUTOMATON_FALSE = 2,
00210     AUTOMATON_TRUE = 3,
00211     AUTOMATON_NUMBER = 4,
00212     AUTOMATON_STRING = 6,
00213     AUTOMATON_KEY = 7
00214 } automaton;
00215
00216 unsigned state;
00217 unsigned substate;
00218
00219 uint32_t codepoint[2];
00220
00221 unsigned char* buf;
00222 size_t buf_used;
00223 size_t buf_allocated;
00224
00225 size_t last_cl_offset; /* Offset of most recently seen '\r' */
00226 } JSON_PARSER;
00227
00228
00229
00230 /* Fill `config` with options used by default.
00231 */
00232 WOLFSENTRY_API_VOID json_default_config(JSON_CONFIG* config);
00233
00234
00235 /* Initialize the parser, associate it with the given callbacks and
00236 * configuration. Returns zero on success, non-zero on an error.
00237 *
00238 * If `config` is NULL, default values are used.
00239 */
00240 WOLFSENTRY_API int json_init(
00241 #ifdef WOLFSENTRY
00242     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00243 #endif
00244     JSON_PARSER* parser,
00245     const JSON_CALLBACKS* callbacks,
00246     const JSON_CONFIG* config,
00247     void* user_data);
00248
00249 /* Feed the parser with more input.
00250 *
00251 * Returns zero on success.
00252 *
00253 * If an error occurs it returns non-zero and any attempt to call json_feed()
00254 * again shall just fail with the same error code. Note the application should
00255 * still call json_fini() to release all resources allocated by the parser.
00256 */
00257 WOLFSENTRY_API int json_feed(JSON_PARSER* parser, const unsigned char* input, size_t size);
00258
00259 /* Finish parsing of the document (note it can still call some callbacks); and
00260 * release any resources held by the parser.
00261 *
00262 * Returns zero on success, or non-zero on failure.
00263 *
00264 * If `p_pos` is not NULL, it is filled with info about reached position in the
00265 * input. It can help in diagnostics if the parsing failed.
00266 *
00267 * Note that if the preceding call to json_feed() failed, the error status also
00268 * propagates into json_fini().
00269 *
00270 * Also note this function may still fail even when all preceding calls to
00271 * json_feed() succeeded. This typically happens when the parser was fed with
00272 * an incomplete JSON document.
00273 */
00274 WOLFSENTRY_API int json_fini(JSON_PARSER* parser, JSON_INPUT_POS* p_pos);
00275
00276
00277 /* Simple wrapper function for json_init() + json_feed() + json_fini(), usable
00278 * when the provided input contains complete JSON document.
00279 */
00280 WOLFSENTRY_API int json_parse(
00281 #ifdef WOLFSENTRY
00282     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00283 #endif
00284     const unsigned char* input, size_t size,
00285     const JSON_CALLBACKS* callbacks, const JSON_CONFIG* config,
00286     void* user_data, JSON_INPUT_POS* p_pos);
00287
00288
00289 /* Converts error code to human readable error message
00290 */
00291 WOLFSENTRY_API const char* json_error_str(int err_code);
00292
00293 WOLFSENTRY_API const char* json_type_str(JSON_TYPE type);

```

```

00294
00295
00296 /*****
00297  *** Utilities ***
00298  *****/
00299
00300 /* When implementing the callback processing the parsed data, these utilities
00301  * below may come handy.
00302  */
00303
00304 /* Analyze the string holding a JSON number, and analyze whether it can
00305  * fit into integer types.
00306  *
00307  * (Note it says "no" in cases the number string contains any fraction or
00308  * exponent part.)
00309  */
00310 WOLFSENTRY_API int json_analyze_number(const unsigned char* num, size_t num_size,
00311                                       int* p_is_int32_compatible,
00312                                       int* p_is_uint32_compatible,
00313                                       int* p_is_int64_compatible,
00314                                       int* p_is_uint64_compatible);
00315
00316 /* Convert the string holding JSON number to the given C type.
00317  *
00318  * Note the conversion to any of the integer types is undefined unless
00319  * json_analyze_number() says it's fine.
00320  *
00321  * Also note that json_number_to_double() can fail with JSON_ERR_OUTOFMEMORY.
00322  * Hence its prototype differs.
00323  */
00324 WOLFSENTRY_API int32_t json_number_to_int32(const unsigned char* num, size_t num_size);
00325 WOLFSENTRY_API uint32_t json_number_to_uint32(const unsigned char* num, size_t num_size);
00326 WOLFSENTRY_API int64_t json_number_to_int64(const unsigned char* num, size_t num_size);
00327 WOLFSENTRY_API uint64_t json_number_to_uint64(const unsigned char* num, size_t num_size);
00328 WOLFSENTRY_API int json_number_to_double(const unsigned char* num, size_t num_size, double* p_result);
00329
00330
00331 typedef int (*JSON_DUMP_CALLBACK)(const unsigned char* /*str*/, size_t /*size*/, void* /*user_data*/);
00332
00333 /* Helpers for writing numbers and strings in JSON-compatible format.
00334  *
00335  * Note that json_dump_string() assumes the string is a well-formed UTF-8
00336  * string which needs no additional Unicode validation. The function "only"
00337  * handles proper escaping of control characters.
00338  *
00339  * The provided writer callback must write all the data provided to it and
00340  * return zero to indicate success, or non-zero to indicate an error and abort
00341  * the operation.
00342  *
00343  * All these return zero on success, JSON_ERR_OUTOFMEMORY, or an error code
00344  * propagated from the writer callback.
00345  *
00346  * (Given that all the other JSON stuff is trivial to output, the application
00347  * is supposed to implement that manually.)
00348  */
00349 WOLFSENTRY_API int json_dump_int32(int32_t i32, JSON_DUMP_CALLBACK write_func, void* user_data);
00350 WOLFSENTRY_API int json_dump_uint32(uint32_t u32, JSON_DUMP_CALLBACK write_func, void* user_data);
00351 WOLFSENTRY_API int json_dump_int64(int64_t i64, JSON_DUMP_CALLBACK write_func, void* user_data);
00352 WOLFSENTRY_API int json_dump_uint64(uint64_t u64, JSON_DUMP_CALLBACK write_func, void* user_data);
00353 WOLFSENTRY_API int json_dump_double(double dbl, JSON_DUMP_CALLBACK write_func, void* user_data);
00354 WOLFSENTRY_API int json_dump_string(const unsigned char* str, size_t size, JSON_DUMP_CALLBACK
00355   write_func, void* user_data);
00356
00357 #ifdef __cplusplus
00358 } /* extern "C" { */
00359 #endif
00360
00361 #endif /* CENTIJSON_SAX_H */

```

## 10.3 centijson\_value.h

```

00001 /*
00002  * centijson_value.h
00003  *
00004  * Copyright (C) 2022-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.

```

```

00012 *
00013 * wolfSentry is distributed in the hope that it will be useful,
00014 * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015 * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016 * GNU General Public License for more details.
00017 *
00018 * You should have received a copy of the GNU General Public License
00019 * along with this program; if not, write to the Free Software
00020 * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021 */
00022
00023 /*
00024 * C Reusables
00025 * <http://github.com/mity/c-reusables>
00026 *
00027 * Copyright (c) 2018 Martin Mitas
00028 *
00029 * Permission is hereby granted, free of charge, to any person obtaining a
00030 * copy of this software and associated documentation files (the "Software"),
00031 * to deal in the Software without restriction, including without limitation
00032 * the rights to use, copy, modify, merge, publish, distribute, sublicense,
00033 * and/or sell copies of the Software, and to permit persons to whom the
00034 * Software is furnished to do so, subject to the following conditions:
00035 *
00036 * The above copyright notice and this permission notice shall be included in
00037 * all copies or substantial portions of the Software.
00038 *
00039 * THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS
00040 * OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY,
00041 * FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE
00042 * AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER
00043 * LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING
00044 * FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS
00045 * IN THE SOFTWARE.
00046 */
00047
00048 #ifndef CENTIJSON_VALUE_H
00049 #define CENTIJSON_VALUE_H
00050
00051 #ifdef __cplusplus
00052 extern "C" {
00053 #endif
00054
00055 #ifdef WOLFSENTRY
00056 #include "wolfentry.h"
00057 #endif
00058 #ifndef WOLFSENTRY_API
00059 #define WOLFSENTRY_API
00060 #endif
00061
00062 #ifndef WOLFSENTRY
00063 #include <stdint.h>
00064 #endif
00065
00066 /* The value structure.
00067 * Use as opaque.
00068 */
00069 typedef struct JSON_VALUE {
00070     /* We need at least 2 * sizeof(void*). Sixteen bytes covers that on 64-bit
00071     * platforms and it seems as a good compromise allowing to "inline" all
00072     * numeric types as well as short strings; which is good idea: most dict
00073     * keys as well as many string values are in practice quite short. */
00074     union {
00075         uint8_t data_bytes[16];
00076         void *data_ptrs[16 / sizeof(void *)];
00077     } data;
00078 } JSON_VALUE;
00079
00080
00081 /* Value types.
00082 */
00083 typedef enum JSON_VALUE_TYPE {
00084     JSON_VALUE_NULL = 0,
00085     JSON_VALUE_BOOL,
00086     JSON_VALUE_INT32,
00087     JSON_VALUE_UINT32,
00088     JSON_VALUE_INT64,
00089     JSON_VALUE_UINT64,
00090     JSON_VALUE_FLOAT,
00091     JSON_VALUE_DOUBLE,
00092     JSON_VALUE_STRING,
00093     JSON_VALUE_ARRAY,
00094     JSON_VALUE_DICT
00095 } JSON_VALUE_TYPE;
00096
00097
00098 /* Free any resources the value holds.

```

```

00099  * For ARRAY and DICT it is recursive.
00100  */
00101  WOLFSENTRY_API int json_value_fini(
00102  #ifdef WOLFSENTRY
00103      WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00104  #endif
00105      JSON_VALUE* v);
00106
00107  /* Get value type.
00108  */
00109  WOLFSENTRY_API JSON_VALUE_TYPE json_value_type(const JSON_VALUE* v);
00110
00111  /* Check whether the value is "compatible" with the given type.
00112  *
00113  * This is especially useful for determining whether a numeric value can be
00114  * "casted" to other numeric type. The function does some basic checking
00115  * whether such conversion loses substantial information.
00116  *
00117  * For example, value initialized with init_float(&v, 1.0f) is considered
00118  * compatible with INT32, because 1.0f has zero fraction and 1 fits between
00119  * INT32_MIN and INT32_MAX. Therefore calling int32_value(&v) gets sensible
00120  * result.
00121  */
00122  WOLFSENTRY_API int json_value_is_compatible(const JSON_VALUE* v, JSON_VALUE_TYPE type);
00123
00124  /* Values newly added into array or dictionary are of type VALUE_NULL.
00125  *
00126  * Additionally, for such newly created values, an internal flag is used to
00127  * mark that the value was never explicitly initialized by the application.
00128  *
00129  * This function checks value of the flag, and allows thus the caller to
00130  * distinguish whether the value was just added; or whether the value was
00131  * explicitly initialized as VALUE_NULL with value_init_null().
00132  *
00133  * Caller is supposed to initialize all such newly added value with any of the
00134  * value_init_XXX() functions, and hence reset the flag.
00135  */
00136  WOLFSENTRY_API int json_value_is_new(const JSON_VALUE* v);
00137
00138  /* Simple recursive getter, capable to get a value dwelling deep in the
00139  * hierarchy formed by nested arrays and dictionaries.
00140  *
00141  * Limitations: The function is not capable to deal with object keys which
00142  * contain zero byte '\0', slash '/' or brackets '[' ']' because those are
00143  * interpreted by the function as special characters:
00144  *
00145  * -- '/' delimits dictionary keys (and optionally also array indexes;
00146  *    paths "foo/[4]" and "foo[4]" are treated as equivalent.)
00147  * -- '[' ']' enclose array indexes (for distinguishing from numbered
00148  *    dictionary keys). Note that negative indexes are supported here;
00149  *    '[-1]' refers to the last element in the array, '[-2]' to the element
00150  *    before the last element etc.
00151  * -- '\0' terminates the whole path (as is normal with C strings).
00152  *
00153  * Examples:
00154  *
00155  * (1) value_path(root, "") gets directly the root.
00156  *
00157  * (2) value_path(root, "foo") gets value keyed with 'foo' if root is a
00158  *    dictionary having such value, or NULL otherwise.
00159  *
00160  * (3) value_path(root, "[4]") gets value with index 4 if root is an array
00161  *    having so many members, or NULL otherwise.
00162  *
00163  * (4) value_path(root, "foo[2]/bar/baz[3]") walks deeper and deeper and
00164  *    returns a value stored there assuming these all conditions are true:
00165  *    -- root is dictionary having the key "foo";
00166  *    -- that value is a nested list having the index [2];
00167  *    -- that value is a nested dictionary having the key "bar";
00168  *    -- that value is a nested dictionary having the key "baz";
00169  *    -- and finally, that is a list having the index [3].
00170  *    If any of those is not fulfilled, then NULL is returned.
00171  */
00172  WOLFSENTRY_API JSON_VALUE* json_value_path(JSON_VALUE* root, const char* path);
00173
00174  /* value_build_path() is similar to value_path(); but allows easy populating
00175  * of value hierarchies.
00176  *
00177  * If all values along the path already exist, the behavior is exactly the same
00178  * as value_path().
00179  *
00180  * But when a value corresponding to any component of the path does not exist
00181  * then, instead of returning NULL, new value is added into the parent
00182  * container (assuming the parent existing container has correct type as
00183  * assumed by the path.)
00184  *
00185  * Caller may use empty "[]" to always enforce appending a new value into an

```

```

00186 * array. E.g. value_build_path(root, "multiple_values/[]/name") makes sure the
00187 * root contains an array under the key "multiple_values", and a new dictionary
00188 * is appended at the end of the array. This new dictionary gets a new value
00189 * under the key "name". Assuming the function succeeds, the caller can now be
00190 * sure the "name" is initialized as VALUE_NULL because the new dictionary has
00191 * been just created and added as the last element if the list.
00192 *
00193 * If such new value does not correspond to the last path component, the new
00194 * value gets initialized as the right type so subsequent path component can
00195 * be treated the same way.
00196 *
00197 * If the function creates the value corresponding to the last component of the
00198 * path, it is initialized as VALUE_NULL and the "new flag" is set for it, so
00199 * caller can test this condition with value_is_new().
00200 *
00201 * Returns NULL if the path cannot be resolved because any existing value
00202 * has a type incompatible with the path; if creation of any value along the
00203 * path fails; or if an array index is out of bounds.
00204 */
00205 /* missing implementation */
00206 /* WOLFSENTRY_API JSON_VALUE* json_value_build_path(JSON_VALUE* root, const char* path); */
00207
00208
00209 /*****
00210 *** VALUE_NULL ***
00211 *****/
00212
00213 /* Note it is guaranteed that VALUE_NULL does not need any explicit clean-up;
00214 * i.e. application may avoid calling value_fini().
00215 *
00216 * But it is allowed to. value_fini() for VALUE_NULL is a noop.
00217 */
00218
00219
00220 /* Static initializer.
00221 */
00222 #define JSON_VALUE_NULL_INITIALIZER { { 0,0,0,0,0,0,0,0,0,0,0,0,0,0 } }
00223
00224 WOLFSENTRY_API_VOID json_value_init_null(JSON_VALUE* v);
00225
00226
00227 /*****
00228 *** VALUE_BOOL ***
00229 *****/
00230
00231 WOLFSENTRY_API int json_value_init_bool(JSON_VALUE* v, int b);
00232
00233 WOLFSENTRY_API int json_value_bool(const JSON_VALUE* v);
00234
00235
00236 /*****
00237 *** Numeric types ***
00238 *****/
00239
00240
00241 /* Initializers.
00242 */
00243 WOLFSENTRY_API int json_value_init_int32(
00244 #ifdef WOLFSENTRY
00245     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00246 #endif
00247     JSON_VALUE* v, int32_t i32);
00248 WOLFSENTRY_API int json_value_init_uint32(
00249 #ifdef WOLFSENTRY
00250     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00251 #endif
00252     JSON_VALUE* v, uint32_t u32);
00253 WOLFSENTRY_API int json_value_init_int64(
00254 #ifdef WOLFSENTRY
00255     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00256 #endif
00257     JSON_VALUE* v, int64_t i64);
00258 WOLFSENTRY_API int json_value_init_uint64(
00259 #ifdef WOLFSENTRY
00260     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00261 #endif
00262     JSON_VALUE* v, uint64_t u64);
00263 WOLFSENTRY_API int json_value_init_float(
00264 #ifdef WOLFSENTRY
00265     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00266 #endif
00267     JSON_VALUE* v, float f);
00268 WOLFSENTRY_API int json_value_init_double(
00269 #ifdef WOLFSENTRY
00270     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00271 #endif
00272     JSON_VALUE* v, double d);

```

```

00273
00274 /* Getters.
00275 *
00276 * Note you may use any of the getter function for any numeric value. These
00277 * functions perform required conversions under the hood. The conversion may
00278 * have have the same side/limitations as C casting.
00279 *
00280 * However application may use json_value_is_compatible() to verify whether the
00281 * conversion should provide a reasonable result.
00282 */
00283 WOLFSENTRY_API int32_t json_value_int32(const JSON_VALUE* v);
00284 WOLFSENTRY_API uint32_t json_value_uint32(const JSON_VALUE* v);
00285 WOLFSENTRY_API int64_t json_value_int64(const JSON_VALUE* v);
00286 WOLFSENTRY_API uint64_t json_value_uint64(const JSON_VALUE* v);
00287 WOLFSENTRY_API float json_value_float(const JSON_VALUE* v);
00288 WOLFSENTRY_API double json_value_double(const JSON_VALUE* v);
00289
00290
00291 /*****
00292 *** JSON_VALUE_STRING ***
00293 *****/
00294
00295 /* Note JSON_VALUE_STRING allows to store any sequences of any bytes, even a binary
00296 * data. No particular encoding of the string is assumed. Even zero bytes are
00297 * allowed (but then the caller has to use json_value_init_string_() and specify
00298 * the string length explicitly).
00299 */
00300
00301 /* The function json_value_init_string_() initializes the JSON_VALUE_STRING with any
00302 * sequence of bytes, of any length. It also adds automatically one zero byte
00303 * (not counted in the length of the string).
00304 *
00305 * The function json_value_init_string() is equivalent to calling directly
00306 * json_value_init_string(str, strlen(str)).
00307 *
00308 * The parameter str is allowed to be NULL (then the functions behave the same
00309 * way as if it is points to an empty string).
00310 */
00311 WOLFSENTRY_API int json_value_init_string_(
00312 #ifdef WOLFSENTRY
00313     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00314 #endif
00315     JSON_VALUE* v, const unsigned char* str, size_t len);
00316 WOLFSENTRY_API int json_value_init_string(
00317 #ifdef WOLFSENTRY
00318     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00319 #endif
00320     JSON_VALUE* v, const unsigned char* str);
00321
00322 /* Get pointer to the internal buffer holding the string. The caller may assume
00323 * the returned string is always zero-terminated.
00324 */
00325 WOLFSENTRY_API const unsigned char* json_value_string(const JSON_VALUE* v);
00326
00327 /* Get length of the string. (The implicit zero terminator does not count.)
00328 */
00329 WOLFSENTRY_API size_t json_value_string_length(const JSON_VALUE* v);
00330
00331
00332 /*****
00333 *** JSON_VALUE_ARRAY ***
00334 *****/
00335
00336 /* Array of values.
00337 *
00338 * Note that any new value added into the array with json_value_array_append() or
00339 * json_value_array_insert() is initially of the type JSON_VALUE_NULL and that it has
00340 * an internal flag marking the value as new (so that json_value_is_new() returns
00341 * non-zero for it). Application is supposed to initialize the newly added
00342 * value by any of the value initialization functions.
00343 *
00344 * WARNING: Modifying contents of an array (i.e. inserting, appending and also
00345 * removing a value) can lead to reallocation of internal array buffer.
00346 * Hence, consider all JSON_VALUE* pointers invalid after modifying the array.
00347 * That includes the return values of json_value_array_get(), json_value_array_get_all(),
00348 * but also preceding calls of json_value_array_append() and json_value_array_insert().
00349 */
00350 WOLFSENTRY_API int json_value_init_array(
00351 #ifdef WOLFSENTRY
00352     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00353 #endif
00354     JSON_VALUE* v);
00355
00356 /* Get count of items in the array.
00357 */
00358 WOLFSENTRY_API size_t json_value_array_size(const JSON_VALUE* v);
00359

```

```

00360 /* Get the specified item.
00361 */
00362 WOLFSENTRY_API JSON_VALUE* json_value_array_get(const JSON_VALUE* v, size_t index);
00363
00364 /* Get pointer to internal C array of all items.
00365 */
00366 WOLFSENTRY_API JSON_VALUE* json_value_array_get_all(const JSON_VALUE* v);
00367
00368 /* Append/insert new item.
00369 */
00370 WOLFSENTRY_API JSON_VALUE* json_value_array_append(
00371 #ifdef WOLFSENTRY
00372     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00373 #endif
00374     JSON_VALUE* v);
00375 WOLFSENTRY_API JSON_VALUE* json_value_array_insert(
00376 #ifdef WOLFSENTRY
00377     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00378 #endif
00379     JSON_VALUE* v, size_t index);
00380
00381 /* Remove an item (or range of items).
00382 */
00383 WOLFSENTRY_API int json_value_array_remove(
00384 #ifdef WOLFSENTRY
00385     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00386 #endif
00387     JSON_VALUE* v, size_t index);
00388 WOLFSENTRY_API int json_value_array_remove_range(
00389 #ifdef WOLFSENTRY
00390     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00391 #endif
00392     JSON_VALUE* v, size_t index, size_t count);
00393
00394 /* Remove and destroy all members (recursively).
00395 */
00396 WOLFSENTRY_API int json_value_array_clean(
00397 #ifdef WOLFSENTRY
00398     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00399 #endif
00400     JSON_VALUE* v);
00401
00402
00403 /*****
00404 *** JSON_VALUE_DICT ***
00405 *****/
00406
00407 /* Dictionary of values. (Internally implemented as red-black tree.)
00408 *
00409 * Note that any new value added into the dictionary is initially of the type
00410 * JSON_VALUE_NULL and that it has an internal flag marking the value as new
00411 * (so that json_value_is_new() returns non-zero for it). Application is supposed
00412 * to initialize the newly added value by any of the value initialization
00413 * functions.
00414 *
00415 * Note that all the functions adding/removing any items may invalidate all
00416 * pointers into the dictionary.
00417 */
00418
00419
00420 /* Flag for init_dict_ex() asking to maintain the order in which the dictionary
00421 * is populated and enabling dict_walk_ordered().
00422 *
00423 * If used, the dictionary consumes more memory.
00424 */
00425 #define JSON_VALUE_DICT_MAINTAINORDER    0x0001
00426
00427 /* Initialize the value as a (empty) dictionary.
00428 *
00429 * json_value_init_dict_ex() allows to specify custom comparer function (may be NULL)
00430 * or flags changing the default behavior of the dictionary.
00431 */
00432 WOLFSENTRY_API int json_value_init_dict(
00433 #ifdef WOLFSENTRY
00434     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00435 #endif
00436     JSON_VALUE* v);
00437 WOLFSENTRY_API int json_value_init_dict_ex(
00438 #ifdef WOLFSENTRY
00439     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00440 #endif
00441     JSON_VALUE* v,
00442     int (*custom_cmp_func)(const unsigned char* /*key1*/, size_t /*len1*/,
00443                           const unsigned char* /*key2*/, size_t /*len2*/),
00444     unsigned flags);
00445
00446 /* Get flags of the dictionary.

```



```

00447  */
00448 WOLFSENTRY_API unsigned json_value_dict_flags(const JSON_VALUE* v);
00449
00450 /* Get count of items in the dictionary.
00451  */
00452 WOLFSENTRY_API size_t json_value_dict_size(const JSON_VALUE* v);
00453
00454 /* Get all keys.
00455  *
00456  * If the buffer provided by the caller is too small, only subset of keys shall
00457  * be retrieved.
00458  *
00459  * Returns count of retrieved keys.
00460  */
00461 WOLFSENTRY_API size_t json_value_dict_keys_sorted(const JSON_VALUE* v, const JSON_VALUE** buffer,
size_t buffer_size);
00462 WOLFSENTRY_API size_t json_value_dict_keys_ordered(const JSON_VALUE* v, const JSON_VALUE** buffer,
size_t buffer_size);
00463
00464 /* Find an item with the given key, or return NULL if no such item exists.
00465  */
00466 WOLFSENTRY_API JSON_VALUE* json_value_dict_get(const JSON_VALUE* v, const unsigned char* key, size_t
key_len);
00467 WOLFSENTRY_API JSON_VALUE* json_value_dict_get(const JSON_VALUE* v, const unsigned char* key);
00468
00469 /* Add new item with the given key of type JSON_VALUE_NULL.
00470  *
00471  * Returns NULL if the key is already used.
00472  */
00473 WOLFSENTRY_API JSON_VALUE* json_value_dict_add(
00474 #ifdef WOLFSENTRY
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00475 #endif
    JSON_VALUE* v, const unsigned char* key, size_t key_len);
00476 WOLFSENTRY_API JSON_VALUE* json_value_dict_add(
00477 #ifdef WOLFSENTRY
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00478 #endif
    JSON_VALUE* v, const unsigned char* key);
00479
00480 /* This is combined operation of json_value_dict_get() and json_value_dict_add().
00481  *
00482  * Get value of the given key. If no such value exists, new one is added.
00483  * Application can check for such situation with json_value_is_new().
00484  *
00485  * NULL is returned only in an out-of-memory situation.
00486  */
00487 WOLFSENTRY_API JSON_VALUE* json_value_dict_get_or_add(
00488 #ifdef WOLFSENTRY
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00489 #endif
    JSON_VALUE* v, const unsigned char* key, size_t key_len);
00490 WOLFSENTRY_API JSON_VALUE* json_value_dict_get_or_add(
00491 #ifdef WOLFSENTRY
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00492 #endif
    JSON_VALUE* v, const unsigned char* key);
00493
00494 /* Remove and destroy (recursively) the given item from the dictionary.
00495  */
00496 WOLFSENTRY_API int json_value_dict_remove(
00497 #ifdef WOLFSENTRY
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00498 #endif
    JSON_VALUE* v, const unsigned char* key, size_t key_len);
00499 WOLFSENTRY_API int json_value_dict_remove(
00500 #ifdef WOLFSENTRY
    WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00501 #endif
    JSON_VALUE* v, const unsigned char* key);
00502
00503 /* Walking over all items in the dictionary. The callback function is called
00504  * for every item in the dictionary, providing key and value and propagating
00505  * the user data into it. If the callback returns non-zero, the function
00506  * aborts immediately.
00507  *
00508  * Note dict_walk_ordered() is supported only if DICT_MAINTAINORDER
00509  * flag was used in init_dict().
00510  */
00511 WOLFSENTRY_API int json_value_dict_walk_ordered(const JSON_VALUE* v,
int (*visit_func)(const JSON_VALUE*, JSON_VALUE*, void*), void* ctx);
00512 WOLFSENTRY_API int json_value_dict_walk_sorted(const JSON_VALUE* v,
int (*visit_func)(const JSON_VALUE*, JSON_VALUE*, void*), void* ctx);
00513
00514 /* Remove and destroy all members (recursively).
00515  */
00516 WOLFSENTRY_API int json_value_dict_clean(

```

```

00531 #ifdef WOLFSENTRY
00532     WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00533 #endif
00534     JSON_VALUE* v);
00535
00536 #ifdef WOLFSENTRY
00537 WOLFSENTRY_API int
00538 json_value_clone(WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct wolfentry_allocator *allocator),
00539                 const JSON_VALUE* node, JSON_VALUE *clone);
00540 #endif
00541
00542 #ifdef __cplusplus
00543 }
00544 #endif
00545
00546 #endif /* CENTIJSON_VALUE_H */

```

## 10.4 wolfentry/wolfentry.h File Reference

The main include file for wolfSentry applications.

```

#include <wolfentry/wolfentry_settings.h>
#include <wolfentry/wolfentry_af.h>
#include <wolfentry/wolfentry_errcodes.h>
#include <wolfentry/centijson_dom.h>
#include <wolfentry/wolfentry_util.h>

```

### Data Structures

- struct [wolfentry\\_allocator](#)  
*Struct for passing shims that abstract the native implementation of the heap allocator.*
- struct [wolfentry\\_timecbs](#)  
*Struct for passing shims that abstract the native implementation of time functions.*
- struct [wolfentry\\_semcbs](#)  
*Struct for passing shims that abstract the native implementation of counting semaphores.*
- struct [wolfentry\\_host\\_platform\\_interface](#)  
*struct for passing shims that abstract native implementations of the heap allocator, time functions, and semaphores*
- struct [wolfentry\\_route\\_endpoint](#)  
*struct for exporting socket addresses, with fixed-length fields*
- struct [wolfentry\\_route\\_metadata\\_exports](#)  
*struct for exporting route metadata for access by applications*
- struct [wolfentry\\_route\\_exports](#)  
*struct for exporting a route for access by applications*
- struct [wolfentry\\_sockaddr](#)  
*struct for passing socket addresses into wolfentry\_route\_\*() API routines*
- struct [wolfentry\\_eventconfig](#)  
*struct for representing event configuration*
- struct [wolfentry\\_kv\\_pair](#)  
*public structure for passing user-defined values in/out of wolfSentry*

## Macros

- **#define WOLFSENTRY\_VERSION\_MAJOR**  
*Macro for major version number of installed headers.*
- **#define WOLFSENTRY\_VERSION\_MINOR**  
*Macro for minor version number of installed headers.*
- **#define WOLFSENTRY\_VERSION\_TINY**  
*Macro for tiny version number of installed headers.*
- **#define WOLFSENTRY\_VERSION\_ENCODE(major, minor, tiny)**  
*Macro to convert a wolfSentry version to a single integer, for comparison to other similarly converted versions.*
- **#define WOLFSENTRY\_VERSION**  
*The version recorded in [wolfsentry.h](#), encoded as an integer.*
- **#define WOLFSENTRY\_VERSION\_GT(major, minor, tiny)**  
*Helper macro that is true if the given version is greater than that in [wolfsentry.h](#).*
- **#define WOLFSENTRY\_VERSION\_GE(major, minor, tiny)**  
*Helper macro that is true if the given version is greater than or equal to that in [wolfsentry.h](#).*
- **#define WOLFSENTRY\_VERSION\_EQ(major, minor, tiny)**  
*Helper macro that is true if the given version equals that in [wolfsentry.h](#).*
- **#define WOLFSENTRY\_VERSION\_LT(major, minor, tiny)**  
*Helper macro that is true if the given version is less than that in [wolfsentry.h](#).*
- **#define WOLFSENTRY\_VERSION\_LE(major, minor, tiny)**  
*Helper macro that is true if the given version is less than or equal to that in [wolfsentry.h](#).*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_IN**  
*Common context argument generator for use at the beginning of arg lists in function prototypes and definitions. Pair with WOLFSENTRY\_CONTEXT\_ARGS\_OUT in the caller argument list.*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX(ctx)**  
*Variant of WOLFSENTRY\_CONTEXT\_ARGS\_IN that allows a fully type-qualified context to be supplied explicitly (allowing contexts other than `struct wolfsentry_context`)*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX4(ctx, thr)**  
*Variant of WOLFSENTRY\_CONTEXT\_ARGS\_IN that allows the identifiers for context and thread pointers to be supplied explicitly.*
- **#define WOLFSENTRY\_CONTEXT\_ELEMENTS**  
*Variant of WOLFSENTRY\_CONTEXT\_ARGS\_IN for constructing structs.*
- **#define WOLFSENTRY\_CONTEXT\_SET\_ELEMENTS(s)**  
*Counterpart to WOLFSENTRY\_CONTEXT\_ELEMENTS to access the wolfsentry context.*
- **#define WOLFSENTRY\_CONTEXT\_GET\_ELEMENTS(s)**  
*Counterpart to WOLFSENTRY\_CONTEXT\_ELEMENTS to access the thread context (exists only if defined ( $\leftrightarrow$  WOLFSENTRY\_THREADSAFE))*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT**  
*Common context argument generator to use in calls to functions taking WOLFSENTRY\_CONTEXT\_ARGS\_IN*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX(ctx)**  
*Variant of WOLFSENTRY\_CONTEXT\_ARGS\_OUT that allows passing an explicitly identified context argument generator to use in calls to functions taking WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX2(x)**  
*Variant of WOLFSENTRY\_CONTEXT\_ARGS\_OUT corresponding to WOLFSENTRY\_CONTEXT\_ELEMENTS*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX3(x, y)**  
*Special-purpose variant of WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX for accessing context element `y` in structure pointer `x`*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX4(x, y)**  
*Special-purpose variant of WOLFSENTRY\_CONTEXT\_ARGS\_OUT that simply expands to `x` or `x, y` depending on WOLFSENTRY\_THREADSAFE*
- **#define WOLFSENTRY\_CONTEXT\_ARGS\_NOT\_USED**

Helper macro for function implementations that need to accept `WOLFSENTRY_CONTEXT_ARGS_IN` for API conformance, but don't actually use the arguments.

- **#define WOLFSENTRY\_CONTEXT\_ARGS\_THREAD\_NOT\_USED**

Helper macro for function implementations that need to accept `WOLFSENTRY_CONTEXT_ARGS_IN` for API conformance, but don't actually use the `thread` argument.

- **#define WOLFSENTRY\_THREAD\_HEADER\_DECLS**
- **#define WOLFSENTRY\_THREAD\_HEADER\_INIT(flags)**

For `WOLFSENTRY_THREADSAFE` applications, this allocates the required thread context on the stack.

- **#define WOLFSENTRY\_THREAD\_HEADER\_INIT\_CHECKED(flags)**

For `WOLFSENTRY_THREADSAFE` applications, this performs the required thread context initialization, with options from its `wolfentry_thread_flags_t flags` arg.

- **#define WOLFSENTRY\_THREAD\_HEADER(flags)**

For `WOLFSENTRY_THREADSAFE` applications, this performs the required thread context initialization, with options from its `wolfentry_thread_flags_t flags` arg, and returns on failure.

- **#define WOLFSENTRY\_THREAD\_HEADER\_CHECK()**

For `WOLFSENTRY_THREADSAFE` applications, this allocates the required thread context on the stack, and initializes it with options from its `wolfentry_thread_flags_t flags` arg.

- **#define WOLFSENTRY\_THREAD\_HEADER\_CHECKED(flags)**

For `WOLFSENTRY_THREADSAFE` applications, checks if thread context initialization succeeded, and returns on failure.

- **#define WOLFSENTRY\_THREAD\_TAILER(flags)**

For `WOLFSENTRY_THREADSAFE` applications, this allocates the required thread context on the stack, and initializes it with options from its `wolfentry_thread_flags_t flags` arg, returning on failure.

- **#define WOLFSENTRY\_THREAD\_TAILER\_CHECKED(flags)**

For `WOLFSENTRY_THREADSAFE` applications, this cleans up a thread context allocated with `WOLFSENTRY_THREAD_HEADER*`, with options from its `wolfentry_thread_flags_t flags` arg, returning on error.

- **#define WOLFSENTRY\_THREAD\_GET\_ERROR**

For `WOLFSENTRY_THREADSAFE` applications, this evaluates to the most recent result from `WOLFSENTRY_THREAD_HEADER_INIT` or `WOLFSENTRY_THREAD_TAILER()`

- **#define WOLFSENTRY\_ACTION\_RES\_USER\_SHIFT 24U**

Bit shift for user-defined bit span in `wolfentry_action_res_t`.

- **#define WOLFSENTRY\_ACTION\_RES\_USER7 (1U << 31U)**

user-defined result bit #8 of 8. Defined with a macro to retain ISO C compliance on enum range.

- **#define WOLFSENTRY\_ROUTE\_DEFAULT\_POLICY\_MASK (WOLFSENTRY\_ACTION\_RES\_ACCEPT | WOLFSENTRY\_ACTION\_RES\_REJECT | WOLFSENTRY\_ACTION\_RES\_STOP | WOLFSENTRY\_ACTION\_RES\_ERROR)**

Bit mask spanning the bits allowed by `wolfentry_route_table_default_policy_set()`

- **#define WOLFSENTRY\_ROUTE\_WILDCARD\_FLAGS**

Bit mask for the wildcard bits in a `wolfentry_route_flags_t`.

- **#define WOLFSENTRY\_ROUTE\_IMMUTABLE\_FLAGS**

Bit mask for the bits in a `wolfentry_route_flags_t` that can't change after the implicated route has been inserted in the route table.

- **#define WOLFSENTRY\_SOCKADDR(n)**

- **#define WOLFSENTRY\_LENGTH\_NULL\_TERMINATED**

A macro with a painfully long name that can be passed as a length to routines taking a length argument, to signify that the associated string is null-terminated and its length should be computed on that basis.

- **#define WOLFSENTRY\_KV\_FLAG\_MASK**

A bit mask to retain only the flag bits in a `wolfentry_kv_type_t`.

- **#define WOLFSENTRY\_KV\_KEY\_LEN(kv)**

Evaluates to the length of the key of a `wolfentry_kv_pair`.

- **#define WOLFSENTRY\_KV\_KEY(kv)**

Evaluates to the key of a `wolfentry_kv_pair`.

- **#define WOLFSENTRY\_KV\_TYPE(kv)**

Evaluates to the type of a `wolfentry_kv_pair`, with flag bits masked out.

- **#define WOLFSENTRY\_KV\_V\_UINT(kv)**  
Evaluates to the `uint64_t` value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_UINT`.
- **#define WOLFSENTRY\_KV\_V\_SINT(kv)**  
Evaluates to the `int64_t` value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_INT`.
- **#define WOLFSENTRY\_KV\_V\_FLOAT(kv)**  
Evaluates to the `double` value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_FLOAT`.
- **#define WOLFSENTRY\_KV\_V\_STRING\_LEN(kv)**  
Evaluates to the `size_t` length of the value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_STRING`.
- **#define WOLFSENTRY\_KV\_V\_STRING(kv)**  
Evaluates to the `char *` value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_STRING`.
- **#define WOLFSENTRY\_KV\_V\_BYTES\_LEN(kv)**  
Evaluates to the `size_t` length of the value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_BYTES`.
- **#define WOLFSENTRY\_KV\_V\_BYTES(kv)**  
Evaluates to the `byte *` value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_BYTES`.
- **#define WOLFSENTRY\_KV\_V\_JSON(kv)**  
Evaluates to the `JSON_VALUE *` value of a `wolfsentry_kv_pair` of type `WOLFSENTRY_KV_JSON`.
- **#define WOLFSENTRY\_BASE64\_DECODED\_BUFSPC(buf, len)**  
Given valid base64 string `buf` of length `len`, evaluates to the exact decoded length.

## Typedefs

- **typedef void \*(\* wolfsentry\_malloc\_cb\_t)** (void \*context, struct wolfsentry\_thread\_context \*thread, size\_t size)  
Pointer to malloc-like function. Takes extra initial args `context` and, if `!defined(WOLFSENTRY_SINGLETHREADED)`, `thread` arg.
- **typedef void \*(\* wolfsentry\_free\_cb\_t)** (void \*context, struct wolfsentry\_thread\_context \*thread, void \*ptr)  
Pointer to free-like function. Takes extra initial args `context` and, if `!defined(WOLFSENTRY_SINGLETHREADED)`, `thread` arg.
- **typedef void \*(\* wolfsentry\_realloc\_cb\_t)** (void \*context, struct wolfsentry\_thread\_context \*thread, void \*ptr, size\_t size)  
Pointer to realloc-like function. Takes extra initial args `context` and, if `!defined(WOLFSENTRY_SINGLETHREADED)`, `thread` arg.
- **typedef void \*(\* wolfsentry\_memalign\_cb\_t)** (void \*context, struct wolfsentry\_thread\_context \*thread, size\_t alignment, size\_t size)  
Pointer to memalign-like function. Takes extra initial args `context` and, if `!defined(WOLFSENTRY_SINGLETHREADED)`, `thread` arg.
- **typedef void \*(\* wolfsentry\_free\_aligned\_cb\_t)** (void \*context, struct wolfsentry\_thread\_context \*thread, void \*ptr)  
Pointer to special-purpose free-like function, needed only if the `memalign` pointer in a struct `wolfsentry_allocator` is non-null. Can be same as routine supplied as `wolfsentry_free_cb_t`, or can be a separate routine, e.g. with special handling for pad bytes. Takes extra initial args `context` and, if `!defined(WOLFSENTRY_SINGLETHREADED)`, `thread` arg.
- **typedef wolfsentry\_errcode\_t(\* wolfsentry\_get\_time\_cb\_t)** (void \*context, wolfsentry\_time\_t \*ts)  
Pointer to function that returns time denominated in `wolfsentry_time_t`. Takes an initial `context` arg, which can be ignored.
- **typedef wolfsentry\_time\_t(\* wolfsentry\_diff\_time\_cb\_t)** (wolfsentry\_time\_t earlier, wolfsentry\_time\_t later)  
Pointer to function that subtracts `earlier` from `later`, returning the result.
- **typedef wolfsentry\_time\_t(\* wolfsentry\_add\_time\_cb\_t)** (wolfsentry\_time\_t start\_time, wolfsentry\_time\_t time\_interval)  
Pointer to function that adds two `wolfsentry_time_t` times, returning the result.
- **typedef wolfsentry\_errcode\_t(\* wolfsentry\_to\_epoch\_time\_cb\_t)** (wolfsentry\_time\_t when, time\_t \*epoch\_secs, long \*epoch\_nsecs)

Pointer to function that converts a `wolfentry_time_t` to seconds and nanoseconds since midnight UTC, 1970-Jan-1.

- typedef `wolfentry_errcode_t`(\* `wolfentry_from_epoch_time_cb_t`) (time\_t epoch\_secs, long epoch\_nsecs, `wolfentry_time_t` \*when)

Pointer to function that converts seconds and nanoseconds since midnight UTC, 1970-Jan-1, to a `wolfentry_time_t`.

- typedef `wolfentry_errcode_t`(\* `wolfentry_interval_to_seconds_cb_t`) (`wolfentry_time_t` howlong, time\_t \*howlong\_secs, long \*howlong\_nsecs)

Pointer to function that converts a `wolfentry_time_t` expressing an interval to the corresponding seconds and nanoseconds.

- typedef `wolfentry_errcode_t`(\* `wolfentry_interval_from_seconds_cb_t`) (time\_t howlong\_secs, long howlong\_nsecs, `wolfentry_time_t` \*howlong)

Pointer to function that converts seconds and nanoseconds expressing an interval to the corresponding `wolfentry_time_t`.

- typedef int(\* `sem_init_cb_t`) (sem\_t \*sem, int pshared, unsigned int value)
- typedef int(\* `sem_post_cb_t`) (sem\_t \*sem)
- typedef int(\* `sem_wait_cb_t`) (sem\_t \*sem)
- typedef int(\* `sem_timedwait_cb_t`) (sem\_t \*sem, const struct timespec \*abs\_timeout)
- typedef int(\* `sem_trywait_cb_t`) (sem\_t \*sem)
- typedef int(\* `sem_destroy_cb_t`) (sem\_t \*sem)
- typedef `wolfentry_errcode_t`(\* `wolfentry_action_callback_t`) (`WOLFENTRY_CONTEXT_ARGS_IN`, const struct wolfentry\_action \*action, void \*handler\_arg, void \*caller\_arg, const struct wolfentry\_event \*trigger\_event, `wolfentry_action_type_t` action\_type, const struct wolfentry\_route \*trigger\_route, struct wolfentry\_route\_table \*route\_table, struct wolfentry\_route \*rule\_route, `wolfentry_action_res_t` \*action\_results)

A callback that is triggered when an action is taken.

- typedef `wolfentry_errcode_t`(\* `wolfentry_make_id_cb_t`) (void \*context, `wolfentry_ent_id_t` \*id)
- typedef void(\* `wolfentry_cleanup_callback_t`) (`WOLFENTRY_CONTEXT_ARGS_IN`, void \*cleanup\_arg)

Function type to pass to `wolfentry_cleanup_push()`

- typedef `wolfentry_errcode_t`(\* `wolfentry_addr_family_parser_t`) (`WOLFENTRY_CONTEXT_ARGS_IN`, const char \*addr\_text, int addr\_text\_len, `byte` \*addr\_internal, `wolfentry_addr_bits_t` \*addr\_internal\_bits)

Function type for parsing handler, to pass to `wolfentry_addr_family_handler_install()`

- typedef `wolfentry_errcode_t`(\* `wolfentry_addr_family_formatter_t`) (`WOLFENTRY_CONTEXT_ARGS_IN`, const `byte` \*addr\_internal, unsigned int addr\_internal\_bits, char \*addr\_text, int \*addr\_text\_len)

Function type for formatting handler, to pass to `wolfentry_addr_family_handler_install()`

- typedef `wolfentry_errcode_t`(\* `wolfentry_kv_validator_t`) (`WOLFENTRY_CONTEXT_ARGS_IN`, struct `wolfentry_kv_pair` \*kv)

## Enumerations

- enum `wolfentry_init_flags_t` {  
`WOLFENTRY_INIT_FLAG_NONE` ,  
`WOLFENTRY_INIT_FLAG_LOCK_SHARED_ERROR_CHECKING` }

flags to pass to `wolfentry_init_ex()`, to be ORed together.

- enum `wolfentry_thread_flags_t` {  
`WOLFENTRY_THREAD_FLAG_NONE` ,  
`WOLFENTRY_THREAD_FLAG_DEADLINE` ,  
`WOLFENTRY_THREAD_FLAG_READONLY` }

`wolfentry_thread_flags_t` flags are to be ORed together.

- enum `wolfentry_lock_flags_t` {  
`WOLFENTRY_LOCK_FLAG_NONE` ,  
`WOLFENTRY_LOCK_FLAG_PSHARED` ,  
`WOLFENTRY_LOCK_FLAG_SHARED_ERROR_CHECKING` ,  
`WOLFENTRY_LOCK_FLAG_NONRECURSIVE_MUTEX` ,  
`WOLFENTRY_LOCK_FLAG_NONRECURSIVE_SHARED` ,  
`WOLFENTRY_LOCK_FLAG_GET_RESERVATION_TOO` ,  
`WOLFENTRY_LOCK_FLAG_TRY_RESERVATION_TOO` ,  
`WOLFENTRY_LOCK_FLAG_ABANDON_RESERVATION_TOO` ,  
`WOLFENTRY_LOCK_FLAG_AUTO_DOWNGRADE` ,  
`WOLFENTRY_LOCK_FLAG_RETAIN_SEMAPHORE` }  
*flags to pass to `wolfentry_lock_*` () functions, to be OR'd together*
- enum `wolfentry_object_type_t` {  
`WOLFENTRY_OBJECT_TYPE_UNINITED` ,  
`WOLFENTRY_OBJECT_TYPE_TABLE` ,  
`WOLFENTRY_OBJECT_TYPE_ACTION` ,  
`WOLFENTRY_OBJECT_TYPE_EVENT` ,  
`WOLFENTRY_OBJECT_TYPE_ROUTE` ,  
`WOLFENTRY_OBJECT_TYPE_KV` ,  
`WOLFENTRY_OBJECT_TYPE_ADDR_FAMILY_BYNUMBER` ,  
`WOLFENTRY_OBJECT_TYPE_ADDR_FAMILY_BYNAME` }  
*enum for communicating the type of an object.*
- enum `wolfentry_action_flags_t` {  
`WOLFENTRY_ACTION_FLAG_NONE` ,  
`WOLFENTRY_ACTION_FLAG_DISABLED` }  
*enum for communicating attributes of an action object*
- enum `wolfentry_action_type_t` {  
`WOLFENTRY_ACTION_TYPE_NONE` ,  
`WOLFENTRY_ACTION_TYPE_POST` ,  
`WOLFENTRY_ACTION_TYPE_INSERT` ,  
`WOLFENTRY_ACTION_TYPE_MATCH` ,  
`WOLFENTRY_ACTION_TYPE_UPDATE` ,  
`WOLFENTRY_ACTION_TYPE_DELETE` ,  
`WOLFENTRY_ACTION_TYPE_DECISION` }  
*enum communicating (to action handlers and internal logic) what type of action is being evaluated*
- enum `wolfentry_action_res_t` {  
`WOLFENTRY_ACTION_RES_NONE` ,  
`WOLFENTRY_ACTION_RES_ACCEPT` ,  
`WOLFENTRY_ACTION_RES_REJECT` ,  
`WOLFENTRY_ACTION_RES_CONNECT` ,  
`WOLFENTRY_ACTION_RES_DISCONNECT` ,  
`WOLFENTRY_ACTION_RES_DEROGATORY` ,  
`WOLFENTRY_ACTION_RES_COMMENDABLE` ,  
`WOLFENTRY_ACTION_RES_STOP` ,  
`WOLFENTRY_ACTION_RES_DEALLOCATED` ,  
`WOLFENTRY_ACTION_RES_INSERTED` ,  
`WOLFENTRY_ACTION_RES_ERROR` ,  
`WOLFENTRY_ACTION_RES_FALLTHROUGH` ,  
`WOLFENTRY_ACTION_RES_UPDATE` ,  
`WOLFENTRY_ACTION_RES_PORT_RESET` ,  
`WOLFENTRY_ACTION_RES_SENDING` ,  
`WOLFENTRY_ACTION_RES_RECEIVED` ,  
`WOLFENTRY_ACTION_RES_BINDING` ,  
`WOLFENTRY_ACTION_RES_LISTENING` ,  
`WOLFENTRY_ACTION_RES_STOPPED_LISTENING` ,  
`WOLFENTRY_ACTION_RES_CONNECTING_OUT` ,  
`WOLFENTRY_ACTION_RES_CLOSED` ,



```

WOLFSENTRY_ACTION_RES_UNREACHABLE ,
WOLFSENTRY_ACTION_RES_SOCK_ERROR ,
WOLFSENTRY_ACTION_RES_USER0 ,
WOLFSENTRY_ACTION_RES_USER1 ,
WOLFSENTRY_ACTION_RES_USER2 ,
WOLFSENTRY_ACTION_RES_USER3 ,
WOLFSENTRY_ACTION_RES_USER4 ,
WOLFSENTRY_ACTION_RES_USER5 ,
WOLFSENTRY_ACTION_RES_USER6 }

```

*bit field used to communicate states and attributes through the evaluation pipeline.*

- enum `wolfentry_route_flags_t` {  
`WOLFSENTRY_ROUTE_FLAG_NONE = 0U` ,  
`WOLFSENTRY_ROUTE_FLAG_SA_FAMILY_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_ADDR_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_SA_PROTO_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_PORT_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_ADDR_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_PORT_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_REMOTE_INTERFACE_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_LOCAL_INTERFACE_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_WILDCARD` ,  
`WOLFSENTRY_ROUTE_FLAG_TCPLIKE_PORT_NUMBERS` ,  
`WOLFSENTRY_ROUTE_FLAG_DIRECTION_IN` ,  
`WOLFSENTRY_ROUTE_FLAG_DIRECTION_OUT` ,  
`WOLFSENTRY_ROUTE_FLAG_REMOTE_ADDR_BITMASK` ,  
`WOLFSENTRY_ROUTE_FLAG_LOCAL_ADDR_BITMASK` ,  
`WOLFSENTRY_ROUTE_FLAG_IN_TABLE` ,  
`WOLFSENTRY_ROUTE_FLAG_PENDING_DELETE` ,  
`WOLFSENTRY_ROUTE_FLAG_INSERT_ACTIONS_CALLED` ,  
`WOLFSENTRY_ROUTE_FLAG_DELETE_ACTIONS_CALLED` ,  
`WOLFSENTRY_ROUTE_FLAG_PENALTYBOXED` ,  
`WOLFSENTRY_ROUTE_FLAG_GREENLISTED` ,  
`WOLFSENTRY_ROUTE_FLAG_DONT_COUNT_HITS` ,  
`WOLFSENTRY_ROUTE_FLAG_DONT_COUNT_CURRENT_CONNECTIONS` ,  
`WOLFSENTRY_ROUTE_FLAG_PORT_RESET` }

*bit field specifying attributes of a route/rule*

- enum `wolfentry_format_flags_t` {  
`WOLFSENTRY_FORMAT_FLAG_NONE` ,  
`WOLFSENTRY_FORMAT_FLAG_ALWAYS_NUMERIC` }

*Macro to instantiate a `wolfentry_sockaddr` with an `addr` field sized to hold `n` bits of address data. Cast to `struct wolfentry_sockaddr` to pass as API argument.*

- enum `wolfentry_event_flags_t` {  
`WOLFSENTRY_EVENT_FLAG_NONE` ,  
`WOLFSENTRY_EVENT_FLAG_IS_PARENT_EVENT` ,  
`WOLFSENTRY_EVENT_FLAG_IS_SUBEVENT` }

*bit field with attribute flags for events*

- enum `wolfentry_eventconfig_flags_t` {  
`WOLFSENTRY_EVENTCONFIG_FLAG_NONE` ,  
`WOLFSENTRY_EVENTCONFIG_FLAG_DEROGATORY_THRESHOLD_IGNORE_COMMENDABLE` ,  
`WOLFSENTRY_EVENTCONFIG_FLAG_COMMENDABLE_CLEARS_DEROGATORY` ,  
`WOLFSENTRY_EVENTCONFIG_FLAG_INHIBIT_ACTIONS` }

*bit field with config flags for events*

- enum `wolfentry_clone_flags_t` {  
`WOLFSENTRY_CLONE_FLAG_NONE` ,  
`WOLFSENTRY_CLONE_FLAG_AS_AT_CREATION` ,  
`WOLFSENTRY_CLONE_FLAG_NO_ROUTES` }

*Flags to be OR'd together to control the dynamics of `wolfentry_context_clone()` and other cloning functions.*



- enum [wolfentry\\_kv\\_type\\_t](#) {  
**WOLFENTRY\_KV\_NONE** = 0 ,  
**WOLFENTRY\_KV\_NULL** ,  
**WOLFENTRY\_KV\_TRUE** ,  
**WOLFENTRY\_KV\_FALSE** ,  
**WOLFENTRY\_KV\_UINT** ,  
**WOLFENTRY\_KV\_SINT** ,  
**WOLFENTRY\_KV\_FLOAT** ,  
**WOLFENTRY\_KV\_STRING** ,  
**WOLFENTRY\_KV\_BYTES** ,  
**WOLFENTRY\_KV\_JSON** ,  
**WOLFENTRY\_KV\_FLAG\_READONLY** = 1<<30 }  
*enum to represent the type of a user-defined value*

## Functions

- WOLFENTRY\_API struct [wolfentry\\_build\\_settings](#) [wolfentry\\_get\\_build\\_settings](#) (void)  
*Return the [wolfentry\\_build\\_settings](#) of the library as built.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_build\\_settings\\_compatible](#) (struct [wolfentry\\_build\\_settings](#) caller\_build\_settings)  
*Return success if the application and library were built with mutually compatible wolfSentry version and configuration.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_init\\_thread\\_context](#) (struct [wolfentry\\_thread\\_context](#) \*thread\_context, [wolfentry\\_thread\\_flags\\_t](#) init\_thread\_flags, void \*user\_context)  
*Initialize thread\_context according to init\_thread\_flags, storing user\_context for later retrieval with [wolfentry\\_get\\_thread\\_user\\_context\(\)](#).*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_alloc\\_thread\\_context](#) (struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi, struct [wolfentry\\_thread\\_context](#) \*\*thread\_context, [wolfentry\\_thread\\_flags\\_t](#) init\_thread\_flags, void \*user\_context)  
*Allocate space for thread\_context using the allocator in hpi, then call [wolfentry\\_init\\_thread\\_context\(\)](#).*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_get\\_thread\\_id](#) (struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_thread\\_id\\_t](#) \*id)  
*Write the [wolfentry\\_thread\\_id\\_t](#) of thread to id.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_get\\_thread\\_user\\_context](#) (struct [wolfentry\\_thread\\_context](#) \*thread, void \*\*user\_context)  
*Store to user\_context the pointer previously passed to [wolfentry\\_init\\_thread\\_context\(\)](#).*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_get\\_thread\\_deadline](#) (struct [wolfentry\\_thread\\_context](#) \*thread, struct [timespec](#) \*deadline)  
*Store the deadline for thread to deadline, or if the thread has no deadline set, store [WOLFENTRY\\_DEADLINE\\_NEVER](#) to deadline->tv\_sec and deadline->tv\_nsec.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_get\\_thread\\_flags](#) (struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_thread\\_flags\\_t](#) \*thread\_flags)  
*Store the flags of thread to thread\_flags.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_destroy\\_thread\\_context](#) (struct [wolfentry\\_thread\\_context](#) \*thread\_context, [wolfentry\\_thread\\_flags\\_t](#) thread\_flags)  
*Perform final integrity checking on the thread state, and deallocate its ID.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_free\\_thread\\_context](#) (struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi, struct [wolfentry\\_thread\\_context](#) \*\*thread\_context, [wolfentry\\_thread\\_flags\\_t](#) thread\_flags)  
*Call [wolfentry\\_destroy\\_thread\\_context\(\)](#) on \*thread\_context, and if that succeeds, deallocate the thread object previously allocated by [wolfentry\\_alloc\\_thread\\_context\(\)](#).*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_set\\_deadline\\_rel\\_usecs](#) ([WOLFENTRY\\_CONTEXT\\_ARGS\\_IN](#), int usecs)  
*Set the thread deadline to usecs in the future. The thread will not wait for a lock beyond that deadline.*
- WOLFENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_set\\_deadline\\_abs](#) ([WOLFENTRY\\_CONTEXT\\_ARGS\\_IN](#), time\_t epoch\_secs, long epoch\_nsecs)

Set the thread deadline to the time identified by `epoch_secs` and `epoch_nsecs`. The thread will not wait for a lock beyond that deadline.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_clear\_deadline** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#))  
Clear any thread deadline previously set. On time-unbounded calls such as [wolfentry\\_lock\\_shared\(\)](#) and [wolfentry\\_lock\\_mutex\(\)](#), the thread will sleep until the lock is available.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_set\_thread\_readonly** (struct [wolfentry\\_thread](#) ↵ context \*thread\_context)  
Set the thread state to allow only readonly locks to be gotten, allowing multiple shared locks to be concurrently held. If any mutexes or reservations are currently held, the call will fail.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_set\_thread\_readwrite** (struct [wolfentry\\_thread](#) ↵ context \*thread\_context)  
Set the thread state to allow both readonly and mutex locks to be gotten. If multiple shared locks are currently held, the call will fail.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_init** (struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi, struct [wolfentry\\_thread\\_context](#) \*thread, struct [wolfentry\\_rwlock](#) \*lock, [wolfentry\\_lock\\_flags\\_t](#) flags)  
This initializes a semaphore lock structure created by the user.
- WOLFSENTRY\_API [size\\_t](#) **wolfentry\_lock\_size** (void)
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_alloc** (struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi, struct [wolfentry\\_thread\\_context](#) \*thread, struct [wolfentry\\_rwlock](#) \*\*lock, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Allocates and initializes a semaphore lock structure for use with `wolfSentry`.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_shared** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Requests a shared lock.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_shared\_abstimed** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, const struct [timespec](#) \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Requests a shared lock with an absolute timeout.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_shared\_timed** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Requests a shared lock with a relative timeout.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_mutex** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Requests an exclusive lock.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_mutex\_abstimed** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, const struct [timespec](#) \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Requests an exclusive lock with an absolute timeout.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_mutex\_timed** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Requests an exclusive lock with a relative timeout.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_mutex2shared** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Downgrade an exclusive lock to a shared lock.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_shared2mutex** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Upgrade a shared lock to an exclusive lock.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_shared2mutex\_abstimed** (struct [wolfentry\\_rwlock](#) ↵ \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, const struct [timespec](#) \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Attempt to upgrade a shared lock to an exclusive lock with an absolute timeout.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_shared2mutex\_timed** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)  
Attempt to upgrade a shared lock to an exclusive lock with a relative timeout.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_lock\_shared2mutex\_reserve** (struct [wolfentry\\_rwlock](#) \*lock, struct [wolfentry\\_thread\\_context](#) \*thread, [wolfentry\\_lock\\_flags\\_t](#) flags)

*Attempt to reserve a upgrade of a shared lock to an exclusive lock.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_shared2mutex\\_redeem](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Redeem a reservation of a lock upgrade from shared to exclusive.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_shared2mutex\\_redeem\\_abstimed](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, const struct timespec \*abs\_timeout, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Redeem a reservation of a lock upgrade from shared to exclusive with an absolute timeout.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_shared2mutex\\_redeem\\_timed](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_time\\_t](#) max\_wait, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Redeem a reservation of a lock upgrade from shared to exclusive with a relative timeout.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_shared2mutex\\_abandon](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Abandon a reservation of a lock upgrade from shared to exclusive.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_have\\_shared](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Check if the lock is held in shared state.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_have\\_mutex](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Check if the lock is held in exclusive state.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_have\\_either](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Check if the lock is held in either shared or exclusive state.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_have\\_shared2mutex\\_reservation](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Check if an upgrade reservation is held on the lock.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_get\\_flags](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) \*flags)

*Extract the current flags from the lock.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_unlock](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Unlock a lock.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_destroy](#) (struct wolfsentry\_rwlock \*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Destroy a lock that was created with [wolfsentry\\_lock\\_init\(\)](#)*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_lock\\_free](#) (struct wolfsentry\_rwlock \*\*lock, struct wolfsentry\_thread\_context \*thread, [wolfsentry\\_lock\\_flags\\_t](#) flags)

*Destroy and free a lock that was created with [wolfsentry\\_lock\\_alloc\(\)](#). The lock's pointer will also be set to NULL.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_time\\_now\\_plus\\_delta](#) (struct wolfsentry\_context \*wolfsentry, [wolfsentry\\_time\\_t](#) td, [wolfsentry\\_time\\_t](#) \*res)

*Generate a [wolfsentry\\_time\\_t](#) at a given offset from current time.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_time\\_to\\_timespec](#) (struct wolfsentry\_context \*wolfsentry, [wolfsentry\\_time\\_t](#) t, struct timespec \*ts)

*Convert a [wolfsentry\\_time\\_t](#) to a struct timespec.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_time\\_now\\_plus\\_delta\\_timespec](#) (struct wolfsentry\_context \*wolfsentry, [wolfsentry\\_time\\_t](#) td, struct timespec \*ts)

*Generate a struct timespec at a given offset, supplied as [wolfsentry\\_time\\_t](#), from current time.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_get\\_time](#) (struct wolfsentry\_context \*wolfsentry, [wolfsentry\\_time\\_t](#) \*time\_p)

*Get current time as [wolfsentry\\_time\\_t](#).*

- WOLFSENTRY\_API [wolfsentry\\_time\\_t wolfsentry\\_diff\\_time](#) (struct wolfsentry\_context \*wolfsentry, [wolfsentry\\_time\\_t](#) later, [wolfsentry\\_time\\_t](#) earlier)

- Compute the interval between *later* and *earlier*, using [wolfentry\\_time\\_t](#).
- WOLFSENTRY\_API [wolfentry\\_time\\_t](#) **wolfentry\_add\_time** (struct wolfentry\_context \*wolfentry, [wolfentry\\_time\\_t](#) start\_time, [wolfentry\\_time\\_t](#) time\_interval)
- Compute the time *time\_interval* after *start\_time*, using [wolfentry\\_time\\_t](#).
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_to\_epoch\_time** (struct wolfentry\_context \*wolfentry, [wolfentry\\_time\\_t](#) when, time\_t \*epoch\_secs, long \*epoch\_nsecs)
- Convert a [wolfentry\\_time\\_t](#) to seconds and nanoseconds since 1970-Jan-1 0:00 UTC.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_from\_epoch\_time** (struct wolfentry\_context \*wolfentry, time\_t epoch\_secs, long epoch\_nsecs, [wolfentry\\_time\\_t](#) \*when)
- Convert seconds and nanoseconds since 1970-Jan-1 0:00 UTC to a [wolfentry\\_time\\_t](#).
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_interval\_to\_seconds** (struct wolfentry\_context \*wolfentry, [wolfentry\\_time\\_t](#) howlong, time\_t \*howlong\_secs, long \*howlong\_nsecs)
- Convert an interval in [wolfentry\\_time\\_t](#) to seconds and nanoseconds.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_interval\_from\_seconds** (struct wolfentry\_context \*wolfentry, time\_t howlong\_secs, long howlong\_nsecs, [wolfentry\\_time\\_t](#) \*howlong)
- Convert an interval in seconds and nanoseconds to [wolfentry\\_time\\_t](#).
- WOLFSENTRY\_API struct [wolfentry\\_timecb](#) \* **wolfentry\_get\_timecb** (struct wolfentry\_context \*wolfentry)
- Return the active time handlers from the supplied context.
- WOLFSENTRY\_API void \* **wolfentry\_malloc** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, size\_t size)
- Allocate *size* bytes using the *malloc* configured in the wolfSentry context.
- WOLFSENTRY\_API\_VOID **wolfentry\_free** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*ptr)
- Free *ptr* using the *free* configured in the wolfSentry context.
- WOLFSENTRY\_API void \* **wolfentry\_realloc** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*ptr, size\_t size)
- Reallocate *ptr* to *size* bytes using the *realloc* configured in the wolfSentry context.
- WOLFSENTRY\_API void \* **wolfentry\_memalign** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, size\_t alignment, size\_t size)
- Allocate *size* bytes, aligned to *alignment*, using the *memalign* configured in the wolfSentry context.
- WOLFSENTRY\_API\_VOID **wolfentry\_free\_aligned** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, void \*ptr)
- Free *ptr*, previously allocated with [wolfentry\\_memalign\(\)](#), using the *free\_aligned* configured in the wolfSentry context.
- WOLFSENTRY\_API int **\_wolfentry\_get\_n\_mallocs** (void)
- In library builds with `WOLFSENTRY_MALLOC_BUILTINS` and `WOLFSENTRY_MALLOC_DEBUG` defined, this returns the net number of allocations performed as of time of call. I.e., it returns zero iff all allocations have been freed.
- WOLFSENTRY\_API struct [wolfentry\\_allocator](#) \* **wolfentry\_get\_allocator** (struct wolfentry\_context \*wolfentry)
- Return a pointer to the [wolfentry\\_allocator](#) associated with the supplied *wolfentry\_context*, mainly for passing to [json\\_init\(\)](#), [json\\_parse\(\)](#), [json\\_value\\_\\*](#)(), and [json\\_dom\\_\\*](#)().
- WOLFSENTRY\_API const char \* **wolfentry\_action\_res\_assoc\_by\_flag** ([wolfentry\\_action\\_res\\_t](#) res, unsigned int bit)
- Given a *bit* number (from 0 to 31), return the name of that bit if set in *res*, else return a null pointer.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_action\_res\_assoc\_by\_name** (const char \*bit\_name, size\_t bit\_name\_len, [wolfentry\\_action\\_res\\_t](#) \*res)
- Given a *bit\_name*, set \**res* to the corresponding bit number if known, failing which, return `ITEM_NOT_FOUND`.
- WOLFSENTRY\_API struct [wolfentry\\_host\\_platform\\_interface](#) \* **wolfentry\_get\_hpi** (struct wolfentry\_context \*wolfentry)
- Return a pointer to the [wolfentry\\_host\\_platform\\_interface](#) associated with the supplied *wolfentry\_context*, mainly for passing to [wolfentry\\_alloc\\_thread\\_context\(\)](#), [wolfentry\\_free\\_thread\\_context\(\)](#), [wolfentry\\_lock\\_init\(\)](#), and [wolfentry\\_lock\\_alloc\(\)](#).
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_cleanup\_push** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_cleanup\\_callback\\_t](#) handler, void \*arg)
- Register *handler* to be called at shutdown with *arg*.

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_cleanup\_pop** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), int execute\_p)  
*Remove the most recently registered and unpopped handler from the cleanup stack, and if execute\_p is nonzero, call it with the arg with which it was registered.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_cleanup\_all** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#))  
*Iteratively call [wolfentry\\_cleanup\\_pop\(\)](#), executing each handler as it is popped, passing it the arg with which it was registered.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_handler\_install** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_addr\\_family\\_t](#) family\_bynumber, const char \*family\_byname, int family\_byname\_len, [wolfentry\\_addr\\_family\\_parser\\_t](#) parser, [wolfentry\\_addr\\_family\\_formatter\\_t](#) formatter, int max\_addr\_bits)  
*Install handlers for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_get\_parser** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_addr\\_family\\_t](#) family, [wolfentry\\_addr\\_family\\_parser\\_t](#) \*parser)  
*Retrieve the parsing handler for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_get\_formatter** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_addr\\_family\\_t](#) family, [wolfentry\\_addr\\_family\\_formatter\\_t](#) \*formatter)  
*Retrieve the formatting handler for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_handler\_remove\_bynumber** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_addr\\_family\\_t](#) family\_bynumber, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Remove the handlers for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_drop\_reference** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct [wolfentry\\_addr\\_family\\_bynumber](#) \*family\_bynumber, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Release an address family record previously returned by [wolfentry\\_addr\\_family\\_ntop\(\)](#)*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_handler\_remove\_byname** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const char \*family\_byname, int family\_byname\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Remove the handlers for an address family.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_pton** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const char \*family\_name, int family\_name\_len, [wolfentry\\_addr\\_family\\_t](#) \*family\_number)  
*Look up an address family by name, returning its number.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_ntop** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_addr\\_family\\_t](#) family, struct [wolfentry\\_addr\\_family\\_bynumber](#) \*\*addr\_family, const char \*\*family\_name)  
*Look up an address family by number, returning a pointer to its name. The caller must release addr\_family, using [wolfentry\\_addr\\_family\\_drop\\_reference\(\)](#), when done accessing family\_name.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_addr\_family\_max\_addr\_bits** ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfentry\\_addr\\_family\\_t](#) family, [wolfentry\\_addr\\_bits\\_t](#) \*bits)  
*Look up the max address size for an address family identified by number.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_eventconfig\_init** (struct [wolfentry\\_context](#) \*wolfentry, struct [wolfentry\\_eventconfig](#) \*config)  
*Initializes a [wolfentry\\_eventconfig](#) struct with the defaults from the wolfentry context. If no wolfentry context is provided this will initialize to zero.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_eventconfig\_check** (const struct [wolfentry\\_eventconfig](#) \*config)  
*Checks the config for self-consistency and validity.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_init\_ex** (struct [wolfentry\\_build\\_settings](#) caller\_build\_settings, [WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN\\_EX](#)(const struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi), const struct [wolfentry\\_eventconfig](#) \*config, struct [wolfentry\\_context](#) \*\*wolfentry, [wolfentry\\_init\\_flags\\_t](#) flags)  
*Variant of [wolfentry\\_init\(\)](#) that accepts a flags argument, for additional control over configuration.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_init** (struct [wolfentry\\_build\\_settings](#) caller\_build\_settings, [WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN\\_EX](#)(const struct [wolfentry\\_host\\_platform\\_interface](#) \*hpi), const struct [wolfentry\\_eventconfig](#) \*config, struct [wolfentry\\_context](#) \*\*wolfentry)  
*Allocates and initializes the wolfentry context.*



- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_defaultconfig\\_get](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct [wolfentry\\_eventconfig](#) \*config)  
*Get the default config from a wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_defaultconfig\\_update](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct [wolfentry\\_eventconfig](#) \*config)  
*Updates mutable fields of the default config (all but [wolfentry\\_eventconfig::route\\_private\\_data\\_size](#) and [wolfentry\\_eventconfig::route\\_private\\_data\\_alignment](#))*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_flush](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Flushes the route, event, and user value tables from the wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_free](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX(struct wolfentry\_context \*\*wolfentry))  
*Frees the wolfentry context and the tables within it. The wolfentry context will be a pointer to NULL upon success.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_shutdown](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN\_EX(struct wolfentry\_context \*\*wolfentry))  
*Shut down wolfSentry, freeing all resources. Gets an exclusive lock on the context, then calls [wolfentry\\_context\\_free\(\)](#).*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_inhibit\\_actions](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Disable automatic dispatch of actions on the wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_enable\\_actions](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Re-enable automatic dispatch of actions on the wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_clone](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_context \*\*clone, [wolfentry\\_clone\\_flags\\_t](#) flags)  
*Clones a wolfentry context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_exchange](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_context \*\*wolfentry2)  
*Swaps information between two wolfentry contexts.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_mutex](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Calls [wolfentry\\_lock\\_mutex\(\)](#) on the context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_mutex\\_abstimed](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct timespec \*abs\_timeout)  
*Calls [wolfentry\\_lock\\_mutex\\_abstimed\(\)](#) on the context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_mutex\\_abstimed\\_ex](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct timespec \*abs\_timeout, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*variant of [wolfentry\\_context\\_lock\\_mutex\\_abstimed\(\)](#) with a *flags* arg.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_mutex\\_timed](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_time\\_t](#) max\_wait)  
*Calls [wolfentry\\_lock\\_mutex\\_timed\(\)](#) on the context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_mutex\\_timed\\_ex](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_time\\_t](#) max\_wait, [wolfentry\\_lock\\_flags\\_t](#) flags)  
*variant of [wolfentry\\_context\\_lock\\_mutex\\_timed\(\)](#) with a *flags* arg.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_shared](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Calls [wolfentry\\_lock\\_shared\(\)](#) on the context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_shared\\_abstimed](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct timespec \*abs\_timeout)  
*Calls [wolfentry\\_lock\\_shared\\_abstimed\(\)](#) on the context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_shared\\_with\\_reservation\\_abstimed](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct timespec \*abs\_timeout)  
*Calls [wolfentry\\_lock\\_shared\\_abstimed\(\)](#) on the context, with the `WOLFSENTRY_LOCK_FLAG_GET_↔RESERVATION_TOO` flag.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_shared\\_timed](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_time\\_t](#) max\_wait)  
*Calls [wolfentry\\_lock\\_shared\\_timed\(\)](#) on the context.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t wolfentry\\_context\\_lock\\_shared\\_with\\_reservation\\_timed](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_time\\_t](#) max\_wait)

- Calls [wolfsentry\\_lock\\_shared\\_timed\(\)](#) on the context, with the `WOLFSENTRY_LOCK_FLAG_GET_RESERVATION←_TOO` flag.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_context\\_unlock](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#))  
*Calls [wolfsentry\\_lock\\_unlock\(\)](#) on the context.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_context\\_unlock\\_and\\_abandon\\_reservation](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#))  
*Calls [wolfsentry\\_lock\\_unlock\(\)](#) on the context, with the `WOLFSENTRY_LOCK_FLAG_ABANDON_RESERVATION←_TOO` flag.*
  - WOLFSENTRY\_API [wolfsentry\\_object\\_type\\_t](#) [wolfsentry\\_get\\_object\\_type](#) (const void \*object)  
*Get the object type from a wolfsentry object pointer.*
  - WOLFSENTRY\_API [wolfsentry\\_ent\\_id\\_t](#) [wolfsentry\\_get\\_object\\_id](#) (const void \*object)  
*Get the ID from a wolfsentry object pointer.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_table\\_ent\\_get\\_by\\_id](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [wolfsentry\\_ent\\_id\\_t](#) id, struct wolfsentry\_table\_ent\_header \*\*ent)  
*Retrieve an object pointer given its ID. Lock must be obtained before entry, and ent is only valid while lock is held, or if [wolfsentry\\_object\\_checkout\(\)](#) is called for the object.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_object\\_checkout](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*object)  
*Increment the refcount for an object, making it safe from deallocation until [wolfsentry\\_object\\_release\(\)](#). Caller must have a context lock on entry.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_object\\_release](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*object, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Decrement the refcount for an object, deallocating it if no references remain. Caller does not need to have a context lock on entry.*
  - WOLFSENTRY\_API [wolfsentry\\_hitcount\\_t](#) [wolfsentry\\_table\\_n\\_inserts](#) (struct wolfsentry\_table\_header \*table)  
*Get the number of inserts into a table.*
  - WOLFSENTRY\_API [wolfsentry\\_hitcount\\_t](#) [wolfsentry\\_table\\_n\\_deletes](#) (struct wolfsentry\_table\_header \*table)  
*Get the number of deletes from a table.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_check\\_flags\\_sensical](#) ([wolfsentry\\_route\\_flags\\_t](#) flags)  
*Check the self-consistency of flags.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_insert\\_into\\_table](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct wolfsentry\_route\_table \*route\_table, void \*caller\_arg, const struct [wolfsentry\\_sockaddr](#) \*remote, const struct [wolfsentry\\_sockaddr](#) \*local, [wolfsentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label←\_len, [wolfsentry\\_ent\\_id\\_t](#) \*id, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Variant of [wolfsentry\\_route\\_insert\(\)](#) that takes an explicit route\_table.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_insert\\_by\\_exports\\_into\\_table](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct wolfsentry\_route\_table \*route\_table, void \*caller\_arg, const struct [wolfsentry\\_route\\_exports](#) \*route←\_exports, [wolfsentry\\_ent\\_id\\_t](#) \*id, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Variant of [wolfsentry\\_route\\_insert\(\)](#) that accepts the new route as wolfsentry\_route\_exports, and takes an explicit route\_table.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_insert](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*caller\_arg, const struct [wolfsentry\\_sockaddr](#) \*remote, const struct [wolfsentry\\_sockaddr](#) \*local, [wolfsentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label←\_len, [wolfsentry\\_ent\\_id\\_t](#) \*id, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Insert a route into the route table.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_insert\\_by\\_exports](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*caller\_arg, const struct [wolfsentry\\_route\\_exports](#) \*route\_exports, [wolfsentry\\_ent\\_id\\_t](#) \*id, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Variant of [wolfsentry\\_route\\_insert\(\)](#) that accepts the new route as wolfsentry\_route\_exports.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_insert\\_into\\_table\\_and\\_check\\_out](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct [wolfentry\\_route\\_table](#) \*route\_table, void \*caller\_arg, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, struct [wolfentry\\_route](#) \*\*route, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
 Variant of [wolfentry\\_route\\_insert\(\)](#) that takes an explicit *route\_table*, and returns the inserted route, which the caller must eventually drop using [wolfentry\\_route\\_drop\\_reference\(\)](#) or [wolfentry\\_object\\_release\(\)](#)
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_insert\\_by\\_exports\\_into\\_table\\_and\\_check\\_out](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct [wolfentry\\_route\\_table](#) \*route\_table, void \*caller\_arg, const struct [wolfentry\\_route\\_exports](#) \*route\_exports, struct [wolfentry\\_route](#) \*\*route, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
 Variant of [wolfentry\\_route\\_insert\(\)](#) that accepts the new route as *wolfentry\_route\_exports*, takes an explicit *route\_table*, and returns the inserted route, which the caller must eventually drop using [wolfentry\\_route\\_drop\\_reference\(\)](#) or [wolfentry\\_object\\_release\(\)](#)
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_insert\\_and\\_check\\_out](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*caller\_arg, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, struct [wolfentry\\_route](#) \*\*route, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
 Variant of [wolfentry\\_route\\_insert\(\)](#) that returns the inserted route, which the caller must eventually drop using [wolfentry\\_route\\_drop\\_reference\(\)](#) or [wolfentry\\_object\\_release\(\)](#)
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_insert\\_by\\_exports\\_and\\_check\\_out](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*caller\_arg, const struct [wolfentry\\_route\\_exports](#) \*route\_exports, struct [wolfentry\\_route](#) \*\*route, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
 Variant of [wolfentry\\_route\\_insert\(\)](#) that accepts the new route as *wolfentry\_route\_exports* and returns the inserted route, which the caller must eventually drop using [wolfentry\\_route\\_drop\\_reference\(\)](#) or [wolfentry\\_object\\_release\(\)](#)
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_delete\\_from\\_table](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct [wolfentry\\_route\\_table](#) \*route\_table, void \*caller\_arg, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results, int \*n\_deleted)  
 Variant of [wolfentry\\_route\\_delete\(\)](#) that takes an explicit *route\_table*.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_delete](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*caller\_arg, const struct [wolfentry\\_sockaddr](#) \*remote, const struct [wolfentry\\_sockaddr](#) \*local, [wolfentry\\_route\\_flags\\_t](#) flags, const char \*trigger\_label, int trigger\_label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results, int \*n\_deleted)  
 Delete route from the route table. The supplied parameters, including the flags, must match the route exactly, else *ITEM\_NOT\_FOUND* will result. To avoid fidgety parameter matching, use [wolfentry\\_route\\_delete\\_by\\_id\(\)](#). The supplied trigger event, if any, is passed to action handlers, and has no bearing on route matching.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_delete\\_by\\_id](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*caller\_arg, [wolfentry\\_ent\\_id\\_t](#) id, const char \*trigger\_label, int trigger\_label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
 Delete a route from its route table using its ID. The supplied trigger event, if any, is passed to action handlers, and has no bearing on route matching.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_get\\_main\\_table](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), struct [wolfentry\\_route\\_table](#) \*\*table)  
 Get a pointer to the internal route table. Caller must have a lock on the context at entry.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_iterate\\_start](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), const struct [wolfentry\\_route\\_table](#) \*table, struct [wolfentry\\_cursor](#) \*\*cursor)  
 Open a cursor to iterate through a routes table. Caller must have a lock on the context at entry.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_iterate\\_seek\\_to\\_head](#) (const struct [wolfentry\\_route\\_table](#) \*table, struct [wolfentry\\_cursor](#) \*cursor)  
 Reset the cursor to the beginning of a table.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_iterate\\_seek\\_to\\_tail](#) (const struct [wolfentry\\_route\\_table](#) \*table, struct [wolfentry\\_cursor](#) \*cursor)  
 Move the cursor to the end of a table.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_iterate\\_current](#) (const struct [wolfentry\\_route\\_table](#) \*table, struct [wolfentry\\_cursor](#) \*cursor, struct [wolfentry\\_route](#) \*\*route)



*Get the current position for the table cursor.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_iterate\\_prev](#) (const struct wolfsentry\_route\_table \*table, struct wolfsentry\_cursor \*cursor, struct wolfsentry\_route \*\*route)

*Get the previous position for the table cursor.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_iterate\\_next](#) (const struct wolfsentry\_route\_table \*table, struct wolfsentry\_cursor \*cursor, struct wolfsentry\_route \*\*route)

*Get the next position for the table cursor.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_iterate\\_end](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfsentry\_route\_table \*table, struct wolfsentry\_cursor \*\*cursor)

*Frees the table cursor. Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_default\\_policy\\_set](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table, [wolfsentry\\_action\\_res\\_t](#) default\_policy)

*Set a table's default policy.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_default\\_policy\\_set](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfsentry\\_action\\_res\\_t](#) default\_policy)

*variant of [wolfsentry\\_route\\_table\\_default\\_policy\\_set\(\)](#) that uses the main route table implicitly, and takes care of context locking.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_default\\_policy\\_get](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table, [wolfsentry\\_action\\_res\\_t](#) \*default\_policy)

*Get a table's default policy. Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_default\\_policy\\_get](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfsentry\\_action\\_res\\_t](#) \*default\_policy)

*variant of [wolfsentry\\_route\\_table\\_default\\_policy\\_get\(\)](#) that uses the main route table implicitly. Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_get\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfsentry\_route\_table \*table, const struct [wolfsentry\\_sockaddr](#) \*remote, const struct [wolfsentry\\_sockaddr](#) \*local, [wolfsentry\\_route\\_flags\\_t](#) flags, const char \*event\_label, int event\_label\_len, int exact\_p, [wolfsentry\\_route\\_flags\\_t](#) \*inexact\_matches, struct wolfsentry\_route \*\*route)

*Increments a reference counter for a route.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_drop\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route \*route, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)

*Decrease a reference counter for a route.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_clear\\_default\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table)

*Clear an event previously set by [wolfsentry\\_route\\_table\\_set\\_default\\_event\(\)](#).*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_set\\_default\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table, const char \*event\_label, int event\_label\_len)

*Set an event to be used as a foster parent event for routes with no parent event of their own.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_get\\_default\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table, char \*event\_label, int \*event\_label\_len)

*Get the event, if any, set by [wolfsentry\\_route\\_table\\_set\\_default\\_event\(\)](#)*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_table\\_fallthrough\\_route\\_get](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*route\_table, const struct wolfsentry\_route \*\*fallthrough\_route)

*Retrieve the default route in a route table, chiefly to pass to [wolfsentry\\_route\\_update\\_flags\(\)](#).*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_get\\_addrs](#) (const struct wolfsentry\_route \*route, [wolfsentry\\_addr\\_family\\_t](#) \*af, [wolfsentry\\_addr\\_bits\\_t](#) \*local\_addr\_len, const [byte](#) \*\*local\_addr, [wolfsentry\\_addr\\_bits\\_t](#) \*remote\_addr\_len, const [byte](#) \*\*remote\_addr)

*Extract numeric address family and binary address pointers from a [wolfsentry\\_route](#)*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_export](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfsentry\_route \*route, struct [wolfsentry\\_route\\_exports](#) \*route\_exports)

*Exports a route.*

- WOLFSENTRY\_API const struct wolfsentry\_event \* [wolfsentry\\_route\\_parent\\_event](#) (const struct wolfsentry\_route \*route)

Get a parent event from a given route. Typically used in the `wolfentry_action_callback_t` callback. Note: returned `wolfentry_event` remains valid only as long as the `wolfentry` lock is held (shared or exclusive).

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_with_table` (WOLFENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_route_table` \*route\_table, const struct `wolfentry_sockaddr` \*remote, const struct `wolfentry_sockaddr` \*local, `wolfentry_route_flags_t` flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_ent_id_t` \*id, `wolfentry_route_flags_t` \*inexact\_matches, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that accepts an explicit `route_table`.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch` (WOLFENTRY\_CONTEXT\_ARGS\_IN, const struct `wolfentry_sockaddr` \*remote, const struct `wolfentry_sockaddr` \*local, `wolfentry_route_flags_t` flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_ent_id_t` \*id, `wolfentry_route_flags_t` \*inexact\_matches, `wolfentry_action_res_t` \*action\_results)

Submit an event into `wolfentry` and pass it through the filters. The `action_results` are cleared on entry, and can be checked to see what actions `wolfentry` took, and what actions the caller should take (most saliently, `WOLFENTRY_ACTION_RES_ACCEPT` or `WOLFENTRY_ACTION_RES_REJECT`). `action_results` can be filtered with constructs like `WOLFENTRY_MASKIN_BITS` (`action_results`, `WOLFENTRY_ACTION_RES_REJECT`)

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_with_table_with_initiated_result` (WOLFENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_route_table` \*route\_table, const struct `wolfentry_sockaddr` \*remote, const struct `wolfentry_sockaddr` \*local, `wolfentry_route_flags_t` flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_ent_id_t` \*id, `wolfentry_route_flags_t` \*inexact\_matches, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that accepts an explicit `route_table`, and doesn't clear `action_results` on entry.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_with_initiated_result` (WOLFENTRY\_CONTEXT\_ARGS\_IN, const struct `wolfentry_sockaddr` \*remote, const struct `wolfentry_sockaddr` \*local, `wolfentry_route_flags_t` flags, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_ent_id_t` \*id, `wolfentry_route_flags_t` \*inexact\_matches, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that doesn't clear `action_results` on entry.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_id` (WOLFENTRY\_CONTEXT\_ARGS\_IN, `wolfentry_ent_id_t` id, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, mainly for use by application code that tracks ID/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_id_with_initiated_result` (WOLFENTRY\_CONTEXT\_ARGS\_IN, `wolfentry_ent_id_t` id, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, and doesn't clear `action_results` on entry, mainly for use by application code that tracks ID/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_route` (WOLFENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_route` \*route, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, mainly for use by application code that tracks route/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_event_dispatch_by_route_with_initiated_result` (WOLFENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_route` \*route, const char \*event\_label, int event\_label\_len, void \*caller\_arg, `wolfentry_action_res_t` \*action\_results)

Variant of `wolfentry_route_event_dispatch()` that preselects the matched route by ID, and doesn't clear `action_results` on entry, mainly for use by application code that tracks route/session relationships.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_table_max_purgeable_routes_get` (WOLFENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_route_table` \*table, `wolfentry_hitcount_t` \*max\_purgeable\_routes)

Retrieve the current limit for ephemeral routes in `table`. Caller must have a lock on the context at entry.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_table_max_purgeable_routes_set` (WOLFENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_route_table` \*table, `wolfentry_hitcount_t` max\_purgeable\_routes)

Set the limit for ephemeral routes in `table`. Caller must have a mutex on the context at entry.

- WOLFENTRY\_API `wolfentry_errcode_t wolfentry_route_stale_purge` (WOLFENTRY\_CONTEXT\_ARGS\_IN, struct `wolfentry_route_table` \*table, `wolfentry_action_res_t` \*action\_results)

- Purges stale (expired) routes from `table`.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_stale\\_purge\\_one](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Variant of [wolfsentry\\_route\\_stale\\_purge\(\)](#) that purges at most one stale route, to limit time spent working.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_stale\\_purge\\_one\\_opportunistically](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Variant of [wolfsentry\\_route\\_stale\\_purge\(\)](#) that purges at most one stale route, and only if the context lock is uncontended.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_flush\\_table](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route\_table \*table, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Flush routes from a given table.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_bulk\\_clear\\_insert\\_action\\_status](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Clears the [WOLFSENTRY\\_ROUTE\\_FLAG\\_INSERT\\_ACTIONS\\_CALLED](#) flag on all routes in the table.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_bulk\\_insert\\_actions](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Executes the insert actions for all routes in the table that don't have [WOLFSENTRY\\_ROUTE\\_FLAG\\_INSERT\\_ACTIONS\\_CALLED](#) set.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_get\\_private\\_data](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route \*route, void \*\*private\_data, size\_t \*private\_data\_size)  
*Gets the private data for a given route.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_get\\_flags](#) (const struct wolfsentry\_route \*route, [wolfsentry\\_route\\_flags\\_t](#) \*flags)  
*Gets the flags for a route.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_get\\_metadata](#) (const struct wolfsentry\_route \*route, struct [wolfsentry\\_route\\_metadata\\_exports](#) \*metadata)  
*Gets the metadata for a route.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_reset\\_metadata\\_exports](#) (struct [wolfsentry\\_route\\_exports](#) \*route\_exports)  
*clear metadata counts ([wolfsentry\\_route\\_metadata\\_exports::purge\\_after](#), [wolfsentry\\_route\\_metadata\\_exports::connection\\_count](#), [wolfsentry\\_route\\_metadata\\_exports::derogatory\\_count](#), and [wolfsentry\\_route\\_metadata\\_exports::commendable\\_count](#)) in [wolfsentry\\_route\\_exports](#) to prepare for use with [wolfsentry\\_route\\_insert\\_by\\_exports\(\)](#)*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_update\\_flags](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route \*route, [wolfsentry\\_route\\_flags\\_t](#) flags\_to\_set, [wolfsentry\\_route\\_flags\\_t](#) flags\_to\_clear, [wolfsentry\\_route\\_flags\\_t](#) \*flags\_before, [wolfsentry\\_route\\_flags\\_t](#) \*flags\_after, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)  
*Update the route flags.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_increment\\_derogatory\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route \*route, int count\_to\_add, int \*new\_derogatory\_count\_ptr)  
*Increase the derogatory event count of a route.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_increment\\_commendable\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route \*route, int count\_to\_add, int \*new\_commendable\_count)  
*Increase the commendable event count of a route.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_reset\\_derogatory\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route \*route, int \*old\_derogatory\_count\_ptr)  
*Reset the derogatory event count of a route.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_reset\\_commendable\\_count](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_route \*route, int \*old\_commendable\_count\_ptr)  
*Reset the commendable event count of a route.*
  - WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_route\\_set\\_wildcard](#) (struct wolfsentry\_route \*route, [wolfsentry\\_route\\_flags\\_t](#) wildcards\_to\_set)  
*Set wildcard flags for a route.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_format\\_address](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_addr\\_family\\_t](#) sa\_family, const byte \*addr, unsigned int addr\_bits, char \*buf, int \*buflen)  
*Render a binary address in human-readable form to a buffer.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_flag\\_assoc\\_by\\_flag](#) ([wolfentry\\_route\\_flags\\_t](#) flag, const char \*\*name)  
*Retrieve the name of a route flag, given its numeric value. Note that flag must have exactly one bit set, else ITEM\_NOT\_FOUND will be returned.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_flag\\_assoc\\_by\\_name](#) (const char \*name, int len, [wolfentry\\_route\\_flags\\_t](#) \*flag)  
*Retrieve the numeric value of a route flag, given its name.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_format\\_json](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route \*r, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Render a route to an output buffer, in JSON format, advancing the output buffer pointer by the length of the rendered output.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_dump\\_json\\_start](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*\*cursor, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Start a rendering loop to export the route table contents as a JSON document that is valid input for [wolfentry\\_config\\_json\\_feed\(\)](#) or [wolfentry\\_config\\_json\\_oneshot\(\)](#), advancing the output buffer pointer by the length of the rendered output, and decrementing json\_out\_len by the same amount. Caller must have a shared or exclusive lock on the context at entry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_dump\\_json\\_next](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*cursor, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Render a route within a loop started with [wolfentry\\_route\\_table\\_dump\\_json\\_start\(\)](#), advancing the output buffer pointer by the length of the rendered output, and decrementing json\_out\_len by the same amount.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_table\\_dump\\_json\\_end](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route\_table \*table, struct wolfentry\_cursor \*\*cursor, unsigned char \*\*json\_out, size\_t \*json\_out\_len, [wolfentry\\_format\\_flags\\_t](#) flags)  
*Finish a rendering loop started with [wolfentry\\_route\\_table\\_dump\\_json\\_start\(\)](#), advancing the output buffer pointer by the length of the rendered output, and decrementing json\_out\_len by the same amount.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_render\\_flags](#) ([wolfentry\\_route\\_flags\\_t](#) flags, FILE \*f)  
*Render route flags in human-readable form to a stream.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_render](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfentry\_route \*r, FILE \*f)  
*Renders route information to a file pointer.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_route\\_exports\\_render](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct [wolfentry\\_route\\_exports](#) \*r, FILE \*f)  
*Renders route exports information to a file pointer.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_insert](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfentry\\_action\\_flags\\_t](#) flags, [wolfentry\\_action\\_callback\\_t](#) handler, void \*handler\_arg, [wolfentry\\_ent\\_id\\_t](#) \*id)  
*Insert a new action into wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfentry\\_action\\_res\\_t](#) \*action\_results)  
*Delete an action from wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_flush\\_all](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)  
*Flush all actions from wolfentry.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_get\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, struct wolfentry\_action \*\*action)  
*Get a reference to an action.*
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_action\\_drop\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_action \*action, [wolfentry\\_action\\_res\\_t](#) \*action\_results)

- Drop a reference to an action.*

  - WOLFSENTRY\_API const char \* [wolfsentry\\_action\\_get\\_label](#) (const struct wolfsentry\_action \*action)

*Get the label for an action. This is the internal pointer to the label so should not be freed by the application.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_action\\_get\\_flags](#) (struct wolfsentry\_action \*action, [wolfsentry\\_action\\_flags\\_t](#) \*flags)

*Get the flags for an action.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_action\\_update\\_flags](#) (struct wolfsentry\_action \*action, [wolfsentry\\_action\\_flags\\_t](#) flags\_to\_set, [wolfsentry\\_action\\_flags\\_t](#) flags\_to\_clear, [wolfsentry\\_action\\_flags\\_t](#) \*flags\_before, [wolfsentry\\_action\\_flags\\_t](#) \*flags\_after)

*Update the flags for an action.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_insert](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfsentry\\_priority\\_t](#) priority, const struct [wolfsentry\\_eventconfig](#) \*config, [wolfsentry\\_event\\_flags\\_t](#) flags, [wolfsentry\\_event\\_id\\_t](#) \*id)

*Insert an event into wolfsentry.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)

*Delete an event from wolfsentry.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_flush\\_all](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN)

*Flush all events from wolfsentry.*
- WOLFSENTRY\_API const char \* [wolfsentry\\_event\\_get\\_label](#) (const struct wolfsentry\_event \*event)

*Get the label for an event. This is the internal pointer to the label so should not be freed by the application.*
- WOLFSENTRY\_API [wolfsentry\\_event\\_flags\\_t](#) [wolfsentry\\_event\\_get\\_flags](#) (const struct wolfsentry\_event \*event)

*Get the flags for an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_get\\_config](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, struct [wolfsentry\\_eventconfig](#) \*config)

*Get the configuration for an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_update\\_config](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, const struct [wolfsentry\\_eventconfig](#) \*config)

*Update the configuration for an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_get\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*label, int label\_len, struct wolfsentry\_event \*\*event)

*Get a reference to an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_drop\\_reference](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_event \*event, [wolfsentry\\_action\\_res\\_t](#) \*action\_results)

*Drop a reference to an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_action\\_prepend](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfsentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len)

*Prepend an action into an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_action\\_append](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfsentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len)

*Append an action into an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_action\\_insert\\_after](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfsentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len, const char \*point\_action\_label, int point\_action\_label\_len)

*Insert an action into an event after another action.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_action\\_delete](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfsentry\\_action\\_type\\_t](#) which\_action\_list, const char \*action\_label, int action\_label\_len)

*Delete an action from an event.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_event\\_set\\_aux\\_event](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, const char \*aux\_event\_label, int aux\_event\_label\_len)



*Set an auxiliary event for an event.*

- WOLFSENTRY\_API const struct wolfentry\_event \* **wolfentry\_event\_get\_aux\_event** (const struct wolfentry\_event \*event)

*Retrieve an auxiliary event previously set with [wolfentry\\_event\\_set\\_aux\\_event\(\)](#).*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_event\_action\_list\_start** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*event\_label, int event\_label\_len, [wolfentry\\_action\\_type\\_t](#) which\_action\_list, struct wolfentry\_↵\_action\_list\_ent \*\*cursor)

*Open a cursor for the actions in an event. Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_event\_action\_list\_next** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_action\_list\_ent \*\*cursor, const char \*\*action\_label, int \*action\_label\_len)

*Get the next action in an event cursor. Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_event\_action\_list\_done** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_action\_list\_ent \*\*cursor)

*End iteration started with [wolfentry\\_event\\_action\\_list\\_start\(\)](#). Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_set\_validator** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, [wolfentry\\_kv\\_validator\\_t](#) validator, [wolfentry\\_action\\_res\\_t](#) \*action\_results)

*Install a supplied [wolfentry\\_kv\\_validator\\_t](#) to validate all user values before inserting them into the value table.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_set\_mutability** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int mutable)

*Set the user-defined value with the designated key as readwrite (mutable=1) or readonly (mutable=0). A read-only value cannot be changed or deleted.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_get\_mutability** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int \*mutable)

*Query the mutability of the user-defined value with the designated key. Readonly value cannot be changed or deleted.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_get\_type** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, [wolfentry\\_kv\\_type\\_t](#) \*type)

*Returns the type of the value with the designated key, using [WOLFSENTRY\\_KV\\_TYPE\(\)](#).*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_delete** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len)

*Deletes the value with the designated key.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_store\_null** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int overwrite\_p)

*Inserts or overwrites a [WOLFSENTRY\\_KV\\_NULL](#) value with the designated key.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_store\_bool** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, [wolfentry\\_kv\\_type\\_t](#) value, int overwrite\_p)

*Inserts or overwrites a [WOLFSENTRY\\_KV\\_TRUE](#) or [WOLFSENTRY\\_KV\\_FALSE](#) value with the designated key.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_get\_bool** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, [wolfentry\\_kv\\_type\\_t](#) \*value)

*Gets a [WOLFSENTRY\\_KV\\_TRUE](#) or [WOLFSENTRY\\_KV\\_FALSE](#) value with the designated key.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_store\_uint** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, uint64\_t value, int overwrite\_p)

*Inserts or overwrites a [WOLFSENTRY\\_KV\\_UINT](#) value with the designated key.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_get\_uint** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, uint64\_t \*value)

*Gets a [WOLFSENTRY\\_KV\\_UINT](#) value with the designated key.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_store\_sint** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int64\_t value, int overwrite\_p)

*Inserts or overwrites a [WOLFSENTRY\\_KV\\_SINT](#) value with the designated key.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_value\_get\_sint** (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, int64\_t \*value)

*Gets a [WOLFSENTRY\\_KV\\_UINT](#) value with the designated key.*

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_store\\_double](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, double value, int overwrite\_p)  
*Inserts or overwrites a WOLFSENTRY\_KV\_FLOAT value with the designated key.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_get\\_float](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, double \*value)  
*Gets a WOLFSENTRY\_KV\_UINT value with the designated key.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_store\\_string](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const char \*value, int value\_len, int overwrite\_p)  
*Inserts or overwrites a WOLFSENTRY\_KV\_STRING value with the designated key.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_get\\_string](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const char \*\*value, int \*value\_len, struct wolfsentry\_kv\_pair\_internal \*\*user\_value\_record)  
*Gets a WOLFSENTRY\_KV\_STRING value with the designated key.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_store\\_bytes](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const byte \*value, int value\_len, int overwrite\_p)  
*Inserts or overwrites a WOLFSENTRY\_KV\_BYTES value with the designated key and a binary-clean value.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_store\\_bytes\\_base64](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const char \*value, int value\_len, int overwrite\_p)  
*Inserts or overwrites a WOLFSENTRY\_KV\_BYTES value with the designated key and a base64-encoded value.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_get\\_bytes](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, const byte \*\*value, int \*value\_len, struct wolfsentry\_kv\_pair\_internal \*\*user\_value\_record)  
*Gets a WOLFSENTRY\_KV\_BYTES value with the designated key.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_store\\_json](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, JSON\_VALUE \*value, int overwrite\_p)  
*Inserts or overwrites a WOLFSENTRY\_KV\_JSON value with the designated key and a value from json\_dom↔\_parse() (or built up programmatically with the [centijson\\_value.h](#) API).*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_get\\_json](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const char \*key, int key\_len, JSON\_VALUE \*\*value, struct wolfsentry\_kv\_pair\_internal \*\*user\_value\_record)  
*Gets a WOLFSENTRY\_KV\_JSON value with the designated key.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_value\\_release\\_record](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_kv\_pair\_internal \*\*user\_value\_record)  
*Release a user\_value\_record from wolfsentry\_user\_value\_get\_string(), wolfsentry\_user\_value\_get\_bytes or wolfsentry\_user\_value\_get\_json().*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_kv\\_pair\\_export](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_kv\_pair\_internal \*kv, const struct wolfsentry\_kv\_pair \*\*kv\_exports)  
*Extract the struct wolfsentry\_kv\_pair from a struct wolfsentry\_kv\_pair\_internal. Caller must have a shared or exclusive lock on the context.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_kv\\_type\\_to\\_string](#) (wolfsentry\_kv\_type\_t type, const char \*\*out)  
*Return a human-readable rendering of a wolfsentry\_kv\_type\_t.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_kv\\_render\\_value](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, const struct wolfsentry\_kv\_pair \*kv, char \*out, int \*out\_len)  
*Render kv in human-readable form to caller-preallocated buffer out.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_values\\_iterate\\_start](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_cursor \*\*cursor)  
*Start an iteration loop on the user values table of this context. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_values\\_iterate\\_seek\\_to\\_head](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_cursor \*cursor)  
*Move the cursor to point to the start of the user values table. Caller must have a lock on the context at entry.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t wolfsentry\\_user\\_values\\_iterate\\_seek\\_to\\_tail](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfsentry\_cursor \*cursor)  
*Move the cursor to point to the end of the user values table. Caller must have a lock on the context at entry.*

- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_values\\_iterate\\_current](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor, struct wolfentry\_kv\_pair\_internal \*\*kv)  
Return the item to which the cursor currently points, without moving the cursor. Caller must have a lock on the context at entry.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_values\\_iterate\\_prev](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor, struct wolfentry\_kv\_pair\_internal \*\*kv)  
Move the cursor to the previous item, and return it. Caller must have a lock on the context at entry.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_values\\_iterate\\_next](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*cursor, struct wolfentry\_kv\_pair\_internal \*\*kv)  
Move the cursor to the next item, and return it. Caller must have a lock on the context at entry.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_user\\_values\\_iterate\\_end](#) (WOLFSENTRY\_CONTEXT\_ARGS\_IN, struct wolfentry\_cursor \*\*cursor)  
End an iteration loop started with [wolfentry\\_user\\_values\\_iterate\\_start\(\)](#). Caller must have a lock on the context at entry.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) [wolfentry\\_base64\\_decode](#) (const char \*src, size\_t src\_len, byte \*dest, size\_t \*dest\_spc, int ignore\_junk\_p)  
Convert base64-encoded input *src* to binary output *dest*, optionally ignoring (with nonzero *ignore\_junk\_p*) non-base64 characters in *src*.

### 10.4.1 Detailed Description

The main include file for wolfSentry applications.

Include this file in your application for core wolfSentry capabilities.

## 10.5 wolfentry.h

[Go to the documentation of this file.](#)

```

00001 /*
00002  * wolfentry.h
00003  *
00004  * Copyright (C) 2021-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00029 #ifndef WOLFSENTRY_H
00030 #define WOLFSENTRY_H
00031
00053 #define WOLFSENTRY_VERSION_MAJOR 1
00055 #define WOLFSENTRY_VERSION_MINOR 5
00057 #define WOLFSENTRY_VERSION_TINY 0
00059 #define WOLFSENTRY_VERSION_ENCODE(major, minor, tiny) (((major) << 16U) | ((minor) << 8U) | (tiny))
00061 #define WOLFSENTRY_VERSION WOLFSENTRY_VERSION_ENCODE(WOLFSENTRY_VERSION_MAJOR,
WOLFSENTRY_VERSION_MINOR, WOLFSENTRY_VERSION_TINY)
00063 #define WOLFSENTRY_VERSION_GT(major, minor, tiny) (WOLFSENTRY_VERSION >
WOLFSENTRY_VERSION_ENCODE(major, minor, tiny))
00065 #define WOLFSENTRY_VERSION_GE(major, minor, tiny) (WOLFSENTRY_VERSION >=
WOLFSENTRY_VERSION_ENCODE(major, minor, tiny))
00067 #define WOLFSENTRY_VERSION_EQ(major, minor, tiny) (WOLFSENTRY_VERSION ==
WOLFSENTRY_VERSION_ENCODE(major, minor, tiny))

```



```

00069 #define WOLFSENTRY_VERSION_LT(major, minor, tiny) (WOLFSENTRY_VERSION <
        WOLFSENTRY_VERSION_ENCODE(major, minor, tiny))
00071 #define WOLFSENTRY_VERSION_LE(major, minor, tiny) (WOLFSENTRY_VERSION <=
        WOLFSENTRY_VERSION_ENCODE(major, minor, tiny))
00075 typedef enum {
00076     WOLFSENTRY_INIT_FLAG_NONE = 0,
00077     WOLFSENTRY_INIT_FLAG_LOCK_SHARED_ERROR_CHECKING = 1<<0
00078 } wolfsentry_init_flags_t;
00079
00082 #ifndef WOLFSENTRY
00084 #define WOLFSENTRY /* activate wolfSentry codepaths in CentiJSON headers */
00086 #endif
00087
00088 #include <wolfsentry/wolfsentry_settings.h>
00089 #include <wolfsentry/wolfsentry_af.h>
00090 #include <wolfsentry/wolfsentry_errcodes.h>
00091
00092 struct wolfsentry_allocator;
00093 struct wolfsentry_context;
00094 struct wolfsentry_thread_context;
00095
00100 #ifdef WOLFSENTRY_THREADSAFE
00101
00102 typedef void *(*wolfsentry_malloc_cb_t)(void *context, struct wolfsentry_thread_context *thread,
        size_t size);
00104 typedef void *(*wolfsentry_free_cb_t)(void *context, struct wolfsentry_thread_context *thread, void
        *ptr);
00108 typedef void *(*wolfsentry_realloc_cb_t)(void *context, struct wolfsentry_thread_context *thread, void
        *ptr, size_t size);
00112 typedef void *(*wolfsentry_memalign_cb_t)(void *context, struct wolfsentry_thread_context *thread,
        size_t alignment, size_t size);
00116 typedef void *(*wolfsentry_free_aligned_cb_t)(void *context, struct wolfsentry_thread_context *thread,
        void *ptr);
00122 #else /* !WOLFSENTRY_THREADSAFE */
00123
00124 typedef void *(*wolfsentry_malloc_cb_t)(void *context, size_t size);
00125 typedef void *(*wolfsentry_free_cb_t)(void *context, void *ptr);
00126 typedef void *(*wolfsentry_realloc_cb_t)(void *context, void *ptr, size_t size);
00127 typedef void *(*wolfsentry_memalign_cb_t)(void *context, size_t alignment, size_t size);
00128 typedef void *(*wolfsentry_free_aligned_cb_t)(void *context, void *ptr);
00129
00130 #endif /* WOLFSENTRY_THREADSAFE */
00131
00133 struct wolfsentry_allocator {
00134     void *context;
00136     wolfsentry_malloc_cb_t malloc;
00138     wolfsentry_free_cb_t free;
00140     wolfsentry_realloc_cb_t realloc;
00142     wolfsentry_memalign_cb_t memalign;
00146     wolfsentry_free_aligned_cb_t free_aligned;
00148 };
00149
00156 typedef wolfsentry_errcode_t (*wolfsentry_get_time_cb_t)(void *context, wolfsentry_time_t *ts);
00159 typedef wolfsentry_time_t (*wolfsentry_diff_time_cb_t)(wolfsentry_time_t earlier, wolfsentry_time_t
        later);
00161 typedef wolfsentry_time_t (*wolfsentry_add_time_cb_t)(wolfsentry_time_t start_time, wolfsentry_time_t
        time_interval);
00163 typedef wolfsentry_errcode_t (*wolfsentry_to_epoch_time_cb_t)(wolfsentry_time_t when, time_t
        *epoch_secs, long *epoch_nsecs);
00165 typedef wolfsentry_errcode_t (*wolfsentry_from_epoch_time_cb_t)(time_t epoch_secs, long epoch_nsecs,
        wolfsentry_time_t *when);
00167 typedef wolfsentry_errcode_t (*wolfsentry_interval_to_seconds_cb_t)(wolfsentry_time_t howlong, time_t
        *howlong_secs, long *howlong_nsecs);
00169 typedef wolfsentry_errcode_t (*wolfsentry_interval_from_seconds_cb_t)(time_t howlong_secs, long
        howlong_nsecs, wolfsentry_time_t *howlong);
00173 struct wolfsentry_timecbs {
00174     void *context;
00176     wolfsentry_get_time_cb_t get_time;
00178     wolfsentry_diff_time_cb_t diff_time;
00180     wolfsentry_add_time_cb_t add_time;
00182     wolfsentry_to_epoch_time_cb_t to_epoch_time;
00184     wolfsentry_from_epoch_time_cb_t from_epoch_time;
00186     wolfsentry_interval_to_seconds_cb_t interval_to_seconds;
00188     wolfsentry_interval_from_seconds_cb_t interval_from_seconds;
00190 };
00191
00194 #ifdef WOLFSENTRY_THREADSAFE
00195
00200 typedef int (*sem_init_cb_t)(sem_t *sem, int pshared, unsigned int value);
00202 typedef int (*sem_post_cb_t)(sem_t *sem);
00204 typedef int (*sem_wait_cb_t)(sem_t *sem);
00206 typedef int (*sem_timedwait_cb_t)(sem_t *sem, const struct timespec *abs_timeout);
00208 typedef int (*sem_trywait_cb_t)(sem_t *sem);
00210 typedef int (*sem_destroy_cb_t)(sem_t *sem);
00214 struct wolfsentry_semcbs {
00215     sem_init_cb_t sem_init;
00217     sem_post_cb_t sem_post;

```

```

00219     sem_wait_cb_t sem_wait;
00221     sem_timedwait_cb_t sem_timedwait;
00223     sem_trywait_cb_t sem_trywait;
00225     sem_destroy_cb_t sem_destroy;
00227 };
00228
00231 #endif /* WOLFSENTRY_THREADSafe */
00232
00238 struct wolfentry_host_platform_interface {
00239     struct wolfentry_build_settings caller_build_settings;
00241     /* must be first */ struct wolfentry_allocator allocator;
00243     struct wolfentry_timecbs timecbs;
00245 #ifdef WOLFSENTRY_THREADSafe
00246     struct wolfentry_semcbs semcbs;
00248 #endif
00249 };
00250
00251 WOLFSENTRY_API struct wolfentry_build_settings wolfentry_get_build_settings(void);
00253 WOLFSENTRY_API wolfentry_errcode_t wolfentry_build_settings_compatible(struct
    wolfentry_build_settings caller_build_settings);
00258 #ifndef WOLFSENTRY_THREADSafe
00259
00265 typedef enum {
00266     WOLFSENTRY_THREAD_FLAG_NONE = 0,
00268     WOLFSENTRY_THREAD_FLAG_DEADLINE = 1<<0,
00270     WOLFSENTRY_THREAD_FLAG_READONLY = 1<<1
00272 } wolfentry_thread_flags_t;
00273
00274 #define WOLFSENTRY_CONTEXT_ARGS_IN struct wolfentry_context *wolfentry, struct
    wolfentry_thread_context *thread
00276 #define WOLFSENTRY_CONTEXT_ARGS_IN_EX(ctx) ctx, struct wolfentry_thread_context *thread
00281 #define WOLFSENTRY_CONTEXT_ARGS_IN_EX4(ctx, thr) struct wolfentry_context *ctx, struct
    wolfentry_thread_context *thr
00283 #define WOLFSENTRY_CONTEXT_ELEMENTS struct wolfentry_context *wolfentry; struct
    wolfentry_thread_context *thread
00285 #define WOLFSENTRY_CONTEXT_SET_ELEMENTS(s) (s).wolfentry = wolfentry; (s).thread = thread
00287 #define WOLFSENTRY_CONTEXT_GET_ELEMENTS(s) (s).wolfentry, (s).thread
00289 #define WOLFSENTRY_CONTEXT_ARGS_OUT wolfentry, thread
00291 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX(ctx) ctx, thread
00293 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX2(x) (x)->wolfentry, (x)->thread
00295 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX3(x, y) (x)->y, (x)->thread
00297 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX4(x, y) x, y
00299 #define WOLFSENTRY_CONTEXT_ARGS_NOT_USED (void)wolfentry; (void)thread
00301 #define WOLFSENTRY_CONTEXT_ARGS_THREAD_NOT_USED (void)thread
00304 /* note WOLFSENTRY_THREAD_HEADER_DECLS includes final semicolon. */
00305 #define WOLFSENTRY_THREAD_HEADER_DECLS
00306     struct wolfentry_thread_context_public thread_buffer =
00307         WOLFSENTRY_THREAD_CONTEXT_PUBLIC_INITIALIZER;
00308     struct wolfentry_thread_context *thread =
00309         (struct wolfentry_thread_context *)&thread_buffer;
00310     wolfentry_errcode_t _thread_context_ret;
00313 #define WOLFSENTRY_THREAD_HEADER_INIT(flags)
00314     (_thread_context_ret =
00315         wolfentry_init_thread_context(thread, flags, NULL /* user_context */))
00318 #define WOLFSENTRY_THREAD_HEADER_INIT_CHECKED(flags)
00319     do {
00320         _thread_context_ret =
00321             wolfentry_init_thread_context(thread, flags, NULL /* user_context */); \
00322         if (_thread_context_ret < 0)
00323             return _thread_context_ret;
00324     } while (0)
00327 #define WOLFSENTRY_THREAD_HEADER(flags)
00328     struct wolfentry_thread_context_public thread_buffer =
00329         WOLFSENTRY_THREAD_CONTEXT_PUBLIC_INITIALIZER;
00330     struct wolfentry_thread_context *thread =
00331         (struct wolfentry_thread_context *)&thread_buffer;
00332     wolfentry_errcode_t _thread_context_ret =
00333         wolfentry_init_thread_context(thread, flags, NULL /* user_context */)
00336 #define WOLFSENTRY_THREAD_HEADER_CHECK()
00337     do {
00338         if (_thread_context_ret < 0)
00339             return _thread_context_ret;
00340     } while (0)
00343 #define WOLFSENTRY_THREAD_HEADER_CHECKED(flags)
00344     WOLFSENTRY_THREAD_HEADER(flags);
00345     WOLFSENTRY_THREAD_HEADER_CHECK()
00348 #define WOLFSENTRY_THREAD_TAILER(flags) (_thread_context_ret =
    wolfentry_destroy_thread_context(thread, flags))
00350 #define WOLFSENTRY_THREAD_TAILER_CHECKED(flags) do { WOLFSENTRY_THREAD_TAILER(flags); if
    (_thread_context_ret < 0) return _thread_context_ret; } while (0)
00352 #define WOLFSENTRY_THREAD_GET_ERROR _thread_context_ret
00356 typedef enum {
00357     WOLFSENTRY_LOCK_FLAG_NONE = 0,
00359     WOLFSENTRY_LOCK_FLAG_PSHARED = 1<<0,
00361     WOLFSENTRY_LOCK_FLAG_SHARED_ERROR_CHECKING = 1<<1,
00363     WOLFSENTRY_LOCK_FLAG_NONRECURSIVE_MUTEX = 1<<2,
00365     WOLFSENTRY_LOCK_FLAG_NONRECURSIVE_SHARED = 1<<3,

```

```
00367     WOLFSENTRY_LOCK_FLAG_GET_RESERVATION_TOO = 1<<4,
00369     WOLFSENTRY_LOCK_FLAG_TRY_RESERVATION_TOO = 1<<5,
00371     WOLFSENTRY_LOCK_FLAG_ABANDON_RESERVATION_TOO = 1<<6,
00373     WOLFSENTRY_LOCK_FLAG_AUTO_DOWNGRADE = 1<<7,
00375     WOLFSENTRY_LOCK_FLAG_RETAIN_SEMAPHORE = 1<<8
00377 } wolfentry_lock_flags_t;
00378
00379 WOLFSENTRY_API wolfentry_errcode_t wolfentry_init_thread_context(struct wolfentry_thread_context
*thread_context, wolfentry_thread_flags_t init_thread_flags, void *user_context);
00381 WOLFSENTRY_API wolfentry_errcode_t wolfentry_alloc_thread_context(struct
wolfentry_host_platform_interface *hpi, struct wolfentry_thread_context **thread_context,
wolfentry_thread_flags_t init_thread_flags, void *user_context);
00383 WOLFSENTRY_API wolfentry_errcode_t wolfentry_get_thread_id(struct wolfentry_thread_context *thread,
wolfentry_thread_id_t *id);
00385 WOLFSENTRY_API wolfentry_errcode_t wolfentry_get_thread_user_context(struct
wolfentry_thread_context *thread, void **user_context);
00387 WOLFSENTRY_API wolfentry_errcode_t wolfentry_get_thread_deadline(struct wolfentry_thread_context
*thread, struct timespec *deadline);
00389 WOLFSENTRY_API wolfentry_errcode_t wolfentry_get_thread_flags(struct wolfentry_thread_context
*thread, wolfentry_thread_flags_t *thread_flags);
00391 WOLFSENTRY_API wolfentry_errcode_t wolfentry_destroy_thread_context(struct wolfentry_thread_context
*thread_context, wolfentry_thread_flags_t thread_flags);
00393 WOLFSENTRY_API wolfentry_errcode_t wolfentry_free_thread_context(struct
wolfentry_host_platform_interface *hpi, struct wolfentry_thread_context **thread_context,
wolfentry_thread_flags_t thread_flags);
00395 WOLFSENTRY_API wolfentry_errcode_t wolfentry_set_deadline_rel_usecs(WOLFSENTRY_CONTEXT_ARGS_IN, int
usecs);
00397 WOLFSENTRY_API wolfentry_errcode_t wolfentry_set_deadline_abs(WOLFSENTRY_CONTEXT_ARGS_IN, time_t
epoch_secs, long epoch_nsecs);
00399 WOLFSENTRY_API wolfentry_errcode_t wolfentry_clear_deadline(WOLFSENTRY_CONTEXT_ARGS_IN);
00401 WOLFSENTRY_API wolfentry_errcode_t wolfentry_set_thread_readonly(struct wolfentry_thread_context
*thread_context);
00403 WOLFSENTRY_API wolfentry_errcode_t wolfentry_set_thread_readwrite(struct wolfentry_thread_context
*thread_context);
00406 struct wolfentry_rwlock;
00407
00422 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_init(struct wolfentry_host_platform_interface
*hpi, struct wolfentry_thread_context *thread, struct wolfentry_rwlock *lock,
wolfentry_lock_flags_t flags);
00423 WOLFSENTRY_API size_t wolfentry_lock_size(void);
00438 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_alloc(struct wolfentry_host_platform_interface
*hpi, struct wolfentry_thread_context *thread, struct wolfentry_rwlock **lock,
wolfentry_lock_flags_t flags);
00450 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared(struct wolfentry_rwlock *lock, struct
wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00463 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared_abstimed(struct wolfentry_rwlock *lock,
struct wolfentry_thread_context *thread, const struct timespec *abs_timeout, wolfentry_lock_flags_t
flags);
00476 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared_timed(struct wolfentry_rwlock *lock,
struct wolfentry_thread_context *thread, wolfentry_time_t max_wait, wolfentry_lock_flags_t flags);
00488 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_mutex(struct wolfentry_rwlock *lock, struct
wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00501 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_mutex_abstimed(struct wolfentry_rwlock *lock,
struct wolfentry_thread_context *thread, const struct timespec *abs_timeout, wolfentry_lock_flags_t
flags);
00514 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_mutex_timed(struct wolfentry_rwlock *lock, struct
wolfentry_thread_context *thread, wolfentry_time_t max_wait, wolfentry_lock_flags_t flags);
00526 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_mutex2shared(struct wolfentry_rwlock *lock,
struct wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00538 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex(struct wolfentry_rwlock *lock,
struct wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00551 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_abstimed(struct wolfentry_rwlock
*lock, struct wolfentry_thread_context *thread, const struct timespec *abs_timeout,
wolfentry_lock_flags_t flags);
00564 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_timed(struct wolfentry_rwlock *lock,
struct wolfentry_thread_context *thread, wolfentry_time_t max_wait, wolfentry_lock_flags_t flags);
00580 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_reserve(struct wolfentry_rwlock
*lock, struct wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00592 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_redeem(struct wolfentry_rwlock
*lock, struct wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00605 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_redeem_abstimed(struct
wolfentry_rwlock *lock, struct wolfentry_thread_context *thread, const struct timespec *abs_timeout,
wolfentry_lock_flags_t flags);
00618 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_redeem_timed(struct wolfentry_rwlock
*lock, struct wolfentry_thread_context *thread, wolfentry_time_t max_wait, wolfentry_lock_flags_t
flags);
00630 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_shared2mutex_abandon(struct wolfentry_rwlock
*lock, struct wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00644 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_have_shared(struct wolfentry_rwlock *lock, struct
wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00658 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_have_mutex(struct wolfentry_rwlock *lock, struct
wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00673 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_have_either(struct wolfentry_rwlock *lock, struct
wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00686 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_have_shared2mutex_reservation(struct
wolfentry_rwlock *lock, struct wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00698 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_get_flags(struct wolfentry_rwlock *lock, struct
```

```

        wolfentry_thread_context *thread, wolfentry_lock_flags_t *flags);
00710 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_unlock(struct wolfentry_rwlock *lock, struct
        wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00723 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_destroy(struct wolfentry_rwlock *lock, struct
        wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00737 WOLFSENTRY_API wolfentry_errcode_t wolfentry_lock_free(struct wolfentry_rwlock **lock, struct
        wolfentry_thread_context *thread, wolfentry_lock_flags_t flags);
00738
00739 #else /* !WOLFSENTRY_THREADSafe */
00740
00741 #define WOLFSENTRY_CONTEXT_ARGS_IN struct wolfentry_context *wolfentry
00742 #define WOLFSENTRY_CONTEXT_ARGS_IN_EX(ctx) ctx
00743 #define WOLFSENTRY_CONTEXT_ELEMENTS struct wolfentry_context *wolfentry
00744 #define WOLFSENTRY_CONTEXT_SET_ELEMENTS(s) (s).wolfentry = wolfentry
00745 #define WOLFSENTRY_CONTEXT_GET_ELEMENTS(s) (s).wolfentry
00746 #define WOLFSENTRY_CONTEXT_ARGS_OUT wolfentry
00747 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX(ctx) ctx
00748 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX2(x) (x)->wolfentry
00749 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX3(x, y) (x)->y
00750 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX4(x, y) x
00751 #define WOLFSENTRY_CONTEXT_ARGS_NOT_USED (void)wolfentry
00752 #define WOLFSENTRY_CONTEXT_ARGS_THREAD_NOT_USED DO_NOTHING
00753
00754 #define WOLFSENTRY_THREAD_HEADER_DECLS
00755 #define WOLFSENTRY_THREAD_HEADER(flags) DO_NOTHING
00756 #define WOLFSENTRY_THREAD_HEADER_INIT(flags) 0
00757 #define WOLFSENTRY_THREAD_HEADER_INIT_CHECKED(flags) DO_NOTHING
00758 #define WOLFSENTRY_THREAD_HEADER_CHECKED(flags) DO_NOTHING
00759 #define WOLFSENTRY_THREAD_HEADER_CHECK() DO_NOTHING
00760 #define WOLFSENTRY_THREAD_GET_ERROR 0
00761 #define WOLFSENTRY_THREAD_TAILER(flags) 0
00762 #define WOLFSENTRY_THREAD_TAILER_CHECKED(flags) DO_NOTHING
00763
00764 #define wolfentry_lock_init(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00765 #define wolfentry_lock_alloc(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00766 #define wolfentry_lock_shared(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00767 #define wolfentry_lock_shared_abstimed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00768 #define wolfentry_lock_mutex_timed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00769 #define wolfentry_lock_mutex(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00770 #define wolfentry_lock_mutex_abstimed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00771 #define wolfentry_lock_mutex_timed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00772 #define wolfentry_lock_mutex2shared(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00773 #define wolfentry_lock_shared2mutex(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00774 #define wolfentry_lock_shared2mutex_abstimed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00775 #define wolfentry_lock_shared2mutex_timed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00776 #define wolfentry_lock_shared2mutex_reserve(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00777 #define wolfentry_lock_shared2mutex_redeem(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00778 #define wolfentry_lock_shared2mutex_redeem_abstimed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00779 #define wolfentry_lock_shared2mutex_redeem_timed(x, y, z, w) WOLFSENTRY_ERROR_ENCODE(OK)
00780 #define wolfentry_lock_shared2mutex_abandon(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00781 #define wolfentry_lock_have_shared(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00782 #define wolfentry_lock_have_mutex(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00783 #define wolfentry_lock_have_either(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00784 #define wolfentry_lock_have_shared2mutex_reservation(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00785 #define wolfentry_lock_unlock(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00786 #define wolfentry_lock_destroy(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00787 #define wolfentry_lock_free(x, y, z) WOLFSENTRY_ERROR_ENCODE(OK)
00788
00789 #endif /* WOLFSENTRY_THREADSafe */
00790
00791 typedef enum {
00792     WOLFSENTRY_OBJECT_TYPE_UNINITED = 0,
00801     WOLFSENTRY_OBJECT_TYPE_TABLE,
00803     WOLFSENTRY_OBJECT_TYPE_ACTION,
00805     WOLFSENTRY_OBJECT_TYPE_EVENT,
00807     WOLFSENTRY_OBJECT_TYPE_ROUTE,
00809     WOLFSENTRY_OBJECT_TYPE_KV,
00811     WOLFSENTRY_OBJECT_TYPE_ADDR_FAMILY_BYNUMBER,
00813     WOLFSENTRY_OBJECT_TYPE_ADDR_FAMILY_BYNAME
00815 } wolfentry_object_type_t;
00816
00824 typedef enum {
00825     WOLFSENTRY_ACTION_FLAG_NONE = 0U,
00827     WOLFSENTRY_ACTION_FLAG_DISABLED = 1U « 0U
00829 } wolfentry_action_flags_t;
00830
00832 typedef enum {
00833     WOLFSENTRY_ACTION_TYPE_NONE = 0,
00835     WOLFSENTRY_ACTION_TYPE_POST = 1,
00837     WOLFSENTRY_ACTION_TYPE_INSERT = 2,
00839     WOLFSENTRY_ACTION_TYPE_MATCH = 3,
00841     WOLFSENTRY_ACTION_TYPE_UPDATE = 4,
00843     WOLFSENTRY_ACTION_TYPE_DELETE = 5,
00845     WOLFSENTRY_ACTION_TYPE_DECISION = 6
00847 } wolfentry_action_type_t;
00848
00850 typedef enum {

```

```

00851     WOLFSENTRY_ACTION_RES_NONE           = 0U,
00853     WOLFSENTRY_ACTION_RES_ACCEPT        = 1U << 0U,
00855     WOLFSENTRY_ACTION_RES_REJECT        = 1U << 1U,
00857     WOLFSENTRY_ACTION_RES_CONNECT       = 1U << 2U,
00859     WOLFSENTRY_ACTION_RES_DISCONNECT    = 1U << 3U,
00861     WOLFSENTRY_ACTION_RES_DEROGATORY    = 1U << 4U,
00863     WOLFSENTRY_ACTION_RES_COMMENDABLE   = 1U << 5U,
00866     WOLFSENTRY_ACTION_RES_EXCLUDE_REJECT_ROUTES = WOLFSENTRY_ACTION_RES_DEROGATORY |
WOLFSENTRY_ACTION_RES_COMMENDABLE, /* internal use -- overload used by wolfentry_route_lookup_0() */
00868     WOLFSENTRY_ACTION_RES_STOP           = 1U << 6U,
00870     WOLFSENTRY_ACTION_RES_DEALLOCATED    = 1U << 7U,
00872     WOLFSENTRY_ACTION_RES_INSERTED       = 1U << 8U,
00874     WOLFSENTRY_ACTION_RES_ERROR          = 1U << 9U,
00876     WOLFSENTRY_ACTION_RES_FALLTHROUGH    = 1U << 10U,
00878     WOLFSENTRY_ACTION_RES_UPDATE         = 1U << 11U,
00880     WOLFSENTRY_ACTION_RES_PORT_RESET     = 1U << 12U,
00882     WOLFSENTRY_ACTION_RES_SENDING        = 1U << 13U,
00884     WOLFSENTRY_ACTION_RES_RECEIVED       = 1U << 14U,
00886     WOLFSENTRY_ACTION_RES_BINDING        = 1U << 15U,
00888     WOLFSENTRY_ACTION_RES_LISTENING      = 1U << 16U,
00890     WOLFSENTRY_ACTION_RES_STOPPED_LISTENING = 1U << 17U,
00892     WOLFSENTRY_ACTION_RES_CONNECTING_OUT = 1U << 18U,
00894     WOLFSENTRY_ACTION_RES_CLOSED         = 1U << 19U,
00896     WOLFSENTRY_ACTION_RES_UNREACHABLE    = 1U << 20U,
00898     WOLFSENTRY_ACTION_RES_SOCK_ERROR     = 1U << 21U,
00901     WOLFSENTRY_ACTION_RES_RESERVED22    = 1U << 22U,
00902     WOLFSENTRY_ACTION_RES_RESERVED23    = 1U << 23U,
00904     WOLFSENTRY_ACTION_RES_USER0         = 1U << 24U,
00906     WOLFSENTRY_ACTION_RES_USER1         = 1U << 25U,
00908     WOLFSENTRY_ACTION_RES_USER2         = 1U << 26U,
00910     WOLFSENTRY_ACTION_RES_USER3         = 1U << 27U,
00912     WOLFSENTRY_ACTION_RES_USER4         = 1U << 28U,
00914     WOLFSENTRY_ACTION_RES_USER5         = 1U << 29U,
00916     WOLFSENTRY_ACTION_RES_USER6         = 1U << 30U
00918     /* see macro definition of WOLFSENTRY_ACTION_RES_USER7 below. */
00919
00921 } wolfentry_action_res_t;
00922
00924 #define WOLFSENTRY_ACTION_RES_USER_BASE WOLFSENTRY_ACTION_RES_USER0
00927 #define WOLFSENTRY_ACTION_RES_USER_SHIFT 24U
00929 #define WOLFSENTRY_ACTION_RES_USER7 (1U << 31U)
00934 struct wolfentry_table_header;
00935 struct wolfentry_table_ent_header;
00936 struct wolfentry_route;
00937 struct wolfentry_route_table;
00938 struct wolfentry_event;
00939 struct wolfentry_event_table;
00940 struct wolfentry_action;
00941 struct wolfentry_action_table;
00942 struct wolfentry_action_list;
00943 struct wolfentry_action_list_ent;
00944 struct wolfentry_cursor;
00945
00967 typedef wolfentry_errcode_t (*wolfentry_action_callback_t)(
00968     WOLFSENTRY_CONTEXT_ARGS_IN,
00969     const struct wolfentry_action *action,
00970     void *handler_arg,
00971     void *caller_arg,
00972     const struct wolfentry_event *trigger_event,
00973     wolfentry_action_type_t action_type,
00974     const struct wolfentry_route *trigger_route,
00975     struct wolfentry_route_table *route_table,
00976     struct wolfentry_route *rule_route,
00977     wolfentry_action_res_t *action_results);
00978
00985 #define WOLFSENTRY_ROUTE_DEFAULT_POLICY_MASK (WOLFSENTRY_ACTION_RES_ACCEPT |
WOLFSENTRY_ACTION_RES_REJECT | WOLFSENTRY_ACTION_RES_STOP | WOLFSENTRY_ACTION_RES_ERROR)
00989 typedef enum {
00990     WOLFSENTRY_ROUTE_FLAG_NONE           = 0U,
00992     /* note the wildcard bits need to be at the start, in order of field
00993      * comparison by wolfentry_route_key_cmp_1(), due to math in
00994      * wolfentry_route_lookup_0().
00995      */
00996     WOLFSENTRY_ROUTE_FLAG_SA_FAMILY_WILDCARD = 1U<<0U,
00998     WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_ADDR_WILDCARD = 1U<<1U,
01000     WOLFSENTRY_ROUTE_FLAG_SA_PROTO_WILDCARD = 1U<<2U,
01002     WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_PORT_WILDCARD = 1U<<3U,
01004     WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_ADDR_WILDCARD = 1U<<4U,
01006     WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_PORT_WILDCARD = 1U<<5U,
01008     WOLFSENTRY_ROUTE_FLAG_REMOTE_INTERFACE_WILDCARD = 1U<<6U,
01010     WOLFSENTRY_ROUTE_FLAG_LOCAL_INTERFACE_WILDCARD = 1U<<7U,
01012     WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_WILDCARD = 1U<<8U,
01014     WOLFSENTRY_ROUTE_FLAG_TCPLIKE_PORT_NUMBERS = 1U<<9U,
01016     WOLFSENTRY_ROUTE_FLAG_DIRECTION_IN = 1U<<10U,
01018     WOLFSENTRY_ROUTE_FLAG_DIRECTION_OUT = 1U<<11U,
01020     WOLFSENTRY_ROUTE_FLAG_REMOTE_ADDR_BITMASK = 1U<<12U,
01022     WOLFSENTRY_ROUTE_FLAG_LOCAL_ADDR_BITMASK = 1U<<13U,

```

```

01025     /* immutable above here. */
01026
01027     /* internal use from here... */
01028     WOLFSENTRY_ROUTE_FLAG_IN_TABLE                = 1U<<14U,
01030     WOLFSENTRY_ROUTE_FLAG_PENDING_DELETE          = 1U<<15U,
01032     WOLFSENTRY_ROUTE_FLAG_INSERT_ACTIONS_CALLED   = 1U<<16U,
01034     WOLFSENTRY_ROUTE_FLAG_DELETE_ACTIONS_CALLED   = 1U<<17U,
01037     /* ...to here. */
01038
01039     /* mutable below here. */
01040
01041     WOLFSENTRY_ROUTE_FLAG_PENALTYBOXED            = 1U<<20U,
01043     WOLFSENTRY_ROUTE_FLAG_GREENLISTED             = 1U<<21U,
01045     WOLFSENTRY_ROUTE_FLAG_DONT_COUNT_HITS         = 1U<<22U,
01047     WOLFSENTRY_ROUTE_FLAG_DONT_COUNT_CURRENT_CONNECTIONS = 1U<<23U,
01049     WOLFSENTRY_ROUTE_FLAG_PORT_RESET              = 1U<<24U
01051 } wolfentry_route_flags_t;
01052
01053 /* note, _PARENT_EVENT_WILDCARD is excluded because it isn't an intrinsic attribute of network/bus
traffic. */
01054 #define WOLFSENTRY_ROUTE_WILDCARD_FLAGS
((wolfentry_route_flags_t)WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_WILDCARD - 1U)
01057 #define WOLFSENTRY_ROUTE_IMMUTABLE_FLAGS ((wolfentry_route_flags_t)WOLFSENTRY_ROUTE_FLAG_IN_TABLE -
1U)
01061 #define WOLFSENTRY_ROUTE_FLAG_TRIGGER_WILDCARD WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_WILDCARD /* xxx
backward compatibility */
01065 struct wolfentry_route_endpoint {
01066     wolfentry_port_t sa_port;
01068     wolfentry_addr_bits_t addr_len;
01070     byte extra_port_count;
01072     byte interface;
01074 };
01075
01077 struct wolfentry_route_metadata_exports {
01078     wolfentry_time_t insert_time;
01080     wolfentry_time_t last_hit_time;
01082     wolfentry_time_t last_penaltybox_time;
01084     wolfentry_time_t purge_after;
01086     uint16_t connection_count;
01088     uint16_t derogatory_count;
01090     uint16_t commendable_count;
01092     wolfentry_hitcount_t hit_count;
01094 };
01095
01097 struct wolfentry_route_exports {
01098     const char *parent_event_label;
01100     int parent_event_label_len;
01102     wolfentry_route_flags_t flags;
01104     wolfentry_addr_family_t sa_family;
01106     wolfentry_proto_t sa_proto;
01108     struct wolfentry_route_endpoint remote;
01110     struct wolfentry_route_endpoint local;
01112     const byte *remote_address;
01114     const byte *local_address;
01116     const wolfentry_port_t *remote_extra_ports;
01118     const wolfentry_port_t *local_extra_ports;
01120     struct wolfentry_route_metadata_exports meta;
01122     void *private_data;
01124     size_t private_data_size;
01126 };
01127
01129 struct wolfentry_sockaddr {
01130     wolfentry_addr_family_t sa_family;
01132     wolfentry_proto_t sa_proto;
01134     wolfentry_port_t sa_port;
01136     wolfentry_addr_bits_t addr_len;
01138     byte interface;
01140     attr_align_to(4) byte addr[WOLFSENTRY_FLEXIBLE_ARRAY_SIZE];
01142 };
01143
01144 #define WOLFSENTRY_SOCKADDR(n) struct {
01145     wolfentry_addr_family_t sa_family;
01146     wolfentry_proto_t sa_proto;
01147     wolfentry_port_t sa_port;
01148     wolfentry_addr_bits_t addr_len;
01149     byte interface;
01150     attr_align_to(4) byte addr[WOLFSENTRY_BITS_TO_BYTES(n)];
01151 }
01155 typedef enum {
01156     WOLFSENTRY_FORMAT_FLAG_NONE = 0,
01158     WOLFSENTRY_FORMAT_FLAG_ALWAYS_NUMERIC = 1U << 0U
01160 } wolfentry_format_flags_t;
01161
01169 typedef enum {
01170     WOLFSENTRY_EVENT_FLAG_NONE = 0,
01172     WOLFSENTRY_EVENT_FLAG_IS_PARENT_EVENT = 1U << 0U,
01174     WOLFSENTRY_EVENT_FLAG_IS_SUBEVENT = 1U << 1U

```



```

01176 } wolfentry_event_flags_t;
01177
01179 typedef enum {
01180     WOLFSENTRY_EVENTCONFIG_FLAG_NONE = 0U,
01182     WOLFSENTRY_EVENTCONFIG_FLAG_DEROGATORY_THRESHOLD_IGNORE_COMMENDABLE = 1U << 0U,
01184     WOLFSENTRY_EVENTCONFIG_FLAG_COMMENDABLE_CLEARS_DEROGATORY = 1U << 1U,
01186     WOLFSENTRY_EVENTCONFIG_FLAG_INHIBIT_ACTIONS = 1U << 2U
01188 } wolfentry_eventconfig_flags_t;
01189
01191 struct wolfentry_eventconfig {
01192     size_t route_private_data_size;
01194     size_t route_private_data_alignment;
01196     uint32_t max_connection_count;
01198     wolfentry_hitcount_t derogatory_threshold_for_penaltybox;
01200     wolfentry_time_t penaltybox_duration;
01202     wolfentry_time_t route_idle_time_for_purge;
01204     wolfentry_eventconfig_flags_t flags;
01206     wolfentry_route_flags_t route_flags_to_add_on_insert;
01208     wolfentry_route_flags_t route_flags_to_clear_on_insert;
01210     wolfentry_action_res_t action_res_filter_bits_set;
01212     wolfentry_action_res_t action_res_filter_bits_unset;
01214     wolfentry_action_res_t action_res_bits_to_add;
01216     wolfentry_action_res_t action_res_bits_to_clear;
01218 };
01219
01226 WOLFSENTRY_API wolfentry_errcode_t wolfentry_time_now_plus_delta(struct wolfentry_context
    *wolfentry, wolfentry_time_t td, wolfentry_time_t *res);
01229 #ifdef WOLFSENTRY_THREADSAFE
01230 WOLFSENTRY_API wolfentry_errcode_t wolfentry_time_to_timespec(struct wolfentry_context *wolfentry,
    wolfentry_time_t t, struct timespec *ts);
01232 WOLFSENTRY_API wolfentry_errcode_t wolfentry_time_now_plus_delta_timespec(struct wolfentry_context
    *wolfentry, wolfentry_time_t td, struct timespec *ts);
01234 #endif
01235
01236 WOLFSENTRY_API wolfentry_errcode_t wolfentry_get_time(struct wolfentry_context *wolfentry,
    wolfentry_time_t *time_p);
01238 WOLFSENTRY_API wolfentry_time_t wolfentry_diff_time(struct wolfentry_context *wolfentry,
    wolfentry_time_t later, wolfentry_time_t earlier);
01240 WOLFSENTRY_API wolfentry_time_t wolfentry_add_time(struct wolfentry_context *wolfentry,
    wolfentry_time_t start_time, wolfentry_time_t time_interval);
01242 WOLFSENTRY_API wolfentry_errcode_t wolfentry_to_epoch_time(struct wolfentry_context *wolfentry,
    wolfentry_time_t when, time_t *epoch_secs, long *epoch_nsecs);
01244 WOLFSENTRY_API wolfentry_errcode_t wolfentry_from_epoch_time(struct wolfentry_context *wolfentry,
    time_t epoch_secs, long epoch_nsecs, wolfentry_time_t *when);
01246 WOLFSENTRY_API wolfentry_errcode_t wolfentry_interval_to_seconds(struct wolfentry_context
    *wolfentry, wolfentry_time_t howlong, time_t *howlong_secs, long *howlong_nsecs);
01248 WOLFSENTRY_API wolfentry_errcode_t wolfentry_interval_from_seconds(struct wolfentry_context
    *wolfentry, time_t howlong_secs, long howlong_nsecs, wolfentry_time_t *howlong);
01251 WOLFSENTRY_API struct wolfentry_timecbs *wolfentry_get_timecbs(struct wolfentry_context
    *wolfentry);
01259 typedef wolfentry_errcode_t (*wolfentry_make_id_cb_t)(void *context, wolfentry_ent_id_t *id);
01265 WOLFSENTRY_API void *wolfentry_malloc(WOLFSENTRY_CONTEXT_ARGS_IN, size_t size);
01267 WOLFSENTRY_API void wolfentry_free(WOLFSENTRY_CONTEXT_ARGS_IN, void *ptr);
01269 WOLFSENTRY_API void *wolfentry_realloc(WOLFSENTRY_CONTEXT_ARGS_IN, void *ptr, size_t size);
01271 WOLFSENTRY_API void *wolfentry_memalign(WOLFSENTRY_CONTEXT_ARGS_IN, size_t alignment, size_t size);
01273 WOLFSENTRY_API void wolfentry_free_aligned(WOLFSENTRY_CONTEXT_ARGS_IN, void *ptr);
01275 #if (defined(WOLFSENTRY_MALLOC_BUILTINS) && defined(WOLFSENTRY_MALLOC_DEBUG)) ||
    defined(WOLFSENTRY_FOR_DOXYGEN)
01276 WOLFSENTRY_API int _wolfentry_get_n_mallocs(void);
01278 #endif
01279
01280 WOLFSENTRY_API struct wolfentry_allocator *wolfentry_get_allocator(struct wolfentry_context
    *wolfentry);
01285 #if defined(WOLFSENTRY_PROTOCOL_NAMES) || !defined(WOLFSENTRY_NO_JSON)
01289 WOLFSENTRY_API const char *wolfentry_action_res_assoc_by_flag(wolfentry_action_res_t res, unsigned
    int bit);
01291 WOLFSENTRY_API wolfentry_errcode_t wolfentry_action_res_assoc_by_name(const char *bit_name, size_t
    bit_name_len, wolfentry_action_res_t *res);
01294 #endif
01295
01300 WOLFSENTRY_API struct wolfentry_host_platform_interface *wolfentry_get_hpi(struct wolfentry_context
    *wolfentry);
01303 typedef void (*wolfentry_cleanup_callback_t)(
    WOLFSENTRY_CONTEXT_ARGS_IN,
01305     void *cleanup_arg);
01308 WOLFSENTRY_API wolfentry_errcode_t wolfentry_cleanup_push(
    WOLFSENTRY_CONTEXT_ARGS_IN,
01309     wolfentry_cleanup_callback_t handler,
01311     void *arg);
01314 WOLFSENTRY_API wolfentry_errcode_t wolfentry_cleanup_pop(
    WOLFSENTRY_CONTEXT_ARGS_IN,
01316     int execute_p);
01319 WOLFSENTRY_API wolfentry_errcode_t wolfentry_cleanup_all(
    WOLFSENTRY_CONTEXT_ARGS_IN);
01329 /* must return _BUFFER_TOO_SMALL and set *addr_internal_bits to an
01330  * accurate value when supplied with a NULL output buf ptr.
01331  * whenever _BUFFER_TOO_SMALL is returned, *addr_*_bits must be set to an

```

```

01332  * accurate value.
01333  */
01334  typedef wolfentry_errcode_t (*wolfentry_addr_family_parser_t)(
01335      WOLFENTRY_CONTEXT_ARGS_IN,
01336      const char *addr_text,
01337      int addr_text_len,
01338      byte *addr_internal,
01339      wolfentry_addr_bits_t *addr_internal_bits);
01340  typedef wolfentry_errcode_t (*wolfentry_addr_family_formatter_t)(
01341      WOLFENTRY_CONTEXT_ARGS_IN,
01342      const byte *addr_internal,
01343      unsigned int addr_internal_bits,
01344      char *addr_text,
01345      int *addr_text_len);
01346  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_handler_install(
01347      WOLFENTRY_CONTEXT_ARGS_IN,
01348      wolfentry_addr_family_t family_bynumber,
01349      const char *family_byname, /* if defined(WOLFENTRY_PROTOCOL_NAMES), must not be NULL, else
01350      ignored. */
01351      int family_byname_len,
01352      wolfentry_addr_family_parser_t parser,
01353      wolfentry_addr_family_formatter_t formatter,
01354      int max_addr_bits);
01355  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_get_parser(
01356      WOLFENTRY_CONTEXT_ARGS_IN,
01357      wolfentry_addr_family_t family,
01358      wolfentry_addr_family_parser_t *parser);
01359  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_get_formatter(
01360      WOLFENTRY_CONTEXT_ARGS_IN,
01361      wolfentry_addr_family_t family,
01362      wolfentry_addr_family_formatter_t *formatter);
01363  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_handler_remove_bynumber(
01364      WOLFENTRY_CONTEXT_ARGS_IN,
01365      wolfentry_addr_family_t family_bynumber,
01366      wolfentry_action_res_t *action_results);
01367  struct wolfentry_addr_family_bynumber;
01368  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_drop_reference(
01369      WOLFENTRY_CONTEXT_ARGS_IN,
01370      struct wolfentry_addr_family_bynumber *family_bynumber,
01371      wolfentry_action_res_t *action_results);
01372  #ifdef WOLFENTRY_PROTOCOL_NAMES
01373  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_handler_remove_byname(
01374      WOLFENTRY_CONTEXT_ARGS_IN,
01375      const char *family_byname,
01376      int family_byname_len,
01377      wolfentry_action_res_t *action_results);
01378  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_pton(
01379      WOLFENTRY_CONTEXT_ARGS_IN,
01380      const char *family_name,
01381      int family_name_len,
01382      wolfentry_addr_family_t *family_number);
01383  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_ntop(
01384      WOLFENTRY_CONTEXT_ARGS_IN,
01385      wolfentry_addr_family_t family,
01386      struct wolfentry_addr_family_bynumber **addr_family,
01387      const char **family_name);
01388  #endif /* WOLFENTRY_PROTOCOL_NAMES */
01389  WOLFENTRY_API wolfentry_errcode_t wolfentry_addr_family_max_addr_bits(
01390      WOLFENTRY_CONTEXT_ARGS_IN,
01391      wolfentry_addr_family_t family,
01392      wolfentry_addr_bits_t *bits);
01393  WOLFENTRY_API wolfentry_errcode_t wolfentry_eventconfig_init(
01394      struct wolfentry_context *wolfentry,
01395      struct wolfentry_eventconfig *config);
01396  WOLFENTRY_API wolfentry_errcode_t wolfentry_eventconfig_check(
01397      const struct wolfentry_eventconfig *config);
01398  WOLFENTRY_API wolfentry_errcode_t wolfentry_init_ex(
01399      struct wolfentry_build_settings caller_build_settings,
01400      WOLFENTRY_CONTEXT_ARGS_IN_EX(const struct wolfentry_host_platform_interface *hpi),
01401      const struct wolfentry_eventconfig *config,
01402      struct wolfentry_context **wolfentry,
01403      wolfentry_init_flags_t flags);
01404  WOLFENTRY_API wolfentry_errcode_t wolfentry_init(
01405      struct wolfentry_build_settings caller_build_settings,
01406      WOLFENTRY_CONTEXT_ARGS_IN_EX(const struct wolfentry_host_platform_interface *hpi),
01407      const struct wolfentry_eventconfig *config,
01408      struct wolfentry_context **wolfentry);
01409  WOLFENTRY_API wolfentry_errcode_t wolfentry_defaultconfig_get(
01410      WOLFENTRY_CONTEXT_ARGS_IN,
01411      struct wolfentry_eventconfig *config);
01412  WOLFENTRY_API wolfentry_errcode_t wolfentry_defaultconfig_update(
01413      WOLFENTRY_CONTEXT_ARGS_IN,
01414      const struct wolfentry_eventconfig *config);

```



```

01504 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_flush(WOLFSENTRY_CONTEXT_ARGS_IN);
01514 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_free(WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct
    wolfsentry_context **wolfsentry));
01523 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_shutdown(WOLFSENTRY_CONTEXT_ARGS_IN_EX(struct
    wolfsentry_context **wolfsentry));
01531 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_inhibit_actions(WOLFSENTRY_CONTEXT_ARGS_IN);
01539 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_enable_actions(WOLFSENTRY_CONTEXT_ARGS_IN);
01540
01542 typedef enum {
01543     WOLFSENTRY_CLONE_FLAG_NONE = 0U,
01545     WOLFSENTRY_CLONE_FLAG_AS_AT_CREATION = 1U << 0U,
01547     WOLFSENTRY_CLONE_FLAG_NO_ROUTES = 2U << 0U
01549 } wolfsentry_clone_flags_t;
01560 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_clone(WOLFSENTRY_CONTEXT_ARGS_IN, struct
    wolfsentry_context **clone, wolfsentry_clone_flags_t flags);
01570 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_exchange(WOLFSENTRY_CONTEXT_ARGS_IN, struct
    wolfsentry_context *wolfsentry2);
01571
01578 #ifdef WOLFSENTRY_THREADSAFE
01579
01580 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_mutex(
01581     WOLFSENTRY_CONTEXT_ARGS_IN);
01583 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_mutex_abstimed(
01584     WOLFSENTRY_CONTEXT_ARGS_IN,
01585     const struct timespec *abs_timeout);
01587 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_mutex_abstimed_ex(
01588     WOLFSENTRY_CONTEXT_ARGS_IN,
01589     const struct timespec *abs_timeout,
01590     wolfsentry_lock_flags_t flags);
01592 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_mutex_timed(
01593     WOLFSENTRY_CONTEXT_ARGS_IN,
01594     wolfsentry_time_t max_wait);
01596 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_mutex_timed_ex(
01597     WOLFSENTRY_CONTEXT_ARGS_IN,
01598     wolfsentry_time_t max_wait,
01599     wolfsentry_lock_flags_t flags);
01601 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_shared(
01602     WOLFSENTRY_CONTEXT_ARGS_IN);
01604 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_shared_abstimed(
01605     WOLFSENTRY_CONTEXT_ARGS_IN,
01606     const struct timespec *abs_timeout);
01608 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_shared_with_reservation_abstimed(
01609     WOLFSENTRY_CONTEXT_ARGS_IN,
01610     const struct timespec *abs_timeout);
01612 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_shared_timed(
01613     WOLFSENTRY_CONTEXT_ARGS_IN,
01614     wolfsentry_time_t max_wait);
01616 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_lock_shared_with_reservation_timed(
01617     WOLFSENTRY_CONTEXT_ARGS_IN,
01618     wolfsentry_time_t max_wait);
01620 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_unlock(
01621     WOLFSENTRY_CONTEXT_ARGS_IN);
01623 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_context_unlock_and_abandon_reservation(
01624     WOLFSENTRY_CONTEXT_ARGS_IN);
01627 #else /* !WOLFSENTRY_THREADSAFE */
01628
01629 #define wolfsentry_context_lock_mutex(x) WOLFSENTRY_ERROR_ENCODE(OK)
01630 #define wolfsentry_context_lock_mutex_abstimed(x, y) WOLFSENTRY_ERROR_ENCODE(OK)
01631 #define wolfsentry_context_lock_mutex_timed(x, y) WOLFSENTRY_ERROR_ENCODE(OK)
01632 #define wolfsentry_context_lock_shared(x) WOLFSENTRY_ERROR_ENCODE(OK)
01633 #define wolfsentry_context_lock_shared_abstimed(x, y) WOLFSENTRY_ERROR_ENCODE(OK)
01634 #define wolfsentry_context_lock_shared_with_reservation_abstimed(x, y) WOLFSENTRY_ERROR_ENCODE(OK)
01635 #define wolfsentry_context_lock_shared_timed(x, y) WOLFSENTRY_ERROR_ENCODE(OK)
01636 #define wolfsentry_context_unlock(x) WOLFSENTRY_ERROR_ENCODE(OK)
01637
01638 #endif /* WOLFSENTRY_THREADSAFE */
01639
01642 #define WOLFSENTRY_LENGTH_NULL_TERMINATED (-1)
01656 WOLFSENTRY_API wolfsentry_object_type_t wolfsentry_get_object_type(const void *object);
01657
01665 WOLFSENTRY_API wolfsentry_ent_id_t wolfsentry_get_object_id(const void *object);
01666
01667 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_table_ent_get_by_id(
01668     WOLFSENTRY_CONTEXT_ARGS_IN,
01669     wolfsentry_ent_id_t id,
01670     struct wolfsentry_table_ent_header **ent);
01673 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_object_checkout(WOLFSENTRY_CONTEXT_ARGS_IN, void
    *object);
01676 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_object_release(WOLFSENTRY_CONTEXT_ARGS_IN, void
    *object, wolfsentry_action_res_t *action_results);
01686 WOLFSENTRY_API wolfsentry_hitcount_t wolfsentry_table_n_inserts(struct wolfsentry_table_header
    *table);
01687
01695 WOLFSENTRY_API wolfsentry_hitcount_t wolfsentry_table_n_deletes(struct wolfsentry_table_header
    *table);
01696
01703 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_check_flags_sensical(

```

```

01704     wolfentry_route_flags_t flags);
01707 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert_into_table(
01708     WOLFENTRY_CONTEXT_ARGS_IN,
01709     struct wolfentry_route_table *route_table,
01710     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01711     const struct wolfentry_sockaddr *remote,
01712     const struct wolfentry_sockaddr *local,
01713     wolfentry_route_flags_t flags,
01714     const char *event_label,
01715     int event_label_len,
01716     wolfentry_ent_id_t *id,
01717     wolfentry_action_res_t *action_results);
01720 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert_by_exports_into_table(
01721     WOLFENTRY_CONTEXT_ARGS_IN,
01722     struct wolfentry_route_table *route_table,
01723     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01724     const struct wolfentry_route_exports *route_exports,
01725     wolfentry_ent_id_t *id,
01726     wolfentry_action_res_t *action_results);
01745 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert(
01746     WOLFENTRY_CONTEXT_ARGS_IN,
01747     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01748     const struct wolfentry_sockaddr *remote,
01749     const struct wolfentry_sockaddr *local,
01750     wolfentry_route_flags_t flags,
01751     const char *event_label,
01752     int event_label_len,
01753     wolfentry_ent_id_t *id,
01754     wolfentry_action_res_t *action_results);
01755
01756 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert_by_exports(
01757     WOLFENTRY_CONTEXT_ARGS_IN,
01758     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01759     const struct wolfentry_route_exports *route_exports,
01760     wolfentry_ent_id_t *id,
01761     wolfentry_action_res_t *action_results);
01764 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert_into_table_and_check_out(
01765     WOLFENTRY_CONTEXT_ARGS_IN,
01766     struct wolfentry_route_table *route_table,
01767     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01768     const struct wolfentry_sockaddr *remote,
01769     const struct wolfentry_sockaddr *local,
01770     wolfentry_route_flags_t flags,
01771     const char *event_label,
01772     int event_label_len,
01773     struct wolfentry_route **route,
01774     wolfentry_action_res_t *action_results);
01777 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert_by_exports_into_table_and_check_out(
01778     WOLFENTRY_CONTEXT_ARGS_IN,
01779     struct wolfentry_route_table *route_table,
01780     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01781     const struct wolfentry_route_exports *route_exports,
01782     struct wolfentry_route **route,
01783     wolfentry_action_res_t *action_results);
01786 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert_and_check_out(
01787     WOLFENTRY_CONTEXT_ARGS_IN,
01788     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01789     const struct wolfentry_sockaddr *remote,
01790     const struct wolfentry_sockaddr *local,
01791     wolfentry_route_flags_t flags,
01792     const char *event_label,
01793     int event_label_len,
01794     struct wolfentry_route **route,
01795     wolfentry_action_res_t *action_results);
01798 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_insert_by_exports_and_check_out(
01799     WOLFENTRY_CONTEXT_ARGS_IN,
01800     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01801     const struct wolfentry_route_exports *route_exports,
01802     struct wolfentry_route **route,
01803     wolfentry_action_res_t *action_results);
01806 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_delete_from_table(
01807     WOLFENTRY_CONTEXT_ARGS_IN,
01808     struct wolfentry_route_table *route_table,
01809     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01810     const struct wolfentry_sockaddr *remote,
01811     const struct wolfentry_sockaddr *local,
01812     wolfentry_route_flags_t flags,
01813     const char *event_label,
01814     int event_label_len,
01815     wolfentry_action_res_t *action_results,
01816     int *n_deleted);
01835 WOLFENTRY_API wolfentry_errcode_t wolfentry_route_delete(
01836     WOLFENTRY_CONTEXT_ARGS_IN,
01837     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01838     const struct wolfentry_sockaddr *remote,
01839     const struct wolfentry_sockaddr *local,
01840     wolfentry_route_flags_t flags,

```

```

01841     const char *trigger_label,
01842     int trigger_label_len,
01843     wolfsentry_action_res_t *action_results,
01844     int *n_deleted);
01845
01859 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_delete_by_id(
01860     WOLFSENTRY_CONTEXT_ARGS_IN,
01861     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
01862     wolfsentry_ent_id_t id,
01863     const char *trigger_label,
01864     int trigger_label_len,
01865     wolfsentry_action_res_t *action_results);
01866
01878 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_main_table(
01879     WOLFSENTRY_CONTEXT_ARGS_IN,
01880     struct wolfsentry_route_table **table);
01881
01894 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_iterate_start(
01895     WOLFSENTRY_CONTEXT_ARGS_IN,
01896     const struct wolfsentry_route_table *table,
01897     struct wolfsentry_cursor **cursor);
01898
01907 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_iterate_seek_to_head(
01908     const struct wolfsentry_route_table *table,
01909     struct wolfsentry_cursor *cursor);
01910
01919 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_iterate_seek_to_tail(
01920     const struct wolfsentry_route_table *table,
01921     struct wolfsentry_cursor *cursor);
01922
01932 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_iterate_current(
01933     const struct wolfsentry_route_table *table,
01934     struct wolfsentry_cursor *cursor,
01935     struct wolfsentry_route **route);
01936
01946 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_iterate_prev(
01947     const struct wolfsentry_route_table *table,
01948     struct wolfsentry_cursor *cursor,
01949     struct wolfsentry_route **route);
01950
01960 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_iterate_next(
01961     const struct wolfsentry_route_table *table,
01962     struct wolfsentry_cursor *cursor,
01963     struct wolfsentry_route **route);
01964
01977 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_iterate_end(
01978     WOLFSENTRY_CONTEXT_ARGS_IN,
01979     const struct wolfsentry_route_table *table,
01980     struct wolfsentry_cursor **cursor);
01981
01992 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_default_policy_set(
01993     WOLFSENTRY_CONTEXT_ARGS_IN,
01994     struct wolfsentry_route_table *table,
01995     wolfsentry_action_res_t default_policy);
01996
01997 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_default_policy_set(
01998     WOLFSENTRY_CONTEXT_ARGS_IN,
01999     wolfsentry_action_res_t default_policy);
02015 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_default_policy_get(
02016     WOLFSENTRY_CONTEXT_ARGS_IN,
02017     struct wolfsentry_route_table *table,
02018     wolfsentry_action_res_t *default_policy);
02019
02020 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_default_policy_get(
02021     WOLFSENTRY_CONTEXT_ARGS_IN,
02022     wolfsentry_action_res_t *default_policy);
02042 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_reference(
02043     WOLFSENTRY_CONTEXT_ARGS_IN,
02044     const struct wolfsentry_route_table *table,
02045     const struct wolfsentry_sockaddr *remote,
02046     const struct wolfsentry_sockaddr *local,
02047     wolfsentry_route_flags_t flags,
02048     const char *event_label,
02049     int event_label_len,
02050     int exact_p,
02051     wolfsentry_route_flags_t *inexact_matches,
02052     struct wolfsentry_route **route);
02053
02064 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_drop_reference(
02065     WOLFSENTRY_CONTEXT_ARGS_IN,
02066     struct wolfsentry_route *route,
02067     wolfsentry_action_res_t *action_results);
02068
02069 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_clear_default_event(
02070     WOLFSENTRY_CONTEXT_ARGS_IN,
02071     struct wolfsentry_route_table *table);
02074 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_set_default_event(

```

```

02075     WOLFSENTRY_CONTEXT_ARGS_IN,
02076     struct wolfsentry_route_table *table,
02077     const char *event_label,
02078     int event_label_len);
02081 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_get_default_event(
02082     WOLFSENTRY_CONTEXT_ARGS_IN,
02083     struct wolfsentry_route_table *table,
02084     char *event_label,
02085     int *event_label_len);
02096 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_fallthrough_route_get(
02097     WOLFSENTRY_CONTEXT_ARGS_IN,
02098     struct wolfsentry_route_table *route_table,
02099     const struct wolfsentry_route **fallthrough_route);
02100
02109 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_addrs(
02110     const struct wolfsentry_route *route,
02111     wolfsentry_addr_family_t *af,
02112     wolfsentry_addr_bits_t *local_addr_len,
02113     const byte **local_addr,
02114     wolfsentry_addr_bits_t *remote_addr_len,
02115     const byte **remote_addr);
02116
02132 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_export(
02133     WOLFSENTRY_CONTEXT_ARGS_IN,
02134     const struct wolfsentry_route *route,
02135     struct wolfsentry_route_exports *route_exports);
02136
02137 /* returned wolfsentry_event remains valid only as long as the wolfsentry lock
02138  * is held (shared or exclusive), unless the route was obtained via
02139  * wolfsentry_route_get_reference(), in which case it's valid until
02140  * wolfsentry_route_drop_reference()..
02141  */
02151 WOLFSENTRY_API const struct wolfsentry_event *wolfsentry_route_parent_event(const struct
wolfsentry_route *route);
02152
02153 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch_with_table(
02154     WOLFSENTRY_CONTEXT_ARGS_IN,
02155     struct wolfsentry_route_table *route_table,
02156     const struct wolfsentry_sockaddr *remote,
02157     const struct wolfsentry_sockaddr *local,
02158     wolfsentry_route_flags_t flags,
02159     const char *event_label,
02160     int event_label_len,
02161     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
02162     wolfsentry_ent_id_t *id,
02163     wolfsentry_route_flags_t *inexact_matches,
02164     wolfsentry_action_res_t *action_results);
02184 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch(
02185     WOLFSENTRY_CONTEXT_ARGS_IN,
02186     const struct wolfsentry_sockaddr *remote,
02187     const struct wolfsentry_sockaddr *local,
02188     wolfsentry_route_flags_t flags,
02189     const char *event_label,
02190     int event_label_len,
02191     void *caller_arg, /* passed to action callback(s). */
02192     wolfsentry_ent_id_t *id,
02193     wolfsentry_route_flags_t *inexact_matches,
02194     wolfsentry_action_res_t *action_results);
02195
02196 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch_with_table_with_initiated_result(
02197     WOLFSENTRY_CONTEXT_ARGS_IN,
02198     struct wolfsentry_route_table *route_table,
02199     const struct wolfsentry_sockaddr *remote,
02200     const struct wolfsentry_sockaddr *local,
02201     wolfsentry_route_flags_t flags,
02202     const char *event_label,
02203     int event_label_len,
02204     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
02205     wolfsentry_ent_id_t *id,
02206     wolfsentry_route_flags_t *inexact_matches,
02207     wolfsentry_action_res_t *action_results);
02210 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch_with_initiated_result(
02211     WOLFSENTRY_CONTEXT_ARGS_IN,
02212     const struct wolfsentry_sockaddr *remote,
02213     const struct wolfsentry_sockaddr *local,
02214     wolfsentry_route_flags_t flags,
02215     const char *event_label,
02216     int event_label_len,
02217     void *caller_arg, /* passed to action callback(s). */
02218     wolfsentry_ent_id_t *id,
02219     wolfsentry_route_flags_t *inexact_matches,
02220     wolfsentry_action_res_t *action_results);
02223 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch_by_id(
02224     WOLFSENTRY_CONTEXT_ARGS_IN,
02225     wolfsentry_ent_id_t id,
02226     const char *event_label,
02227     int event_label_len,

```

```

02228     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
02229     wolfsentry_action_res_t *action_results
02230 );
02231 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch_by_id_with_initiated_result(
02232     WOLFSENTRY_CONTEXT_ARGS_IN,
02233     wolfsentry_ent_id_t id,
02234     const char *event_label,
02235     int event_label_len,
02236     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
02237     wolfsentry_action_res_t *action_results
02238 );
02239 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch_by_route(
02240     WOLFSENTRY_CONTEXT_ARGS_IN,
02241     struct wolfsentry_route *route,
02242     const char *event_label,
02243     int event_label_len,
02244     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
02245     wolfsentry_action_res_t *action_results
02246 );
02247 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_event_dispatch_by_route_with_initiated_result(
02248     WOLFSENTRY_CONTEXT_ARGS_IN,
02249     struct wolfsentry_route *route,
02250     const char *event_label,
02251     int event_label_len,
02252     void *caller_arg, /* passed to action callback(s) as the caller_arg. */
02253     wolfsentry_action_res_t *action_results
02254 );
02255 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_max_purgeable_routes_get(
02256     WOLFSENTRY_CONTEXT_ARGS_IN,
02257     struct wolfsentry_route_table *table,
02258     wolfsentry_hitcount_t *max_purgeable_routes);
02259 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_max_purgeable_routes_set(
02260     WOLFSENTRY_CONTEXT_ARGS_IN,
02261     struct wolfsentry_route_table *table,
02262     wolfsentry_hitcount_t max_purgeable_routes);
02263 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_stale_purge(
02264     WOLFSENTRY_CONTEXT_ARGS_IN,
02265     struct wolfsentry_route_table *table,
02266     wolfsentry_action_res_t *action_results);
02267 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_stale_purge_one(
02268     WOLFSENTRY_CONTEXT_ARGS_IN,
02269     struct wolfsentry_route_table *table,
02270     wolfsentry_action_res_t *action_results);
02271 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_stale_purge_one_opportunisticly(
02272     WOLFSENTRY_CONTEXT_ARGS_IN,
02273     struct wolfsentry_route_table *table,
02274     wolfsentry_action_res_t *action_results);
02275 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_flush_table(
02276     WOLFSENTRY_CONTEXT_ARGS_IN,
02277     struct wolfsentry_route_table *table,
02278     wolfsentry_action_res_t *action_results);
02279 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_bulk_clear_insert_action_status(
02280     WOLFSENTRY_CONTEXT_ARGS_IN,
02281     wolfsentry_action_res_t *action_results);
02282 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_bulk_insert_actions(
02283     WOLFSENTRY_CONTEXT_ARGS_IN,
02284     wolfsentry_action_res_t *action_results);
02285 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_private_data(
02286     WOLFSENTRY_CONTEXT_ARGS_IN,
02287     struct wolfsentry_route *route,
02288     void **private_data,
02289     size_t *private_data_size);
02290 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_flags(
02291     const struct wolfsentry_route *route,
02292     wolfsentry_route_flags_t *flags);
02293 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_get_metadata(
02294     const struct wolfsentry_route *route,
02295     struct wolfsentry_route_metadata_exports *metadata);
02296 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_reset_metadata_exports(
02297     struct wolfsentry_route_exports *route_exports);
02298 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_update_flags(
02299     WOLFSENTRY_CONTEXT_ARGS_IN,
02300     struct wolfsentry_route *route,
02301     wolfsentry_route_flags_t flags_to_set,
02302     wolfsentry_route_flags_t flags_to_clear,
02303     wolfsentry_route_flags_t *flags_before,
02304     wolfsentry_route_flags_t *flags_after,
02305     wolfsentry_action_res_t *action_results);
02306 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_increment_derogatory_count(

```

```

02410     WOLFSENTRY_CONTEXT_ARGS_IN,
02411     struct wolfsentry_route *route,
02412     int count_to_add,
02413     int *new_derogatory_count_ptr);
02416 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_increment_commendable_count(
02417     WOLFSENTRY_CONTEXT_ARGS_IN,
02418     struct wolfsentry_route *route,
02419     int count_to_add,
02420     int *new_commendable_count);
02423 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_reset_derogatory_count(
02424     WOLFSENTRY_CONTEXT_ARGS_IN,
02425     struct wolfsentry_route *route,
02426     int *old_derogatory_count_ptr);
02429 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_reset_commendable_count(
02430     WOLFSENTRY_CONTEXT_ARGS_IN,
02431     struct wolfsentry_route *route,
02432     int *old_commendable_count_ptr);
02443 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_set_wildcard(
02444     struct wolfsentry_route *route,
02445     wolfsentry_route_flags_t wildcards_to_set);
02446
02447 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_format_address(
02448     WOLFSENTRY_CONTEXT_ARGS_IN,
02449     wolfsentry_addr_family_t sa_family,
02450     const byte *addr,
02451     unsigned int addr_bits,
02452     char *buf,
02453     int *buflen);
02456 #if defined(WOLFSENTRY_PROTOCOL_NAMES) || defined(WOLFSENTRY_JSON_DUMP_UTILS) ||
    !defined(WOLFSENTRY_NO_JSON)
02457
02458 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_flag_assoc_by_flag(
02459     wolfsentry_route_flags_t flag,
02460     const char **name);
02463 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_flag_assoc_by_name(
02464     const char *name,
02465     int len,
02466     wolfsentry_route_flags_t *flag);
02469 #endif /* WOLFSENTRY_PROTOCOL_NAMES || WOLFSENTRY_JSON_DUMP_UTILS || !WOLFSENTRY_NO_JSON */
02470
02471 #if !defined(WOLFSENTRY_NO_JSON) || defined(WOLFSENTRY_JSON_DUMP_UTILS)
02472
02473 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_format_json(
02474     WOLFSENTRY_CONTEXT_ARGS_IN,
02475     const struct wolfsentry_route *r,
02476     unsigned char **json_out,
02477     size_t *json_out_len,
02478     wolfsentry_format_flags_t flags);
02481 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_dump_json_start(
02482     WOLFSENTRY_CONTEXT_ARGS_IN,
02483     const struct wolfsentry_route_table *table,
02484     struct wolfsentry_cursor **cursor,
02485     unsigned char **json_out,
02486     size_t *json_out_len,
02487     wolfsentry_format_flags_t flags);
02490 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_dump_json_next(
02491     WOLFSENTRY_CONTEXT_ARGS_IN,
02492     const struct wolfsentry_route_table *table,
02493     struct wolfsentry_cursor *cursor,
02494     unsigned char **json_out,
02495     size_t *json_out_len,
02496     wolfsentry_format_flags_t flags);
02499 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_table_dump_json_end(
02500     WOLFSENTRY_CONTEXT_ARGS_IN,
02501     const struct wolfsentry_route_table *table,
02502     struct wolfsentry_cursor **cursor,
02503     unsigned char **json_out,
02504     size_t *json_out_len,
02505     wolfsentry_format_flags_t flags);
02508 #endif /* !WOLFSENTRY_NO_JSON || WOLFSENTRY_JSON_DUMP_UTILS */
02509
02510 #ifndef WOLFSENTRY_NO_STDIO_STREAMS
02511 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_render_flags(wolfsentry_route_flags_t flags, FILE
    *f);
02524 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_render(WOLFSENTRY_CONTEXT_ARGS_IN, const struct
    wolfsentry_route *r, FILE *f);
02535 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_route_exports_render(WOLFSENTRY_CONTEXT_ARGS_IN, const
    struct wolfsentry_route_exports *r, FILE *f);
02536 #endif
02537
02558 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_insert(
02559     WOLFSENTRY_CONTEXT_ARGS_IN,
02560     const char *label,
02561     int label_len,
02562     wolfsentry_action_flags_t flags,
02563     wolfsentry_action_callback_t handler,
02564     void *handler_arg,

```

```

02565     wolfsentry_ent_id_t *id);
02566
02578 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_delete(
02579     WOLFSENTRY_CONTEXT_ARGS_IN,
02580     const char *label,
02581     int label_len,
02582     wolfsentry_action_res_t *action_results);
02583
02591 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_flush_all(WOLFSENTRY_CONTEXT_ARGS_IN);
02592
02604 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_get_reference(
02605     WOLFSENTRY_CONTEXT_ARGS_IN,
02606     const char *label,
02607     int label_len,
02608     struct wolfsentry_action **action);
02609
02620 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_drop_reference(
02621     WOLFSENTRY_CONTEXT_ARGS_IN,
02622     struct wolfsentry_action *action,
02623     wolfsentry_action_res_t *action_results);
02624
02632 WOLFSENTRY_API const char *wolfsentry_action_get_label(const struct wolfsentry_action *action);
02633
02642 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_get_flags(
02643     struct wolfsentry_action *action,
02644     wolfsentry_action_flags_t *flags);
02645
02657 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_action_update_flags(
02658     struct wolfsentry_action *action,
02659     wolfsentry_action_flags_t flags_to_set,
02660     wolfsentry_action_flags_t flags_to_clear,
02661     wolfsentry_action_flags_t *flags_before,
02662     wolfsentry_action_flags_t *flags_after);
02663
02684 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_insert(
02685     WOLFSENTRY_CONTEXT_ARGS_IN,
02686     const char *label,
02687     int label_len,
02688     wolfsentry_priority_t priority,
02689     const struct wolfsentry_eventconfig *config,
02690     wolfsentry_event_flags_t flags,
02691     wolfsentry_ent_id_t *id);
02692
02702 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_delete(
02703     WOLFSENTRY_CONTEXT_ARGS_IN,
02704     const char *label,
02705     int label_len,
02706     wolfsentry_action_res_t *action_results);
02707
02715 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_flush_all(WOLFSENTRY_CONTEXT_ARGS_IN);
02716
02724 WOLFSENTRY_API const char *wolfsentry_event_get_label(const struct wolfsentry_event *event);
02725
02733 WOLFSENTRY_API wolfsentry_event_flags_t wolfsentry_event_get_flags(const struct wolfsentry_event
02734     *event);
02734
02746 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_get_config(
02747     WOLFSENTRY_CONTEXT_ARGS_IN,
02748     const char *label,
02749     int label_len,
02750     struct wolfsentry_eventconfig *config);
02751
02763 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_update_config(
02764     WOLFSENTRY_CONTEXT_ARGS_IN,
02765     const char *label,
02766     int label_len,
02767     const struct wolfsentry_eventconfig *config);
02768
02780 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_get_reference(
02781     WOLFSENTRY_CONTEXT_ARGS_IN,
02782     const char *label,
02783     int label_len,
02784     struct wolfsentry_event **event);
02785
02796 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_drop_reference(
02797     WOLFSENTRY_CONTEXT_ARGS_IN,
02798     struct wolfsentry_event *event,
02799     wolfsentry_action_res_t *action_results);
02800
02814 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_event_action_prepend(
02815     WOLFSENTRY_CONTEXT_ARGS_IN,
02816     const char *event_label,
02817     int event_label_len,
02818     wolfsentry_action_type_t which_action_list,
02819     const char *action_label,
02820     int action_label_len);
02821

```



```

02835 WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_append(
02836     WOLFSENTRY_CONTEXT_ARGS_IN,
02837     const char *event_label,
02838     int event_label_len,
02839     wolfentry_action_type_t which_action_list,
02840     const char *action_label,
02841     int action_label_len);
02842
02858 WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_insert_after(
02859     WOLFSENTRY_CONTEXT_ARGS_IN,
02860     const char *event_label,
02861     int event_label_len,
02862     wolfentry_action_type_t which_action_list,
02863     const char *action_label,
02864     int action_label_len,
02865     const char *point_action_label,
02866     int point_action_label_len);
02867
02881 WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_delete(
02882     WOLFSENTRY_CONTEXT_ARGS_IN,
02883     const char *event_label,
02884     int event_label_len,
02885     wolfentry_action_type_t which_action_list,
02886     const char *action_label,
02887     int action_label_len);
02888
02901 WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_set_aux_event(
02902     WOLFSENTRY_CONTEXT_ARGS_IN,
02903     const char *event_label,
02904     int event_label_len,
02905     const char *aux_event_label,
02906     int aux_event_label_len);
02907
02908 WOLFSENTRY_API const struct wolfentry_event *wolfentry_event_get_aux_event(
02909     const struct wolfentry_event *event);
02926 WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_list_start(
02927     WOLFSENTRY_CONTEXT_ARGS_IN,
02928     const char *event_label,
02929     int event_label_len,
02930     wolfentry_action_type_t which_action_list,
02931     struct wolfentry_action_list_ent **cursor);
02932
02946 WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_list_next(
02947     WOLFSENTRY_CONTEXT_ARGS_IN,
02948     struct wolfentry_action_list_ent **cursor,
02949     const char **action_label,
02950     int *action_label_len);
02951
02963 WOLFSENTRY_API wolfentry_errcode_t wolfentry_event_action_list_done(
02964     WOLFSENTRY_CONTEXT_ARGS_IN,
02965     struct wolfentry_action_list_ent **cursor);
02966
02969 #ifdef WOLFSENTRY_HAVE_JSON_DOM
02970 #include <wolfentry/centijson_dom.h>
02971 #endif
02972
02978 typedef enum {
02979     WOLFSENTRY_KV_NONE = 0,
02980     WOLFSENTRY_KV_NULL,
02981     WOLFSENTRY_KV_TRUE,
02982     WOLFSENTRY_KV_FALSE,
02983     WOLFSENTRY_KV_UINT,
02984     WOLFSENTRY_KV_SINT,
02985     WOLFSENTRY_KV_FLOAT,
02986     WOLFSENTRY_KV_STRING,
02987     WOLFSENTRY_KV_BYTES,
02988     WOLFSENTRY_KV_JSON,
02989     WOLFSENTRY_KV_FLAG_READONLY = 1<30
02990 } wolfentry_kv_type_t;
02991
02992 #define WOLFSENTRY_KV_FLAG_MASK WOLFSENTRY_KV_FLAG_READONLY
02996 struct wolfentry_kv_pair {
02997     int key_len;
02999     wolfentry_kv_type_t v_type;
03001     union {
03002         uint64_t v_uint;
03004         int64_t v_sint;
03006         double v_float;
03008         size_t string_len;
03010         size_t bytes_len;
03012 #ifdef WOLFSENTRY_HAVE_JSON_DOM
03013         JSON_VALUE v_json;
03014         /* 16 bytes */ 03015 #endif
03016     } a;
03017     byte b[WOLFSENTRY_FLEXIBLE_ARRAY_SIZE];
03022 };
03023

```



```

03024 #define WOLFSENTRY_KV_KEY_LEN(kv) ((kv)->key_len)
03026 #define WOLFSENTRY_KV_KEY(kv) ((char *)((kv)->b))
03028 #define WOLFSENTRY_KV_TYPE(kv) ((uint32_t)(kv)->v_type & ~(uint32_t)WOLFSENTRY_KV_FLAG_MASK)
03030 #define WOLFSENTRY_KV_V_UINT(kv) ((kv)->a.v_uint)
03032 #define WOLFSENTRY_KV_V_SINT(kv) ((kv)->a.v_sint)
03034 #define WOLFSENTRY_KV_V_FLOAT(kv) ((kv)->a.v_float)
03036 #define WOLFSENTRY_KV_V_STRING_LEN(kv) ((kv)->a.string_len)
03038 #define WOLFSENTRY_KV_V_STRING(kv) ((char *)((kv)->b + (kv)->key_len + 1))
03040 #define WOLFSENTRY_KV_V_BYTES_LEN(kv) ((kv)->a.bytes_len)
03042 #define WOLFSENTRY_KV_V_BYTES(kv) ((kv)->b + (kv)->key_len + 1)
03044 #ifndef WOLFSENTRY_HAVE_JSON_DOM
03045 #define WOLFSENTRY_KV_V_JSON(kv) (&(kv)->a.v_json)
03047 #endif
03048
03049 typedef wolfsentry_errcode_t (*wolfsentry_kv_validator_t)(
03050     WOLFSENTRY_CONTEXT_ARGS_IN,
03051     struct wolfsentry_kv_pair *kv);
03052 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_set_validator(
03053     WOLFSENTRY_CONTEXT_ARGS_IN,
03054     wolfsentry_kv_validator_t validator,
03055     wolfsentry_action_res_t *action_results);
03056 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_set_mutability(
03057     WOLFSENTRY_CONTEXT_ARGS_IN,
03058     const char *key,
03059     int key_len,
03060     int mutable);
03061 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_mutability(
03062     WOLFSENTRY_CONTEXT_ARGS_IN,
03063     const char *key,
03064     int key_len,
03065     int *mutable);
03066 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_type(
03067     WOLFSENTRY_CONTEXT_ARGS_IN,
03068     const char *key,
03069     int key_len,
03070     wolfsentry_kv_type_t *type);
03071 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_delete(
03072     WOLFSENTRY_CONTEXT_ARGS_IN,
03073     const char *key,
03074     int key_len);
03075 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_store_null(
03076     WOLFSENTRY_CONTEXT_ARGS_IN,
03077     const char *key,
03078     int key_len,
03079     int overwrite_p);
03080 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_store_bool(
03081     WOLFSENTRY_CONTEXT_ARGS_IN,
03082     const char *key,
03083     int key_len,
03084     wolfsentry_kv_type_t value,
03085     int overwrite_p);
03086 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_bool(
03087     WOLFSENTRY_CONTEXT_ARGS_IN,
03088     const char *key,
03089     int key_len,
03090     wolfsentry_kv_type_t *value);
03091 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_store_uint(
03092     WOLFSENTRY_CONTEXT_ARGS_IN,
03093     const char *key,
03094     int key_len,
03095     uint64_t value,
03096     int overwrite_p);
03097 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_uint(
03098     WOLFSENTRY_CONTEXT_ARGS_IN,
03099     const char *key,
03100     int key_len,
03101     uint64_t *value);
03102 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_store_sint(
03103     WOLFSENTRY_CONTEXT_ARGS_IN,
03104     const char *key,
03105     int key_len,
03106     int64_t value,
03107     int overwrite_p);
03108 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_sint(
03109     WOLFSENTRY_CONTEXT_ARGS_IN,
03110     const char *key,
03111     int key_len,
03112     int64_t *value);
03113 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_store_double(
03114     WOLFSENTRY_CONTEXT_ARGS_IN,
03115     const char *key,
03116     int key_len,
03117     double value,
03118     int overwrite_p);
03119 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_float(
03120     WOLFSENTRY_CONTEXT_ARGS_IN,
03121     const char *key,
03122     int key_len,
03123     double *value);
03124 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_double(
03125     WOLFSENTRY_CONTEXT_ARGS_IN,
03126     const char *key,
03127     int key_len,
03128     double *value);
03129 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_double(
03130     WOLFSENTRY_CONTEXT_ARGS_IN,
03131     const char *key,
03132     int key_len,
03133     double *value);
03134 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_double(
03135     WOLFSENTRY_CONTEXT_ARGS_IN,
03136     const char *key,
03137     int key_len,
03138     double *value);
03139 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_double(
03140     WOLFSENTRY_CONTEXT_ARGS_IN,
03141     const char *key,
03142     int key_len,
03143     double *value);
03144 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_double(
03145     WOLFSENTRY_CONTEXT_ARGS_IN,
03146     const char *key,
03147     int key_len,
03148     double *value);
03149 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_value_get_double(
03150     WOLFSENTRY_CONTEXT_ARGS_IN,
03151     const char *key,
03152     int key_len,
03153     double *value);

```

```

03150     int key_len,
03151     double *value);
03154 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_store_string(
03155     WOLFSENTRY_CONTEXT_ARGS_IN,
03156     const char *key,
03157     int key_len,
03158     const char *value,
03159     int value_len,
03160     int overwrite_p);
03163 struct wolfentry_kv_pair_internal;
03164
03171 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_get_string(
03172     WOLFSENTRY_CONTEXT_ARGS_IN,
03173     const char *key,
03174     int key_len,
03175     const char **value,
03176     int *value_len,
03177     struct wolfentry_kv_pair_internal **user_value_record);
03178
03179 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_store_bytes(
03180     WOLFSENTRY_CONTEXT_ARGS_IN,
03181     const char *key,
03182     int key_len,
03183     const byte *value,
03184     int value_len,
03185     int overwrite_p);
03188 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_store_bytes_base64(
03189     WOLFSENTRY_CONTEXT_ARGS_IN,
03190     const char *key,
03191     int key_len,
03192     const char *value,
03193     int value_len,
03194     int overwrite_p);
03203 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_get_bytes(
03204     WOLFSENTRY_CONTEXT_ARGS_IN,
03205     const char *key,
03206     int key_len,
03207     const byte **value,
03208     int *value_len,
03209     struct wolfentry_kv_pair_internal **user_value_record);
03210
03211 #ifdef WOLFSENTRY_HAVE_JSON_DOM
03212 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_store_json(
03213     WOLFSENTRY_CONTEXT_ARGS_IN,
03214     const char *key,
03215     int key_len,
03216     JSON_VALUE *value,
03217     int overwrite_p);
03226 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_get_json(
03227     WOLFSENTRY_CONTEXT_ARGS_IN,
03228     const char *key,
03229     int key_len,
03230     JSON_VALUE **value,
03231     struct wolfentry_kv_pair_internal **user_value_record);
03232 #endif /* WOLFSENTRY_HAVE_JSON_DOM */
03233
03234 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_value_release_record(
03235     WOLFSENTRY_CONTEXT_ARGS_IN,
03236     struct wolfentry_kv_pair_internal **user_value_record);
03239 WOLFSENTRY_API wolfentry_errcode_t wolfentry_kv_pair_export(
03240     WOLFSENTRY_CONTEXT_ARGS_IN,
03241     struct wolfentry_kv_pair_internal *kv,
03242     const struct wolfentry_kv_pair **kv_exports);
03245 WOLFSENTRY_API wolfentry_errcode_t wolfentry_kv_type_to_string(
03246     wolfentry_kv_type_t type,
03247     const char **out);
03250 WOLFSENTRY_API wolfentry_errcode_t wolfentry_kv_render_value(
03251     WOLFSENTRY_CONTEXT_ARGS_IN,
03252     const struct wolfentry_kv_pair *kv,
03253     char *out,
03254     int *out_len);
03257 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_values_iterate_start(
03258     WOLFSENTRY_CONTEXT_ARGS_IN,
03259     struct wolfentry_cursor **cursor);
03262 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_values_iterate_seek_to_head(
03263     WOLFSENTRY_CONTEXT_ARGS_IN,
03264     struct wolfentry_cursor *cursor);
03267 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_values_iterate_seek_to_tail(
03268     WOLFSENTRY_CONTEXT_ARGS_IN,
03269     struct wolfentry_cursor *cursor);
03272 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_values_iterate_current(
03273     WOLFSENTRY_CONTEXT_ARGS_IN,
03274     struct wolfentry_cursor *cursor,
03275     struct wolfentry_kv_pair_internal **kv);
03278 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_values_iterate_prev(
03279     WOLFSENTRY_CONTEXT_ARGS_IN,
03280     struct wolfentry_cursor *cursor,

```

```

03281     struct wolfsentry_kv_pair_internal **kv);
03284 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_values_iterate_next(
03285     WOLFSENTRY_CONTEXT_ARGS_IN,
03286     struct wolfsentry_cursor *cursor,
03287     struct wolfsentry_kv_pair_internal **kv);
03290 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_user_values_iterate_end(
03291     WOLFSENTRY_CONTEXT_ARGS_IN,
03292     struct wolfsentry_cursor **cursor);
03295 #define WOLFSENTRY_BASE64_DECODED_BUFSPC(buf, len) \
03296     (((len)+3)/4)*3 - ((len) > 1 ? \
03297         (buf)[(len)-1] == '=' ? \
03298         0) \
03299     - ((len) > 2 ? ((buf)[(len)-2] == '=') : 0)) \
03300
03302 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_base64_decode(
03303     const char *src,
03304     size_t src_len,
03305     byte *dest,
03306     size_t *dest_spc,
03307     int ignore_junk_p);
03312 #ifndef WOLFSENTRY_LWIP
03313     #include "wolfsentry/wolfsentry_lwip.h"
03314 #endif
03315
03316 /* conditionally include wolfsentry_util.h last -- none of the above rely on it.
03317 */
03318 #ifndef WOLFSENTRY_NO_UTIL_H
03319 #include <wolfsentry/wolfsentry_util.h>
03320 #endif
03321
03322 #endif /* WOLFSENTRY_H */

```

## 10.6 wolfsentry/wolfsentry\_af.h File Reference

Definitions for address families.

### Macros

- #define **WOLFSENTRY\_AF\_UNSPEC** 0
- #define **WOLFSENTRY\_AF\_UNIX** 1  
*Unix domain sockets.*
- #define **WOLFSENTRY\_AF\_LOCAL** 1  
*POSIX name for WOLFSENTRY\_AF\_UNIX.*
- #define **WOLFSENTRY\_AF\_INET** 2  
*Internet IP Protocol.*
- #define **WOLFSENTRY\_AF\_AX25** 3  
*Amateur Radio AX.25.*
- #define **WOLFSENTRY\_AF\_IPX** 4  
*Novell IPX.*
- #define **WOLFSENTRY\_AF\_APPLETALK** 5  
*AppleTalk DDP.*
- #define **WOLFSENTRY\_AF\_NETROM** 6  
*Amateur Radio NET/ROM.*
- #define **WOLFSENTRY\_AF\_BRIDGE** 7  
*Multiprotocol bridge.*
- #define **WOLFSENTRY\_AF\_ATMPVC** 8  
*ATM PVCs.*
- #define **WOLFSENTRY\_AF\_X25** 9  
*Reserved for X.25 project.*
- #define **WOLFSENTRY\_AF\_INET6** 10  
*IP version 6.*

- **#define WOLFSENTRY\_AF\_ROSE 11**  
*Amateur Radio X.25 PLP.*
- **#define WOLFSENTRY\_AF\_DECnet 12**  
*Reserved for DECnet project.*
- **#define WOLFSENTRY\_AF\_NETBEUI 13**  
*Reserved for 802.2LLC project.*
- **#define WOLFSENTRY\_AF\_SECURITY 14**  
*Security callback pseudo AF.*
- **#define WOLFSENTRY\_AF\_KEY 15**  
*PF\_KEY key management API.*
- **#define WOLFSENTRY\_AF\_NETLINK 16**
- **#define WOLFSENTRY\_AF\_ROUTE WOLFSENTRY\_AF\_NETLINK**  
*Alias to emulate 4.4BSD.*
- **#define WOLFSENTRY\_AF\_PACKET 17**  
*Packet family.*
- **#define WOLFSENTRY\_AF\_ASH 18**  
*Ash.*
- **#define WOLFSENTRY\_AF\_ECONET 19**  
*Acorn Econet.*
- **#define WOLFSENTRY\_AF\_ATMSVC 20**  
*ATM SVCs.*
- **#define WOLFSENTRY\_AF\_RDS 21**  
*RDS sockets.*
- **#define WOLFSENTRY\_AF\_SNA 22**  
*Linux SNA Project (nutters!)*
- **#define WOLFSENTRY\_AF\_IRDA 23**  
*IRDA sockets.*
- **#define WOLFSENTRY\_AF\_PPPOX 24**  
*PPPoX sockets.*
- **#define WOLFSENTRY\_AF\_WANPIPE 25**  
*Wanpipe API Sockets.*
- **#define WOLFSENTRY\_AF\_LLC 26**  
*Linux LLC.*
- **#define WOLFSENTRY\_AF\_IB 27**  
*Native InfiniBand address.*
- **#define WOLFSENTRY\_AF\_MPLS 28**  
*MPLS.*
- **#define WOLFSENTRY\_AF\_CAN 29**  
*Controller Area Network.*
- **#define WOLFSENTRY\_AF\_TIPC 30**  
*TIPC sockets.*
- **#define WOLFSENTRY\_AF\_BLUETOOTH 31**  
*Bluetooth sockets.*
- **#define WOLFSENTRY\_AF\_IUCV 32**  
*IUCV sockets.*
- **#define WOLFSENTRY\_AF\_RXRPC 33**  
*RxRPC sockets.*
- **#define WOLFSENTRY\_AF\_ISDN 34**  
*mISDN sockets*
- **#define WOLFSENTRY\_AF\_PHONET 35**  
*Phonet sockets.*

- **#define WOLFSENTRY\_AF\_IEEE802154** 36  
*IEEE802154 sockets.*
- **#define WOLFSENTRY\_AF\_CAIF** 37  
*CAIF sockets.*
- **#define WOLFSENTRY\_AF\_ALG** 38  
*Algorithm sockets.*
- **#define WOLFSENTRY\_AF\_NFC** 39  
*NFC sockets.*
- **#define WOLFSENTRY\_AF\_VSOCK** 40  
*vSockets*
- **#define WOLFSENTRY\_AF\_KCM** 41  
*Kernel Connection Multiplexor.*
- **#define WOLFSENTRY\_AF\_QIPCRTR** 42  
*Qualcomm IPC Router.*
- **#define WOLFSENTRY\_AF\_SMC** 43  
*smc sockets: reserve number for PF\_SMC protocol family that reuses WOLFSENTRY\_AF\_INET address family*
- **#define WOLFSENTRY\_AF\_XDP** 44  
*XDP sockets.*
- **#define WOLFSENTRY\_AF\_BSD\_OFFSET** 100  
*from FreeBSD at commit a56e5ad6, except WOLFSENTRY\_AF\_LINK64, added here.*
- **#define WOLFSENTRY\_AF\_IMPLINK** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 3)  
*arpanet imp addresses*
- **#define WOLFSENTRY\_AF\_PUP** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 4)  
*pup protocols: e.g. BSP*
- **#define WOLFSENTRY\_AF\_CHAOS** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 5)  
*mit CHAOS protocols*
- **#define WOLFSENTRY\_AF\_NETBIOS** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 6)  
*SMB protocols.*
- **#define WOLFSENTRY\_AF\_ISO** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 7)  
*ISO protocols.*
- **#define WOLFSENTRY\_AF\_OSI** [WOLFSENTRY\\_AF\\_ISO](#)
- **#define WOLFSENTRY\_AF\_ECMA** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 8)  
*European computer manufacturers.*
- **#define WOLFSENTRY\_AF\_DATAKIT** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 9)  
*datakit protocols*
- **#define WOLFSENTRY\_AF\_DLI** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 13)  
*DEC Direct data link interface.*
- **#define WOLFSENTRY\_AF\_LAT** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 14)  
*LAT.*
- **#define WOLFSENTRY\_AF\_HYLINK** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 15)  
*NSC Hyperchannel.*
- **#define WOLFSENTRY\_AF\_LINK48** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 18)  
*Link layer interface, explicit EUI-48.*
- **#define WOLFSENTRY\_AF\_LINK** [WOLFSENTRY\\_AF\\_LINK48](#)  
*Link layer interface, implicit EUI-48.*
- **#define WOLFSENTRY\_AF\_LINK64** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 19)  
*Link layer interface, explicit EUI-64.*
- **#define WOLFSENTRY\_AF\_COIP** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 20)  
*connection-oriented IP, aka ST II*
- **#define WOLFSENTRY\_AF\_CNT** ([WOLFSENTRY\\_AF\\_BSD\\_OFFSET](#) + 21)  
*Computer Network Technology.*

- `#define WOLFSENTRY_AF_SIP (WOLFSENTRY_AF_BSD_OFFSET + 24)`  
*Simple Internet Protocol.*
- `#define WOLFSENTRY_AF_SLOW (WOLFSENTRY_AF_BSD_OFFSET + 33)`  
*802.3ad slow protocol*
- `#define WOLFSENTRY_AF_SCLUSTER (WOLFSENTRY_AF_BSD_OFFSET + 34)`  
*Sitara cluster protocol.*
- `#define WOLFSENTRY_AF_ARP (WOLFSENTRY_AF_BSD_OFFSET + 35)`
- `#define WOLFSENTRY_AF_IEEE80211 (WOLFSENTRY_AF_BSD_OFFSET + 37)`  
*IEEE 802.11 protocol.*
- `#define WOLFSENTRY_AF_INET_SDP (WOLFSENTRY_AF_BSD_OFFSET + 40)`  
*OFED Socket Direct Protocol ipv4.*
- `#define WOLFSENTRY_AF_INET6_SDP (WOLFSENTRY_AF_BSD_OFFSET + 42)`  
*OFED Socket Direct Protocol ipv6.*
- `#define WOLFSENTRY_AF_HYPERV (WOLFSENTRY_AF_BSD_OFFSET + 43)`  
*HyperV sockets.*
- `#define WOLFSENTRY_AF_USER_OFFSET 256`

### 10.6.1 Detailed Description

Definitions for address families.

Included by `wolfentry.h`.

## 10.7 wolfentry\_af.h

[Go to the documentation of this file.](#)

```
00001 /*
00002  * wolfentry_af.h
00003  *
00004  * Copyright (C) 2022-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00029 #ifndef WOLFSENTRY_AF_H
00030 #define WOLFSENTRY_AF_H
00031
00036 /* per Linux kernel 5.12, include/linux/socket.h */
00037
00038 #define WOLFSENTRY_AF_UNSPEC      0
00039 #define WOLFSENTRY_AF_UNIX       1
00040 #define WOLFSENTRY_AF_LOCAL      1
00041 #define WOLFSENTRY_AF_INET       2
00042 #define WOLFSENTRY_AF_AX25       3
00043 #define WOLFSENTRY_AF_IPX        4
00044 #define WOLFSENTRY_AF_APPLETALK  5
00045 #define WOLFSENTRY_AF_NETROM     6
00046 #define WOLFSENTRY_AF_BRIDGE     7
00047 #define WOLFSENTRY_AF_ATMPVC     8
00048 #define WOLFSENTRY_AF_X25        9
```

```

00049 #define WOLFSENTRY_AF_INET6      10
00050 #define WOLFSENTRY_AF_ROSE         11
00051 #define WOLFSENTRY_AF_DECnet       12
00052 #define WOLFSENTRY_AF_NETBEUI      13
00053 #define WOLFSENTRY_AF_SECURITY      14
00054 #define WOLFSENTRY_AF_KEY          15
00055 #define WOLFSENTRY_AF_NETLINK      16
00056 #define WOLFSENTRY_AF_ROUTE         WOLFSENTRY_AF_NETLINK
00057 #define WOLFSENTRY_AF_PACKET       17
00058 #define WOLFSENTRY_AF_ASH           18
00059 #define WOLFSENTRY_AF_ECONET        19
00060 #define WOLFSENTRY_AF_ATMSVC        20
00061 #define WOLFSENTRY_AF_RDS           21
00062 #define WOLFSENTRY_AF_SNA           22
00063 #define WOLFSENTRY_AF_IRDA          23
00064 #define WOLFSENTRY_AF_PPPOX         24
00065 #define WOLFSENTRY_AF_WANPIPE       25
00066 #define WOLFSENTRY_AF_LLC           26
00067 #define WOLFSENTRY_AF_IB            27
00068 #define WOLFSENTRY_AF_MPLS          28
00069 #define WOLFSENTRY_AF_CAN           29
00070 #define WOLFSENTRY_AF_TIPC          30
00071 #define WOLFSENTRY_AF_BLUETOOTH     31
00072 #define WOLFSENTRY_AF_IUCV          32
00073 #define WOLFSENTRY_AF_RXRPC         33
00074 #define WOLFSENTRY_AF_ISDN          34
00075 #define WOLFSENTRY_AF_PHONET        35
00076 #define WOLFSENTRY_AF_IEEE802154    36
00077 #define WOLFSENTRY_AF_CAIF          37
00078 #define WOLFSENTRY_AF_ALG           38
00079 #define WOLFSENTRY_AF_NFC           39
00080 #define WOLFSENTRY_AF_VSOCK         40
00081 #define WOLFSENTRY_AF_KCM           41
00082 #define WOLFSENTRY_AF_QIPCRTR       42
00083 #define WOLFSENTRY_AF_SMC           43
00084 #define WOLFSENTRY_AF_XDP           44
00086 #define WOLFSENTRY_AF_BSD_OFFSET    100
00087
00089 #define WOLFSENTRY_AF_IMPLINK        (WOLFSENTRY_AF_BSD_OFFSET + 3)
00090 #define WOLFSENTRY_AF_PUP            (WOLFSENTRY_AF_BSD_OFFSET + 4)
00091 #define WOLFSENTRY_AF_CHAOS          (WOLFSENTRY_AF_BSD_OFFSET + 5)
00092 #define WOLFSENTRY_AF_NETBIOS        (WOLFSENTRY_AF_BSD_OFFSET + 6)
00093 #define WOLFSENTRY_AF_ISO            (WOLFSENTRY_AF_BSD_OFFSET + 7)
00094 #define WOLFSENTRY_AF_OSI            WOLFSENTRY_AF_ISO
00095 #define WOLFSENTRY_AF_ECMA           (WOLFSENTRY_AF_BSD_OFFSET + 8)
00096 #define WOLFSENTRY_AF_DATAKIT        (WOLFSENTRY_AF_BSD_OFFSET + 9)
00097 #define WOLFSENTRY_AF_DLI            (WOLFSENTRY_AF_BSD_OFFSET + 13)
00098 #define WOLFSENTRY_AF_LAT            (WOLFSENTRY_AF_BSD_OFFSET + 14)
00099 #define WOLFSENTRY_AF_HYLINK         (WOLFSENTRY_AF_BSD_OFFSET + 15)
00100 #define WOLFSENTRY_AF_LINK48         (WOLFSENTRY_AF_BSD_OFFSET + 18)
00101 #define WOLFSENTRY_AF_LINK           WOLFSENTRY_AF_LINK48
00102 #define WOLFSENTRY_AF_LINK64         (WOLFSENTRY_AF_BSD_OFFSET + 19)
00103 #define WOLFSENTRY_AF_COIP           (WOLFSENTRY_AF_BSD_OFFSET + 20)
00104 #define WOLFSENTRY_AF_CNT            (WOLFSENTRY_AF_BSD_OFFSET + 21)
00105 #define WOLFSENTRY_AF_SIP            (WOLFSENTRY_AF_BSD_OFFSET + 24)
00106 #define WOLFSENTRY_AF_SLOW           (WOLFSENTRY_AF_BSD_OFFSET + 33)
00107 #define WOLFSENTRY_AF_SCLUSTER       (WOLFSENTRY_AF_BSD_OFFSET + 34)
00108 #define WOLFSENTRY_AF_ARP            (WOLFSENTRY_AF_BSD_OFFSET + 35)
00109 #define WOLFSENTRY_AF_IEEE80211      (WOLFSENTRY_AF_BSD_OFFSET + 37)
00110 #define WOLFSENTRY_AF_INET_SDP       (WOLFSENTRY_AF_BSD_OFFSET + 40)
00111 #define WOLFSENTRY_AF_INET6_SDP     (WOLFSENTRY_AF_BSD_OFFSET + 42)
00112 #define WOLFSENTRY_AF_HYPERV         (WOLFSENTRY_AF_BSD_OFFSET + 43)
00114 #define WOLFSENTRY_AF_USER_OFFSET    256
00115
00118 #endif /* WOLFSENTRY_AF_H */

```

## 10.8 wolfsentry/wolfsentry\_errcodes.h File Reference

Definitions for diagnostics.

```
#include <errno.h>
```

### Macros

- `#define WOLFSENTRY_SOURCE_ID`

In each source file in the wolfSentry library, `WOLFSENTRY_SOURCE_ID` is defined to a number that is decoded using `enum wolfentry_source_id`. Application source files that use the below error encoding and rendering macros must also define `WOLFSENTRY_SOURCE_ID` to a number, starting with `WOLFSENTRY_SOURCE_ID_USER_BASE`, and can use `wolfentry_user_source_string_set()` or `WOLFSENTRY_REGISTER_SOURCE()` to arrange for error and warning messages that render the source code file by name.

- **#define WOLFSENTRY\_ERRCODE\_FMT**  
String-literal macro for formatting `wolfentry_errcode_t` using `printf()`-type functions.
- **#define WOLFSENTRY\_SOURCE\_ID\_MAX** 127
- **#define WOLFSENTRY\_ERROR\_ID\_MAX** 255
- **#define WOLFSENTRY\_LINE\_NUMBER\_MAX** 65535
- **#define WOLFSENTRY\_ERROR\_DECODE\_ERROR\_CODE(x)**  
Extract the bare error (negative) or success (zero/positive) code from an encoded `wolfentry_errcode_t`
- **#define WOLFSENTRY\_ERROR\_DECODE\_SOURCE\_ID(x)**  
Extract the bare source file ID from an encoded `wolfentry_errcode_t`
- **#define WOLFSENTRY\_ERROR\_DECODE\_LINE\_NUMBER(x)**  
Extract the bare source line number from an encoded `wolfentry_errcode_t`
- **#define WOLFSENTRY\_ERROR\_RECODE(x)**  
Take an encoded `wolfentry_errcode_t` and recode it with the current source ID and line number.
- **#define WOLFSENTRY\_ERROR\_CODE\_IS(x, name)**  
Take an encoded `wolfentry_errcode_t` `x` and test if its error code matches short-form error name (e.g. `INVALID_ARG`).
- **#define WOLFSENTRY\_SUCCESS\_CODE\_IS(x, name)**  
Take an encoded `wolfentry_errcode_t` `x` and test if its error code matches short-form success name (e.g. `OK`).
- **#define WOLFSENTRY\_IS\_FAILURE(x)**  
Evaluates to true if `x` is a `wolfentry_errcode_t` that encodes a failure.
- **#define WOLFSENTRY\_IS\_SUCCESS(x)**  
Evaluates to true if `x` is a `wolfentry_errcode_t` that encodes a success.
- **#define WOLFSENTRY\_ERROR\_FMT**  
Convenience string-constant macro for formatting a `wolfentry_errcode_t` for rendering by a `printf`-type function.
- **#define WOLFSENTRY\_ERROR\_FMT\_ARGS(x)**  
Convenience macro supplying args to match the format directives in `WOLFSENTRY_ERROR_FMT`.
- **#define WOLFSENTRY\_ERROR\_ENCODE(name)**  
Compute a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form error name (e.g. `INVALID_ARG`).
- **#define WOLFSENTRY\_SUCCESS\_ENCODE(x)**  
Compute a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form success name (e.g. `OK`).
- **#define WOLFSENTRY\_DEBUG\_CALL\_TRACE**  
Define to build the library or application to output codepoint and error code info at each return point.
- **#define WOLFSENTRY\_ERROR\_RETURN(x)**  
Return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form error name (e.g. `INVALID_ARG`).
- **#define WOLFSENTRY\_SUCCESS\_RETURN(x)**  
Return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form success name (e.g. `OK`).
- **#define WOLFSENTRY\_ERROR\_RETURN\_RECODED(x)**  
Take an encoded `wolfentry_errcode_t`, recode it with the current source ID and line number, and return it.
- **#define WOLFSENTRY\_ERROR\_REReturn(x)**  
Return an encoded `wolfentry_errcode_t`.
- **#define WOLFSENTRY\_RETURN\_VALUE(x)**



- Return an arbitrary value.*
- **#define WOLFENTRY\_RETURN\_VOID**  
*Return from a void function.*
- **#define WOLFENTRY\_SUCCESS\_RETURN\_RECODED(x)**  
*Take an encoded `wolfentry_errcode_t`, recode it with the current source ID and line number, and return it.*
- **#define WOLFENTRY\_SUCCESS\_REReturn(x)**  
*Return an encoded `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_UNLOCK\_FOR\_RETURN\_EX(ctx)**
- **#define WOLFENTRY\_UNLOCK\_FOR\_RETURN()**  
*Unlock a previously locked `wolfentry_context`, and if the unlock fails, return the error.*
- **#define WOLFENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN\_EX(ctx)**
- **#define WOLFENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN()**  
*Unlock a previously locked `wolfentry_context`, and abandon a held promotion reservation if any (see `wolfentry_lock_unlock()`), and if the operation fails, return the error.*
- **#define WOLFENTRY\_MUTEX\_EX(ctx)**  
*Get a mutex on a `wolfentry_context`, evaluating to the resulting `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_MUTEX\_OR\_RETURN()**
- **#define WOLFENTRY\_SHARED\_EX(ctx)**  
*Get a mutex on the current context, and on failure, return the `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_SHARED\_OR\_RETURN()**
- **#define WOLFENTRY\_PROMOTABLE\_EX(ctx)**  
*Get a shared lock on the current context, and on failure, return the `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_PROMOTABLE\_OR\_RETURN()**
- **#define WOLFENTRY\_UNLOCK\_AND\_RETURN(ret)**  
*Get a shared lock with mutex promotion reservation on the current context, and on failure, return the `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_ERROR\_UNLOCK\_AND\_RETURN(name)**  
*Unlock the current context, and return the supplied `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_ERROR\_UNLOCK\_AND\_RETURN\_RECODED(x)**  
*Unlock the current context, then take an encoded `wolfentry_errcode_t` `x`, recode it with the current source ID and line number, and return it.*
- **#define WOLFENTRY\_ERROR\_UNLOCK\_AND\_RETURN\_EX(ctx, name)**  
*Unlock a previously locked `wolfentry_context` `ctx`, and return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form error `name` (e.g. `INVALID_ARG`).*
- **#define WOLFENTRY\_ERROR\_UNLOCK\_AND\_RETURN\_RECODED\_EX(ctx, x)**  
*Unlock a previously locked `wolfentry_context` `ctx`, then take an encoded `wolfentry_errcode_t` `x`, recode it with the current source ID and line number, and return it.*
- **#define WOLFENTRY\_ERROR\_UNLOCK\_AND\_REReturn(x)**  
*Unlock the current context, and return an encoded `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_ERROR\_REReturn\_AND\_UNLOCK(y)**  
*Calculate the `wolfentry_errcode_t` return value for an expression `y`, then unlock the current context, and finally, return the encoded `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_SUCCESS\_UNLOCK\_AND\_RETURN(name)**  
*Unlock the current context, and return a `wolfentry_errcode_t` encoding the current source ID and line number, and the designated short-form success `name` (e.g. `INVALID_ARG`).*
- **#define WOLFENTRY\_SUCCESS\_UNLOCK\_AND\_RETURN\_RECODED(x)**  
*Unlock the current context, then take an encoded `wolfentry_errcode_t` `x`, recode it with the current source ID and line number, and return it.*
- **#define WOLFENTRY\_SUCCESS\_UNLOCK\_AND\_REReturn(x)**  
*Unlock the current context, and return an encoded `wolfentry_errcode_t`.*
- **#define WOLFENTRY\_SUCCESS\_REReturn\_AND\_UNLOCK(y)**  
*Calculate the `wolfentry_errcode_t` return value for an expression `y`, then unlock the current context, and finally, return the encoded `wolfentry_errcode_t`.*

- **#define WOLFSENTRY\_UNLOCK\_AND\_RETURN\_VALUE(x)**  
*Unlock the current context, and return a value x.*
- **#define WOLFSENTRY\_UNLOCK\_AND\_RETURN\_VOID**  
*Unlock the current context, and return void.*
- **#define WOLFSENTRY\_RETURN\_OK**  
*Return a `wolfentry_errcode_t` encoding the current source ID and line number, and the success code OK.*
- **#define WOLFSENTRY\_UNLOCK\_AND\_RETURN\_OK**  
*Unlock the current context, and return a `wolfentry_errcode_t` encoding the current source ID and line number, and the success code OK.*
- **#define WOLFSENTRY\_RERETURN\_IF\_ERROR(y)**  
*If `wolfentry_errcode_t y` is a failure code, return it.*
- **#define WOLFSENTRY\_UNLOCK\_AND\_RERETURN\_IF\_ERROR(y)**  
*If `wolfentry_errcode_t y` is a failure code, unlock the current context and return the code.*
- **#define WOLFSENTRY\_WARN(fmt, ...)**  
*Render a warning message using `WOLFSENTRY_PRINTF_ERR()`, or if `WOLFSENTRY_NO_STDIO_STREAMS` or `WOLFSENTRY_NO_DIAG_MSGS` is set, DO NOTHING.*
- **#define WOLFSENTRY\_WARN\_ON\_FAILURE(...)**  
*Evaluate the supplied expression, and if the resulting `wolfentry_errcode_t` encodes an error, render the expression and the decoded error using `WOLFSENTRY_PRINTF_ERR()`, but if `WOLFSENTRY_NO_STDIO_STREAMS` or `WOLFSENTRY_NO_DIAG_MSGS` is set, don't render a warning.*
- **#define WOLFSENTRY\_WARN\_ON\_FAILURE\_LIBC(...)**  
*Evaluate the supplied expression, and if it evaluates to a negative value, render the expression and the decoded `errno` using `WOLFSENTRY_PRINTF_ERR()`, but if `WOLFSENTRY_NO_STDIO_STREAMS` or `WOLFSENTRY_NO_DIAG_MSGS` is set, don't render a warning.*
- **#define WOLFSENTRY\_REGISTER\_SOURCE()**  
*Helper macro to call `wolfentry_user_source_string_set()` with appropriate arguments.*
- **#define WOLFSENTRY\_REGISTER\_ERROR(name, msg)**  
*Helper macro to call `wolfentry_user_error_string_set()` with appropriate arguments, given a short-form name and freeform string msg.*

## Typedefs

- **typedef int32\_t wolfentry\_errcode\_t**  
*The structured result code type for wolfSentry. It encodes a failure or success code, a source code file ID, and a line number.*

## Enumerations

- **enum wolfentry\_source\_id {**  
**WOLFSENTRY\_SOURCE\_ID\_UNSET = 0 ,**  
**WOLFSENTRY\_SOURCE\_ID\_ACTIONS\_C = 1 ,**  
**WOLFSENTRY\_SOURCE\_ID\_EVENTS\_C = 2 ,**  
**WOLFSENTRY\_SOURCE\_ID\_WOLFSENTRY\_INTERNAL\_C = 3 ,**  
**WOLFSENTRY\_SOURCE\_ID\_ROUTES\_C = 4 ,**  
**WOLFSENTRY\_SOURCE\_ID\_WOLFSENTRY\_UTIL\_C = 5 ,**  
**WOLFSENTRY\_SOURCE\_ID\_KV\_C = 6 ,**  
**WOLFSENTRY\_SOURCE\_ID\_ADDR\_FAMILIES\_C = 7 ,**  
**WOLFSENTRY\_SOURCE\_ID\_JSON\_LOAD\_CONFIG\_C = 8 ,**  
**WOLFSENTRY\_SOURCE\_ID\_JSON\_UTIL\_C = 9 ,**  
**WOLFSENTRY\_SOURCE\_ID\_LWIP\_PACKET\_FILTER\_GLUE\_C = 10 ,**  
**WOLFSENTRY\_SOURCE\_ID\_ACTION\_BUILTINS\_C = 11 ,**  
**WOLFSENTRY\_SOURCE\_ID\_USER\_BASE = 112 }**

- enum **wolfentry\_error\_id** {
  - WOLFENTRY\_ERROR\_ID\_OK** = 0 ,
  - WOLFENTRY\_ERROR\_ID\_NOT\_OK** = -1 ,
  - WOLFENTRY\_ERROR\_ID\_INTERNAL\_CHECK\_FATAL** = -2 ,
  - WOLFENTRY\_ERROR\_ID\_SYS\_OP\_FATAL** = -3 ,
  - WOLFENTRY\_ERROR\_ID\_SYS\_OP\_FAILED** = -4 ,
  - WOLFENTRY\_ERROR\_ID\_SYS\_RESOURCE\_FAILED** = -5 ,
  - WOLFENTRY\_ERROR\_ID\_INCOMPATIBLE\_STATE** = -6 ,
  - WOLFENTRY\_ERROR\_ID\_TIMED\_OUT** = -7 ,
  - WOLFENTRY\_ERROR\_ID\_INVALID\_ARG** = -8 ,
  - WOLFENTRY\_ERROR\_ID\_BUSY** = -9 ,
  - WOLFENTRY\_ERROR\_ID\_INTERRUPTED** = -10 ,
  - WOLFENTRY\_ERROR\_ID\_NUMERIC\_ARG\_TOO\_BIG** = -11 ,
  - WOLFENTRY\_ERROR\_ID\_NUMERIC\_ARG\_TOO\_SMALL** = -12 ,
  - WOLFENTRY\_ERROR\_ID\_STRING\_ARG\_TOO\_LONG** = -13 ,
  - WOLFENTRY\_ERROR\_ID\_BUFFER\_TOO\_SMALL** = -14 ,
  - WOLFENTRY\_ERROR\_ID\_IMPLEMENTATION\_MISSING** = -15 ,
  - WOLFENTRY\_ERROR\_ID\_ITEM\_NOT\_FOUND** = -16 ,
  - WOLFENTRY\_ERROR\_ID\_ITEM\_ALREADY\_PRESENT** = -17 ,
  - WOLFENTRY\_ERROR\_ID\_ALREADY\_STOPPED** = -18 ,
  - WOLFENTRY\_ERROR\_ID\_WRONG\_OBJECT** = -19 ,
  - WOLFENTRY\_ERROR\_ID\_DATA\_MISSING** = -20 ,
  - WOLFENTRY\_ERROR\_ID\_NOT\_PERMITTED** = -21 ,
  - WOLFENTRY\_ERROR\_ID\_ALREADY** = -22 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_INVALID\_KEY** = -23 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_INVALID\_VALUE** = -24 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_OUT\_OF\_SEQUENCE** = -25 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_UNEXPECTED** = -26 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_MISPLACED\_KEY** = -27 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_PARSER** = -28 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_MISSING\_HANDLER** = -29 ,
  - WOLFENTRY\_ERROR\_ID\_CONFIG\_JSON\_VALUE\_SIZE** = -30 ,
  - WOLFENTRY\_ERROR\_ID\_OP\_NOT\_SUPP\_FOR\_PROTO** = -31 ,
  - WOLFENTRY\_ERROR\_ID\_WRONG\_TYPE** = -32 ,
  - WOLFENTRY\_ERROR\_ID\_BAD\_VALUE** = -33 ,
  - WOLFENTRY\_ERROR\_ID\_DEADLOCK\_AVERTED** = -34 ,
  - WOLFENTRY\_ERROR\_ID\_OVERFLOW\_AVERTED** = -35 ,
  - WOLFENTRY\_ERROR\_ID\_LACKING\_MUTEX** = -36 ,
  - WOLFENTRY\_ERROR\_ID\_LACKING\_READ\_LOCK** = -37 ,
  - WOLFENTRY\_ERROR\_ID\_LIB\_MISMATCH** = -38 ,
  - WOLFENTRY\_ERROR\_ID\_LIBCONFIG\_MISMATCH** = -39 ,
  - WOLFENTRY\_ERROR\_ID\_IO\_FAILED** = -40 ,
  - WOLFENTRY\_ERROR\_ID\_WRONG\_ATTRIBUTES** = -41 ,
  - WOLFENTRY\_ERROR\_ID\_USER\_BASE** = -128 ,
  - WOLFENTRY\_SUCCESS\_ID\_OK** = 0 ,
  - WOLFENTRY\_SUCCESS\_ID\_LOCK\_OK\_AND\_GOT\_RESV** = 1 ,
  - WOLFENTRY\_SUCCESS\_ID\_HAVE\_MUTEX** = 2 ,
  - WOLFENTRY\_SUCCESS\_ID\_HAVE\_READ\_LOCK** = 3 ,
  - WOLFENTRY\_SUCCESS\_ID\_USED\_FALLBACK** = 4 ,
  - WOLFENTRY\_SUCCESS\_ID\_YES** = 5 ,
  - WOLFENTRY\_SUCCESS\_ID\_NO** = 6 ,
  - WOLFENTRY\_SUCCESS\_ID\_ALREADY\_OK** = 7 ,
  - WOLFENTRY\_SUCCESS\_ID\_USER\_BASE** = 128 }

## Functions

- WOLFENTRY\_API const char \* **wolfentry\_errcode\_source\_string** ([wolfentry\\_errcode\\_t](#) e)

Return the name of the source code file associated with `wolfentry_errcode_t e`, or "unknown user defined source", or "unknown source".

- WOLFSENTRY\_API const char \* **wolfentry\_errcode\_error\_string** ([wolfentry\\_errcode\\_t e](#))  
Return a description of the failure or success code associated with `wolfentry_errcode_t e`, or various "unknown" strings if not known.
- WOLFSENTRY\_API const char \* **wolfentry\_errcode\_error\_name** ([wolfentry\\_errcode\\_t e](#))  
Return the short name of the failure or success code associated with `wolfentry_errcode_t e`, or `wolfentry_errcode_error_string(e)` if not known.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_source\_string\_set** (enum `wolfentry_source_id` `wolfentry_source_id`, const char \*`source_string`)  
Register a source code file so that `wolfentry_errcode_source_string()`, and therefore `WOLFSENTRY_ERROR_FMT_ARGS()` and `WOLFSENTRY_WARN_ON_FAILURE()`, can render it. Note that `source_string` must be a string constant or otherwise remain valid for the duration of runtime.
- WOLFSENTRY\_API [wolfentry\\_errcode\\_t](#) **wolfentry\_user\_error\_string\_set** (enum `wolfentry_error_id` `wolfentry_error_id`, const char \*`message_string`)  
Register an error (negative) or success (positive) code, and corresponding message, so that `wolfentry_errcode_error_string()` and therefore `WOLFSENTRY_ERROR_FMT_ARGS()` and `WOLFSENTRY_WARN_ON_FAILURE()`, can render it in human-readable form. Note that `error_string` must be a string constant or otherwise remain valid for the duration of runtime.

## 10.8.1 Detailed Description

Definitions for diagnostics.

Included by [wolfentry.h](#).

## 10.9 wolfentry\_errcodes.h

[Go to the documentation of this file.](#)

```
00001 /*
00002  * wolfentry_errcodes.h
00003  *
00004  * Copyright (C) 2021-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00029 #ifndef WOLFSENTRY_ERRCODES_H
00030 #define WOLFSENTRY_ERRCODES_H
00031
00036 #ifdef WOLFSENTRY_FOR_DOXYGEN
00037 #define WOLFSENTRY_SOURCE_ID
00039 #endif
00040
00041 typedef int32_t wolfentry_errcode_t;
00042 #ifdef FREERTOS
00043 #define WOLFSENTRY_ERRCODE_FMT "%d"
00044 #elif defined(PRId32)
00045 #define WOLFSENTRY_ERRCODE_FMT "%" PRId32
00046 #else
00047 #define WOLFSENTRY_ERRCODE_FMT "%d"
```

```

00049 #endif
00050
00051 /* these must be all-1s */
00052 #define WOLFSENTRY_SOURCE_ID_MAX 127
00053 #define WOLFSENTRY_ERROR_ID_MAX 255
00054 #define WOLFSENTRY_LINE_NUMBER_MAX 65535
00055
00056 #define WOLFSENTRY_ERROR_ENCODE_0(x) (((x) < 0) ?
00057     -(((~(x)) & WOLFSENTRY_ERROR_ID_MAX)
00058     | (((__LINE__ & WOLFSENTRY_LINE_NUMBER_MAX) << 8)
00059     | ((WOLFSENTRY_SOURCE_ID & WOLFSENTRY_SOURCE_ID_MAX) << 24)))
00060     :
00061     (((x) & WOLFSENTRY_ERROR_ID_MAX)
00062     | (((__LINE__ & WOLFSENTRY_LINE_NUMBER_MAX) << 8)
00063     | ((WOLFSENTRY_SOURCE_ID & WOLFSENTRY_SOURCE_ID_MAX) << 24)))
00064
00065 #if defined(__GNUC__) && !defined(__STRICT_ANSI__)
00066 #define WOLFSENTRY_ERROR_ENCODE_1(x) ({
00067     wolfsentry_errcode_t _xret = (x);
00068     wolfsentry_static_assert2(((x) >= -WOLFSENTRY_ERROR_ID_MAX)
00069     && ((x) <= WOLFSENTRY_ERROR_ID_MAX),
00070     "error code must be -"
00071     _q(WOLFSENTRY_ERROR_ID_MAX)
00072     " <= e <= "
00073     _q(WOLFSENTRY_ERROR_ID_MAX) )
00074     wolfsentry_static_assert2(__LINE__ <= WOLFSENTRY_LINE_NUMBER_MAX,
00075     "line number must be 1-" _q(WOLFSENTRY_LINE_NUMBER_MAX) )
00076     wolfsentry_static_assert2((WOLFSENTRY_SOURCE_ID >= 0)
00077     && (WOLFSENTRY_SOURCE_ID <= 0x7f),
00078     "source file ID must be 0-" _q(WOLFSENTRY_SOURCE_ID_MAX) )
00079     WOLFSENTRY_ERROR_ENCODE_0(_xret);
00080 })
00081 #else
00082 #define WOLFSENTRY_ERROR_ENCODE_1(x) WOLFSENTRY_ERROR_ENCODE_0(x)
00083 #endif
00084
00085 #define WOLFSENTRY_ERROR_DECODE_ERROR_CODE_1(x) ((int)(((x) < 0) ? -(~(x) & WOLFSENTRY_ERROR_ID_MAX) :
00086     ((x) & WOLFSENTRY_ERROR_ID_MAX)))
00087 #define WOLFSENTRY_ERROR_DECODE_SOURCE_ID_1(x) ((int)(((x) < 0) ? ((~(x)) >> 24) : ((x) >> 24)))
00088 #define WOLFSENTRY_ERROR_DECODE_LINE_NUMBER_1(x) ((int)(((x) < 0) ? (((~(x)) >> 8) &
00089     WOLFSENTRY_LINE_NUMBER_MAX) : (((x) >> 8) & WOLFSENTRY_LINE_NUMBER_MAX)))
00090
00091 #ifndef WOLFSENTRY_NO_INLINE
00092
00093 #if defined(__GNUC__) && !defined(__STRICT_ANSI__)
00094 #define WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x) ({ wolfsentry_errcode_t _xret = (x);
00095     WOLFSENTRY_ERROR_DECODE_ERROR_CODE_1(_xret); })
00096 #define WOLFSENTRY_ERROR_DECODE_SOURCE_ID(x) ({ wolfsentry_errcode_t _xret = (x);
00097     WOLFSENTRY_ERROR_DECODE_SOURCE_ID_1(_xret); })
00098 #define WOLFSENTRY_ERROR_DECODE_LINE_NUMBER(x) ({ wolfsentry_errcode_t _xret = (x);
00099     WOLFSENTRY_ERROR_DECODE_LINE_NUMBER_1(_xret); })
00100 #else
00101 #define WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x) WOLFSENTRY_ERROR_DECODE_ERROR_CODE_1(x)
00102 #define WOLFSENTRY_ERROR_DECODE_SOURCE_ID(x) WOLFSENTRY_ERROR_DECODE_SOURCE_ID_1(x)
00103 #define WOLFSENTRY_ERROR_DECODE_LINE_NUMBER(x) WOLFSENTRY_ERROR_DECODE_LINE_NUMBER_1(x)
00104 #endif
00105
00106 static inline int WOLFSENTRY_ERROR_DECODE_ERROR_CODE(wolfsentry_errcode_t x) {
00107     return WOLFSENTRY_ERROR_DECODE_ERROR_CODE_1(x);
00108 }
00109 static inline int WOLFSENTRY_ERROR_DECODE_SOURCE_ID(wolfsentry_errcode_t x) {
00110     return WOLFSENTRY_ERROR_DECODE_SOURCE_ID_1(x);
00111 }
00112 static inline int WOLFSENTRY_ERROR_DECODE_LINE_NUMBER(wolfsentry_errcode_t x) {
00113     return WOLFSENTRY_ERROR_DECODE_LINE_NUMBER_1(x);
00114 }
00115 #endif
00116
00117 #define WOLFSENTRY_ERROR_RECODE(x) WOLFSENTRY_ERROR_ENCODE_0(WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x))
00118 #define WOLFSENTRY_ERROR_CODE_IS(x, name) (WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x) ==
00119     WOLFSENTRY_ERROR_ID_ ## name)
00120 #define WOLFSENTRY_SUCCESS_CODE_IS(x, name) (WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x) ==
00121     WOLFSENTRY_SUCCESS_ID_ ## name)
00122 #define WOLFSENTRY_IS_FAILURE(x) ((x) < 0)
00123 #define WOLFSENTRY_IS_SUCCESS(x) ((x) >= 0)
00124 #ifndef WOLFSENTRY_ERROR_STRINGS
00125 #define WOLFSENTRY_ERROR_FMT "code " WOLFSENTRY_ERRCODE_FMT " (%s), src " WOLFSENTRY_ERRCODE_FMT "
00126     (%s), line " WOLFSENTRY_ERRCODE_FMT
00127 #define WOLFSENTRY_ERROR_FMT_ARGS(x) WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x),
00128     wolfsentry_errcode_error_string(x), WOLFSENTRY_ERROR_DECODE_SOURCE_ID(x),
00129     wolfsentry_errcode_source_string(x), WOLFSENTRY_ERROR_DECODE_LINE_NUMBER(x)
00130 #else
00131 #define WOLFSENTRY_ERROR_FMT "code " WOLFSENTRY_ERRCODE_FMT ", src " WOLFSENTRY_ERRCODE_FMT ", line "
00132     WOLFSENTRY_ERRCODE_FMT
00133 #endif

```

```

00141 #define WOLFSENTRY_ERROR_FMT_ARGS(x) WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x),
      WOLFSENTRY_ERROR_DECODE_SOURCE_ID(x), WOLFSENTRY_ERROR_DECODE_LINE_NUMBER(x)
00142 #endif /* WOLFSENTRY_ERROR_STRINGS */
00143
00144 #define WOLFSENTRY_ERROR_ENCODE(name) WOLFSENTRY_ERROR_ENCODE_0(WOLFSENTRY_ERROR_ID_ ## name)
00146 #define WOLFSENTRY_SUCCESS_ENCODE(x) WOLFSENTRY_ERROR_ENCODE_0(WOLFSENTRY_SUCCESS_ID_ ## x)
00149 #ifndef WOLFSENTRY_FOR_DOXYGEN
00150 #define WOLFSENTRY_DEBUG_CALL_TRACE
00161 #undef WOLFSENTRY_DEBUG_CALL_TRACE
00162 #endif
00163
00164 #if defined(WOLFSENTRY_DEBUG_CALL_TRACE) && !defined(WOLFSENTRY_NO_STDIO_STREAMS)
00165     #define WOLFSENTRY_ERROR_RETURN(x) WOLFSENTRY_ERROR_RETURN_1(WOLFSENTRY_ERROR_ID_ ## x)
00166     #define WOLFSENTRY_SUCCESS_RETURN(x) WOLFSENTRY_ERROR_RETURN_1(WOLFSENTRY_SUCCESS_ID_ ## x)
00167     #if defined(WOLFSENTRY_ERROR_STRINGS) && defined(__GNUC__) && !defined(__STRICT_ANSI__)
00168         #ifdef WOLFSENTRY_CALL_DEPTH_RETURNS_STRING
00169             WOLFSENTRY_API const char *_wolfentry_call_depth(void);
00170             #define _INDENT_FMT "%s"
00171             #define _INDENT_ARGS _wolfentry_call_depth()
00172             #else
00173             WOLFSENTRY_API unsigned int _wolfentry_call_depth(void);
00174             #define _INDENT_FMT "%s"
00175             #define _INDENT_ARGS _wolfentry_call_depth(), ""
00176             #endif
00177             #define WOLFSENTRY_ERROR_RETURN_1(x) do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR(_INDENT_FMT "%s L%d %s(): return %d (%s)\n",
      _INDENT_ARGS, _fn, _LINE_, _FUNCTION_, x, wolfentry_errcode_error_name(x)); return
      WOLFSENTRY_ERROR_ENCODE_1(x); } while (0)
00178             #define WOLFSENTRY_ERROR_RETURN_RECODED(x) do { wolfentry_errcode_t _xret = (x); const char
*_fn = strrchr(__FILE__, '/'); if (_fn) { ++_fn; } else { _fn = __FILE__; }
      WOLFSENTRY_PRINTF_ERR(_INDENT_FMT "%s L%d %s(): return-recoded %d (%s)\n", _INDENT_ARGS, _fn,
      _LINE_, _FUNCTION_, WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret),
      wolfentry_errcode_error_name(_xret)); return
      WOLFSENTRY_ERROR_ENCODE_0(WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret)); } while (0)
00179             #define WOLFSENTRY_ERROR_RERETURN(x) do { wolfentry_errcode_t _xret = (x); const char *_fn =
strrchr(__FILE__, '/'); if (_fn) { ++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR(_INDENT_FMT
      "%s L%d %s(): rereturn %d (%s)\n", _INDENT_ARGS, _fn, _LINE_, _FUNCTION_,
      WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret), wolfentry_errcode_error_name(_xret)); return (_xret); }
      while (0)
00180             #define WOLFSENTRY_RETURN_VALUE(x) do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR(_INDENT_FMT "%s L%d %s(): return value\n",
      _INDENT_ARGS, _fn, _LINE_, _FUNCTION_); return (x); } while (0)
00181             #define WOLFSENTRY_RETURN_VOID do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR(_INDENT_FMT "%s L%d %s(): return void\n",
      _INDENT_ARGS, _fn, _LINE_, _FUNCTION_); return; } while (0)
00182             #elif defined(WOLFSENTRY_ERROR_STRINGS)
00183             #define WOLFSENTRY_ERROR_RETURN_1(x) do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d: return %d (%s)\n", _fn, _LINE_, x,
      wolfentry_errcode_error_name(x)); return WOLFSENTRY_ERROR_ENCODE_1(x); } while (0)
00184             #define WOLFSENTRY_ERROR_RETURN_RECODED(x) do { wolfentry_errcode_t _xret = (x); const char
*_fn = strrchr(__FILE__, '/'); if (_fn) { ++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s
      L%d: return-recoded %d (%s)\n", _fn, _LINE_, WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret),
      wolfentry_errcode_error_name(_xret)); return
      WOLFSENTRY_ERROR_ENCODE_0(WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret)); } while (0)
00185             #define WOLFSENTRY_ERROR_RERETURN(x) do { wolfentry_errcode_t _xret = (x); const char *_fn =
strrchr(__FILE__, '/'); if (_fn) { ++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d:
      rereturn %d (%s)\n", _fn, _LINE_, WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret),
      wolfentry_errcode_error_name(_xret)); return (_xret); } while (0)
00186             #define WOLFSENTRY_RETURN_VALUE(x) do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d: return value\n", _fn, _LINE_);
      return (x); } while (0)
00187             #define WOLFSENTRY_RETURN_VOID do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d: return void\n", _fn, _LINE_);
      return; } while (0)
00188             #else
00189             #define WOLFSENTRY_ERROR_RETURN_1(x) do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d: return %d\n", _fn, _LINE_, x);
      return WOLFSENTRY_ERROR_ENCODE_1(x); } while (0)
00190             #define WOLFSENTRY_ERROR_RETURN_RECODED(x) do { wolfentry_errcode_t _xret = (x); const char
*_fn = strrchr(__FILE__, '/'); if (_fn) { ++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s
      L%d: return-recoded %d\n", _fn, _LINE_, WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret)); return
      WOLFSENTRY_ERROR_ENCODE_0(WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret)); } while (0)
00191             #define WOLFSENTRY_ERROR_RERETURN(x) do { wolfentry_errcode_t _xret = (x); const char *_fn =
strrchr(__FILE__, '/'); if (_fn) { ++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d:
      rereturn %d\n", _fn, _LINE_, WOLFSENTRY_ERROR_DECODE_ERROR_CODE(_xret)); return (_xret); } while (0)
00192             #define WOLFSENTRY_RETURN_VALUE(x) do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d: return value\n", _fn, _LINE_);
      return (x); } while (0)
00193             #define WOLFSENTRY_RETURN_VOID do { const char *_fn = strrchr(__FILE__, '/'); if (_fn) {
++_fn; } else { _fn = __FILE__; } WOLFSENTRY_PRINTF_ERR("%s L%d: return void\n", _fn, _LINE_);
      return; } while (0)
00194             #endif
00195             #else
00196             #define WOLFSENTRY_ERROR_RETURN(x) return WOLFSENTRY_ERROR_ENCODE(x)
00198             #define WOLFSENTRY_SUCCESS_RETURN(x) return WOLFSENTRY_SUCCESS_ENCODE(x)
00200             #define WOLFSENTRY_ERROR_RETURN_RECODED(x) return
      WOLFSENTRY_ERROR_ENCODE_0(WOLFSENTRY_ERROR_DECODE_ERROR_CODE(x))

```



```

00202     #define WOLFSENTRY_ERROR_RERETURN(x) return (x)
00204     #define WOLFSENTRY_RETURN_VALUE(x) return (x)
00206     #define WOLFSENTRY_RETURN_VOID return
00208 #endif
00209
00210 #define WOLFSENTRY_SUCCESS_RETURN_RECODED(x) WOLFSENTRY_ERROR_RETURN_RECODED(x)
00212 #define WOLFSENTRY_SUCCESS_RERETURN(x) WOLFSENTRY_ERROR_RERETURN(x)
00215 #ifndef WOLFSENTRY_THREADSAFE
00216
00217     #define WOLFSENTRY_UNLOCK_FOR_RETURN_EX(ctx) do { \
00218         wolfentry_errcode_t _lock_ret; \
00219         if ((_lock_ret = wolfentry_context_unlock(ctx, thread)) < 0) { \
00220             WOLFSENTRY_ERROR_RERETURN(_lock_ret); \
00221         } \
00222     } while (0)
00225     #define WOLFSENTRY_UNLOCK_FOR_RETURN() WOLFSENTRY_UNLOCK_FOR_RETURN_EX(wolfentry)
00228     #define WOLFSENTRY_UNLOCK_AND_UNRESERVE_FOR_RETURN_EX(ctx) do { \
00229         wolfentry_errcode_t _lock_ret; \
00230         if ((_lock_ret = wolfentry_context_unlock_and_abandon_reservation(ctx, thread)) < 0) { \
00231             WOLFSENTRY_ERROR_RERETURN(_lock_ret); \
00232         } \
00233     } while (0)
00236     #define WOLFSENTRY_UNLOCK_AND_UNRESERVE_FOR_RETURN() \
WOLFSENTRY_UNLOCK_AND_UNRESERVE_FOR_RETURN_EX(wolfentry)
00239     #define WOLFSENTRY_MUTEX_EX(ctx) wolfentry_context_lock_mutex_abstimed(ctx, thread, NULL)
00242     #define WOLFSENTRY_MUTEX_OR_RETURN() do { \
00243         wolfentry_errcode_t _lock_ret; \
00244         if ((_lock_ret = WOLFSENTRY_MUTEX_EX(wolfentry)) < 0) \
00245             WOLFSENTRY_ERROR_RERETURN(_lock_ret); \
00246     } while (0)
00249     #define WOLFSENTRY_SHARED_EX(ctx) wolfentry_context_lock_shared_abstimed(ctx, thread, NULL)
00252     #define WOLFSENTRY_SHARED_OR_RETURN() do { \
00253         wolfentry_errcode_t _lock_ret; \
00254         if (thread == NULL) \
00255             _lock_ret = WOLFSENTRY_MUTEX_EX(wolfentry); \
00256         else \
00257             _lock_ret = WOLFSENTRY_SHARED_EX(wolfentry); \
00258         WOLFSENTRY_RERETURN_IF_ERROR(_lock_ret); \
00259     } while (0)
00262     #define WOLFSENTRY_PROMOTABLE_EX(ctx) \
wolfentry_context_lock_shared_with_reservation_abstimed(ctx, thread, NULL)
00265     #define WOLFSENTRY_PROMOTABLE_OR_RETURN() do { \
00266         wolfentry_errcode_t _lock_ret; \
00267         if (thread == NULL) \
00268             _lock_ret = WOLFSENTRY_MUTEX_EX(wolfentry); \
00269         else \
00270             _lock_ret = WOLFSENTRY_PROMOTABLE_EX(wolfentry); \
00271         WOLFSENTRY_RERETURN_IF_ERROR(_lock_ret); \
00272     } while (0)
00275     #define WOLFSENTRY_UNLOCK_AND_RETURN(ret) do { \
00276         WOLFSENTRY_UNLOCK_FOR_RETURN(); \
00277         WOLFSENTRY_ERROR_RERETURN(ret); \
00278     } while (0)
00281 #else
00282     #define WOLFSENTRY_UNLOCK_FOR_RETURN() DO_NOTHING
00283     #define WOLFSENTRY_UNLOCK_FOR_RETURN_EX(ctx) DO_NOTHING
00284     #define WOLFSENTRY_MUTEX_EX(ctx) ((void)(ctx), WOLFSENTRY_ERROR_ENCODE(OK))
00285     #define WOLFSENTRY_MUTEX_OR_RETURN() (void)wolfentry
00286     #define WOLFSENTRY_SHARED_EX(ctx) (void)(ctx)
00287     #define WOLFSENTRY_SHARED_OR_RETURN() (void)wolfentry
00288     #define WOLFSENTRY_PROMOTABLE_EX(ctx) (void)(ctx)
00289     #define WOLFSENTRY_PROMOTABLE_OR_RETURN() (void)wolfentry
00290     #define WOLFSENTRY_UNLOCK_AND_RETURN(lock, ret) WOLFSENTRY_ERROR_RERETURN(ret)
00291 #endif
00292
00293 #define WOLFSENTRY_ERROR_UNLOCK_AND_RETURN(name) do { WOLFSENTRY_UNLOCK_FOR_RETURN(); \
WOLFSENTRY_ERROR_RETURN(name); } while (0)
00295 #define WOLFSENTRY_ERROR_UNLOCK_AND_RETURN_RECODED(x) do { WOLFSENTRY_UNLOCK_FOR_RETURN(); \
WOLFSENTRY_ERROR_RETURN_RECODED(x); } while (0)
00297 #define WOLFSENTRY_ERROR_UNLOCK_AND_RETURN_EX(ctx, name) do { WOLFSENTRY_UNLOCK_FOR_RETURN_EX(ctx); \
WOLFSENTRY_ERROR_RETURN(name); } while (0)
00299 #define WOLFSENTRY_ERROR_UNLOCK_AND_RETURN_RECODED_EX(ctx, x) do { \
WOLFSENTRY_UNLOCK_FOR_RETURN_EX(ctx); WOLFSENTRY_ERROR_RETURN_RECODED(x); } while (0)
00301 #define WOLFSENTRY_ERROR_UNLOCK_AND_RETURN(x) do { WOLFSENTRY_UNLOCK_FOR_RETURN(); \
WOLFSENTRY_ERROR_RERETURN(x); } while (0)
00303 #define WOLFSENTRY_ERROR_RERETURN_AND_UNLOCK(y) do { wolfentry_errcode_t _yret = (y); \
WOLFSENTRY_UNLOCK_FOR_RETURN(); WOLFSENTRY_ERROR_RERETURN(_yret); } while (0)
00306 #define WOLFSENTRY_SUCCESS_UNLOCK_AND_RETURN(name) do { WOLFSENTRY_UNLOCK_FOR_RETURN(); \
WOLFSENTRY_SUCCESS_RETURN(name); } while (0)
00308 #define WOLFSENTRY_SUCCESS_UNLOCK_AND_RETURN_RECODED(x) do { WOLFSENTRY_UNLOCK_FOR_RETURN(); \
WOLFSENTRY_SUCCESS_RETURN_RECODED(x); } while (0)
00310 #define WOLFSENTRY_SUCCESS_UNLOCK_AND_RERETURN(x) do { WOLFSENTRY_UNLOCK_FOR_RETURN(); \
WOLFSENTRY_SUCCESS_RERETURN(x); } while (0)
00312 #define WOLFSENTRY_SUCCESS_RERETURN_AND_UNLOCK(y) do { wolfentry_errcode_t _yret = (y); \
WOLFSENTRY_UNLOCK_FOR_RETURN(); WOLFSENTRY_SUCCESS_RERETURN(_yret); } while (0)
00315 #define WOLFSENTRY_UNLOCK_AND_RETURN_VALUE(x) do { WOLFSENTRY_UNLOCK_FOR_RETURN(); \
WOLFSENTRY_RETURN_VALUE(x); } while (0)

```

```

00317 #define WOLFSENTRY_UNLOCK_AND_RETURN_VOID do { WOLFSENTRY_UNLOCK_FOR_RETURN(); WOLFSENTRY_RETURN_VOID;
    } while (0)
00320 #define WOLFSENTRY_RETURN_OK WOLFSENTRY_SUCCESS_RETURN(OK)
00322 #define WOLFSENTRY_UNLOCK_AND_RETURN_OK do { WOLFSENTRY_UNLOCK_FOR_RETURN();
    WOLFSENTRY_SUCCESS_RETURN(OK); } while (0)
00324 #define WOLFSENTRY_RERETURN_IF_ERROR(y) do { wolfentry_errcode_t _yret = (y); if (_yret < 0)
    WOLFSENTRY_ERROR_RERETURN(_yret); } while (0)
00326 #define WOLFSENTRY_UNLOCK_AND_RERETURN_IF_ERROR(y) do { wolfentry_errcode_t _yret = (y); if (_yret <
    0) { WOLFSENTRY_UNLOCK_FOR_RETURN(); WOLFSENTRY_ERROR_RERETURN(_yret); } } while (0)
00329 #ifdef WOLFSENTRY_ERROR_STRINGS
00330 WOLFSENTRY_API const char *wolfentry_errcode_source_string(wolfentry_errcode_t e);
00332 WOLFSENTRY_API const char *wolfentry_errcode_error_string(wolfentry_errcode_t e);
00334 WOLFSENTRY_API const char *wolfentry_errcode_error_name(wolfentry_errcode_t e);
00336 #endif
00337
00338 #if !defined(WOLFSENTRY_NO_STDIO_STREAMS) && !defined(WOLFSENTRY_NO_DIAG_MSGS)
00339
00340 #include <errno.h>
00341
00342 #ifdef __STRICT_ANSI__
00343 #define WOLFSENTRY_WARN(fmt,...) WOLFSENTRY_PRINTF_ERR("%s@L%d " fmt, __FILE__, __LINE__, __VA_ARGS__)
00344 #else
00345 #define WOLFSENTRY_WARN(fmt,...) WOLFSENTRY_PRINTF_ERR("%s@L%d " fmt, __FILE__, __LINE__, ##
    __VA_ARGS__)
00347 #endif
00348
00349 #define WOLFSENTRY_WARN_ON_FAILURE(...) do { wolfentry_errcode_t _ret = (__VA_ARGS__); if (_ret < 0)
    { WOLFSENTRY_WARN(__VA_ARGS__ ": " WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(_ret)); } }
    while(0)
00351 #define WOLFSENTRY_WARN_ON_FAILURE_LIBC(...) do { if ((__VA_ARGS__) < 0) {
    WOLFSENTRY_WARN(__VA_ARGS__ ": %s\n", strerror(errno)); } } while(0)
00354 #else
00355
00356 #define WOLFSENTRY_WARN(fmt,...) DO_NOTHING
00357 #define WOLFSENTRY_WARN_ON_FAILURE(...) do { if ((__VA_ARGS__) < 0) {} } while (0)
00358 #define WOLFSENTRY_WARN_ON_FAILURE_LIBC(...) do { if ((__VA_ARGS__) < 0) {} } while (0)
00359
00360 #endif /* !WOLFSENTRY_NO_STDIO_STREAMS && !WOLFSENTRY_NO_DIAG_MSGS */
00361
00362 #ifdef WOLFSENTRY_CPPCHECK
00363     #undef WOLFSENTRY_ERROR_ENCODE
00364     #define WOLFSENTRY_ERROR_ENCODE(x) 0
00365     #undef WOLFSENTRY_SUCCESS_ENCODE
00366     #define WOLFSENTRY_SUCCESS_ENCODE(x) 0
00367 #endif
00368
00369 enum wolfentry_source_id {
00370     WOLFSENTRY_SOURCE_ID_UNSET = 0,
00371     WOLFSENTRY_SOURCE_ID_ACTIONS_C = 1,
00372     WOLFSENTRY_SOURCE_ID_EVENTS_C = 2,
00373     WOLFSENTRY_SOURCE_ID_WOLFSENTRY_INTERNAL_C = 3,
00374     WOLFSENTRY_SOURCE_ID_ROUTES_C = 4,
00375     WOLFSENTRY_SOURCE_ID_WOLFSENTRY_UTIL_C = 5,
00376     WOLFSENTRY_SOURCE_ID_KV_C = 6,
00377     WOLFSENTRY_SOURCE_ID_ADDR_FAMILIES_C = 7,
00378     WOLFSENTRY_SOURCE_ID_JSON_LOAD_CONFIG_C = 8,
00379     WOLFSENTRY_SOURCE_ID_JSON_JSON_UTIL_C = 9,
00380     WOLFSENTRY_SOURCE_ID_LWIP_PACKET_FILTER_GLUE_C = 10,
00381     WOLFSENTRY_SOURCE_ID_ACTION_BUILTINS_C = 11,
00382
00383     WOLFSENTRY_SOURCE_ID_USER_BASE = 112
00384 };
00385
00386 #ifdef WOLFSENTRY_ERROR_STRINGS
00387 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_source_string_set(enum wolfentry_source_id
    wolfentry_source_id, const char *source_string);
00389 #define WOLFSENTRY_REGISTER_SOURCE() wolfentry_user_source_string_set(WOLFSENTRY_SOURCE_ID,__FILE__)
00391 #endif
00392
00393 enum wolfentry_error_id {
00394     WOLFSENTRY_ERROR_ID_OK = 0,
00395     WOLFSENTRY_ERROR_ID_NOT_OK = -1,
00396     WOLFSENTRY_ERROR_ID_INTERNAL_CHECK_FATAL = -2,
00397     WOLFSENTRY_ERROR_ID_SYS_OP_FATAL = -3,
00398     WOLFSENTRY_ERROR_ID_SYS_OP_FAILED = -4,
00399     WOLFSENTRY_ERROR_ID_SYS_RESOURCE_FAILED = -5,
00400     WOLFSENTRY_ERROR_ID_INCOMPATIBLE_STATE = -6,
00401     WOLFSENTRY_ERROR_ID_TIMED_OUT = -7,
00402     WOLFSENTRY_ERROR_ID_INVALID_ARG = -8,
00403     WOLFSENTRY_ERROR_ID_BUSY = -9,
00404     WOLFSENTRY_ERROR_ID_INTERRUPTED = -10,
00405     WOLFSENTRY_ERROR_ID_NUMERIC_ARG_TOO_BIG = -11,
00406     WOLFSENTRY_ERROR_ID_NUMERIC_ARG_TOO_SMALL = -12,
00407     WOLFSENTRY_ERROR_ID_STRING_ARG_TOO_LONG = -13,
00408     WOLFSENTRY_ERROR_ID_BUFFER_TOO_SMALL = -14,
00409     WOLFSENTRY_ERROR_ID_IMPLEMENTATION_MISSING = -15,
00410     WOLFSENTRY_ERROR_ID_ITEM_NOT_FOUND = -16,

```



```

00411     WOLFSENTRY_ERROR_ID_ITEM_ALREADY_PRESENT    = -17,
00412     WOLFSENTRY_ERROR_ID_ALREADY_STOPPED        = -18,
00413     WOLFSENTRY_ERROR_ID_WRONG_OBJECT           = -19,
00414     WOLFSENTRY_ERROR_ID_DATA_MISSING           = -20,
00415     WOLFSENTRY_ERROR_ID_NOT_PERMITTED          = -21,
00416     WOLFSENTRY_ERROR_ID_ALREADY               = -22,
00417     WOLFSENTRY_ERROR_ID_CONFIG_INVALID_KEY     = -23,
00418     WOLFSENTRY_ERROR_ID_CONFIG_INVALID_VALUE   = -24,
00419     WOLFSENTRY_ERROR_ID_CONFIG_OUT_OF_SEQUENCE = -25,
00420     WOLFSENTRY_ERROR_ID_CONFIG_UNEXPECTED      = -26,
00421     WOLFSENTRY_ERROR_ID_CONFIG_MISPLACED_KEY   = -27,
00422     WOLFSENTRY_ERROR_ID_CONFIG_PARSER          = -28,
00423     WOLFSENTRY_ERROR_ID_CONFIG_MISSING_HANDLER = -29,
00424     WOLFSENTRY_ERROR_ID_CONFIG_JSON_VALUE_SIZE = -30,
00425     WOLFSENTRY_ERROR_ID_OP_NOT_SUPP_FOR_PROTO  = -31,
00426     WOLFSENTRY_ERROR_ID_WRONG_TYPE             = -32,
00427     WOLFSENTRY_ERROR_ID_BAD_VALUE              = -33,
00428     WOLFSENTRY_ERROR_ID_DEADLOCK_AVERTED       = -34,
00429     WOLFSENTRY_ERROR_ID_OVERFLOW_AVERTED       = -35,
00430     WOLFSENTRY_ERROR_ID_LACKING_MUTEX           = -36,
00431     WOLFSENTRY_ERROR_ID_LACKING_READ_LOCK       = -37,
00432     WOLFSENTRY_ERROR_ID_LIB_MISMATCH           = -38,
00433     WOLFSENTRY_ERROR_ID_LIBCONFIG_MISMATCH      = -39,
00434     WOLFSENTRY_ERROR_ID_IO_FAILED              = -40,
00435     WOLFSENTRY_ERROR_ID_WRONG_ATTRIBUTES        = -41,
00436
00437     WOLFSENTRY_ERROR_ID_USER_BASE               = -128,
00438
00439     WOLFSENTRY_SUCCESS_ID_OK                    = 0,
00440     WOLFSENTRY_SUCCESS_ID_LOCK_OK_AND_GOT_RESV = 1,
00441     WOLFSENTRY_SUCCESS_ID_HAVE_MUTEX           = 2,
00442     WOLFSENTRY_SUCCESS_ID_HAVE_READ_LOCK       = 3,
00443     WOLFSENTRY_SUCCESS_ID_USED_FALLBACK        = 4,
00444     WOLFSENTRY_SUCCESS_ID_YES                  = 5,
00445     WOLFSENTRY_SUCCESS_ID_NO                   = 6,
00446     WOLFSENTRY_SUCCESS_ID_ALREADY_OK           = 7,
00447     WOLFSENTRY_SUCCESS_ID_USER_BASE            = 128
00448 };
00449
00450 #ifdef WOLFSENTRY_ERROR_STRINGS
00451 WOLFSENTRY_API wolfentry_errcode_t wolfentry_user_error_string_set(enum wolfentry_error_id
    wolfentry_error_id, const char *message_string);
00453 #define WOLFSENTRY_REGISTER_ERROR(name, msg) wolfentry_user_error_string_set(WOLFSENTRY_ERROR_ID_ ##
    name, msg)
00455 #endif
00456
00459 #endif /* WOLFSENTRY_ERRCODES_H */

```

## 10.10 wolfentry/wolfentry\_json.h File Reference

Types and prototypes for loading/reloading configuration using JSON.

```

#include "wolfentry.h"
#include "centijson_sax.h"

```

### Macros

- `#define WOLFSENTRY`
- `#define WOLFSENTRY_MAX_JSON_NESTING 16`

*Can be overridden.*

### Typedefs

- `typedef uint32_t wolfentry_config_load_flags_t`  
*Type for holding flag bits from [wolfentry\\_config\\_load\\_flags](#).*

## Enumerations

- enum `wolfentry_config_load_flags` {  
`WOLFSENTRY_CONFIG_LOAD_FLAG_NONE` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_NO_FLUSH` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_DRY_RUN` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_LOAD_THEN_COMMIT` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_NO_ROUTES_OR_EVENTS` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_ABORT` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USEFIRST` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USELAST` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_MAINTAININDICTORDER` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_FLUSH_ONLY_ROUTES` ,  
`WOLFSENTRY_CONFIG_LOAD_FLAG_FINI` }

Flags to be OR'd together to communicate options to `wolfentry_config_json_init()`

## Functions

- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_centijson_errcode_translate` (`wolfentry_errcode_t` centijson\_errcode)  
 Convert CentiJSON numeric error code to closest-corresponding wolfSentry error code.
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_config_json_init` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `wolfentry_config_load_flags_t` load\_flags, struct `wolfentry_json_process_state` \*\*jps)  
 Allocate and initialize a struct `wolfentry_json_process_state` with the designated load\_flags, to subsequently pass to `wolfentry_config_json_feed()`.
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_config_json_init_ex` (`WOLFSENTRY_CONTEXT_ARGS_IN`, `wolfentry_config_load_flags_t` load\_flags, const `JSON_CONFIG` \*json\_config, struct `wolfentry_json_process_state` \*\*jps)  
 Variant of `wolfentry_config_json_init()` with an additional `JSON_CONFIG` argument, `json_config`, for tailoring of JSON parsing dynamics.
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_config_json_feed` (struct `wolfentry_json_process_state` \*jps, const unsigned char \*json\_in, size\_t json\_in\_len, char \*err\_buf, size\_t err\_buf\_size)  
 Pass a segment of JSON configuration into the parsing engine. Segments can be as short or as long as desired, to facilitate incremental read-in.
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_config_centijson_errcode` (struct `wolfentry_json_process_state` \*jps, int \*json\_errcode, const char \*\*json\_errmsg)  
 Copy the current error code and/or human-readable error message from a struct `wolfentry_json_process_state` allocated by `wolfentry_config_json_init()`.
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_config_json_fini` (struct `wolfentry_json_process_state` \*\*jps, char \*err\_buf, size\_t err\_buf\_size)  
 To be called when done iterating `wolfentry_config_json_feed()`, completing the configuration load.
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_config_json_oneshot` (`WOLFSENTRY_CONTEXT_ARGS_IN`, const unsigned char \*json\_in, size\_t json\_in\_len, `wolfentry_config_load_flags_t` load\_flags, char \*err\_buf, size\_t err\_buf\_size)  
 Load a complete JSON configuration from an in-memory buffer.
- WOLFSENTRY\_API `wolfentry_errcode_t wolfentry_config_json_oneshot_ex` (`WOLFSENTRY_CONTEXT_ARGS_IN`, const unsigned char \*json\_in, size\_t json\_in\_len, `wolfentry_config_load_flags_t` load\_flags, const `JSON_CONFIG` \*json\_config, char \*err\_buf, size\_t err\_buf\_size)  
 Variant of `wolfentry_config_json_oneshot()` with an additional `JSON_CONFIG` argument, `json_config`, for tailoring of JSON parsing dynamics.

### 10.10.1 Detailed Description

Types and prototypes for loading/reloading configuration using JSON.

Include this file in your application for JSON configuration capabilities.

## 10.11 wolfSentry\_json.h

[Go to the documentation of this file.](#)

```

00001 /*
00002  * wolfSentry_json.h
00003  *
00004  * Copyright (C) 2021-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00029 #ifndef WOLFSENTRY_JSON_H
00030 #define WOLFSENTRY_JSON_H
00031
00032 #include "wolfSentry.h"
00033
00034 #ifndef WOLFSENTRY
00035 #define WOLFSENTRY
00036 #endif
00037 #include "centijson_sax.h"
00038
00043 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_centijson_errcode_translate(wolfSentry_errcode_t
centijson_errcode);
00046 #ifndef WOLFSENTRY_MAX_JSON_NESTING
00047 #define WOLFSENTRY_MAX_JSON_NESTING 16
00048 #endif
00050
00051 typedef uint32_t wolfSentry_config_load_flags_t;
00052 enum wolfSentry_config_load_flags {
00053     WOLFSENTRY_CONFIG_LOAD_FLAG_NONE = 0U,
00054     WOLFSENTRY_CONFIG_LOAD_FLAG_NO_FLUSH = 1U << 0U,
00055     WOLFSENTRY_CONFIG_LOAD_FLAG_DRY_RUN = 1U << 1U,
00056     WOLFSENTRY_CONFIG_LOAD_FLAG_LOAD_THEN_COMMIT = 1U << 2U,
00057     WOLFSENTRY_CONFIG_LOAD_FLAG_NO_ROUTES_OR_EVENTS = 1U << 3U,
00058     WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_ABORT = 1U << 4U,
00059     WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USEFIRST = 1U << 5U,
00060     WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_DUPKEY_USELAST = 1U << 6U,
00061     WOLFSENTRY_CONFIG_LOAD_FLAG_JSON_DOM_MAINTAININDICTORDER = 1U << 7U,
00062     WOLFSENTRY_CONFIG_LOAD_FLAG_FLUSH_ONLY_ROUTES = 1U << 8U,
00063     WOLFSENTRY_CONFIG_LOAD_FLAG_FINI = 1U << 30U
00064 };
00065
00066 struct wolfSentry_json_process_state;
00067
00068 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_config_json_init(
00069     WOLFSENTRY_CONTEXT_ARGS_IN,
00070     wolfSentry_config_load_flags_t load_flags,
00071     struct wolfSentry_json_process_state **jps);
00072 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_config_json_init_ex(
00073     WOLFSENTRY_CONTEXT_ARGS_IN,
00074     wolfSentry_config_load_flags_t load_flags,
00075     const JSON_CONFIG *json_config,
00076     struct wolfSentry_json_process_state **jps);
00077 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_config_json_feed(
00078     struct wolfSentry_json_process_state *jps,
00079     const unsigned char *json_in,
00080     size_t json_in_len,
00081     char *err_buf,
00082     size_t err_buf_size);
00083 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_config_centijson_errcode(struct
wolfSentry_json_process_state *jps, int *json_errcode, const char **json_errmsg);
00084 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_config_json_fini(
00085     struct wolfSentry_json_process_state **jps,
00086     char *err_buf,
00087     size_t err_buf_size);
00088 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_config_json_oneshot(
00089     WOLFSENTRY_CONTEXT_ARGS_IN,
00090     const unsigned char *json_in,
00091     size_t json_in_len,
00092     wolfSentry_config_load_flags_t load_flags,
00093     char *err_buf,

```

```

00118     size_t err_buf_size);
00121 WOLFSENTRY_API wolfsentry_errcode_t wolfsentry_config_json_one_shot_ex(
00122     WOLFSENTRY_CONTEXT_ARGS_IN,
00123     const unsigned char *json_in,
00124     size_t json_in_len,
00125     wolfsentry_config_load_flags_t load_flags,
00126     const JSON_CONFIG *json_config,
00127     char *err_buf,
00128     size_t err_buf_size);
00133 #endif /* WOLFSENTRY_JSON_H */

```

## 10.12 wolfsentry/wolfsentry\_lwip.h File Reference

Prototypes for lwIP callback installation functions, for use in lwIP applications.

```

#include "lwip/init.h"
#include "lwip/filter.h"

```

### Functions

- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_install\\_lwip\\_filter\\_ethernet\\_callback](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) ethernet\_mask)  
*Install wolfSentry callbacks into lwIP for ethernet (layer 2) filtering.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_install\\_lwip\\_filter\\_ip\\_callbacks](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) ip\_mask)  
*Install wolfSentry callbacks into lwIP for IPv4/IPv6 (layer 3) filtering.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_install\\_lwip\\_filter\\_icmp\\_callbacks](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) icmp\_mask)  
*Install wolfSentry callbacks into lwIP for ICMP filtering.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_install\\_lwip\\_filter\\_tcp\\_callback](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) tcp\_mask)  
*Install wolfSentry callbacks into lwIP for TCP (layer 4) filtering.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_install\\_lwip\\_filter\\_udp\\_callback](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) udp\_mask)  
*Install wolfSentry callbacks into lwIP for UDP (layer 4) filtering.*
- WOLFSENTRY\_API [wolfsentry\\_errcode\\_t](#) [wolfsentry\\_install\\_lwip\\_filter\\_callbacks](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), [packet\\_filter\\_event\\_mask\\_t](#) ethernet\_mask, [packet\\_filter\\_event\\_mask\\_t](#) ip\_mask, [packet\\_filter\\_event\\_mask\\_t](#) icmp\_mask, [packet\\_filter\\_event\\_mask\\_t](#) tcp\_mask, [packet\\_filter\\_event\\_mask\\_t](#) udp\_mask)  
*Install wolfSentry callbacks for all layers/protocols enabled by the supplied masks.*
- [WOLFSENTRY\\_API\\_VOID](#) [wolfsentry\\_cleanup\\_lwip\\_filter\\_callbacks](#) ([WOLFSENTRY\\_CONTEXT\\_ARGS\\_IN](#), void \*arg)  
*Disables any wolfSentry callbacks previously installed in lwIP.*

### 10.12.1 Detailed Description

Prototypes for lwIP callback installation functions, for use in lwIP applications.

[packet\\_filter\\_event\\_mask\\_t](#) is passed to lwIP via the callback installation routines, to designate which events are of interest. It is set to a bitwise-OR of values from [packet\\_filter\\_event\\_t](#), defined in `src/include/lwip/filter.h` in the lwIP source tree after applying `lwip/LWIP_PACKET_FILTER_API.patch`. The values are:

FILT\_BINDING – Call into wolfSentry (filter) on binding events  
 FILT\_DISSOCIATE – Call into wolfSentry on socket dissociation events  
 FILT\_LISTENING – Call into wolfSentry at initiation of socket listening  
 FILT\_STOP\_LISTENING – Call into wolfSentry when listening is shut down  
 FILT\_CONNECTING – Call into wolfSentry (filter) when connecting out  
 FILT\_ACCEPTING – Call into wolfSentry (filter) when accepting an inbound connection  
 FILT\_CLOSED – Call into wolfSentry when socket is closed  
 FILT\_REMOTE\_RESET – Call into wolfSentry when a connection was reset by the remote peer  
 FILT\_RECEIVING – Call into wolfSentry (filter) for each regular inbound packet of data  
 FILT\_SENDING – Call into wolfSentry (filter) for each regular outbound packet of data  
 FILT\_ADDR\_UNREACHABLE – Call into wolfSentry when inbound traffic attempts to reach an unknown address  
 FILT\_PORT\_UNREACHABLE – Call into wolfSentry when inbound traffic attempts to reach an unlisted/unbound port  
 FILT\_INBOUND\_ERR – Call into wolfSentry when inbound traffic results in detection of an error by lwIP  
 FILT\_OUTBOUND\_ERR – Call into wolfSentry when outbound traffic results in detection of an error by lwIP

## 10.13 wolfSentry\_lwip.h

[Go to the documentation of this file.](#)

```

00001 /*
00002  * wolfSentry/wolfSentry_lwip.h
00003  *
00004  * Copyright (C) 2021-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00044 #ifndef WOLFSENTRY_LWIP_H
00045 #define WOLFSENTRY_LWIP_H
00046
00051 #include "lwip/init.h"
00052
00053 #if LWIP_PACKET_FILTER_API
00054
00055 #include "lwip/filter.h"
00056
00057 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_install_lwip_filter_ethernet_callback(
00058     WOLFSENTRY_CONTEXT_ARGS_IN,
00059     packet_filter_event_mask_t ethernet_mask);
00062 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_install_lwip_filter_ip_callbacks(
00063     WOLFSENTRY_CONTEXT_ARGS_IN,
00064     packet_filter_event_mask_t ip_mask);
00067 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_install_lwip_filter_icmp_callbacks(
00068     WOLFSENTRY_CONTEXT_ARGS_IN,
00069     packet_filter_event_mask_t icmp_mask);
00072 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_install_lwip_filter_tcp_callback(
00073     WOLFSENTRY_CONTEXT_ARGS_IN,
00074     packet_filter_event_mask_t tcp_mask);
00077 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_install_lwip_filter_udp_callback(
00078     WOLFSENTRY_CONTEXT_ARGS_IN,
00079     packet_filter_event_mask_t udp_mask);
00082 WOLFSENTRY_API wolfSentry_errcode_t wolfSentry_install_lwip_filter_callbacks(
00083     WOLFSENTRY_CONTEXT_ARGS_IN,
00084     packet_filter_event_mask_t ethernet_mask,
00085     packet_filter_event_mask_t ip_mask,
00086     packet_filter_event_mask_t icmp_mask,
00087     packet_filter_event_mask_t tcp_mask,
00088     packet_filter_event_mask_t udp_mask);
00091 WOLFSENTRY_API_VOID wolfSentry_cleanup_lwip_filter_callbacks(

```

```

00092     WOLFSENTRY_CONTEXT_ARGS_IN,
00093     void *arg);
00096 #endif /* LWIP_PACKET_FILTER_API */
00097
00100 #endif /* WOLFSENTRY_LWIP_H */

```

## 10.14 wolfentry/wolfentry\_settings.h File Reference

Target- and config-specific settings and abstractions for wolfSentry.

```

#include <wolfentry/wolfentry_options.h>
#include <inttypes.h>
#include <stdint.h>
#include <stddef.h>
#include <assert.h>
#include <stdio.h>
#include <string.h>
#include <strings.h>
#include <time.h>

```

### Data Structures

- struct [wolfentry\\_thread\\_context\\_public](#)  
*Right-sized, right-aligned opaque container for thread state.*
- struct [wolfentry\\_build\\_settings](#)  
*struct for passing the build version and configuration*

### Macros

- **#define WOLFSENTRY\_USER\_SETTINGS\_FILE** "the\_path"  
*Define to the path of a user settings file to be included, containing extra and override definitions and directives. Can be an absolute or a relative path, subject to a -I path supplied to make using EXTRA\_CFLAGS. Include quotes or <> around the path.*
- **#define WOLFSENTRY\_NO\_ALLOCA**  
*Build flag to use only implementations that avoid alloca().*
- **#define WOLFSENTRY\_C89**  
*Build flag to use only constructs that are pedantically legal in C89.*
- **#define \_\_attribute\_maybe\_unused\_\_**  
*Attribute abstraction to mark a function or variable (typically a static) as possibly unused.*
- **#define DO\_NOTHING**  
*Statement-type abstracted construct that executes no code.*
- **#define WOLFSENTRY\_NO\_INTTYPES\_H**  
*Define to inhibit inclusion of inttypes.h (alternative typedefs or include must be supplied with [WOLFSENTRY\\_USER\\_SETTINGS\\_FILE](#)).*
- **#define WOLFSENTRY\_NO\_STDINT\_H**  
*Define to inhibit inclusion of stdint.h (alternative typedefs or include must be supplied with [WOLFSENTRY\\_USER\\_SETTINGS\\_FILE](#)).*
- **#define WOLFSENTRY\_PRINTF\_ERR(...)**  
*printf-like macro, expecting a format as first arg, used for rendering warning and error messages. Can be overridden in [WOLFSENTRY\\_USER\\_SETTINGS\\_FILE](#).*
- **#define WOLFSENTRY\_SINGLETHREADED**

Define to disable all thread handling and safety in wolfSentry.

- **#define WOLFSENTRY\_USE\_NONPOSIX\_SEMAPHORES**  
 Define if POSIX semaphore API is not available. If no non-POSIX builtin implementation is present in `wolfSentry_util.c`, then `WOLFSENTRY_NO_SEM_BUILTIN` must be set, and the `wolfSentry_host_platform_interface` supplied to wolfSentry APIs must include a full semaphore implementation (shim set) in its `wolfSentry_semcbcs` slot.
- **#define WOLFSENTRY\_USE\_NONPOSIX\_THREADS**  
 Define if POSIX thread API is not available. `WOLFSENTRY_THREAD_INCLUDE`, `WOLFSENTRY_THREAD_ID_T`, and `WOLFSENTRY_THREAD_GET_ID_HANDLER` will need to be supplied in `WOLFSENTRY_USER_SETTINGS_FILE`.
- **#define WOLFSENTRY\_NO\_GNU\_ATOMICS**  
 Define if gnu-style atomic intrinsics are not available. `WOLFSENTRY_ATOMIC_*()` macro definitions for intrinsics will need to be supplied in `WOLFSENTRY_USER_SETTINGS_FILE` (see `wolfSentry_util.h`).
- **#define WOLFSENTRY\_NO\_CLOCK\_BUILTIN**  
 If defined, omit built-in time primitives; the `wolfSentry_host_platform_interface` supplied to wolfSentry APIs must include implementations of all functions in `wolfSentry_timecbcs`.
- **#define WOLFSENTRY\_NO\_SEM\_BUILTIN**  
 If defined, omit built-in semaphore primitives; the `wolfSentry_host_platform_interface` supplied to wolfSentry APIs must include implementations of all functions in `wolfSentry_semcbcs`.
- **#define WOLFSENTRY\_NO\_MALLOC\_BUILTIN**  
 If defined, omit built-in heap allocator primitives; the `wolfSentry_host_platform_interface` supplied to wolfSentry APIs must include implementations of all functions in `wolfSentry_allocator`.
- **#define WOLFSENTRY\_NO\_ERROR\_STRINGS**  
 If defined, omit APIs for rendering error codes and source code files in human readable form. They will be rendered numerically.
- **#define WOLFSENTRY\_NO\_PROTOCOL\_NAMES**  
 If defined, omit APIs for rendering error codes and source code files in human readable form. They will be rendered numerically.
- **#define WOLFSENTRY\_NO\_ADDR\_BITMASK\_MATCHING**  
 If defined, omit support for bitmask matching of addresses, and support only prefix matching.
- **#define WOLFSENTRY\_NO\_IPV6**  
 If defined, omit support for IPv6.
- **#define WOLFSENTRY\_MAX\_BITMASK\_MATCHED\_AFS**  
 The maximum number of distinct address families that can use bitmask matching in routes. Default value is 4.
- **#define WOLFSENTRY\_NO\_GETPROTOBY**  
 Define this to gate out calls to `getprotobyname_r()` and `getservbyname_r()`, necessitating numeric identification of protocols (e.g. 6 for TCP) and services (e.g. 25 for SMTP) in configuration JSON documents.
- **#define WOLFSENTRY\_NO\_POSIX\_MEMALIGN**  
 Define if `posix_memalign()` is not available.
- **#define WOLFSENTRY\_FLEXIBLE\_ARRAY\_SIZE**  
 Value appropriate as a size for an array that will be allocated to a variable size. Built-in value usually works.
- **#define SIZET\_FMT**  
 printf-style format string appropriate for pairing with `size_t`
- **#define WOLFSENTRY\_ENT\_ID\_FMT**  
 printf-style format string appropriate for pairing with `wolfSentry_ent_id_t`
- **#define WOLFSENTRY\_ENT\_ID\_NONE**  
 always-invalid object ID
- **#define WOLFSENTRY\_HITCOUNT\_FMT**  
 printf-style format string appropriate for pairing with `wolfSentry_hitcount_t`
- **#define \_\_wolfSentry\_wur**  
 abstracted attribute designating that the return value must be checked to avoid a compiler warning
- **#define wolfSentry\_static\_assert(c)**  
 abstracted static assert – `c` must be true, else `c` is printed
- **#define wolfSentry\_static\_assert2(c, m)**  
 abstracted static assert – `c` must be true, else `m` is printed



- **#define WOLFSENTRY\_DEADLINE\_NEVER (-1)**  
*Value returned in `deadline->tv_sec` and `deadline->tv_nsec` by `wolfentry_get_thread_deadline()` when thread has no deadline set. Not allowed as explicit values passed to `wolfentry_set_deadline_abs()` – use `wolfentry_clear_deadline()` to clear any deadline. Can be overridden with user settings.*
- **#define WOLFSENTRY\_DEADLINE\_NOW (-2)**  
*Value returned in `deadline->tv_sec` and `deadline->tv_nsec` by `wolfentry_get_thread_deadline()` when thread is in non-blocking mode. Not allowed as explicit values passed to `wolfentry_set_deadline_abs()` – use `wolfentry_set_deadline_rel_usecs(WOLFSENTRY_CONTEXT_ARGS_OUT, 0)` to put thread in non-blocking mode. Can be overridden with user settings.*
- **#define WOLFSENTRY\_SEMAPHORE\_INCLUDE "the\_path"**  
*Define to the path of a header file declaring a semaphore API. Can be an absolute or a relative path, subject to a `-I` path supplied to `make` using `EXTRA_CFLAGS`. Include quotes or `<>` around the path.*
- **#define WOLFSENTRY\_THREAD\_INCLUDE "the\_path"**  
*Define to the path of a header file declaring a threading API. Can be an absolute or a relative path, subject to a `-I` path supplied to `make` using `EXTRA_CFLAGS`. Include quotes or `<>` around the path.*
- **#define WOLFSENTRY\_THREAD\_ID\_T thread\_id\_type**  
*Define to the appropriate type analogous to POSIX `pthread_t`.*
- **#define WOLFSENTRY\_THREAD\_GET\_ID\_HANDLER pthread\_self\_ish\_function**  
*Define to the name of a void function analogous to POSIX `pthread_self`, returning a value of type `WOLFSENTRY_THREAD_ID_T`.*
- **#define WOLFSENTRY\_THREAD\_NO\_ID 0**
- **#define WOLFSENTRY\_THREAD\_CONTEXT\_PUBLIC\_INITIALIZER {0}**
- **#define WOLFSENTRY\_API\_VOID**  
*Function attribute for declaring/defining public void API functions.*
- **#define WOLFSENTRY\_API**  
*Function attribute for declaring/defining public API functions with return values.*
- **#define WOLFSENTRY\_LOCAL\_VOID**  
*Function attribute for declaring/defining private void functions.*
- **#define WOLFSENTRY\_LOCAL**  
*Function attribute for declaring/defining private functions with return values.*
- **#define WOLFSENTRY\_MAX\_ADDR\_BYTES 16**  
*The maximum size allowed for an address, in bytes. Can be overridden. Note that support for bitmask matching for an address family depends on `WOLFSENTRY_MAX_ADDR_BYTES` at least twice the max size of a bare address in that family, as the address and mask are internally stored as a single double-length byte vector. Note also that `WOLFSENTRY_MAX_ADDR_BYTES` entails proportional overhead if wolfSentry is built `WOLFSENTRY_NO_ALLOCA` or `WOLFSENTRY_C89`.*
- **#define WOLFSENTRY\_MAX\_ADDR\_BITS (WOLFSENTRY\_MAX\_ADDR\_BYTES\*8)**  
*The maximum size allowed for an address, in bits. Can be overridden.*
- **#define WOLFSENTRY\_MAX\_LABEL\_BYTES 32**  
*The maximum size allowed for a label, in bytes. Can be overridden.*
- **#define WOLFSENTRY\_BUILTIN\_LABEL\_PREFIX "%"**  
*The prefix string reserved for use in names of built-in actions and events.*
- **#define WOLFSENTRY\_KV\_MAX\_VALUE\_BYTES 16384**  
*The maximum size allowed for scalar user-defined values. Can be overridden.*
- **#define WOLFSENTRY\_CONFIG\_SIGNATURE**  
*Macro to use as the initializer for `wolfentry_build_settings.config` and `wolfentry_host_platform_interface.caller_build_settings`.*

## Typedefs

- **typedef unsigned char byte**  
*8 bits unsigned*
- **typedef uint16\_t wolfentry\_addr\_family\_t**  
*integer type for holding address family number*



- `typedef uint16_t wolfentry_proto_t`  
*integer type for holding protocol number*
- `typedef uint16_t wolfentry_port_t`  
*integer type for holding port number*
- `typedef uint32_t wolfentry_ent_id_t`  
*integer type for holding table entry ID*
- `typedef uint16_t wolfentry_addr_bits_t`  
*integer type for address prefix lengths (in bits)*
- `typedef uint32_t wolfentry_hitcount_t`  
*integer type for holding hit count statistics*
- `typedef int64_t wolfentry_time_t`  
*integer type for holding absolute and relative times, using microseconds in built-in implementations.*
- `typedef uint16_t wolfentry_priority_t`  
*integer type for holding event priority (smaller number is higher priority)*

### 10.14.1 Detailed Description

Target- and config-specific settings and abstractions for wolfSentry.

This file is included by [wolfentry.h](#).

## 10.15 wolfentry\_settings.h

[Go to the documentation of this file.](#)

```

00001 /*
00002  * wolfentry_settings.h
00003  *
00004  * Copyright (C) 2022-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00029 #ifndef WOLFSENTRY_SETTINGS_H
00030 #define WOLFSENTRY_SETTINGS_H
00031
00035 #ifdef WOLFSENTRY_FOR_DOXYGEN
00036 #define WOLFSENTRY_USER_SETTINGS_FILE "the_path"
00038 #undef WOLFSENTRY_USER_SETTINGS_FILE
00039 #endif
00040
00041 #ifdef WOLFSENTRY_USER_SETTINGS_FILE
00042     #include WOLFSENTRY_USER_SETTINGS_FILE
00043 #endif
00044
00045 #if !defined(BUILDING_LIBWOLFSENTRY) && !defined(WOLFSENTRY_USER_SETTINGS_FILE)
00046     #include <wolfentry/wolfentry_options.h>
00047 #endif
00048
00055 #ifdef WOLFSENTRY_FOR_DOXYGEN
00056 #define WOLFSENTRY_NO_ALLOCA
00057 #undef WOLFSENTRY_NO_ALLOCA
00058 #define WOLFSENTRY_C89

```

```

00059 #undef WOLFSENTRY_C89
00060 #endif
00061
00062 #ifdef WOLFSENTRY_C89
00063     #define WOLFSENTRY_NO_INLINE
00064     #ifndef WOLFSENTRY_NO_POSIX_MEMALIGN
00065         #define WOLFSENTRY_NO_POSIX_MEMALIGN
00066     #endif
00067     #define WOLFSENTRY_NO_DESIGNATED_INITIALIZERS
00068     #define WOLFSENTRY_NO_LONG_LONG
00069     #if !defined(WOLFSENTRY_USE_NONPOSIX_SEMAPHORES) && !defined(WOLFSENTRY_SINGLETHREADED)
00070         /* sem_timedwait() was added in POSIX 200112L */
00071         #define WOLFSENTRY_SINGLETHREADED
00072     #endif
00073 #endif
00074
00075 #ifndef __attribute_maybe_unused__
00076 #if defined(__GNUC__)
00077 #define __attribute_maybe_unused__ __attribute__((unused))
00078 #else
00079 #define __attribute_maybe_unused__
00080 #endif
00081 #endif
00082 #endif
00083
00084 #ifdef WOLFSENTRY_NO_INLINE
00086 #define inline __attribute_maybe_unused__
00088 #endif
00089
00090 #ifndef DO_NOTHING
00091 #define DO_NOTHING do {} while (0)
00093 #endif
00094
00097 #ifdef FREERTOS
00098     #include <FreeRTOS.h>
00099     #define WOLFSENTRY_CALL_DEPTH_RETURNS_STRING
00100     #if !defined(WOLFSENTRY_NO_STDIO_STREAMS) && !defined(WOLFSENTRY_PRINTF_ERR)
00101         #define WOLFSENTRY_PRINTF_ERR(...) printf(__VA_ARGS__)
00102     #endif
00103
00104     #define FREERTOS_NANOSECONDS_PER_SECOND 1000000000L
00105     #define FREERTOS_NANOSECONDS_PER_TICK (FREERTOS_NANOSECONDS_PER_SECOND / configTICK_RATE_HZ)
00106
00107     #if !defined(SIZE_T_32) && !defined(SIZE_T_64)
00108         /* size_t is "unsigned int" in STM32 FreeRTOS */
00109         #define SIZE_T_32
00110     #endif
00111 #endif
00112
00117 #ifdef WOLFSENTRY_FOR_DOXYGEN
00118 #define WOLFSENTRY_NO_INTTYPES_H
00120 #undef WOLFSENTRY_NO_INTTYPES_H
00121 #endif
00122 #ifndef WOLFSENTRY_NO_INTTYPES_H
00123 #include <inttypes.h>
00124 #endif
00125 #ifdef WOLFSENTRY_FOR_DOXYGEN
00126 #define WOLFSENTRY_NO_STDINT_H
00128 #undef WOLFSENTRY_NO_STDINT_H
00129 #endif
00130 #ifndef WOLFSENTRY_NO_STDINT_H
00131 #include <stdint.h>
00132 #endif
00133
00136 #if !defined(SIZE_T_32) && !defined(SIZE_T_64)
00137     #if defined(__WORDSIZE) && (__WORDSIZE == 64)
00138         #define SIZE_T_64
00139     #elif defined(INTPTR_MAX) && defined(INT64_MAX) && (INTPTR_MAX == INT64_MAX)
00140         #define SIZE_T_64
00141     #elif defined(__WORDSIZE) && (__WORDSIZE == 32)
00142         #define SIZE_T_32
00143     #elif defined(INTPTR_MAX) && defined(INT32_MAX) && (INTPTR_MAX == INT32_MAX)
00144         #define SIZE_T_32
00145     #else
00146         #error "must define SIZE_T_32 or SIZE_T_64 with user settings."
00147     #endif
00148 #elif defined(SIZE_T_32) && defined(SIZE_T_64)
00149     #error "must define SIZE_T_32 xor SIZE_T_64."
00150 #endif
00151
00156 #if !defined(WOLFSENTRY_NO_STDIO_STREAMS) && !defined(WOLFSENTRY_PRINTF_ERR)
00157     #define WOLFSENTRY_PRINTF_ERR(...) fprintf(stderr, __VA_ARGS__)
00159 #endif
00160
00167 #ifdef WOLFSENTRY_FOR_DOXYGEN
00168 #define WOLFSENTRY_SINGLETHREADED
00170 #undef WOLFSENTRY_SINGLETHREADED
00171 #endif

```

```
00172
00173 #ifndef WOLFSENTRY_SINGLETHREADED
00174
00176 #define WOLFSENTRY_THREADSAFE
00179 #ifdef WOLFSENTRY_FOR_DOXYGEN
00180
00181 #define WOLFSENTRY_USE_NONPOSIX_SEMAPHORES
00183 #undef WOLFSENTRY_USE_NONPOSIX_SEMAPHORES
00184
00185 #define WOLFSENTRY_USE_NONPOSIX_THREADS
00187 #undef WOLFSENTRY_USE_NONPOSIX_THREADS
00188
00189 #define WOLFSENTRY_NO_GNU_ATOMICS
00191 #undef WOLFSENTRY_NO_GNU_ATOMICS
00192
00193 #endif
00194
00195 #ifndef WOLFSENTRY_USE_NONPOSIX_SEMAPHORES
00196     #if defined(__MACH__) || defined(FREERTOS) || defined(_WIN32)
00197         #define WOLFSENTRY_USE_NONPOSIX_SEMAPHORES
00198     #endif
00199 #endif
00200
00201 #ifndef WOLFSENTRY_USE_NONPOSIX_THREADS
00202     #if defined(FREERTOS) || defined(_WIN32)
00203         #define WOLFSENTRY_USE_NONPOSIX_THREADS
00204     #endif
00205 #endif
00206
00209 #ifndef WOLFSENTRY_USE_NONPOSIX_SEMAPHORES
00210     #define WOLFSENTRY_USE_NATIVE_POSIX_SEMAPHORES
00211 #endif
00212
00213 #ifndef WOLFSENTRY_USE_NONPOSIX_THREADS
00214     #define WOLFSENTRY_USE_NATIVE_POSIX_THREADS
00215 #endif
00216
00217 #ifndef WOLFSENTRY_NO_GNU_ATOMICS
00218     #define WOLFSENTRY_HAVE_GNU_ATOMICS
00219 #endif
00220
00223 #endif /* !WOLFSENTRY_SINGLETHREADED */
00224
00225 #ifdef WOLFSENTRY_FOR_DOXYGEN
00226
00227 #define WOLFSENTRY_NO_CLOCK_BUILTIN
00229 #undef WOLFSENTRY_NO_CLOCK_BUILTIN
00230
00231 #define WOLFSENTRY_NO_SEM_BUILTIN
00233 #undef WOLFSENTRY_NO_SEM_BUILTIN
00234
00235 #define WOLFSENTRY_NO_MALLOC_BUILTIN
00237 #undef WOLFSENTRY_NO_MALLOC_BUILTIN
00238
00239 #define WOLFSENTRY_NO_ERROR_STRINGS
00241 #undef WOLFSENTRY_NO_ERROR_STRINGS
00242
00243 #define WOLFSENTRY_NO_PROTOCOL_NAMES
00245 #undef WOLFSENTRY_NO_PROTOCOL_NAMES
00246
00247 #define WOLFSENTRY_NO_ADDR_BITMASK_MATCHING
00249 #undef WOLFSENTRY_NO_ADDR_BITMASK_MATCHING
00250
00251 #define WOLFSENTRY_NO_IPV6
00253 #undef WOLFSENTRY_NO_IPV6
00254
00255 #endif /* WOLFSENTRY_FOR_DOXYGEN */
00256
00257 #ifndef WOLFSENTRY_MAX_BITMASK_MATCHED_AFS
00258     #define WOLFSENTRY_MAX_BITMASK_MATCHED_AFS 4
00260 #endif
00261
00264 #ifndef WOLFSENTRY_NO_CLOCK_BUILTIN
00265     #define WOLFSENTRY_CLOCK_BUILTINS
00266 #endif
00267
00268 #ifndef WOLFSENTRY_NO_MALLOC_BUILTIN
00269     #define WOLFSENTRY_MALLOC_BUILTINS
00270 #endif
00271
00272 #ifndef WOLFSENTRY_NO_SEM_BUILTIN
00273     #define WOLFSENTRY_SEM_BUILTINS
00274 #endif
00275
00276 #ifndef WOLFSENTRY_NO_ERROR_STRINGS
00277     #define WOLFSENTRY_ERROR_STRINGS
00278 #endif
```

```

00279
00280 #ifndef WOLFSENTRY_NO_PROTOCOL_NAMES
00281     #define WOLFSENTRY_PROTOCOL_NAMES
00282 #endif
00283
00284 #ifndef WOLFSENTRY_NO_JSON_DOM
00285     #define WOLFSENTRY_HAVE_JSON_DOM
00286 #endif
00287
00288 #ifndef WOLFSENTRY_NO_ADDR_BITMASK_MATCHING
00289     #define WOLFSENTRY_ADDR_BITMASK_MATCHING
00290 #endif
00291
00292 #ifndef WOLFSENTRY_NO_IPV6
00293     #define WOLFSENTRY_IPV6
00294 #endif
00295
00298 #if !defined(WOLFSENTRY_NO_GETPROTOBY) && (!defined(__GLIBC__) || !defined(__USE_MISC) ||
defined(WOLFSENTRY_C89))
00299     /* get*by*_r() is non-standard. */
00300     #define WOLFSENTRY_NO_GETPROTOBY
00302 #endif
00303
00310 #if defined(WOLFSENTRY_USE_NATIVE_POSIX_SEMAPHORES) || defined(WOLFSENTRY_CLOCK_BUILTINS) ||
defined(WOLFSENTRY_MALLOC_BUILTINS)
00311 #ifndef _XOPEN_SOURCE
00312     #if __STDC_VERSION__ >= 201112L
00313     #define _XOPEN_SOURCE 700
00314     #elif __STDC_VERSION__ >= 199901L
00315     #define _XOPEN_SOURCE 600
00316     #else
00317     #define _XOPEN_SOURCE 500
00318     #endif /* __STDC_VERSION__ */
00319 #endif
00320 #endif
00321
00322 #if !defined(WOLFSENTRY_NO_POSIX_MEMALIGN) && (!defined(_POSIX_C_SOURCE) || (_POSIX_C_SOURCE <
200112L))
00323     #define WOLFSENTRY_NO_POSIX_MEMALIGN
00325 #endif
00326
00327 #if defined(__STRICT_ANSI__)
00328 #define WOLFSENTRY_FLEXIBLE_ARRAY_SIZE 1
00329 #elif defined(__GNUC__) && !defined(__clang__)
00330 #define WOLFSENTRY_FLEXIBLE_ARRAY_SIZE
00332 #else
00333 #define WOLFSENTRY_FLEXIBLE_ARRAY_SIZE 0
00334 #endif
00335
00338 #ifndef WOLFSENTRY_NO_TIME_H
00339 #ifndef __USE_POSIX199309
00340 /* glibc needs this for struct timespec with -std=c99 */
00341 #define __USE_POSIX199309
00342 #endif
00343 #endif
00344
00347 #ifdef SIZE_T_32
00348     #define SIZET_FMT "%u"
00349 #elif __STDC_VERSION__ >= 199901L
00350     #define SIZET_FMT "%zu"
00351 #else
00352     #define SIZET_FMT "%lu"
00354 #endif
00355
00356 #ifndef WOLFSENTRY_NO_STDDEF_H
00357 #include <stddef.h>
00358 #endif
00359 #ifndef WOLFSENTRY_NO_ASSERT_H
00360 #include <assert.h>
00361 #endif
00362 #ifndef WOLFSENTRY_NO_STDIO_H
00363 #ifndef __USE_ISOC99
00364 /* kludge to make glibc snprintf() prototype visible even when -std=c89 */
00366 #define __USE_ISOC99
00368 #include <stdio.h>
00369 #undef __USE_ISOC99
00370 #else
00371 #include <stdio.h>
00372 #endif
00373 #endif
00374 #ifndef WOLFSENTRY_NO_STRING_H
00375 #include <string.h>
00376 #endif
00377 #ifndef WOLFSENTRY_NO_STRINGS_H
00378 #include <strings.h>
00379 #endif
00380 #ifndef WOLFSENTRY_NO_TIME_H

```

```

00381 #include <time.h>
00382 #endif
00383
00384 typedef unsigned char byte;
00387 typedef uint16_t wolfsentry_addr_family_t;
00390 typedef uint16_t wolfsentry_proto_t;
00392 typedef uint16_t wolfsentry_port_t;
00394 #ifdef WOLFSENTRY_ENT_ID_TYPE
00395 typedef WOLFSENTRY_ENT_ID_TYPE wolfsentry_ent_id_t;
00396 #else
00397 typedef uint32_t wolfsentry_ent_id_t;
00399 #define WOLFSENTRY_ENT_ID_FMT "%u"
00401 #endif
00402 #define WOLFSENTRY_ENT_ID_NONE 0
00404 typedef uint16_t wolfsentry_addr_bits_t;
00406 #ifdef WOLFSENTRY_HITCOUNT_TYPE
00407 typedef WOLFSENTRY_HITCOUNT_TYPE wolfsentry_hitcount_t;
00408 #else
00409 typedef uint32_t wolfsentry_hitcount_t;
00411 #define WOLFSENTRY_HITCOUNT_FMT "%u"
00413 #endif
00414 #ifdef WOLFSENTRY_TIME_TYPE
00415 typedef WOLFSENTRY_TIME_TYPE wolfsentry_time_t;
00416 #else
00417 typedef int64_t wolfsentry_time_t;
00419 #endif
00420
00421 #ifdef WOLFSENTRY_PRIORITY_TYPE
00422 typedef WOLFSENTRY_PRIORITY_TYPE wolfsentry_priority_t;
00423 #else
00424 typedef uint16_t wolfsentry_priority_t;
00426 #endif
00427
00428 #ifndef attr_align_to
00429 #ifdef __GNUC__
00430 #define attr_align_to(x) __attribute__((aligned(x)))
00431 #elif defined(_MSC_VER)
00432 /* disable align warning, we want alignment ! */
00433 #pragma warning(disable: 4324)
00434 #define attr_align_to(x) __declspec(align(x))
00435 #else
00436 #error must supply definition for attr_align_to() macro.
00437 #endif
00438 #endif
00439
00440 #ifndef __wolfsentry_wur
00441 #ifdef __wur
00442 #define __wolfsentry_wur __wur
00443 #elif defined(__must_check)
00444 #define __wolfsentry_wur __must_check
00445 #elif defined(__GNUC__) && (__GNUC__ >= 4)
00446 #define __wolfsentry_wur __attribute__((warn_unused_result))
00448 #else
00449 #define __wolfsentry_wur
00450 #endif
00451 #endif
00452
00453 #ifndef wolfsentry_static_assert
00454 #if defined(__GNUC__) && defined(static_assert) && !defined(__STRICT_ANSI__)
00455 /* note semicolon included in expansion, so that assert can completely disappear in ISO C builds. */
00456 #define wolfsentry_static_assert(c) static_assert(c, #c);
00457 #define wolfsentry_static_assert2(c, m) static_assert(c, m);
00458 #else
00459 #define wolfsentry_static_assert(c)
00461 #define wolfsentry_static_assert2(c, m)
00463 #endif
00464 #endif /* !wolfsentry_static_assert */
00465
00472 #if defined(WOLFSENTRY_THREADSAFE)
00473
00474 #ifndef WOLFSENTRY_DEADLINE_NEVER
00475 #define WOLFSENTRY_DEADLINE_NEVER (-1)
00477 #endif
00478 #ifndef WOLFSENTRY_DEADLINE_NOW
00479 #define WOLFSENTRY_DEADLINE_NOW (-2)
00481 #endif
00482
00483 #ifdef WOLFSENTRY_USE_NATIVE_POSIX_SEMAPHORES
00484
00485 #ifdef WOLFSENTRY_SEMAPHORE_INCLUDE
00486
00487 #include WOLFSENTRY_SEMAPHORE_INCLUDE
00488
00489 #else /* !WOLFSENTRY_SEMAPHORE_INCLUDE */
00490
00491 #ifndef __USE_XOPEN2K
00492 /* kludge to force glibc sem_timedwait() prototype visible with -std=c99 */

```

```

00493 #define __USE_XOPEN2K
00494 #include <semaphore.h>
00495 #undef __USE_XOPEN2K
00496 #else
00497 #include <semaphore.h>
00498 #endif
00499
00500 #endif /* !WOLFSENTRY_SEMAPHORE_INCLUDE */
00501
00502 #elif defined(__MACH__)
00503
00504 #include <dispatch/dispatch.h>
00505 #include <semaphore.h>
00506 #define sem_t dispatch_semaphore_t
00507
00508 #elif defined(FREERTOS)
00509
00510 #include <atomic.h>
00511
00512 #ifdef WOLFSENTRY_SEMAPHORE_INCLUDE
00513 #include WOLFSENTRY_SEMAPHORE_INCLUDE
00514 #else
00515 #include <semphr.h>
00516 #endif
00517
00518 #define SEM_VALUE_MAX      0x7FFFU
00519
00520 #define sem_t StaticSemaphore_t
00521
00522 #else
00523
00524 #ifdef WOLFSENTRY_FOR_DOXYGEN
00525 #define WOLFSENTRY_SEMAPHORE_INCLUDE "the_path"
00526 #undef WOLFSENTRY_SEMAPHORE_INCLUDE
00527 #define WOLFSENTRY_THREAD_INCLUDE "the_path"
00528 #undef WOLFSENTRY_THREAD_INCLUDE
00529 #define WOLFSENTRY_THREAD_ID_T thread_id_type
00530 #undef WOLFSENTRY_THREAD_ID_T
00531 #define WOLFSENTRY_THREAD_GET_ID_HANDLER pthread_self_ish_function
00532 #undef WOLFSENTRY_THREAD_GET_ID_HANDLER
00533 #endif
00534
00535 #ifdef WOLFSENTRY_SEMAPHORE_INCLUDE
00536 #include WOLFSENTRY_SEMAPHORE_INCLUDE
00537 #endif
00538
00539 #ifdef WOLFSENTRY_THREAD_INCLUDE
00540 #include WOLFSENTRY_THREAD_INCLUDE
00541 #elif defined(WOLFSENTRY_USE_NATIVE_POSIX_THREADS)
00542 #include <pthread.h>
00543 #endif
00544
00545 #ifdef WOLFSENTRY_THREAD_ID_T
00546 typedef WOLFSENTRY_THREAD_ID_T wolfsentry_thread_id_t;
00547 #elif defined(WOLFSENTRY_USE_NATIVE_POSIX_THREADS)
00548 typedef pthread_t wolfsentry_thread_id_t;
00549 #elif defined(FREERTOS)
00550 typedef TaskHandle_t wolfsentry_thread_id_t;
00551 #else
00552 #error Must supply WOLFSENTRY_THREAD_ID_T for WOLFSENTRY_THREADSAFE on non-POSIX targets.
00553 #endif
00554
00555 /* note WOLFSENTRY_THREAD_GET_ID_HANDLER must return WOLFSENTRY_THREAD_NO_ID on failure. */
00556 #ifdef WOLFSENTRY_THREAD_GET_ID_HANDLER
00557 #elif defined(WOLFSENTRY_USE_NATIVE_POSIX_THREADS)
00558 #define WOLFSENTRY_THREAD_GET_ID_HANDLER pthread_self
00559 #elif defined(FREERTOS)
00560 #define WOLFSENTRY_THREAD_GET_ID_HANDLER xTaskGetCurrentTaskHandle
00561 #else
00562 #error Must supply WOLFSENTRY_THREAD_GET_ID_HANDLER for WOLFSENTRY_THREADSAFE on non-POSIX
00563 targets.
00564 #endif
00565
00566 struct wolfsentry_thread_context;
00567
00568 /* WOLFSENTRY_THREAD_NO_ID must be zero. */
00569 #define WOLFSENTRY_THREAD_NO_ID 0
00570
00571 struct wolfsentry_thread_context_public {
00572     uint64_t opaque[8];
00573 };
00574
00575 #define WOLFSENTRY_THREAD_CONTEXT_PUBLIC_INITIALIZER {0}
00576 #endif
00577
00578 #ifdef BUILDING_LIBWOLFSENTRY
00579 #if defined(_MSC_VER) || defined(__MINGW32__) || defined(__CYGWIN__) || \

```

```

00604     defined(_WIN32_WCE)
00605     #if defined(WOLFSENTRY_DLL)
00606         #define WOLFSENTRY_API_BASE __declspec(dllexport)
00607     #else
00608         #define WOLFSENTRY_API_BASE
00609     #endif
00610     #define WOLFSENTRY_LOCAL_BASE
00611     #elif defined(HAVE_VISIBILITY) && HAVE_VISIBILITY
00612         #define WOLFSENTRY_API_BASE __attribute__((visibility("default")))
00613         #define WOLFSENTRY_LOCAL_BASE __attribute__((visibility("hidden")))
00614     #elif defined(__SUNPRO_C) && (__SUNPRO_C >= 0x550)
00615         #define WOLFSENTRY_API_BASE __global
00616         #define WOLFSENTRY_LOCAL_BASE __hidden
00617     #else
00618         #define WOLFSENTRY_API_BASE
00619         #define WOLFSENTRY_LOCAL_BASE
00620     #endif /* HAVE_VISIBILITY */
00621 #else /* !BUILDING_LIBWOLFSENTRY */
00622     #if defined(_MSC_VER) || defined(__MINGW32__) || defined(__CYGWIN__) || \
00623         defined(_WIN32_WCE)
00624         #if defined(WOLFSENTRY_DLL)
00625             #define WOLFSENTRY_API_BASE __declspec(dllexport)
00626         #else
00627             #define WOLFSENTRY_API_BASE
00628         #endif
00629         #define WOLFSENTRY_LOCAL_BASE
00630     #else
00631         #define WOLFSENTRY_API_BASE
00632         #define WOLFSENTRY_LOCAL_BASE
00633     #endif
00634 #endif /* !BUILDING_LIBWOLFSENTRY */
00635
00638 #define WOLFSENTRY_API_VOID WOLFSENTRY_API_BASE void
00640 #define WOLFSENTRY_API WOLFSENTRY_API_BASE __wolfentry_wur
00643 #define WOLFSENTRY_LOCAL_VOID WOLFSENTRY_LOCAL_BASE void
00645 #define WOLFSENTRY_LOCAL WOLFSENTRY_LOCAL_BASE __wolfentry_wur
00650 #ifndef WOLFSENTRY_NO_DESIGNATED_INITIALIZERS
00651 #define WOLFSENTRY_HAVE_DESIGNATED_INITIALIZERS
00652 #endif
00653
00654 #ifndef WOLFSENTRY_NO_LONG_LONG
00655 #define WOLFSENTRY_HAVE_LONG_LONG
00656 #endif
00657
00660 #ifndef WOLFSENTRY_MAX_ADDR_BYTES
00661 #define WOLFSENTRY_MAX_ADDR_BYTES 16
00663 #elif WOLFSENTRY_MAX_ADDR_BYTES * 8 > 0xffff
00664 #error WOLFSENTRY_MAX_ADDR_BYTES * 8 must fit in a uint16_t.
00665 #endif
00666
00667 #ifndef WOLFSENTRY_MAX_ADDR_BITS
00668 #define WOLFSENTRY_MAX_ADDR_BITS (WOLFSENTRY_MAX_ADDR_BYTES*8)
00670 #else
00671 #if WOLFSENTRY_MAX_ADDR_BITS > (WOLFSENTRY_MAX_ADDR_BYTES*8)
00672 #error WOLFSENTRY_MAX_ADDR_BITS is too large for given/default WOLFSENTRY_MAX_ADDR_BYTES
00673 #endif
00674 #endif
00675
00676 #ifndef WOLFSENTRY_MAX_LABEL_BYTES
00677 #define WOLFSENTRY_MAX_LABEL_BYTES 32
00679 #elif WOLFSENTRY_MAX_LABEL_BYTES > 0xff
00680 #error WOLFSENTRY_MAX_LABEL_BYTES must fit in a byte.
00681 #endif
00682
00683 #ifndef WOLFSENTRY_BUILTIN_LABEL_PREFIX
00684 #define WOLFSENTRY_BUILTIN_LABEL_PREFIX "%"
00686 #endif
00687
00688 #ifndef WOLFSENTRY_KV_MAX_VALUE_BYTES
00689 #define WOLFSENTRY_KV_MAX_VALUE_BYTES 16384
00691 #endif
00692
00693 #if defined(WOLFSENTRY_ENT_ID_TYPE) || \
00694     defined(WOLFSENTRY_HITCOUNT_TYPE) || \
00695     defined(WOLFSENTRY_TIME_TYPE) || \
00696     defined(WOLFSENTRY_PRIORITY_TYPE) || \
00697     defined(WOLFSENTRY_THREAD_ID_T) || \
00698     defined(SIZE_T_32) || \
00699     defined(SIZE_T_64)
00700 #define WOLFSENTRY_USER_DEFINED_TYPES
00701 #endif
00702
00711 enum wolfentry_build_flags {
00712     WOLFSENTRY_CONFIG_FLAG_ENDIANNESSESS_ONE = (1U << 0U),
00713     WOLFSENTRY_CONFIG_FLAG_USER_DEFINED_TYPES = (1U << 1U),
00714     WOLFSENTRY_CONFIG_FLAG_THREADSAFE = (1U << 2U),
00715     WOLFSENTRY_CONFIG_FLAG_CLOCK_BUILTINS = (1U << 3U),

```

```

00716     WOLFSENTRY_CONFIG_FLAG_MALLOC_BUILTINS = (1U << 4U),
00717     WOLFSENTRY_CONFIG_FLAG_ERROR_STRINGS = (1U << 5U),
00718     WOLFSENTRY_CONFIG_FLAG_PROTOCOL_NAMES = (1U << 6U),
00719     WOLFSENTRY_CONFIG_FLAG_NO_STDIO_STREAMS = (1U << 7U),
00720     WOLFSENTRY_CONFIG_FLAG_NO_JSON = (1U << 8U),
00721     WOLFSENTRY_CONFIG_FLAG_HAVE_JSON_DOM = (1U << 9U),
00722     WOLFSENTRY_CONFIG_FLAG_DEBUG_CALL_TRACE = (1U << 10U),
00723     WOLFSENTRY_CONFIG_FLAG_LWIP = (1U << 11U),
00724     WOLFSENTRY_CONFIG_FLAG_SHORT_ENUMS = (1U << 12U),
00725     WOLFSENTRY_CONFIG_FLAG_ADDR_BITMASKS = (1U << 13U),
00726     WOLFSENTRY_CONFIG_FLAG_MAX = WOLFSENTRY_CONFIG_FLAG_ADDR_BITMASKS,
00727     WOLFSENTRY_CONFIG_FLAG_ENDIANNESS_ZERO = (0U << 31U)
00728 };
00729
00733 struct wolfentry_build_settings {
00734     uint32_t version;
00736     uint32_t config;
00738 };
00739
00740 #if !defined(BUILDING_LIBWOLFSENTRY) || defined(WOLFSENTRY_DEFINE_BUILD_SETTINGS)
00741
00744 #ifdef WOLFSENTRY_USER_DEFINED_TYPES
00745     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_USER_DEFINED_TYPES WOLFSENTRY_CONFIG_FLAG_USER_DEFINED_TYPES
00746 #else
00747     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_USER_DEFINED_TYPES 0
00748 #endif
00749
00750 #ifdef WOLFSENTRY_THREADSAFE
00751     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_THREADSAFE WOLFSENTRY_CONFIG_FLAG_THREADSAFE
00752 #else
00753     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_THREADSAFE 0
00754 #endif
00755
00756 #ifdef WOLFSENTRY_CLOCK_BUILTINS
00757     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_CLOCK_BUILTINS WOLFSENTRY_CONFIG_FLAG_CLOCK_BUILTINS
00758 #else
00759     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_CLOCK_BUILTINS 0
00760 #endif
00761
00762 #ifdef WOLFSENTRY_MALLOC_BUILTINS
00763     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_MALLOC_BUILTINS WOLFSENTRY_CONFIG_FLAG_MALLOC_BUILTINS
00764 #else
00765     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_MALLOC_BUILTINS 0
00766 #endif
00767
00768 #ifdef WOLFSENTRY_ERROR_STRINGS
00769     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_ERROR_STRINGS WOLFSENTRY_CONFIG_FLAG_ERROR_STRINGS
00770 #else
00771     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_ERROR_STRINGS 0
00772 #endif
00773
00774 #ifdef WOLFSENTRY_PROTOCOL_NAMES
00775     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_PROTOCOL_NAMES WOLFSENTRY_CONFIG_FLAG_PROTOCOL_NAMES
00776 #else
00777     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_PROTOCOL_NAMES 0
00778 #endif
00779
00780 #ifdef WOLFSENTRY_NO_STDIO_STREAMS
00781     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_NO_STDIO_STREAMS WOLFSENTRY_CONFIG_FLAG_NO_STDIO_STREAMS
00782 #else
00783     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_NO_STDIO_STREAMS 0
00784 #endif
00785
00786 #ifdef WOLFSENTRY_NO_JSON
00787     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_NO_JSON WOLFSENTRY_CONFIG_FLAG_NO_JSON
00788 #else
00789     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_NO_JSON 0
00790 #endif
00791
00792 #ifdef WOLFSENTRY_HAVE_JSON_DOM
00793     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_HAVE_JSON_DOM WOLFSENTRY_CONFIG_FLAG_HAVE_JSON_DOM
00794 #else
00795     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_HAVE_JSON_DOM 0
00796 #endif
00797
00798 #ifdef WOLFSENTRY_DEBUG_CALL_TRACE
00799     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_DEBUG_CALL_TRACE WOLFSENTRY_CONFIG_FLAG_DEBUG_CALL_TRACE
00800 #else
00801     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_DEBUG_CALL_TRACE 0
00802 #endif
00803
00804 #ifdef WOLFSENTRY_LWIP
00805     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_LWIP WOLFSENTRY_CONFIG_FLAG_LWIP
00806 #else
00807     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_LWIP 0
00808 #endif
00809

```



```

00810 /* with compilers that can't evaluate the below expression as a compile-time
00811  * constant, WOLFSENTRY_SHORT_ENUMS can be defined in user settings to 0 or
00812  * 1 to avoid the dependency.
00813  */
00814 #ifndef WOLFSENTRY_SHORT_ENUMS
00815 #if WOLFSENTRY_SHORT_ENUMS == 0
00816     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_SHORT_ENUMS 0
00817 #else
00818     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_SHORT_ENUMS WOLFSENTRY_CONFIG_FLAG_SHORT_ENUMS
00819 #endif
00820 #else
00821     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_SHORT_ENUMS ((sizeof(wolfentry_init_flags_t) < sizeof(int))
? WOLFSENTRY_CONFIG_FLAG_SHORT_ENUMS : 0)
00822 #endif
00823
00824 #ifndef WOLFSENTRY_ADDR_BITMASK_MATCHING
00825     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_ADDR_BITMASKS WOLFSENTRY_CONFIG_FLAG_ADDR_BITMASKS
00826 #else
00827     #define _WOLFSENTRY_CONFIG_FLAG_VALUE_ADDR_BITMASKS 0
00828 #endif
00829
00833 #define WOLFSENTRY_CONFIG_SIGNATURE ( \
00834     WOLFSENTRY_CONFIG_FLAG_ENDIANNESSESS_ONE | \
00835     _WOLFSENTRY_CONFIG_FLAG_VALUE_USER_DEFINED_TYPES | \
00836     _WOLFSENTRY_CONFIG_FLAG_VALUE_THREADSAFE | \
00837     _WOLFSENTRY_CONFIG_FLAG_VALUE_CLOCK_BUILTINS | \
00838     _WOLFSENTRY_CONFIG_FLAG_VALUE_MALLOC_BUILTINS | \
00839     _WOLFSENTRY_CONFIG_FLAG_VALUE_ERROR_STRINGS | \
00840     _WOLFSENTRY_CONFIG_FLAG_VALUE_PROTOCOL_NAMES | \
00841     _WOLFSENTRY_CONFIG_FLAG_VALUE_NO_STDIO_STREAMS | \
00842     _WOLFSENTRY_CONFIG_FLAG_VALUE_NO_JSON | \
00843     _WOLFSENTRY_CONFIG_FLAG_VALUE_HAVE_JSON_DOM | \
00844     _WOLFSENTRY_CONFIG_FLAG_VALUE_DEBUG_CALL_TRACE | \
00845     _WOLFSENTRY_CONFIG_FLAG_VALUE_LWIP | \
00846     _WOLFSENTRY_CONFIG_FLAG_VALUE_SHORT_ENUMS | \
00847     _WOLFSENTRY_CONFIG_FLAG_VALUE_ADDR_BITMASKS)
00848
00849 static __attribute__((maybe_unused)) struct wolfentry_build_settings wolfentry_build_settings = {
00850 #ifdef WOLFSENTRY_HAVE_DESIGNATED_INITIALIZERS
00851     .version =
00852 #endif
00853     WOLFSENTRY_VERSION,
00854 #ifdef WOLFSENTRY_HAVE_DESIGNATED_INITIALIZERS
00855     .config =
00856 #endif
00857     WOLFSENTRY_CONFIG_SIGNATURE
00858 };
00861 #endif /* !BUILDING_LIBWOLFSENTRY || WOLFSENTRY_DEFINE_BUILD_SETTINGS */
00862
00865 #endif /* WOLFSENTRY_SETTINGS_H */

```

## 10.16 wolfentry/wolfentry\_util.h File Reference

Utility and convenience macros for both internal and application use.

### Macros

- **#define offsetof**(structure, element)  
*Evaluates to the byte offset of element in structure.*
- **#define sizeof\_field**(structure, element)  
*Evaluates to the size in bytes of element in structure.*
- **#define instance\_of\_field**(structure, element)  
*Evaluates to a dummy instance of element in structure, e.g. to be passed to [MAX\\_UINT\\_OF\(\)](#).*
- **#define container\_of**(ptr, container\_type, member\_name)  
*Evaluates to a pointer to the struct of type container\_type within which ptr points to the member named member\_name.*
- **#define length\_of\_array**(x)  
*Evaluates to the number of elements in x, which must be an array.*
- **#define end\_ptr\_of\_array**(x)

- Evaluates to a pointer to the byte immediately following the end of array `x`.*

  - **#define `popcount32(x)`**

*Evaluates to the number of set bits in `x`.*
  - **#define `LOG2_32(x)`**

*Evaluates to the floor of the base 2 logarithm of `x`, which must be a 32 bit integer.*
  - **#define `LOG2_64(x)`**

*Evaluates to the floor of the base 2 logarithm of `x`, which must be a 64 bit integer.*
  - **#define `streq(vs, fs, vs_len)`**

*Evaluates to true iff string `vs` of length `vs_len` (not including a terminating null, if any) equals null-terminated string `fs`.*
  - **#define `strcaseeq(vs, fs, vs_len)`**

*Evaluates to true iff string `vs` of length `vs_len` (not including a terminating null, if any) equals null-terminated string `fs`, neglecting case distinctions.*
  - **#define `WOLFENTRY_BYTE_STREAM_DECLARE_STACK(buf, bufsiz)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_DECLARE_HEAP(buf, bufsiz)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_INIT_HEAP(buf)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_FREE_HEAP(buf)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_RESET(buf)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_LEN(buf)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_HEAD(buf)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_PTR(buf)`**

*Byte stream helper macro.*
  - **#define `WOLFENTRY_BYTE_STREAM_SPC(buf)`**

*Byte stream helper macro.*
  - **#define `MAX_UINT_OF(x)`**

*Evaluates to the largest representable `unsigned int` in a word the size of `x`.*
  - **#define `MAX_SINT_OF(x)`**

*Evaluates to the largest representable `signed int` in a word the size of `x`.*
  - **#define `WOLFENTRY_SET_BITS(enumint, bits)`**

*Sets the designated `bits` in `enumint`.*
  - **#define `WOLFENTRY_CHECK_BITS(enumint, bits)`**

*Evaluates to true if `bits` are all set in `enumint`.*
  - **#define `WOLFENTRY_CLEAR_BITS(enumint, bits)`**

*Clears the designated `bits` in `enumint`.*
  - **#define `WOLFENTRY_MASKIN_BITS(enumint, bits)`**

*Evaluates to the bits that are set in both `enumint` and `bits`.*
  - **#define `WOLFENTRY_MASKOUT_BITS(enumint, bits)`**

*Evaluates to the bits that are set `enumint` but not set in `bits`.*
  - **#define `WOLFENTRY_CLEAR_ALL_BITS(enumint)`**

*Clears all bits in `enumint`.*
  - **#define `BITS_PER_BYTE` 8**
  - **#define `WOLFENTRY_BITS_TO_BYTES(x)`**

*Evaluates to the number of bytes needed to represent `x` bits.*
  - **#define `WOLFENTRY_ATOMIC_INCREMENT(i, x)`**

- Adds  $x$  to  $i$  thread-safely, returning the sum.*

  - #define **WOLFENTRY\_ATOMIC\_DECREMENT**( $i$ ,  $x$ )

*Subtracts  $x$  from  $i$  thread-safely, returning the difference.*

  - #define **WOLFENTRY\_ATOMIC\_POSTINCREMENT**( $i$ ,  $x$ )

*Adds  $x$  to  $i$  thread-safely, returning the operand  $i$ .*

  - #define **WOLFENTRY\_ATOMIC\_POSTDECREMENT**( $i$ ,  $x$ )

*Subtracts  $x$  from  $i$  thread-safely, returning the operand  $i$ .*

  - #define **WOLFENTRY\_ATOMIC\_STORE**( $i$ ,  $x$ )

*Sets  $i$  to  $x$ , subject to benign races from other threads.*

  - #define **WOLFENTRY\_ATOMIC\_LOAD**( $i$ )

*Returns the value of  $i$ , subject to benign races from other threads.*

  - #define **WOLFENTRY\_ATOMIC\_CMPXCHG**( $ptr$ ,  $expected$ ,  $desired$ ,  $weak_p$ ,  $success\_memorder$ ,  $failure\_memorder$ )

*Sets  $*ptr$  to  $desired$  and returns true iff  $*ptr$  has the value  $*expected$ , otherwise sets  $*expected$  to the actual value of  $*ptr$  and returns false.*

  - #define **WOLFENTRY\_ATOMIC\_INCREMENT\_BY\_ONE**( $i$ )

*Adds 1 to  $i$  thread-safely, returning the sum.*

  - #define **WOLFENTRY\_ATOMIC\_DECREMENT\_BY\_ONE**( $i$ )

*Subtracts 1 from  $i$  thread-safely, returning the difference.*

  - #define **WOLFENTRY\_ATOMIC\_TEST\_AND\_SET**( $i$ ,  $expected$ ,  $intended$ )
  - #define **WOLFENTRY\_ATOMIC\_UPDATE\_FLAGS**( $i$ ,  $set_i$ ,  $clear_i$ ,  $pre_i$ ,  $post_i$ )

*Sets  $i$  to  $intended$  and returns true iff  $i$  has the value  $expected$ , otherwise sets  $expected$  to the actual value of  $i$  and returns false.*

  - #define **WOLFENTRY\_ATOMIC\_RESET**( $i$ ,  $pre_i$ )

*Sets bits  $set_i$  in  $i$ , clears bits  $clear_i$  in  $i$ , and sets  $pre_i$  to the value of  $i$  before any changes, and  $post_i$  to the value of  $i$  after changes.*

  - #define **WOLFENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY**( $i$ ,  $x$ ,  $out$ )

*Clears all bits in  $i$ , saving the previous value of  $i$  in  $pre_i$ .*

  - #define **WOLFENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY\_BY\_ONE**( $i$ ,  $out$ )

*Adds  $x$  to unsigned integer  $i$ , guarding against overflow, saving the sum to  $out$ . If overflow would occur, error is indicated by saving 0 to  $out$ , and  $i$  is left unchanged.*

  - #define **WOLFENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY**( $i$ ,  $x$ ,  $out$ )

*Increments unsigned integer  $i$  by one, guarding against overflow, saving the result to  $out$ . If overflow would occur, error is indicated by saving 0 to  $out$ , and  $i$  is left unchanged.*

  - #define **WOLFENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY\_BY\_ONE**( $i$ ,  $out$ )

*Subtracts  $x$  from unsigned integer  $i$ , guarding against underflow, saving the difference to  $out$ . If underflow would occur, error is indicated by saving a max-value integer (all-1s) to  $out$ , and  $i$  is left unchanged.*

### 10.16.1 Detailed Description

Utility and convenience macros for both internal and application use.

Included by [wolfentry.h](#).

### 10.16.2 Macro Definition Documentation

#### 10.16.2.1 WOLFENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY

```
#define WOLFENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY (
    i,
    x,
    out )
```

Increments unsigned integer  $i$  by one, guarding against overflow, saving the result to  $out$ . If overflow would occur, error is indicated by saving 0 to  $out$ , and  $i$  is left unchanged.

<

**10.16.2.2 WOLFSENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY\_BY\_ONE**

```
#define WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY_BY_ONE(
    i,
    out )
```

Subtracts *x* from unsigned integer *i*, guarding against underflow, saving the difference to *out*. If underflow would occur, error is indicated by saving a max-value integer (all-1s) to *out*, and *i* is left unchanged.

&lt;

**10.16.2.3 WOLFSENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY**

```
#define WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY(
    i,
    x,
    out )
```

Clears all bits in *i*, saving the previous value of *i* in *pre\_i*.

&lt;

**10.16.2.4 WOLFSENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY\_BY\_ONE**

```
#define WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY_BY_ONE(
    i,
    out )
```

Adds *x* to unsigned integer *i*, guarding against overflow, saving the sum to *out*. If overflow would occur, error is indicated by saving 0 to *out*, and *i* is left unchanged.

&lt;

**10.16.2.5 WOLFSENTRY\_ATOMIC\_RESET**

```
#define WOLFSENTRY_ATOMIC_RESET(
    i,
    pre_i )
```

Sets bits *set\_i* in *i*, clears bits *clear\_i* in *i*, and sets *pre\_i* to the value of *i* before any changes, and *post\_i* to the value of *i* after changes.

&lt;

**10.16.2.6 WOLFSENTRY\_ATOMIC\_TEST\_AND\_SET**

```
#define WOLFSENTRY_ATOMIC_TEST_AND_SET(
    i,
    expected,
    intended )
```

**Value:**

```
WOLFSENTRY_ATOMIC_CMPXCHG(
    &(i),
    &(expected),
    intended,
    0 /* weak */,
    __ATOMIC_SEQ_CST /* success_memmodel */,
    __ATOMIC_SEQ_CST /* failure_memmodel */);
```

```

//
//
//
//
//

```

## 10.16.2.7 WOLFSENTRY\_ATOMIC\_UPDATE\_FLAGS

```
#define WOLFSENTRY_ATOMIC_UPDATE_FLAGS (
    i,
    set_i,
    clear_i,
    pre_i,
    post_i )
```

Sets *i* to intended and returns true iff *i* has the value expected, otherwise sets expected to the actual value of *i* and returns false.

<

## 10.17 wolfentry\_util.h

[Go to the documentation of this file.](#)

```
00001 /*
00002  * wolfentry_util.h
00003  *
00004  * Copyright (C) 2021-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00029 #ifndef WOLFSENTRY_UTIL_H
00030 #define WOLFSENTRY_UTIL_H
00031
00032 #ifndef offsetof
00033 /* gcc and clang define this in stddef.h to use sanitizer-safe builtins. */
00034 #define offsetof(structure, element) ((uintptr_t)&((structure *)0)->element))
00035 #endif
00036 #ifndef sizeof_field
00037 #define sizeof_field(structure, element) sizeof(((structure *)0)->element)
00038 #endif
00039 #ifndef instance_of_field
00040 #define instance_of_field(structure, element) (((structure *)0)->element)
00041 #endif
00042 #ifndef container_of
00043 #define container_of(ptr, container_type, member_name) ((container_type *) (void *) ((byte *) (ptr)) -
    offsetof(container_type, member_name))
00044 #endif
00045 #ifndef length_of_array
00046 #define length_of_array(x) (sizeof (x) / sizeof (x)[0])
00047 #endif
00048 #ifndef end_ptr_of_array
00049 #define end_ptr_of_array(x) (&(x)[length_of_array(x)])
00050 #endif
00051 #ifndef popcount32
00052 #ifdef __GNUC__
00053 #define popcount32(x) __builtin_popcount(x)
00054 #else
00055 #error Must supply binding for popcount32() on non-__GNUC__ targets.
00056 #endif
00057 #endif
00058 #if defined(__GNUC__) && !defined(WOLFSENTRY_NO_BUILTIN_CLZ)
00059 #ifndef LOG2_32
00060 #define LOG2_32(x) (31 - __builtin_clz((unsigned int)(x)))
00061 #endif
00062 #endif
```

```

00071 #endif
00072 #ifndef LOG2_64
00073 #define LOG2_64(x) ((sizeof(unsigned long long) * 8ULL) - (unsigned long
long) __builtin_clzll((unsigned long long) (x)) - 1ULL)
00075 #endif
00076 #endif
00077
00078 #define streq(vs,fs,vs_len) (((vs_len) == strlen(fs)) && (memcmp(vs,fs,vs_len) == 0))
00080 #define strcaseeq(vs,fs,vs_len) (((vs_len) == strlen(fs)) && (strncasecmp(vs,fs,vs_len) == 0))
00083 #define WOLFSENTRY_BYTE_STREAM_DECLARE_STACK(buf, bufsiz) static const size_t buf ## siz = (bufsiz);
unsigned char (buf)[bufsiz], *buf ## _p; size_t buf ## spc
00085 #define WOLFSENTRY_BYTE_STREAM_DECLARE_HEAP(buf, bufsiz) static const size_t buf ## siz = (bufsiz);
unsigned char *(buf), *buf ## _p; size_t buf ## spc
00087 #define WOLFSENTRY_BYTE_STREAM_INIT_HEAP(buf) ((buf) = (unsigned char *)WOLFSENTRY_MALLOC(buf ## siz))
00089 #define WOLFSENTRY_BYTE_STREAM_FREE_HEAP(buf) WOLFSENTRY_FREE(buf)
00091 #define WOLFSENTRY_BYTE_STREAM_RESET(buf) do { (buf ## _p) = (buf); (buf ## spc) = (buf ## siz); }
while (0)
00093 #define WOLFSENTRY_BYTE_STREAM_LEN(buf) ((buf ## siz) - (buf ## spc))
00095 #define WOLFSENTRY_BYTE_STREAM_HEAD(buf) (buf)
00097 #define WOLFSENTRY_BYTE_STREAM_PTR(buf) (&(buf ## _p))
00099 #define WOLFSENTRY_BYTE_STREAM_SPC(buf) (&(buf ## spc))
00102 #define MAX_UINT_OF(x) (((uint64_t)1 < ((sizeof(x) * (uint64_t)BITS_PER_BYTE) - (uint64_t)1)) -
(uint64_t)1) | ((uint64_t)1 < ((sizeof(x) * (uint64_t)BITS_PER_BYTE) - (uint64_t)1)))
00104 #define MAX_SINT_OF(x) ((int64_t) (((uint64_t)1 < ((sizeof(x) * (uint64_t)BITS_PER_BYTE) -
(uint64_t)2)) - (uint64_t)1) | ((uint64_t)1 < ((sizeof(x) * (uint64_t)BITS_PER_BYTE) - (uint64_t)2))))
00107 #define WOLFSENTRY_SET_BITS(enumint, bits) ((enumint) |= (bits))
00109 #define WOLFSENTRY_CHECK_BITS(enumint, bits) (((enumint) & (bits)) == (bits))
00111 #define WOLFSENTRY_CLEAR_BITS(enumint, bits) ((enumint) &= ~(uint32_t)(bits))
00113 #define WOLFSENTRY_MASKIN_BITS(enumint, bits) ((enumint) & (bits))
00115 #define WOLFSENTRY_MASKOUT_BITS(enumint, bits) ((enumint) & ~(uint32_t)(bits))
00117 #define WOLFSENTRY_CLEAR_ALL_BITS(enumint) ((enumint) = 0)
00120 #ifndef BITS_PER_BYTE
00121 #define BITS_PER_BYTE 8
00122 #endif
00123
00124 #define WOLFSENTRY_BITS_TO_BYTES(x) (((x) + 7U) >> 3U)
00127 /* helpers for stringifying the expanded value of a macro argument rather than its literal text: */
00129 #define _qq(x) #x
00130 #define _q(x) _qq(x)
00133 #ifndef WOLFSENTRY_THREADSAFE
00134
00135 #ifdef WOLFSENTRY_HAVE_GNU_ATOMICS
00136
00137 #define WOLFSENTRY_ATOMIC_INCREMENT(i, x) __atomic_add_fetch(&(i),x,__ATOMIC_SEQ_CST)
00139 #define WOLFSENTRY_ATOMIC_DECREMENT(i, x) __atomic_sub_fetch(&(i),x,__ATOMIC_SEQ_CST)
00141 #define WOLFSENTRY_ATOMIC_POSTINCREMENT(i, x) __atomic_fetch_add(&(i),x,__ATOMIC_SEQ_CST)
00143 #define WOLFSENTRY_ATOMIC_POSTDECREMENT(i, x) __atomic_fetch_sub(&(i),x,__ATOMIC_SEQ_CST)
00145 #define WOLFSENTRY_ATOMIC_STORE(i, x) __atomic_store_n(&(i), x, __ATOMIC_RELEASE)
00147 #define WOLFSENTRY_ATOMIC_LOAD(i) __atomic_load_n(&(i), __ATOMIC_CONSUME)
00149 #define WOLFSENTRY_ATOMIC_CMPXCHG(ptr, expected, desired, weak_p, success_memorder, failure_memorder)
__atomic_compare_exchange_n(ptr, expected, desired, weak_p, success_memorder, failure_memorder)
00152 #else
00153
00154 #if !defined(WOLFSENTRY_ATOMIC_INCREMENT) || !defined(WOLFSENTRY_ATOMIC_DECREMENT) || \
00155     !defined(WOLFSENTRY_ATOMIC_POSTINCREMENT) || !defined(WOLFSENTRY_ATOMIC_POSTDECREMENT) || \
00156     !defined(WOLFSENTRY_ATOMIC_STORE) || !defined(WOLFSENTRY_ATOMIC_LOAD) || \
00157     !defined(WOLFSENTRY_ATOMIC_CMPXCHG)
00158 #error Missing required atomic implementation(s)
00159 #endif
00160
00161 #endif /* WOLFSENTRY_HAVE_GNU_ATOMICS */
00162
00163 #define WOLFSENTRY_ATOMIC_INCREMENT_BY_ONE(i) WOLFSENTRY_ATOMIC_INCREMENT(i, 1)
00165 #define WOLFSENTRY_ATOMIC_DECREMENT_BY_ONE(i) WOLFSENTRY_ATOMIC_DECREMENT(i, 1)
00168 /* caution, _TEST_AND_SET() alters arg2 (and returns false) on failure. */
00169 #define WOLFSENTRY_ATOMIC_TEST_AND_SET(i, expected, intended) \
00170     WOLFSENTRY_ATOMIC_CMPXCHG( \
00171         &(i), \
00172         &(expected), \
00173         intended, \
00174         0 /* weak */, \
00175         __ATOMIC_SEQ_CST /* success_memmodel */, \
00176         __ATOMIC_SEQ_CST /* failure_memmodel */); \
00179 #define WOLFSENTRY_ATOMIC_UPDATE_FLAGS(i, set_i, clear_i, pre_i, post_i) \
00180 do { \
00181     *(pre_i) = (i); \
00182     for (;;) { \
00183         *(post_i) = (*(pre_i) | (set_i)) & ~(clear_i); \
00184         if (*(post_i) == *(pre_i)) \
00185             break; \
00186         if (WOLFSENTRY_ATOMIC_CMPXCHG( \
00187             &(i), \
00188             (pre_i), \
00189             *(post_i), \
00190             0 /* weak */, \
00191             __ATOMIC_SEQ_CST /* success_memmodel */, \
00192             __ATOMIC_SEQ_CST /* failure_memmodel */)) \

```

```

00193         break;
00194     }
00195 } while (0)
00198 #define WOLFSENTRY_ATOMIC_RESET(i, pre_i)
00199 do {
00200     *(pre_i) = (i);
00201     for (;;) {
00202         if (*(pre_i) == 0)
00203             break;
00204         if (WOLFSENTRY_ATOMIC_CMPXCHG(
00205             &(i),
00206             (pre_i),
00207             0,
00208             0 /* weak */,
00209             __ATOMIC_SEQ_CST /* success_memmodel */,
00210             __ATOMIC_SEQ_CST /* failure_memmodel */))
00211             break;
00212     }
00213 } while (0)
00216 #define WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY(i, x, out)
00217 do {
00218     __typeof__(i) _pre_i = (i);
00219     __typeof__(i) _post_i = _pre_i;
00220     for (;;) {
00221         if (MAX_UINT_OF(i) - _pre_i < (x)) {
00222             _post_i = 0;
00223             break;
00224         }
00225         _post_i = (__typeof__(i))(_pre_i + (x));
00226         if (_post_i == _pre_i)
00227             break;
00228         if (WOLFSENTRY_ATOMIC_CMPXCHG(
00229             &(i),
00230             &_pre_i,
00231             _post_i,
00232             0 /* weak */,
00233             __ATOMIC_SEQ_CST /* success_memmodel */,
00234             __ATOMIC_SEQ_CST /* failure_memmodel */))
00235             break;
00236     }
00237     (out) = _post_i;
00238 } while(0)
00241 #define WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY_BY_ONE(i, out)
00242     WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY(i, 1U, out)
00245 #define WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY(i, x, out)
00246 do {
00247     __typeof__(i) _pre_i = (i);
00248     __typeof__(i) _post_i = _pre_i;
00249     for (;;) {
00250         if (_pre_i < (x)) {
00251             _post_i = MAX_UINT_OF(i);
00252             break;
00253         }
00254         _post_i = (__typeof__(i))(_pre_i - (x));
00255         if (_post_i == _pre_i)
00256             break;
00257         if (WOLFSENTRY_ATOMIC_CMPXCHG (
00258             &(i),
00259             &_pre_i,
00260             _post_i,
00261             0 /* weak */,
00262             __ATOMIC_SEQ_CST /* success_memmodel */,
00263             __ATOMIC_SEQ_CST /* failure_memmodel */))
00264             break;
00265     }
00266     (out) = _post_i;
00267 } while(0)
00270 #define WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY_BY_ONE(i, out)
00271     WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY(i, 1U, out)
00274 #else /* !WOLFSENTRY_THREADSafe */
00275
00276 #define WOLFSENTRY_ATOMIC_INCREMENT(i, x) ((i) += (x))
00277 #define WOLFSENTRY_ATOMIC_INCREMENT_BY_ONE(i) (++(i))
00278 #define WOLFSENTRY_ATOMIC_DECREMENT(i, x) ((i) -= (x))
00279 #define WOLFSENTRY_ATOMIC_DECREMENT_BY_ONE(i) (--(i))
00280 #define WOLFSENTRY_ATOMIC_STORE(i, x) ((i)=(x))
00281 #define WOLFSENTRY_ATOMIC_LOAD(i) (i)
00282
00283 #define WOLFSENTRY_ATOMIC_UPDATE_FLAGS(i, set_i, clear_i, pre_i, post_i)\
00284 do {
00285     *(pre_i) = (i);
00286     *(post_i) = (*(pre_i) | (set_i)) & ~(clear_i);
00287     if (*(post_i) != *(pre_i))
00288         (i) = *(post_i);
00289 } while (0)
00290
00291 #define WOLFSENTRY_ATOMIC_RESET(i, pre_i) do { *(pre_i) = (i); (i) = 0; } while (0)

```

```

00292
00293 #define WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY(i, x, out)      \
00294     do {                                                            \
00295         if ((x) > MAX_UINT_OF(i)) || ((MAX_UINT_OF(i) - (i) < (x))) \
00296             (out) = 0U;                                             \
00297         else                                                         \
00298             (out) = (i) = (__typeof__(i))((i) + (x));              \
00299     } while (0)
00300
00301 #define WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY_BY_ONE(i, out)  \
00302     WOLFSENTRY_ATOMIC_INCREMENT_UNSIGNED_SAFELY(i, 1U, out)
00303
00304 #define WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY(i, x, out)     \
00305     do {                                                            \
00306         if ((x) > MAX_UINT_OF(i)) || ((i) < (x))                  \
00307             (out) = MAX_UINT_OF(i);                                \
00308         else                                                         \
00309             (out) = (i) = (__typeof__(i))((i) - (x));              \
00310     } while (0)
00311
00312 #define WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY_BY_ONE(i, out) \
00313     WOLFSENTRY_ATOMIC_DECREMENT_UNSIGNED_SAFELY(i, 1U, out)
00314
00315 #endif /* WOLFSENTRY_THREADSAFE */
00316
00317 #endif /* WOLFSENTRY_UTIL_H */

```

## 10.18 wolfentry/wolfssl\_test.h File Reference

Macros and helper functions for wolfSSL `--enable-wolfentry`.

```

#include <wolfentry/wolfentry_util.h>
#include <wolfentry/wolfentry_json.h>

```

### Data Structures

- struct [wolfentry\\_data](#)

### Macros

- #define **WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX**(x) (x)
- #define **WOLFSENTRY\_CONTEXT\_ARGS\_OUT\_EX4**(x, y) (x)
- #define **tcp\_connect**(sockfd, ip, port, udp, sctp, ssl) `tcp_connect_with_wolfSentry(sockfd, ip, port, udp, sctp, ssl, wolfentry)`

### 10.18.1 Detailed Description

Macros and helper functions for wolfSSL `--enable-wolfentry`.

This file is included by `wolfssl/test.h` when defined(`WOLFSSL_WOLFSENTRY_HOOKS`).



## 10.19 wolfssl\_test.h

[Go to the documentation of this file.](#)

```

00001 /*
00002  * wolfssl_test.h
00003  *
00004  * Copyright (C) 2021-2023 wolfSSL Inc.
00005  *
00006  * This file is part of wolfSentry.
00007  *
00008  * wolfSentry is free software; you can redistribute it and/or modify
00009  * it under the terms of the GNU General Public License as published by
00010  * the Free Software Foundation; either version 2 of the License, or
00011  * (at your option) any later version.
00012  *
00013  * wolfSentry is distributed in the hope that it will be useful,
00014  * but WITHOUT ANY WARRANTY; without even the implied warranty of
00015  * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
00016  * GNU General Public License for more details.
00017  *
00018  * You should have received a copy of the GNU General Public License
00019  * along with this program; if not, write to the Free Software
00020  * Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1335, USA
00021  */
00022
00029 #ifndef WOLFSENTRY_WOLFSSL_TEST_H
00030 #define WOLFSENTRY_WOLFSSL_TEST_H
00031
00032 #include <wolfentry/wolfentry_util.h>
00033
00034 #if !defined(NO_FILESYSTEM) && !defined(WOLFSENTRY_NO_JSON)
00035 #include <wolfentry/wolfentry_json.h>
00036 #endif
00037
00038 #if defined(WOLFSENTRY_VERSION_GE)
00039 #if WOLFSENTRY_VERSION_GE(0, 8, 0)
00040 #define HAVE_WOLFSENTRY_API_0v8
00041 #endif
00042 #endif
00043
00044 #ifndef HAVE_WOLFSENTRY_API_0v8
00045 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX(x) (x)
00046 #define WOLFSENTRY_CONTEXT_ARGS_OUT_EX4(x, y) (x)
00047 #endif
00048
00049 struct wolfentry_data {
00050     WOLFSENTRY_SOCKADDR(128) remote;
00051     WOLFSENTRY_SOCKADDR(128) local;
00052     wolfentry_route_flags_t flags;
00053     void *heap;
00054     int alloctype;
00055 };
00056
00057 static void free_wolfentry_data(struct wolfentry_data *data) {
00058     XFREE(data, data->heap, data->alloctype);
00059 }
00060
00061 static struct wolfentry_context *wolfentry = NULL;
00062
00063 static int wolfentry_data_index = -1;
00064
00065 static WC_INLINE int wolfentry_store_endpoints(
00066     WOLFSSL *ssl,
00067     SOCKADDR_IN_T *remote,
00068     SOCKADDR_IN_T *local,
00069     int proto,
00070     wolfentry_route_flags_t flags,
00071     struct wolfentry_data **wolfentry_data_out)
00072 {
00073     struct wolfentry_data *wolfentry_data = (struct wolfentry_data *)XMALLOC(
00074         sizeof *wolfentry_data, NULL, DYNAMIC_TYPE_SOCKADDR);
00075     if (wolfentry_data == NULL)
00076         return WOLFSSL_FAILURE;
00077     wolfentry_data->heap = NULL;
00078     wolfentry_data->alloctype = DYNAMIC_TYPE_SOCKADDR;
00080 #ifdef TEST_IPV6
00082     if ((sizeof wolfentry_data->remote.addr < sizeof remote->sin6_addr) ||
00083         (sizeof wolfentry_data->local.addr < sizeof local->sin6_addr))
00084         return WOLFSSL_FAILURE;
00085     wolfentry_data->remote.sa_family = wolfentry_data->local.sa_family = remote->sin6_family;
00086     wolfentry_data->remote.sa_port = ntohs(remote->sin6_port);
00087     wolfentry_data->local.sa_port = ntohs(local->sin6_port);
00088     if (WOLFSENTRY_MASKIN_BITS(flags, WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_ADDR_WILDCARD)) {

```

```

00089         wolfentry_data->remote.addr_len = 0;
00090         XMEMSET(wolfentry_data->remote.addr, 0, sizeof remote->sin6_addr);
00091     } else {
00092         wolfentry_data->remote.addr_len = sizeof remote->sin6_addr * BITS_PER_BYTE;
00093         XMEMCPY(wolfentry_data->remote.addr, &remote->sin6_addr, sizeof remote->sin6_addr);
00094     }
00095     if (WOLFSENTRY_MASKIN_BITS(flags, WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_ADDR_WILDCARD)) {
00096         wolfentry_data->local.addr_len = 0;
00097         XMEMSET(wolfentry_data->local.addr, 0, sizeof local->sin6_addr);
00098     } else {
00099         wolfentry_data->local.addr_len = sizeof local->sin6_addr * BITS_PER_BYTE;
00100         XMEMCPY(wolfentry_data->local.addr, &local->sin6_addr, sizeof local->sin6_addr);
00101     }
00102 #else
00103     if ((sizeof wolfentry_data->remote.addr < sizeof remote->sin_addr) ||
00104         (sizeof wolfentry_data->local.addr < sizeof local->sin_addr))
00105         return WOLFSSL_FAILURE;
00106     wolfentry_data->remote.sa_family = wolfentry_data->local.sa_family = remote->sin_family;
00107     wolfentry_data->remote.sa_port = ntohs(remote->sin_port);
00108     wolfentry_data->local.sa_port = ntohs(local->sin_port);
00109     if (WOLFSENTRY_MASKIN_BITS(flags, WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_ADDR_WILDCARD)) {
00110         wolfentry_data->remote.addr_len = 0;
00111         XMEMSET(wolfentry_data->remote.addr, 0, sizeof remote->sin_addr);
00112     } else {
00113         wolfentry_data->remote.addr_len = sizeof remote->sin_addr * BITS_PER_BYTE;
00114         XMEMCPY(wolfentry_data->remote.addr, &remote->sin_addr, sizeof remote->sin_addr);
00115     }
00116     if (WOLFSENTRY_MASKIN_BITS(flags, WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_ADDR_WILDCARD)) {
00117         wolfentry_data->local.addr_len = 0;
00118         XMEMSET(wolfentry_data->local.addr, 0, sizeof local->sin_addr);
00119     } else {
00120         wolfentry_data->local.addr_len = sizeof local->sin_addr * BITS_PER_BYTE;
00121         XMEMCPY(wolfentry_data->local.addr, &local->sin_addr, sizeof local->sin_addr);
00122     }
00123 #endif
00124     wolfentry_data->remote.sa_proto = wolfentry_data->local.sa_proto = proto;
00125     wolfentry_data->remote.interface = wolfentry_data->local.interface = 0;
00126     wolfentry_data->flags = flags;
00127
00128     if (wolfSSL_set_ex_data_with_cleanup(
00129         ssl, wolfentry_data_index, wolfentry_data,
00130         (wolfSSL_ex_data_cleanup_routine_t)free_wolfentry_data) !=
00131         WOLFSSL_SUCCESS) {
00132         free_wolfentry_data(wolfentry_data);
00133         return WOLFSSL_FAILURE;
00134     }
00135
00136     if (wolfentry_data_out != NULL)
00137         *wolfentry_data_out = wolfentry_data;
00138
00139     return WOLFSSL_SUCCESS;
00140 }
00141
00142 static int wolfSentry_NetworkFilterCallback(
00143     WOLFSSL *ssl,
00144     struct wolfentry_context *_wolfentry,
00145     wolfSSL_netfilter_decision_t *decision)
00146 {
00147     struct wolfentry_data *data;
00148     char inet_ntop_buf[INET6_ADDRSTRLEN], inet_ntop_buf2[INET6_ADDRSTRLEN];
00149     wolfentry_errcode_t ret;
00150     wolfentry_action_res_t action_results;
00151
00152     #if defined(WOLFSENTRY_THREADSAFE) && defined(HAVE_WOLFSENTRY_API_0v8)
00153         WOLFSENTRY_THREAD_HEADER(WOLFSENTRY_THREAD_FLAG_NONE);
00154         if (WOLFSENTRY_THREAD_GET_ERROR < 0) {
00155             fprintf(stderr, "wolfentry thread init error: "
00156                 WOLFSENTRY_ERROR_FMT "\n",
00157                 WOLFSENTRY_ERROR_FMT_ARGS(WOLFSENTRY_THREAD_GET_ERROR));
00158             return WOLFSSL_FAILURE;
00159         }
00160     #endif /* WOLFSENTRY_THREADSAFE && HAVE_WOLFSENTRY_API_0v8 */
00161
00162     if ((data = wolfSSL_get_ex_data(ssl, wolfentry_data_index)) == NULL)
00163         return WOLFSSL_FAILURE;
00164
00165     ret = wolfentry_route_event_dispatch(
00166         WOLFSENTRY_CONTEXT_ARGS_OUT_EX(_wolfentry),
00167         (const struct wolfentry_sockaddr *)&data->remote,
00168         (const struct wolfentry_sockaddr *)&data->local,
00169         data->flags,
00170         NULL /* event_label */,
00171         0 /* event_label_len */,
00172         NULL /* caller_context */,
00173         NULL /* id */,
00174         NULL /* inexact_matches */,
00175         &action_results);

```

```

00176
00177     if (ret >= 0) {
00178         if (WOLFSENTRY_MASKIN_BITS(action_results, WOLFSENTRY_ACTION_RES_REJECT))
00179             *decision = WOLFSSL_NETFILTER_REJECT;
00180         else if (WOLFSENTRY_MASKIN_BITS(action_results, WOLFSENTRY_ACTION_RES_ACCEPT))
00181             *decision = WOLFSSL_NETFILTER_ACCEPT;
00182         else
00183             *decision = WOLFSSL_NETFILTER_PASS;
00184     } else {
00185         fprintf(stderr, "wolfSentry_route_event_dispatch error "
00186             WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(ret));
00187         *decision = WOLFSSL_NETFILTER_PASS;
00188     }
00189
00190     printf("wolfSentry got network filter callback: family=%d proto=%d rport=%d"
00191         " lport=%d raddr=%s laddr=%s interface=%d; decision=%d (%s)\n",
00192         data->remote.sa_family,
00193         data->remote.sa_proto,
00194         data->remote.sa_port,
00195         data->local.sa_port,
00196         inet_ntop(data->remote.sa_family, data->remote.addr, inet_ntop_buf,
00197             sizeof inet_ntop_buf),
00198         inet_ntop(data->local.sa_family, data->local.addr, inet_ntop_buf2,
00199             sizeof inet_ntop_buf2),
00200         data->remote.interface,
00201         *decision,
00202         *decision == WOLFSSL_NETFILTER_REJECT ? "REJECT" :
00203         *decision == WOLFSSL_NETFILTER_ACCEPT ? "ACCEPT" :
00204         *decision == WOLFSSL_NETFILTER_PASS ? "PASS" :
00205         "???");
00206
00207     #if defined(WOLFSENTRY_THREADSAFE) && defined(HAVE_WOLFSENTRY_API_0v8)
00208     ret = WOLFSENTRY_THREAD_TAILER(WOLFSENTRY_THREAD_FLAG_NONE);
00209     if (ret < 0) {
00210         fprintf(stderr, "wolfSentry thread exit error: "
00211             WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(ret));
00212     }
00213     #endif
00214
00215     return WOLFSSL_SUCCESS;
00216 }
00217
00218 static int wolfSentry_setup(
00219     struct wolfSentry_context **_wolfSentry,
00220     const char *_wolfSentry_config_path,
00221     wolfSentry_route_flags_t route_flags)
00222 {
00223     wolfSentry_errcode_t ret;
00224
00225     #ifndef HAVE_WOLFSENTRY_API_0v8
00226     #ifdef WOLFSENTRY_THREADSAFE
00227         WOLFSENTRY_THREAD_HEADER(WOLFSENTRY_THREAD_FLAG_NONE);
00228         if (WOLFSENTRY_THREAD_GET_ERROR < 0) {
00229             fprintf(stderr, "wolfSentry thread init error: "
00230                 WOLFSENTRY_ERROR_FMT "\n",
00231                 WOLFSENTRY_ERROR_FMT_ARGS(WOLFSENTRY_THREAD_GET_ERROR));
00232             err_sys("unable to initialize wolfSentry thread context");
00233         }
00234     #endif
00235     ret = wolfSentry_init(wolfSentry_build_settings,
00236         WOLFSENTRY_CONTEXT_ARGS_OUT_EX(NULL /* hpi */),
00237         NULL /* default config */,
00238         _wolfSentry);
00239     #else
00240     ret = wolfSentry_init(NULL /* hpi */, NULL /* default config */,
00241         _wolfSentry);
00242     #endif
00243     if (ret < 0) {
00244         fprintf(stderr, "wolfSentry_init() returned " WOLFSENTRY_ERROR_FMT "\n",
00245             WOLFSENTRY_ERROR_FMT_ARGS(ret));
00246         err_sys("unable to initialize wolfSentry");
00247     }
00248
00249     if (wolfSentry_data_index < 0)
00250         wolfSentry_data_index = wolfSSL_get_ex_new_index(0, NULL, NULL, NULL,
00251             NULL);
00252
00253     #if !defined(NO_FILESYSTEM) && !defined(WOLFSENTRY_NO_JSON)
00254     if (_wolfSentry_config_path != NULL) {
00255         unsigned char buf[512];
00256         char err_buf[512];
00257         struct wolfSentry_json_process_state *jps;
00258
00259         FILE *f = fopen(_wolfSentry_config_path, "r");
00260
00261         if (f == NULL) {
00262             fprintf(stderr, "fopen(%s): %s\n", _wolfSentry_config_path, strerror(errno));

```

```

00263         err_sys("unable to open wolfSentry config file");
00264     }
00265
00266     if ((ret = wolfSentry_config_json_init(
00267         WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfSentry),
00268         WOLFSENTRY_CONFIG_LOAD_FLAG_NONE,
00269         &jps)) < 0) {
00270         fprintf(stderr, "wolfSentry_config_json_init() returned "
00271             WOLFSENTRY_ERROR_FMT "\n",
00272             WOLFSENTRY_ERROR_FMT_ARGS(ret));
00273         err_sys("error while initializing wolfSentry config parser");
00274     }
00275
00276     for (;;) {
00277         size_t n = fread(buf, 1, sizeof buf, f);
00278         if ((n < sizeof buf) && ferror(f)) {
00279             fprintf(stderr, "fread(%s): %s\n", _wolfSentry_config_path, strerror(errno));
00280             err_sys("error while reading wolfSentry config file");
00281         }
00282
00283         ret = wolfSentry_config_json_feed(jps, buf, n, err_buf, sizeof err_buf);
00284         if (ret < 0) {
00285             fprintf(stderr, ".*s\n", (int)sizeof err_buf, err_buf);
00286             err_sys("error while loading wolfSentry config file");
00287         }
00288         if ((n < sizeof buf) && feof(f))
00289             break;
00290     }
00291     fclose(f);
00292
00293     if ((ret = wolfSentry_config_json_fini(&jps, err_buf, sizeof err_buf)) < 0) {
00294         fprintf(stderr, ".*s\n", (int)sizeof err_buf, err_buf);
00295         err_sys("error while loading wolfSentry config file");
00296     }
00297 } else
00298 #endif /* !NO_FILESYSTEM && !WOLFSENTRY_NO_JSON */
00299 {
00300     struct wolfSentry_route_table *table;
00301
00302     #ifdef WOLFSENTRY_THREADSAFE
00303     ret = WOLFSENTRY_SHARED_EX(*_wolfSentry);
00304     if (ret < 0) {
00305         fprintf(stderr, "wolfSentry shared lock op failed: "
00306             WOLFSENTRY_ERROR_FMT ".\n",
00307             WOLFSENTRY_ERROR_FMT_ARGS(ret));
00308         return ret;
00309     }
00310     #endif
00311
00312     if ((ret = wolfSentry_route_get_main_table(
00313         WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfSentry),
00314         &table)) < 0)
00315     {
00316         fprintf(stderr, "wolfSentry_route_get_main_table() returned "
00317             WOLFSENTRY_ERROR_FMT "\n",
00318             WOLFSENTRY_ERROR_FMT_ARGS(ret));
00319     #ifdef WOLFSENTRY_THREADSAFE
00320     WOLFSENTRY_WARN_ON_FAILURE(
00321         wolfSentry_context_unlock(
00322             WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfSentry)));
00323     #endif
00324     return ret;
00325 }
00326
00327 if (WOLFSENTRY_MASKIN_BITS(route_flags, WOLFSENTRY_ROUTE_FLAG_DIRECTION_OUT)) {
00328     WOLFSENTRY_SOCKADDR(128) remote, local;
00329     wolfSentry_ent_id_t id;
00330     wolfSentry_action_res_t action_results;
00331
00332     if ((ret = wolfSentry_route_table_default_policy_set(
00333         WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfSentry),
00334         table,
00335         WOLFSENTRY_ACTION_RES_ACCEPT))
00336         < 0) {
00337         fprintf(stderr,
00338             "wolfSentry_route_table_default_policy_set() returned "
00339             WOLFSENTRY_ERROR_FMT "\n",
00340             WOLFSENTRY_ERROR_FMT_ARGS(ret));
00341     #ifdef WOLFSENTRY_THREADSAFE
00342     WOLFSENTRY_WARN_ON_FAILURE(
00343         wolfSentry_context_unlock(
00344             WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfSentry)));
00345     #endif
00346     return ret;
00347 }
00348 }
00349

```

```

00350         XMEMSET(&remote, 0, sizeof remote);
00351         XMEMSET(&local, 0, sizeof local);
00352 #ifdef TEST_IPV6
00353         remote.sa_family = local.sa_family = AF_INET6;
00354         remote.addr_len = 128;
00355         XMEMCPY(remote.addr, "\000\000\000\000\000\000\000\000\000\000\000\000\000\001",
16);
00356 #else
00357         remote.sa_family = local.sa_family = AF_INET;
00358         remote.addr_len = 32;
00359         XMEMCPY(remote.addr, "\177\000\000\001", 4);
00360 #endif
00361
00362         if ((ret = wolfsentry_route_insert
00363             (WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfsentry),
00364              NULL /* caller_context */,
00365              (const struct wolfsentry_sockaddr *)&remote,
00366              (const struct wolfsentry_sockaddr *)&local,
00367              route_flags
00368              WOLFSENTRY_ROUTE_FLAG_GREENLISTED
00369              WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_WILDCARD
00370              WOLFSENTRY_ROUTE_FLAG_REMOTE_INTERFACE_WILDCARD
00371              WOLFSENTRY_ROUTE_FLAG_LOCAL_INTERFACE_WILDCARD
00372              WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_ADDR_WILDCARD
00373              WOLFSENTRY_ROUTE_FLAG_SA_PROTO_WILDCARD
00374              WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_PORT_WILDCARD
00375              WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_PORT_WILDCARD,
00376              0 /* event_label_len */, 0 /* event_label */, &id,
00377              &action_results)) < 0) {
00378             fprintf(stderr, "wolfsentry_route_insert() returned "
00379                     WOLFSENTRY_ERROR_FMT "\n",
00380                     WOLFSENTRY_ERROR_FMT_ARGS(ret));
00381 #ifdef WOLFSENTRY_THREADSAFE
00382             WOLFSENTRY_WARN_ON_FAILURE(
00383                 wolfsentry_context_unlock(
00384                     WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfsentry)));
00385 #endif
00386             return ret;
00387         }
00388     } else if (WOLFSENTRY_MASKIN_BITS(route_flags, WOLFSENTRY_ROUTE_FLAG_DIRECTION_IN)) {
00389         WOLFSENTRY_SOCKADDR(128) remote, local;
00390         wolfsentry_ent_id_t id;
00391         wolfsentry_action_res_t action_results;
00392
00393         if ((ret = wolfsentry_route_table_default_policy_set(
00394             WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfsentry), table,
00395             WOLFSENTRY_ACTION_RES_REJECT|WOLFSENTRY_ACTION_RES_STOP))
00396             < 0) {
00397             fprintf(stderr,
00398                 "wolfsentry_route_table_default_policy_set() returned "
00399                 WOLFSENTRY_ERROR_FMT "\n",
00400                 WOLFSENTRY_ERROR_FMT_ARGS(ret));
00401 #ifdef WOLFSENTRY_THREADSAFE
00402             WOLFSENTRY_WARN_ON_FAILURE(
00403                 wolfsentry_context_unlock(
00404                     WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfsentry)));
00405 #endif
00406             return ret;
00407         }
00408     }
00409     XMEMSET(&remote, 0, sizeof remote);
00410     XMEMSET(&local, 0, sizeof local);
00411 #ifdef TEST_IPV6
00412     remote.sa_family = local.sa_family = AF_INET6;
00413     remote.addr_len = 128;
00414     XMEMCPY(remote.addr, "\000\000\000\000\000\000\000\000\000\000\000\000\000\000\000\000\001",
16);
00415 #else
00416     remote.sa_family = local.sa_family = AF_INET;
00417     remote.addr_len = 32;
00418     XMEMCPY(remote.addr, "\177\000\000\001", 4);
00419 #endif
00420
00421     if ((ret = wolfsentry_route_insert
00422         (WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfsentry),
00423          NULL /* caller_context */,
00424          (const struct wolfsentry_sockaddr *)&remote,
00425          (const struct wolfsentry_sockaddr *)&local,
00426          route_flags
00427          WOLFSENTRY_ROUTE_FLAG_GREENLISTED
00428          WOLFSENTRY_ROUTE_FLAG_PARENT_EVENT_WILDCARD
00429          WOLFSENTRY_ROUTE_FLAG_REMOTE_INTERFACE_WILDCARD
00430          WOLFSENTRY_ROUTE_FLAG_LOCAL_INTERFACE_WILDCARD
00431          WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_ADDR_WILDCARD
00432          WOLFSENTRY_ROUTE_FLAG_SA_PROTO_WILDCARD
00433          WOLFSENTRY_ROUTE_FLAG_SA_REMOTE_PORT_WILDCARD
00434          WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_PORT_WILDCARD,

```

```

00435         0 /* event_label_len */, 0 /* event_label */, &id,
00436         &action_results)) < 0) {
00437             fprintf(stderr, "wolfsentry_route_insert() returned "
00438                 WOLFSENTRY_ERROR_FMT "\n",
00439                 WOLFSENTRY_ERROR_FMT_ARGS(ret));
00440 #ifdef WOLFSENTRY_THREADSAFE
00441             WOLFSENTRY_WARN_ON_FAILURE(
00442                 wolfsentry_context_unlock(
00443                     WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfsentry)));
00444 #endif
00445             return ret;
00446         }
00447     }
00448 #ifdef WOLFSENTRY_THREADSAFE
00449     WOLFSENTRY_WARN_ON_FAILURE(
00450         wolfsentry_context_unlock(
00451             WOLFSENTRY_CONTEXT_ARGS_OUT_EX(*_wolfsentry)));
00452 #endif
00453 }
00454
00455 #if defined(WOLFSENTRY_THREADSAFE) && defined(HAVE_WOLFSENTRY_API_0v8)
00456     ret = WOLFSENTRY_THREAD_TAILER(WOLFSENTRY_THREAD_FLAG_NONE);
00457     if (ret < 0) {
00458         fprintf(stderr, "wolfsentry thread exit error: "
00459             WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(ret));
00460     }
00461 #endif
00462     return 0;
00463 }
00464
00465 static WC_INLINE int tcp_connect_with_wolfSentry(
00466     SOCKET_T* sockfd,
00467     const char* ip,
00468     word16 port,
00469     int udp,
00470     int sctp,
00471     WOLFSSL* ssl,
00472     struct wolfsentry_context *_wolfsentry)
00473 {
00474     SOCKADDR_IN_T remote_addr;
00475     struct wolfsentry_data *wolfsentry_data;
00476     char inet_ntop_buf[INET6_ADDRSTRLEN], inet_ntop_buf2[INET6_ADDRSTRLEN];
00477     wolfsentry_errcode_t ret;
00478     wolfsentry_action_res_t action_results;
00479     wolfSSL_netfilter_decision_t decision;
00480
00481 #if defined(WOLFSENTRY_THREADSAFE) && defined(HAVE_WOLFSENTRY_API_0v8)
00482     WOLFSENTRY_THREAD_HEADER(WOLFSENTRY_THREAD_FLAG_NONE);
00483     if (WOLFSENTRY_THREAD_GET_ERROR < 0) {
00484         fprintf(stderr, "wolfsentry thread init error: "
00485             WOLFSENTRY_ERROR_FMT "\n",
00486             WOLFSENTRY_ERROR_FMT_ARGS(WOLFSENTRY_THREAD_GET_ERROR));
00487         err_sys("unable to initialize wolfSentry thread context");
00488     }
00489 #endif
00490     build_addr(&remote_addr, ip, port, udp, sctp);
00491
00492     {
00493         SOCKADDR_IN_T local_addr;
00494 #ifdef TEST_IPV6
00495         local_addr.sin6_port = 0;
00496 #else
00497         local_addr.sin_port = 0;
00498 #endif
00499     }
00500     ((struct sockaddr *)&local_addr)->sa_family = ((struct sockaddr *)&remote_addr)->sa_family;
00501
00502     if (wolfsentry_store_endpoints(
00503         ssl, &remote_addr, &local_addr,
00504         udp ? IPPROTO_UDP : IPPROTO_TCP,
00505         WOLFSENTRY_ROUTE_FLAG_DIRECTION_OUT|
00506         WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_ADDR_WILDCARD|
00507         WOLFSENTRY_ROUTE_FLAG_SA_LOCAL_PORT_WILDCARD, &wolfsentry_data) != WOLFSSL_SUCCESS)
00508         return WOLFSSL_FAILURE;
00509     }
00510
00511     ret = wolfsentry_route_event_dispatch(
00512         WOLFSENTRY_CONTEXT_ARGS_OUT_EX(_wolfsentry),
00513         (const struct wolfsentry_sockaddr *)&wolfsentry_data->remote,
00514         (const struct wolfsentry_sockaddr *)&wolfsentry_data->local,
00515         wolfsentry_data->flags,
00516         NULL /* event_label */,
00517         0 /* event_label_len */,
00518         NULL /* caller_context */,
00519         NULL /* id */,
00520         NULL /* inexact_matches */);

```

```

00522         &action_results);
00523
00524     if (ret < 0) {
00525         fprintf(stderr, "wolfSentry_route_event_dispatch error "
00526             WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(ret));
00527         decision = WOLFSSL_NETFILTER_PASS;
00528     } else {
00529         if (WOLFSENTRY_MASKIN_BITS(action_results, WOLFSENTRY_ACTION_RES_REJECT))
00530             decision = WOLFSSL_NETFILTER_REJECT;
00531         else if (WOLFSENTRY_MASKIN_BITS(action_results, WOLFSENTRY_ACTION_RES_ACCEPT))
00532             decision = WOLFSSL_NETFILTER_ACCEPT;
00533         else
00534             decision = WOLFSSL_NETFILTER_PASS;
00535     }
00536
00537     printf("wolfSentry callin from tcp_connect_with_wolfSentry: family=%d proto=%d rport=%d"
00538         " lport=%d raddr=%s laddr=%s interface=%d; decision=%d (%s)\n",
00539         wolfSentry_data->remote.sa_family,
00540         wolfSentry_data->remote.sa_proto,
00541         wolfSentry_data->remote.sa_port,
00542         wolfSentry_data->local.sa_port,
00543         inet_ntop(wolfSentry_data->remote.sa_family, wolfSentry_data->remote.addr, inet_ntop_buf,
00544             sizeof inet_ntop_buf),
00545         inet_ntop(wolfSentry_data->local.sa_family, wolfSentry_data->local.addr, inet_ntop_buf2,
00546             sizeof inet_ntop_buf2),
00547         wolfSentry_data->remote.interface,
00548         decision,
00549         decision == WOLFSSL_NETFILTER_REJECT ? "REJECT" :
00550         decision == WOLFSSL_NETFILTER_ACCEPT ? "ACCEPT" :
00551         decision == WOLFSSL_NETFILTER_PASS ? "PASS" :
00552         "???");
00553
00554     if (decision == WOLFSSL_NETFILTER_REJECT)
00555         return SOCKET_FILTERED_E;
00556
00557     if (udp) {
00558         wolfSSL_dtls_set_peer(ssl, &remote_addr, sizeof(remote_addr));
00559     }
00560     tcp_socket(sockfd, udp, sctp);
00561
00562     if (!udp) {
00563         if (connect(*sockfd, (const struct sockaddr*)&remote_addr, sizeof(remote_addr)) != 0)
00564             err_sys_with_errno("tcp connect failed");
00565     }
00566
00567 #if defined(WOLFSENTRY_THREADSAFE) && defined(HAVE_WOLFSENTRY_API_0v8)
00568     ret = WOLFSENTRY_THREAD_TAILER(WOLFSENTRY_THREAD_FLAG_NONE);
00569     if (ret < 0) {
00570         fprintf(stderr, "wolfSentry thread exit error: "
00571             WOLFSENTRY_ERROR_FMT "\n", WOLFSENTRY_ERROR_FMT_ARGS(ret));
00572     }
00573 #endif
00574     return WOLFSSL_SUCCESS;
00575 }
00576
00577 #define tcp_connect(sockfd, ip, port, udp, sctp, ssl) \
00578     tcp_connect_with_wolfSentry(sockfd, ip, port, udp, sctp, ssl, wolfSentry)
00580
00581 #endif /* !WOLFSENTRY_WOLFSSL_TEST_H */

```





# Index

## Action Subsystem, [87](#)

- [wolfentry\\_action\\_callback\\_t](#), [89](#)
- [wolfentry\\_action\\_delete](#), [92](#)
- [wolfentry\\_action\\_drop\\_reference](#), [92](#)
- [WOLFSENTRY\\_ACTION\\_FLAG\\_DISABLED](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_FLAG\\_NONE](#), [90](#)
- [wolfentry\\_action\\_flags\\_t](#), [90](#)
- [wolfentry\\_action\\_flush\\_all](#), [92](#)
- [wolfentry\\_action\\_get\\_flags](#), [93](#)
- [wolfentry\\_action\\_get\\_label](#), [93](#)
- [wolfentry\\_action\\_get\\_reference](#), [93](#)
- [wolfentry\\_action\\_insert](#), [94](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_ACCEPT](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_BINDING](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_CLOSED](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_COMMENDABLE](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_CONNECT](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_CONNECTING\\_OUTP](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_DEALLOCATED](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_DEROGATORY](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_DISCONNECT](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_ERROR](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_FALLTHROUGH](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_INSERTED](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_LISTENING](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_NONE](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_PORT\\_RESET](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_RECEIVED](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_REJECT](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_SENDING](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_SOCKET\\_ERROR](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_STOP](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_STOPPED\\_LISTENING](#), [91](#)
- [wolfentry\\_action\\_res\\_t](#), [90](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_UNREACHABLE](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_UPDATE](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_USER0](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_USER1](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_USER2](#), [91](#)

- [WOLFSENTRY\\_ACTION\\_RES\\_USER3](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_USER4](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_USER5](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_RES\\_USER6](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_TYPE\\_DECISION](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_TYPE\\_DELETE](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_TYPE\\_INSERT](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_TYPE\\_MATCH](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_TYPE\\_NONE](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_TYPE\\_POST](#), [91](#)
- [wolfentry\\_action\\_type\\_t](#), [91](#)
- [WOLFSENTRY\\_ACTION\\_TYPE\\_UPDATE](#), [91](#)
- [wolfentry\\_action\\_update\\_flags](#), [95](#)

## Address Family Subsystem, [108](#)

### allocator

- [wolfentry\\_host\\_platform\\_interface](#), [149](#)

### Allocator (Heap) Functions and Callbacks, [139](#)

- [wolfentry\\_kv\\_pair](#), [150](#)

## Building and Initializing wolfSentry for an application on FreeRTOS/LwIP, [7](#)

### caller\_build\_settings

- [wolfentry\\_host\\_platform\\_interface](#), [149](#)

### config

- [wolfentry\\_build\\_settings](#), [147](#)

## Configuring wolfSentry using a JSON document, [11](#)

## Core Types and Macros, [47](#)

## Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [58](#)

- [WOLFSENTRY\\_DEBUG\\_CALL\\_TRACE](#), [62](#)

- [WOLFSENTRY\\_ERROR\\_UNLOCK\\_AND\\_RETURN](#), [62](#)

- [WOLFSENTRY\\_MUTEX\\_OR\\_RETURN](#), [62](#)

- [WOLFSENTRY\\_PROMOTABLE\\_EX](#), [63](#)

- [WOLFSENTRY\\_PROMOTABLE\\_OR\\_RETURN](#), [63](#)

- [WOLFSENTRY\\_SHARED\\_EX](#), [63](#)

- [WOLFSENTRY\\_SHARED\\_OR\\_RETURN](#), [63](#)

- [WOLFSENTRY\\_UNLOCK\\_AND\\_RETURN](#), [63](#)

- [WOLFSENTRY\\_UNLOCK\\_AND\\_UNRESERVE\\_FOR\\_RETURN](#), [64](#)

- [WOLFSENTRY\\_UNLOCK\\_AND\\_UNRESERVE\\_FOR\\_RETURN\\_EX](#), [64](#)

- [WOLFSENTRY\\_UNLOCK\\_FOR\\_RETURN](#), [64](#)

- [WOLFSENTRY\\_UNLOCK\\_FOR\\_RETURN\\_EX](#), [64](#)

## Event Subsystem, [95](#)

- wolfentry\_event\_action\_append, 98
- wolfentry\_event\_action\_delete, 98
- wolfentry\_event\_action\_insert\_after, 99
- wolfentry\_event\_action\_list\_done, 99
- wolfentry\_event\_action\_list\_next, 100
- wolfentry\_event\_action\_list\_start, 100
- wolfentry\_event\_action\_prepend, 101
- wolfentry\_event\_delete, 101
- wolfentry\_event\_drop\_reference, 102
- WOLFSENTRY\_EVENT\_FLAG\_IS\_PARENT\_EVENT, 97
- WOLFSENTRY\_EVENT\_FLAG\_IS\_SUBEVENT, 97
- WOLFSENTRY\_EVENT\_FLAG\_NONE, 97
- wolfentry\_event\_flags\_t, 97
- wolfentry\_event\_flush\_all, 102
- wolfentry\_event\_get\_config, 103
- wolfentry\_event\_get\_flags, 103
- wolfentry\_event\_get\_label, 103
- wolfentry\_event\_get\_reference, 104
- wolfentry\_event\_insert, 104
- wolfentry\_event\_set\_aux\_event, 105
- wolfentry\_event\_update\_config, 105
- wolfentry\_eventconfig\_check, 107
- WOLFSENTRY\_EVENTCONFIG\_FLAG\_COMMENDABLE, 97
- WOLFSENTRY\_EVENTCONFIG\_FLAG\_DEROGATORY, 97
- WOLFSENTRY\_EVENTCONFIG\_FLAG\_INHIBIT\_ACTIONS, 97
- WOLFSENTRY\_EVENTCONFIG\_FLAG\_NONE, 97
- wolfentry\_eventconfig\_flags\_t, 97
- wolfentry\_eventconfig\_init, 107
- JSON\_CALLBACKS, 145
- JSON\_CONFIG, 145
- JSON\_DOM\_PARSER, 145
- JSON\_INPUT\_POS, 146
- JSON\_PARSER, 146
- JSON\_VALUE, 146
- lwIP Callback Activation Functions, 143
- Object Subsystem, 116
  - wolfentry\_get\_object\_id, 117
  - wolfentry\_get\_object\_type, 117
  - WOLFSENTRY\_OBJECT\_TYPE\_ACTION, 117
  - WOLFSENTRY\_OBJECT\_TYPE\_ADDR\_FAMILY\_BYNAME, 117
  - WOLFSENTRY\_OBJECT\_TYPE\_ADDR\_FAMILY\_BYNUMBER, 117
  - WOLFSENTRY\_OBJECT\_TYPE\_EVENT, 117
  - WOLFSENTRY\_OBJECT\_TYPE\_KV, 117
  - WOLFSENTRY\_OBJECT\_TYPE\_ROUTE, 117
  - wolfentry\_object\_type\_t, 116
  - WOLFSENTRY\_OBJECT\_TYPE\_TABLE, 117
  - WOLFSENTRY\_OBJECT\_TYPE\_UNINITED, 117
  - wolfentry\_table\_n\_deletes, 117
  - wolfentry\_table\_n\_inserts, 118
- Route/Rule Subsystem, 65
  - WOLFSENTRY\_FORMAT\_FLAG\_ALWAYS\_NUMERIC, 71
  - WOLFSENTRY\_FORMAT\_FLAG\_NONE, 71
  - wolfentry\_format\_flags\_t, 71
  - wolfentry\_route\_bulk\_clear\_insert\_action\_status, 73
  - wolfentry\_route\_bulk\_insert\_actions, 73
  - wolfentry\_route\_delete, 73
  - wolfentry\_route\_delete\_by\_id, 74
  - wolfentry\_route\_drop\_reference, 75
  - wolfentry\_route\_event\_dispatch, 75
  - wolfentry\_route\_export, 76
  - wolfentry\_route\_exports\_render, 76
  - WOLFSENTRY\_ROUTE\_FLAG\_DELETE\_ACTIONS\_CALLED, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_DIRECTION\_IN, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_DIRECTION\_OUT, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_DONT\_COUNT\_CURRENT\_CONNECTIONS, 73
  - WOLFSENTRY\_ROUTE\_FLAG\_DONT\_COUNT\_HITS, 73
  - WOLFSENTRY\_ROUTE\_FLAG\_GREENLISTED, 73
  - WOLFSENTRY\_ROUTE\_FLAG\_IGNORE\_COMMENDABLE, 73
  - WOLFSENTRY\_ROUTE\_FLAG\_IN\_TABLE, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_INSERT\_ACTIONS\_CALLED, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_LOCAL\_ADDR\_BITMASK, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_LOCAL\_INTERFACE\_WILDCARD, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_NONE, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_PARENT\_EVENT\_WILDCARD, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_PENALTYBOXED, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_PENDING\_DELETE, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_PORT\_RESET, 73
  - WOLFSENTRY\_ROUTE\_FLAG\_REMOTE\_ADDR\_BITMASK, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_REMOTE\_INTERFACE\_WILDCARD, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_SA\_FAMILY\_WILDCARD, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_SA\_LOCAL\_ADDR\_WILDCARD, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_SA\_LOCAL\_PORT\_WILDCARD, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_SA\_PROTO\_WILDCARD, 72
  - WOLFSENTRY\_ROUTE\_FLAG\_SA\_REMOTE\_ADDR\_WILDCARD, 72

- WOLFSENTRY\_ROUTE\_FLAG\_SA\_REMOTE\_PORT\_WILDCARD, 72
- WOLFSENTRY\_ROUTE\_FLAG\_TCPLIKE\_PORT\_NUMBERS, 72
- wolfentry\_route\_flags\_t, 72
- wolfentry\_route\_flush\_table, 77
- wolfentry\_route\_get\_addrs, 77
- wolfentry\_route\_get\_flags, 78
- wolfentry\_route\_get\_main\_table, 78
- wolfentry\_route\_get\_metadata, 78
- wolfentry\_route\_get\_private\_data, 79
- wolfentry\_route\_get\_reference, 79
- wolfentry\_route\_insert, 80
- wolfentry\_route\_parent\_event, 81
- wolfentry\_route\_render, 81
- wolfentry\_route\_set\_wildcard, 81
- wolfentry\_route\_stale\_purge, 82
- wolfentry\_route\_table\_default\_policy\_get, 82
- wolfentry\_route\_table\_default\_policy\_set, 83
- wolfentry\_route\_table\_fallthrough\_route\_get, 83
- wolfentry\_route\_table\_iterate\_current, 84
- wolfentry\_route\_table\_iterate\_end, 84
- wolfentry\_route\_table\_iterate\_next, 84
- wolfentry\_route\_table\_iterate\_prev, 85
- wolfentry\_route\_table\_iterate\_seek\_to\_head, 85
- wolfentry\_route\_table\_iterate\_seek\_to\_tail, 86
- wolfentry\_route\_table\_iterate\_start, 86
- wolfentry\_route\_update\_flags, 86
- WOLFSENTRY\_SOCKADDR, 71
- sem\_destroy\_cb\_t
  - Semaphore Function Callbacks, 142
- sem\_init\_cb\_t
  - Semaphore Function Callbacks, 142
- sem\_post\_cb\_t
  - Semaphore Function Callbacks, 142
- sem\_timedwait\_cb\_t
  - Semaphore Function Callbacks, 142
- sem\_trywait\_cb\_t
  - Semaphore Function Callbacks, 142
- sem\_wait\_cb\_t
  - Semaphore Function Callbacks, 142
- Semaphore Function Callbacks, 141
  - sem\_destroy\_cb\_t, 142
  - sem\_init\_cb\_t, 142
  - sem\_post\_cb\_t, 142
  - sem\_timedwait\_cb\_t, 142
  - sem\_trywait\_cb\_t, 142
  - sem\_wait\_cb\_t, 142
- semcbs
  - wolfentry\_host\_platform\_interface, 149
- Startup/Configuration/Shutdown Subsystem, 48
  - WOLFSENTRY\_CLONE\_FLAG\_AS\_AT\_CREATION, 53
  - WOLFSENTRY\_CLONE\_FLAG\_NO\_ROUTES, 53
  - WOLFSENTRY\_CLONE\_FLAG\_NONE, 53
  - wolfentry\_clone\_flags\_t, 52
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_DRY\_RUN, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_FINI, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_FLUSH\_ONLY\_ROUTES, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_DUPKEY\_ABANDON, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_DUPKEY\_USING, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_DUPKEY\_USING\_SHARED, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_MAINTAIN\_IDENTITY, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_LOAD\_THEN\_COMMIT, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_NO\_FLUSH, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_NO\_ROUTES\_OR\_EVENTS, 53
  - WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_NONE, 53
  - wolfentry\_config\_load\_flags, 53
  - wolfentry\_context\_clone, 54
  - wolfentry\_context\_enable\_actions, 54
  - wolfentry\_context\_exchange, 54
  - wolfentry\_context\_flush, 55
  - wolfentry\_context\_free, 55
  - wolfentry\_context\_inhibit\_actions, 55
  - wolfentry\_defaultconfig\_get, 56
  - wolfentry\_defaultconfig\_update, 56
  - wolfentry\_init, 57
  - WOLFSENTRY\_INIT\_FLAG\_LOCK\_SHARED\_ERROR\_CHECKING, 54
  - WOLFSENTRY\_INIT\_FLAG\_NONE, 54
  - wolfentry\_init\_flags\_t, 53
  - wolfentry\_shutdown, 57
- Thread Synchronization Subsystem, 118
  - wolfentry\_lock\_alloc, 125
  - wolfentry\_lock\_destroy, 127
  - WOLFSENTRY\_LOCK\_FLAG\_ABANDON\_RESERVATION\_TOO, 125
  - WOLFSENTRY\_LOCK\_FLAG\_AUTO\_DOWNGRADE, 125
  - WOLFSENTRY\_LOCK\_FLAG\_GET\_RESERVATION\_TOO, 125
  - WOLFSENTRY\_LOCK\_FLAG\_NONE, 125
  - WOLFSENTRY\_LOCK\_FLAG\_NONRECURSIVE\_MUTEX, 125
  - WOLFSENTRY\_LOCK\_FLAG\_NONRECURSIVE\_SHARED, 125
  - WOLFSENTRY\_LOCK\_FLAG\_PSHARED, 125
  - WOLFSENTRY\_LOCK\_FLAG\_RETAIN\_SEMAPHORE, 125
  - WOLFSENTRY\_LOCK\_FLAG\_SHARED\_ERROR\_CHECKING, 125
  - WOLFSENTRY\_LOCK\_FLAG\_TRY\_RESERVATION\_TOO, 125
  - wolfentry\_lock\_flags\_t, 124
  - wolfentry\_lock\_free, 127
  - wolfentry\_lock\_get\_flags, 128

- wolfSentry\_lock\_have\_either, 128
- wolfSentry\_lock\_have\_mutex, 129
- wolfSentry\_lock\_have\_shared, 129
- wolfSentry\_lock\_have\_shared2mutex\_reservation, 130
- wolfSentry\_lock\_init, 130
- wolfSentry\_lock\_mutex, 131
- wolfSentry\_lock\_mutex2shared, 131
- wolfSentry\_lock\_mutex\_abstimed, 132
- wolfSentry\_lock\_mutex\_timed, 132
- wolfSentry\_lock\_shared, 133
- wolfSentry\_lock\_shared2mutex, 133
- wolfSentry\_lock\_shared2mutex\_abandon, 134
- wolfSentry\_lock\_shared2mutex\_abstimed, 134
- wolfSentry\_lock\_shared2mutex\_redeem, 135
- wolfSentry\_lock\_shared2mutex\_redeem\_abstimed, 135
- wolfSentry\_lock\_shared2mutex\_redeem\_timed, 136
- wolfSentry\_lock\_shared2mutex\_reserve, 136
- wolfSentry\_lock\_shared2mutex\_timed, 137
- wolfSentry\_lock\_shared\_abstimed, 137
- wolfSentry\_lock\_shared\_timed, 138
- wolfSentry\_lock\_unlock, 138
- WOLFSENTRY\_THREAD\_FLAG\_DEADLINE, 125
- WOLFSENTRY\_THREAD\_FLAG\_NONE, 125
- WOLFSENTRY\_THREAD\_FLAG\_READONLY, 125
- wolfSentry\_thread\_flags\_t, 125
- WOLFSENTRY\_THREAD\_HEADER, 123
- WOLFSENTRY\_THREAD\_HEADER\_CHECK, 123
- WOLFSENTRY\_THREAD\_HEADER\_CHECKED, 123
- WOLFSENTRY\_THREAD\_HEADER\_DECLS, 124
- WOLFSENTRY\_THREAD\_HEADER\_INIT, 124
- WOLFSENTRY\_THREAD\_HEADER\_INIT\_CHECKED, 124
- WOLFSENTRY\_THREAD\_TAILER, 124
- Time Functions and Callbacks, 140
- timecbcs
  - wolfSentry\_host\_platform\_interface, 149
- User-Defined Value Subsystem, 111
  - wolfSentry\_kv\_validator\_t, 115
  - wolfSentry\_user\_value\_get\_bytes, 115
  - wolfSentry\_user\_value\_get\_json, 115
  - wolfSentry\_user\_value\_get\_string, 115
- version
  - wolfSentry\_build\_settings, 147
- wolfSentry – The Wolfssl Embedded Firewall/IDPS, 1
- wolfSentry Release History and Change Log, 21
- wolfSentry/centijson\_dom.h, 155
- wolfSentry/centijson\_sax.h, 157
- wolfSentry/centijson\_value.h, 161
- wolfSentry/wolfSentry.h, 168, 190
- wolfSentry/wolfSentry\_af.h, 209, 212
- wolfSentry/wolfSentry\_errcodes.h, 213, 218
- wolfSentry/wolfSentry\_json.h, 223, 225
- wolfSentry/wolfSentry\_lwip.h, 226, 227
- wolfSentry/wolfSentry\_settings.h, 228, 231
- wolfSentry/wolfSentry\_util.h, 239, 243
- wolfSentry/wolfssl\_test.h, 246, 247
- wolfSentry\_action\_callback\_t
  - Action Subsystem, 89
- wolfSentry\_action\_delete
  - Action Subsystem, 92
- wolfSentry\_action\_drop\_reference
  - Action Subsystem, 92
- WOLFSENTRY\_ACTION\_FLAG\_DISABLED
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_FLAG\_NONE
  - Action Subsystem, 90
- wolfSentry\_action\_flags\_t
  - Action Subsystem, 90
- wolfSentry\_action\_flush\_all
  - Action Subsystem, 92
- wolfSentry\_action\_get\_flags
  - Action Subsystem, 93
- wolfSentry\_action\_get\_label
  - Action Subsystem, 93
- wolfSentry\_action\_get\_reference
  - Action Subsystem, 93
- wolfSentry\_action\_insert
  - Action Subsystem, 94
- WOLFSENTRY\_ACTION\_RES\_ACCEPT
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_BINDING
  - Action Subsystem, 91
- WOLFSENTRY\_ACTION\_RES\_CLOSED
  - Action Subsystem, 91
- WOLFSENTRY\_ACTION\_RES\_COMMENDABLE
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_CONNECT
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_CONNECTING\_OUT
  - Action Subsystem, 91
- WOLFSENTRY\_ACTION\_RES\_DEALLOCATED
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_DEROGATORY
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_DISCONNECT
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_ERROR
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_FALLTHROUGH
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_INSERTED
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_LISTENING
  - Action Subsystem, 91
- WOLFSENTRY\_ACTION\_RES\_NONE
  - Action Subsystem, 90
- WOLFSENTRY\_ACTION\_RES\_PORT\_RESET
  - Action Subsystem, 91
- WOLFSENTRY\_ACTION\_RES\_RECEIVED

- Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_REJECT
  - Action Subsystem, [90](#)
- WOLFSENTRY\_ACTION\_RES\_SENDING
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_SOCK\_ERROR
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_STOP
  - Action Subsystem, [90](#)
- WOLFSENTRY\_ACTION\_RES\_STOPPED\_LISTENING
  - Action Subsystem, [91](#)
- wolfentry\_action\_res\_t
  - Action Subsystem, [90](#)
- WOLFSENTRY\_ACTION\_RES\_UNREACHABLE
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_UPDATE
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_USER0
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_USER1
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_USER2
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_USER3
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_USER4
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_USER5
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_RES\_USER6
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_TYPE\_DECISION
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_TYPE\_DELETE
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_TYPE\_INSERT
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_TYPE\_MATCH
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_TYPE\_NONE
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_TYPE\_POST
  - Action Subsystem, [91](#)
- wolfentry\_action\_type\_t
  - Action Subsystem, [91](#)
- WOLFSENTRY\_ACTION\_TYPE\_UPDATE
  - Action Subsystem, [91](#)
- wolfentry\_action\_update\_flags
  - Action Subsystem, [95](#)
- wolfentry\_allocator, [147](#)
- WOLFSENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY
  - wolfentry\_util.h, [241](#)
- WOLFSENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY\_BY\_ONE
  - wolfentry\_util.h, [241](#)
- WOLFSENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY
  - wolfentry\_util.h, [242](#)
- WOLFSENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY\_BY\_ONE
  - wolfentry\_util.h, [242](#)
- WOLFSENTRY\_ATOMIC\_RESET
  - wolfentry\_util.h, [242](#)
- WOLFSENTRY\_ATOMIC\_TEST\_AND\_SET
  - wolfentry\_util.h, [242](#)
- WOLFSENTRY\_ATOMIC\_UPDATE\_FLAGS
  - wolfentry\_util.h, [242](#)
- wolfentry\_build\_settings, [147](#)
  - config, [147](#)
  - version, [147](#)
- WOLFSENTRY\_CLONE\_FLAG\_AS\_AT\_CREATION
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CLONE\_FLAG\_NO\_ROUTES
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CLONE\_FLAG\_NONE
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- wolfentry\_clone\_flags\_t
  - Startup/Configuration/Shutdown Subsystem, [52](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_DRY\_RUN
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_FINI
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_FLUSH\_ONLY\_ROUTES
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_DUPKEY\_ABORT
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_DUPKEY\_USEFIR
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_DUPKEY\_USELAS
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_JSON\_DOM\_MAINTAINDICTOP
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_LOAD\_THEN\_COMMIT
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_NO\_FLUSH
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_NO\_ROUTES\_OR\_EVENTS
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- WOLFSENTRY\_CONFIG\_LOAD\_FLAG\_NONE
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- wolfentry\_config\_load\_flags
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- wolfentry\_context\_clone
  - Startup/Configuration/Shutdown Subsystem, [54](#)
- wolfentry\_context\_enable\_actions
  - Startup/Configuration/Shutdown Subsystem, [54](#)
- wolfentry\_context\_exchange
  - Startup/Configuration/Shutdown Subsystem, [54](#)
- wolfentry\_context\_flush
  - Startup/Configuration/Shutdown Subsystem, [55](#)
- wolfentry\_context\_free
  - Startup/Configuration/Shutdown Subsystem, [55](#)
- wolfentry\_context\_inhibit\_actions
  - Startup/Configuration/Shutdown Subsystem, [55](#)
- wolfentry\_data, [148](#)
- WOLFSENTRY\_DEBUG\_CALL\_TRACE
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [62](#)
- wolfentry\_defaultconfig\_get



- Startup/Configuration/Shutdown Subsystem, [56](#)
- wolfentry\_defaultconfig\_update
  - Startup/Configuration/Shutdown Subsystem, [56](#)
- WOLFENTRY\_ERROR\_UNLOCK\_AND\_RETURN
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [62](#)
- wolfentry\_event\_action\_append
  - Event Subsystem, [98](#)
- wolfentry\_event\_action\_delete
  - Event Subsystem, [98](#)
- wolfentry\_event\_action\_insert\_after
  - Event Subsystem, [99](#)
- wolfentry\_event\_action\_list\_done
  - Event Subsystem, [99](#)
- wolfentry\_event\_action\_list\_next
  - Event Subsystem, [100](#)
- wolfentry\_event\_action\_list\_start
  - Event Subsystem, [100](#)
- wolfentry\_event\_action\_prepend
  - Event Subsystem, [101](#)
- wolfentry\_event\_delete
  - Event Subsystem, [101](#)
- wolfentry\_event\_drop\_reference
  - Event Subsystem, [102](#)
- WOLFENTRY\_EVENT\_FLAG\_IS\_PARENT\_EVENT
  - Event Subsystem, [97](#)
- WOLFENTRY\_EVENT\_FLAG\_IS\_SUBEVENT
  - Event Subsystem, [97](#)
- WOLFENTRY\_EVENT\_FLAG\_NONE
  - Event Subsystem, [97](#)
- wolfentry\_event\_flags\_t
  - Event Subsystem, [97](#)
- wolfentry\_event\_flush\_all
  - Event Subsystem, [102](#)
- wolfentry\_event\_get\_config
  - Event Subsystem, [103](#)
- wolfentry\_event\_get\_flags
  - Event Subsystem, [103](#)
- wolfentry\_event\_get\_label
  - Event Subsystem, [103](#)
- wolfentry\_event\_get\_reference
  - Event Subsystem, [104](#)
- wolfentry\_event\_insert
  - Event Subsystem, [104](#)
- wolfentry\_event\_set\_aux\_event
  - Event Subsystem, [105](#)
- wolfentry\_event\_update\_config
  - Event Subsystem, [105](#)
- wolfentry\_eventconfig, [148](#)
- wolfentry\_eventconfig\_check
  - Event Subsystem, [107](#)
- WOLFENTRY\_EVENTCONFIG\_FLAG\_COMMENDABLE\_CLEAR\_DEROGATORY\_THREADS
  - Event Subsystem, [97](#)
- WOLFENTRY\_EVENTCONFIG\_FLAG\_DEROGATORY\_THREADS\_IGNORE\_COMMENDABLE
  - Event Subsystem, [97](#)
- WOLFENTRY\_EVENTCONFIG\_FLAG\_INHIBIT\_ACTIONS
  - Event Subsystem, [97](#)
- WOLFENTRY\_EVENTCONFIG\_FLAG\_NONE
  - Event Subsystem, [97](#)
- Event Subsystem, [97](#)
- wolfentry\_eventconfig\_flags\_t
  - Event Subsystem, [97](#)
- wolfentry\_eventconfig\_init
  - Event Subsystem, [107](#)
- WOLFENTRY\_FORMAT\_FLAG\_ALWAYS\_NUMERIC
  - Route/Rule Subsystem, [71](#)
- WOLFENTRY\_FORMAT\_FLAG\_NONE
  - Route/Rule Subsystem, [71](#)
- wolfentry\_format\_flags\_t
  - Route/Rule Subsystem, [71](#)
- wolfentry\_get\_object\_id
  - Object Subsystem, [117](#)
- wolfentry\_get\_object\_type
  - Object Subsystem, [117](#)
- wolfentry\_host\_platform\_interface, [149](#)
  - allocator, [149](#)
  - caller\_build\_settings, [149](#)
  - semcbs, [149](#)
  - timecbs, [149](#)
- wolfentry\_init
  - Startup/Configuration/Shutdown Subsystem, [57](#)
- WOLFENTRY\_INIT\_FLAG\_LOCK\_SHARED\_ERROR\_CHECKING
  - Startup/Configuration/Shutdown Subsystem, [54](#)
- WOLFENTRY\_INIT\_FLAG\_NONE
  - Startup/Configuration/Shutdown Subsystem, [54](#)
- wolfentry\_init\_flags\_t
  - Startup/Configuration/Shutdown Subsystem, [53](#)
- wolfentry\_kv\_pair, [150](#)
  - b, [150](#)
- wolfentry\_kv\_validator\_t
  - User-Defined Value Subsystem, [115](#)
- wolfentry\_lock\_alloc
  - Thread Synchronization Subsystem, [125](#)
- wolfentry\_lock\_destroy
  - Thread Synchronization Subsystem, [127](#)
- WOLFENTRY\_LOCK\_FLAG\_ABANDON\_RESERVATION\_TOO
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_AUTO\_DOWNGRADE
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_GET\_RESERVATION\_TOO
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_NONE
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_NONRECURSIVE\_MUTEX
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_NONRECURSIVE\_SHARED
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_PSHARED
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_RETAIN\_SEMAPHORE
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_SHARED\_ERROR\_CHECKING
  - Thread Synchronization Subsystem, [125](#)
- WOLFENTRY\_LOCK\_FLAG\_TRY\_RESERVATION\_TOO
  - Thread Synchronization Subsystem, [125](#)
- wolfentry\_lock\_flags\_t
  - Thread Synchronization Subsystem, [124](#)

- wolfentry\_lock\_free
  - Thread Synchronization Subsystem, [127](#)
- wolfentry\_lock\_get\_flags
  - Thread Synchronization Subsystem, [128](#)
- wolfentry\_lock\_have\_either
  - Thread Synchronization Subsystem, [128](#)
- wolfentry\_lock\_have\_mutex
  - Thread Synchronization Subsystem, [129](#)
- wolfentry\_lock\_have\_shared
  - Thread Synchronization Subsystem, [129](#)
- wolfentry\_lock\_have\_shared2mutex\_reservation
  - Thread Synchronization Subsystem, [130](#)
- wolfentry\_lock\_init
  - Thread Synchronization Subsystem, [130](#)
- wolfentry\_lock\_mutex
  - Thread Synchronization Subsystem, [131](#)
- wolfentry\_lock\_mutex2shared
  - Thread Synchronization Subsystem, [131](#)
- wolfentry\_lock\_mutex\_abstimed
  - Thread Synchronization Subsystem, [132](#)
- wolfentry\_lock\_mutex\_timed
  - Thread Synchronization Subsystem, [132](#)
- wolfentry\_lock\_shared
  - Thread Synchronization Subsystem, [133](#)
- wolfentry\_lock\_shared2mutex
  - Thread Synchronization Subsystem, [133](#)
- wolfentry\_lock\_shared2mutex\_abandon
  - Thread Synchronization Subsystem, [134](#)
- wolfentry\_lock\_shared2mutex\_abstimed
  - Thread Synchronization Subsystem, [134](#)
- wolfentry\_lock\_shared2mutex\_redeem
  - Thread Synchronization Subsystem, [135](#)
- wolfentry\_lock\_shared2mutex\_redeem\_abstimed
  - Thread Synchronization Subsystem, [135](#)
- wolfentry\_lock\_shared2mutex\_redeem\_timed
  - Thread Synchronization Subsystem, [136](#)
- wolfentry\_lock\_shared2mutex\_reserve
  - Thread Synchronization Subsystem, [136](#)
- wolfentry\_lock\_shared2mutex\_timed
  - Thread Synchronization Subsystem, [137](#)
- wolfentry\_lock\_shared\_abstimed
  - Thread Synchronization Subsystem, [137](#)
- wolfentry\_lock\_shared\_timed
  - Thread Synchronization Subsystem, [138](#)
- wolfentry\_lock\_unlock
  - Thread Synchronization Subsystem, [138](#)
- WOLFENTRY\_MUTEX\_OR\_RETURN
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [62](#)
- WOLFENTRY\_OBJECT\_TYPE\_ACTION
  - Object Subsystem, [117](#)
- WOLFENTRY\_OBJECT\_TYPE\_ADDR\_FAMILY\_BYNAME
  - Object Subsystem, [117](#)
- WOLFENTRY\_OBJECT\_TYPE\_ADDR\_FAMILY\_BYNUMBER
  - Object Subsystem, [117](#)
- WOLFENTRY\_OBJECT\_TYPE\_EVENT
  - Object Subsystem, [117](#)
- WOLFENTRY\_OBJECT\_TYPE\_KV
  - Object Subsystem, [117](#)
- WOLFENTRY\_OBJECT\_TYPE\_ROUTE
  - Object Subsystem, [117](#)
- wolfentry\_object\_type\_t
  - Object Subsystem, [116](#)
- WOLFENTRY\_OBJECT\_TYPE\_TABLE
  - Object Subsystem, [117](#)
- WOLFENTRY\_OBJECT\_TYPE\_UNINITED
  - Object Subsystem, [117](#)
- WOLFENTRY\_PROMOTABLE\_EX
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [63](#)
- WOLFENTRY\_PROMOTABLE\_OR\_RETURN
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [63](#)
- wolfentry\_route\_bulk\_clear\_insert\_action\_status
  - Route/Rule Subsystem, [73](#)
- wolfentry\_route\_bulk\_insert\_actions
  - Route/Rule Subsystem, [73](#)
- wolfentry\_route\_delete
  - Route/Rule Subsystem, [73](#)
- wolfentry\_route\_delete\_by\_id
  - Route/Rule Subsystem, [74](#)
- wolfentry\_route\_drop\_reference
  - Route/Rule Subsystem, [75](#)
- wolfentry\_route\_endpoint, [150](#)
- wolfentry\_route\_event\_dispatch
  - Route/Rule Subsystem, [75](#)
- wolfentry\_route\_export
  - Route/Rule Subsystem, [76](#)
- wolfentry\_route\_exports, [151](#)
- wolfentry\_route\_exports\_render
  - Route/Rule Subsystem, [76](#)
- WOLFENTRY\_ROUTE\_FLAG\_DELETE\_ACTIONS\_CALLED
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_DIRECTION\_IN
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_DIRECTION\_OUT
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_DONT\_COUNT\_CURRENT\_CONNECTIONS
  - Route/Rule Subsystem, [73](#)
- WOLFENTRY\_ROUTE\_FLAG\_DONT\_COUNT\_HITS
  - Route/Rule Subsystem, [73](#)
- WOLFENTRY\_ROUTE\_FLAG\_GREENLISTED
  - Route/Rule Subsystem, [73](#)
- WOLFENTRY\_ROUTE\_FLAG\_IN\_TABLE
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_INSERT\_ACTIONS\_CALLED
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_LOCAL\_ADDR\_BITMASK
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_LOCAL\_INTERFACE\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_NONE
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_PARENT\_EVENT\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFENTRY\_ROUTE\_FLAG\_PENALTYBOXED

- Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_PENDING\_DELETE
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_PORT\_RESET
  - Route/Rule Subsystem, [73](#)
- WOLFSENTRY\_ROUTE\_FLAG\_REMOTE\_ADDR\_BITMASK
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_REMOTE\_INTERFACE\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_SA\_FAMILY\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_SA\_LOCAL\_ADDR\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_SA\_LOCAL\_PORT\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_SA\_PROTO\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_SA\_REMOTE\_ADDR\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_SA\_REMOTE\_PORT\_WILDCARD
  - Route/Rule Subsystem, [72](#)
- WOLFSENTRY\_ROUTE\_FLAG\_TCPLIKE\_PORT\_NUMBER
  - Route/Rule Subsystem, [72](#)
- wolfentry\_route\_flags\_t
  - Route/Rule Subsystem, [72](#)
- wolfentry\_route\_flush\_table
  - Route/Rule Subsystem, [77](#)
- wolfentry\_route\_get\_addrs
  - Route/Rule Subsystem, [77](#)
- wolfentry\_route\_get\_flags
  - Route/Rule Subsystem, [78](#)
- wolfentry\_route\_get\_main\_table
  - Route/Rule Subsystem, [78](#)
- wolfentry\_route\_get\_metadata
  - Route/Rule Subsystem, [78](#)
- wolfentry\_route\_get\_private\_data
  - Route/Rule Subsystem, [79](#)
- wolfentry\_route\_get\_reference
  - Route/Rule Subsystem, [79](#)
- wolfentry\_route\_insert
  - Route/Rule Subsystem, [80](#)
- wolfentry\_route\_metadata\_exports, [152](#)
- wolfentry\_route\_parent\_event
  - Route/Rule Subsystem, [81](#)
- wolfentry\_route\_render
  - Route/Rule Subsystem, [81](#)
- wolfentry\_route\_set\_wildcard
  - Route/Rule Subsystem, [81](#)
- wolfentry\_route\_stale\_purge
  - Route/Rule Subsystem, [82](#)
- wolfentry\_route\_table\_default\_policy\_get
  - Route/Rule Subsystem, [82](#)
- wolfentry\_route\_table\_default\_policy\_set
  - Route/Rule Subsystem, [83](#)
- wolfentry\_route\_table\_fallthrough\_route\_get
  - Route/Rule Subsystem, [83](#)
- wolfentry\_route\_table\_iterate\_current
  - Route/Rule Subsystem, [84](#)
- wolfentry\_route\_table\_iterate\_end
  - Route/Rule Subsystem, [84](#)
- wolfentry\_route\_table\_iterate\_next
  - Route/Rule Subsystem, [84](#)
- wolfentry\_route\_table\_iterate\_prev
  - Route/Rule Subsystem, [85](#)
- wolfentry\_route\_table\_iterate\_seek\_to\_head
  - Route/Rule Subsystem, [85](#)
- wolfentry\_route\_table\_iterate\_seek\_to\_tail
  - Route/Rule Subsystem, [86](#)
- wolfentry\_route\_table\_iterate\_start
  - Route/Rule Subsystem, [86](#)
- wolfentry\_route\_update\_flags
  - Route/Rule Subsystem, [86](#)
- wolfentry\_semcbs, [152](#)
- WOLFSENTRY\_SHARED\_EX
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [63](#)
- WOLFSENTRY\_SHARED\_OR\_RETURN
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [63](#)
- wolfentry\_shutdown
  - Startup/Configuration/Shutdown Subsystem, [57](#)
- WOLFSENTRY\_SOCKADDR
  - Route/Rule Subsystem, [71](#)
- wolfentry\_sockaddr, [153](#)
- wolfentry\_table\_n\_deletes
  - Object Subsystem, [117](#)
- wolfentry\_table\_n\_inserts
  - Object Subsystem, [118](#)
- wolfentry\_thread\_context\_public, [154](#)
- WOLFSENTRY\_THREAD\_FLAG\_DEADLINE
  - Thread Synchronization Subsystem, [125](#)
- WOLFSENTRY\_THREAD\_FLAG\_NONE
  - Thread Synchronization Subsystem, [125](#)
- WOLFSENTRY\_THREAD\_FLAG\_READONLY
  - Thread Synchronization Subsystem, [125](#)
- wolfentry\_thread\_flags\_t
  - Thread Synchronization Subsystem, [125](#)
- WOLFSENTRY\_THREAD\_HEADER
  - Thread Synchronization Subsystem, [123](#)
- WOLFSENTRY\_THREAD\_HEADER\_CHECK
  - Thread Synchronization Subsystem, [123](#)
- WOLFSENTRY\_THREAD\_HEADER\_CHECKED
  - Thread Synchronization Subsystem, [123](#)
- WOLFSENTRY\_THREAD\_HEADER\_DECLS
  - Thread Synchronization Subsystem, [124](#)
- WOLFSENTRY\_THREAD\_HEADER\_INIT
  - Thread Synchronization Subsystem, [124](#)
- WOLFSENTRY\_THREAD\_HEADER\_INIT\_CHECKED
  - Thread Synchronization Subsystem, [124](#)
- WOLFSENTRY\_THREAD\_TAILER
  - Thread Synchronization Subsystem, [124](#)
- wolfentry\_timecbs, [154](#)
- WOLFSENTRY\_UNLOCK\_AND\_RETURN
  - Diagnostics, Control Flow Helpers, and Compiler Attribute Helpers, [63](#)
- WOLFSENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN



- Diagnostics, Control Flow Helpers, and Compiler
  - Attribute Helpers, [64](#)
- WOLFSENTRY\_UNLOCK\_AND\_UNRESERVE\_FOR\_RETURN\_EX
  - Diagnostics, Control Flow Helpers, and Compiler
    - Attribute Helpers, [64](#)
- WOLFSENTRY\_UNLOCK\_FOR\_RETURN
  - Diagnostics, Control Flow Helpers, and Compiler
    - Attribute Helpers, [64](#)
- WOLFSENTRY\_UNLOCK\_FOR\_RETURN\_EX
  - Diagnostics, Control Flow Helpers, and Compiler
    - Attribute Helpers, [64](#)
- wolfentry\_user\_value\_get\_bytes
  - User-Defined Value Subsystem, [115](#)
- wolfentry\_user\_value\_get\_json
  - User-Defined Value Subsystem, [115](#)
- wolfentry\_user\_value\_get\_string
  - User-Defined Value Subsystem, [115](#)
- wolfentry\_util.h
  - WOLFSENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY,
    - [241](#)
  - WOLFSENTRY\_ATOMIC\_DECREMENT\_UNSIGNED\_SAFELY\_BY\_ONE,
    - [241](#)
  - WOLFSENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY,
    - [242](#)
  - WOLFSENTRY\_ATOMIC\_INCREMENT\_UNSIGNED\_SAFELY\_BY\_ONE,
    - [242](#)
  - WOLFSENTRY\_ATOMIC\_RESET, [242](#)
  - WOLFSENTRY\_ATOMIC\_TEST\_AND\_SET, [242](#)
  - WOLFSENTRY\_ATOMIC\_UPDATE\_FLAGS, [242](#)