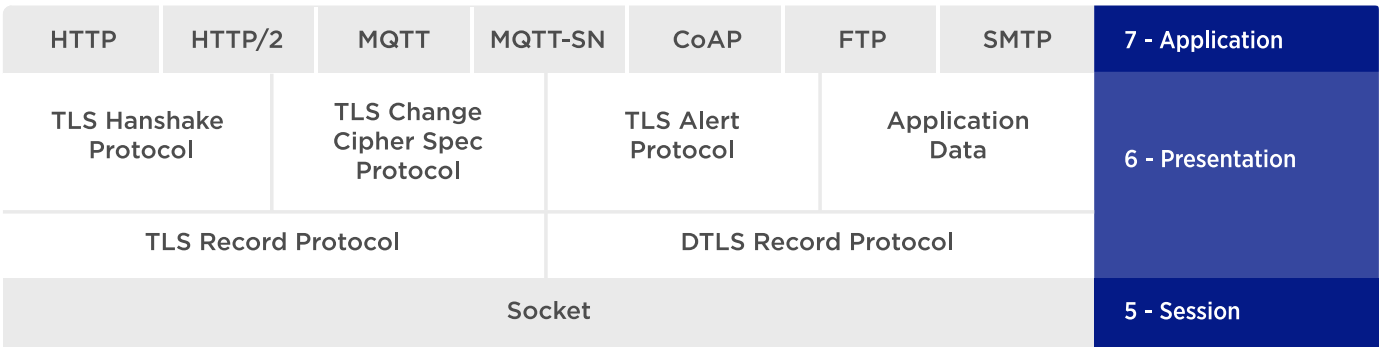
CycloneSSL v2.2.2

Embedded TLS 1.3 / DTLS 1.2 Library

CycloneSSL is a lightweight TLS / DTLS implementation targeted for use by embedded application developers. It provides the ability to secure communications over the Internet (e.g. IoT protocols, electronic mail, web server, file transfer, VoIP).



Main Features

- Server and/or client operation
- Supports TLS 1.0, TLS 1.1, TLS 1.2 and TLS 1.3 protocols
- Supports DTLS 1.0 and DTLS 1.2 (Datagram Transport Layer Security)
- Robust and efficient implementation
- Supports ECC (Elliptic Curve Cryptography)
- Rich set of TLS cipher suites (including Suite B profile)
- RSA, Diffie-Hellman and ECDH key exchange algorithms
- Compliant with BSD socket API
- Flexible memory footprint. Built-time configuration to embed only the necessary features
- Consistent application programming interface (API)
- Portable architecture (no processor dependencies)
- The library is distributed as a full ANSI C and highly maintainable source code

Supported Algorithms

- ECDH key exchange based on Curve25519 (X25519) and Curve448 (X448)
- FFDHE (Finite Field Diffie-Hellman Ephemeral)
- Supports PSK (Pre-Shared Key) cipher suites
- RSA signature schemes (RSASSA PKCS#1 v1.5 and RSASSA-PSS)
- DSA and ECDSA signature schemes
- EdDSA signature scheme (Ed25519 and Ed448 elliptic curves)
- Supports stream ciphers and CBC block ciphers
- Cipher Block Chaining-MAC (CCM) and Galois Counter Mode (GCM)
- ChaCha20Poly1305 Authenticated Encryption with Associated Data (AEAD)
- Supports AES, Camellia, SEED and ARIA encryption algorithms
- Legacy support for RC4, IDEA, DES and 3DES encryption algorithms
- Supports SHA-256, SHA-384 and SHA-512 hash algorithms
- Legacy support for MD5 and SHA-1 hash algorithms
- Session resumption mechanism
- Session ticket mechanism (RFC 5077)
- Supports secure renegotiation (RFC 5746)
- Fallback SCSV signaling cipher suite
- SNI extension (Server Name Indication)
- Raw Public Keys (RFC 7250)
- Maximum Fragment Length extension (RFC 6066)
- Record Size Limit extension (RFC 8449)
- Application-Layer Protocol Negotiation (ALPN) extension
- Extended Master Secret extension
- ClientHello Padding extension (RFC 7685)
- (EC)DHE key establishment (TLS 1.3)
- PSK key establishment (TLS 1.3)
- PSK with (EC)DHE key establishment (TLS 1.3)
- Middlebox compatibility mode (TLS 1.3)
- Key update mechanism (TLS 1.3)
- Early data (TLS 1.3 client)
- X.509 certificate parsing and PKIX path validation
- Parsing of public/private keys (PKCS #1 and PKCS #8 formats supported)
- Parsing of encrypted private keys (PKCS #1 and PKCS #8 formats supported)

Supported Extensions

- server_name (RFC 6066)
- max_fragment_length (RFC 6066)
- supported_groups (RFC 7919)
- ec_point_formats (RFC 8422)
- signature_algorithms (RFC 8446)
- application_layer_protocol_negotiation (RFC 7301)
- client_certificate_type (RFC 7250)
- server_certificate_type (RFC 7250)
- padding (RFC 7685)
- extended_master_secret (RFC 7627)
- record_size_limit (RFC 8449)
- session_ticket (RFC 5077)
- pre_shared_key (RFC 8446)
- early_data (RFC 8446)
- supported_versions (RFC 8446)
- cookie (RFC 8446)
- psk_key_exchange_modes (RFC 8446)
- certificate_authorities (RFC 8446)
- signature_algorithms_cert (RFC 8446)
- key_share (RFC 8446)
- renegotiation_info (RFC 5746)

Supported Processors

- ARM Cortex-M3
- ARM Cortex-M33
- ARM Cortex-M4
- ARM Cortex-M7
- ARM Cortex-R4
- ARM Cortex-A5
- ARM Cortex-A8
- ARM Cortex-A9
- Legacy ARM7TDMI / ARM926EJ-S
- RISC-V
- MIPS M4K
- MIPS microAptiv
- Infineon TriCore AURIX
- PowerPC e200
- Coldfire V2
- RX600
- AVR32
- Xtensa LX6

Supported Compilers / Toolchains

- GNU GCC / Makefile
- AC6 System Workbench for STM32 (SW4STM32)
- HighTec Toolset for TriCore
- IAR Embedded Workbench
- Infineon DAVE
- Keil MDK-ARM
- Microchip Studio (Atmel Studio) & MPLAB X
- Microsoft Visual Studio
- NXP MCUXpresso
- Renesas e2Studio
- Segger Embedded Studio
- ST STM32CubeIDE & TrueSTUDIO
- Tasking VX-Compiler for TriCore
- TI Code Composer Studio (CSS)

Supported Operating Systems

- Amazon FreeRTOS
- ChibiOS/RT
- CMSIS-RTOS
- CMSIS-RTOS2
- CMX-RTX
- Keil RTXv4 and RTXv5
- Micrium µC/OS-II and µC/OS-III
- Microsoft Azure RTOS (ThreadX)
- Segger embOS
- TI-RTOS (SYS/BIOS)
- Zephyr RTOS
- Bare Metal programming (without RTOS)

RFC

- RFC 2246: The TLS Protocol Version 1.0
- RFC 3268: Advanced Encryption Standard (AES) Cipher Suites for TLS
- RFC 4162: Addition of SEED Cipher Suites to Transport Layer Security (TLS)
- RFC 4279: Pre-Shared Key Cipher Suites for Transport Layer Security (TLS)
- RFC 4346: The Transport Layer Security (TLS) Protocol Version 1.1
- RFC 4347: Datagram Transport Layer Security (DTLS)
- RFC 4492: Elliptic Curve Cryptography (ECC) Cipher Suites for TLS
- RFC 5116: An Interface and Algorithms for Authenticated Encryption
- RFC 5246: The Transport Layer Security (TLS) Protocol Version 1.2
- RFC 5280: Internet X.509 Public Key Infrastructure Certificate and CRL Profile
- RFC 5288: AES Galois Counter Mode (GCM) Cipher Suites for TLS
- RFC 5289: TLS ECC Cipher Suites with SHA-256/384 and AES Galois Counter Mode
- RFC 5469: DES and IDEA Cipher Suites for Transport Layer Security (TLS)
- RFC 5487: PSK Cipher Suites for TLS with SHA-256/384 and AES Galois Counter Mode
- RFC 5489: ECDHE_PSK Cipher Suites for Transport Layer Security (TLS)
- RFC 5746: TLS Renegotiation Indication Extension
- RFC 5932: Camellia Cipher Suites for TLS
- RFC 6066: Transport Layer Security (TLS) Extensions: Extension Definitions
- RFC 6101: The Secure Sockets Layer (SSL) Protocol Version 3.0
- RFC 6209: Addition of the ARIA Cipher Suites to Transport Layer Security (TLS)
- RFC 6347: Datagram Transport Layer Security Version 1.2
- RFC 6367: Addition of the Camellia Cipher Suites to Transport Layer Security (TLS)
- RFC 6460: Suite B Profile for Transport Layer Security (TLS)
- RFC 6655: AES-CCM Cipher Suites for Transport Layer Security (TLS)
- RFC 7027: Elliptic Curve Cryptography (ECC) Brainpool Curves for TLS
- RFC 7250: Using Raw Public Keys in TLS and DTLS
- RFC 7251: AES-CCM Elliptic Curve Cryptography (ECC) Cipher Suites for TLS
- RFC 7301: TLS Application-Layer Protocol Negotiation Extension
- RFC 7507: TLS Fallback Signaling Cipher Suite Value (SCSV)
- RFC 7525: Recommendations for Secure Use of TLS and DTLS
- RFC 7539: ChaCha20 and Poly1305 for IETF Protocols
- RFC 7627: TLS Session Hash and Extended Master Secret Extension
- RFC 7685: A Transport Layer Security (TLS) ClientHello Padding Extension
- RFC 7905: ChaCha20-Poly1305 Cipher Suites for Transport Layer Security (TLS)
- RFC 7919: Negotiated Finite Field Diffie-Hellman Ephemeral Parameters for TLS
- RFC 8422: ECC Cipher Suites for TLS Versions 1.2 and Earlier
- RFC 8442: ECDHE_PSK with AES-GCM and AES-CCM Cipher Suites for TLS 1.2
- RFC 8446: The Transport Layer Security (TLS) Protocol Version 1.3
- RFC 8447: IANA Registry Updates for TLS and DTLS
- RFC 8449: Record Size Limit Extension for TLS
- RFC 8734: Elliptic Curve Cryptography (ECC) Brainpool Curves for TLS Version 1.3
- RFC 8996: Deprecating TLS 1.0 and TLS 1.1
- RFC 9150: TLS 1.3 Authentication and Integrity-Only Cipher Suites
- RFC 9155: Deprecating MD5 and SHA-1 Signature Hashes in TLS 1.2 and DTLS 1.2

NIST

- SP 800-52: Guidelines for the Selection and Use of TLS Implementations