



**CycloneTCP** is a dual IPv4/IPv6 stack dedicated to embedded applications. CycloneTCP conforms to RFC standards and offers seamless interoperability with existing TCP/IP systems. By supporting IPv6, CycloneTCP eases deployment of next-generation Internet. The stack is distributed as a full ANSI C and highly maintainable source code.

HTTP	HTTP/2	MQTT	MQTT-SN	CoAP	FTP	7 - Application
SMTP	SNTP	DNS	NetBIOS	SNMPv3	TFTP	
WebSocket		mDNS	DNS-SD	DHCP	DHCPv6	
Socket						5 - Session
TCP		UDP		RAW		4 - Transport
IPv4			IPv6			3 - Network
ARP	Auto-IP		NDP	SLAAC		
ICMP	IGMPv2		ICMPv6	MLDv1		
Ethernet	Wi-Fi	PPP	USB/RNDIS	G3-PLC		2 - Data Link

### Main Features

- Dual stack (IPv4 and/or IPv6)
- Built-in support for multiple network interfaces
- Flexible memory footprint (built-time configuration to embed only the necessary features)
- Configurable memory model (static memory pool or heap memory allocation)
- Portable architecture (no processor dependencies)
- Straightforward port to any RTOS
- Highly maintainable source code
- Debugging and trace functionality to ease development and integration
- BSD style socket API
- Blocking/non-blocking socket operation and event-driven functions (select and poll)
- Efficient data transfer through zero copy
- Well-crafted TCP module with selective acknowledgement (SACK) and congestion control
- Raw socket interface
- IP fragmentation and reassembly support
- Support for virtual interfaces (multiple MAC addresses per physical interface)
- Support for multi-homed hosts (multiple IPv4 addresses per interface)
- Ethernet port multiplication using VLAN tagging (SMSC switches) or tail tagging (Micrel switches)
- VLAN support (802.1q and 802.1ad)
- USB Device RNDIS class driver (for STM32 microcontrollers)

## Supported Protocols

- DNS client
- NetBIOS client and responder
- LLMNR client and responder
- mDNS client and responder
- DNS-SD responder (DNS-based service discovery)
- DHCP client and server
- Auto-IP (dynamic configuration of IPv4 link-local addresses)
- DHCPv6 client and relay agent
- SLAAC (IPv6 stateless address autoconfiguration)
- Multicast support (IGMPv2 and MLDv1)
- FTP / FTPS client and server (implicit TLS and explicit TLS modes supported)
- HTTP / HTTPS client
- HTTP / HTTPS server with SSI, CGI scripting and WebSocket support
- HTTP/2 client (including HPACK compression, server push and https scheme)
- MQTT v3.1.1 client (TCP, TLS, WebSocket and secure WebSocket transport layers supported)
- MQTT-SN client (UDP and DTLS transport layers supported)
- CoAP client and server (DTLS-secured CoAP, Observe and Block-Wise Transfers supported)
- SMTP client
- SNTP client (network time synchronization)
- SNMP agent (SNMPv1, SNMPv2c and SNMPv3 supported)
- Remote management of SNMP users and access rights (SNMP-USM-MIB and SNMP-VACM-MIB)
- Standard MIBs: MIB-II, IF-MIB, IP-MIB, TCP-MIB, UDP-MIB, SNMPv2-MIB
- TFTP client and server
- Modbus/TCP client and server (Modbus/TCP security supported)
- WebSocket client and server (WebSocket connections tunneled over SSL/TLS supported)
- PPP (Point-to-Point Protocol)

## Supported Processors

- ARM Cortex-M3
- 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 (RTXv5 and FreeRTOS)
- Keil RTX
- Micrium  $\mu$ C/OS-II and  $\mu$ C/OS-III
- Microsoft Azure RTOS (ThreadX)
- Segger embOS
- SYS/BIOS (TI-RTOS)
- Bare Metal programming (without RTOS)

### Data Link Layer (PPP)

- [RFC 1332](#): The PPP Internet Protocol Control Protocol (IPCP)
- [RFC 1334](#): PPP Authentication Protocols
- [RFC 1661](#): The Point-to-Point Protocol (PPP)
- [RFC 1662](#): PPP in HDLC-like Framing
- [RFC 1994](#): PPP Challenge Handshake Authentication Protocol (CHAP)
- [RFC 2472](#): IP Version 6 over PPP

### Network Layer (IPv4)

- [RFC 791](#): Internet Protocol Specification
- [RFC 792](#): Internet Control Message Protocol Specification
- [RFC 815](#): IP Datagram Reassembly Algorithms
- [RFC 826](#): Ethernet Address Resolution Protocol
- [RFC 1112](#): Host Extensions for IP Multicasting
- [RFC 1122](#): Requirements for Internet Hosts - Communication Layers
- [RFC 2113](#): IP Router Alert Option
- [RFC 2236](#): Internet Group Management Protocol, Version 2
- [RFC 3927](#): Dynamic Configuration of IPv4 Link-Local Addresses
- [RFC 5227](#): IPv4 Address Conflict Detection

### Network Layer (IPv6)

- [RFC 2460](#): Internet Protocol, Version 6 (IPv6) Specification
- [RFC 2464](#): Transmission of IPv6 Packets over Ethernet Networks
- [RFC 2710](#): Multicast Listener Discovery (MLD) for IPv6
- [RFC 3484](#): Default Address Selection for Internet Protocol version 6 (IPv6)
- [RFC 3493](#): Basic Socket Interface Extensions for IPv6
- [RFC 4291](#): IP Version 6 Addressing Architecture
- [RFC 4294](#): IPv6 Node Requirements
- [RFC 4443](#): Internet Control Message Protocol Version 6 (ICMPv6) Specification
- [RFC 4861](#): Neighbor Discovery for IP version 6 (IPv6)
- [RFC 4862](#): IPv6 Stateless Address Autoconfiguration
- [RFC 6106](#): IPv6 Router Advertisement Options for DNS Configuration

### Transport Layer

- [RFC 768](#): User Datagram Protocol
- [RFC 793](#): Transmission Control Protocol
- [RFC 2018](#): TCP Selective Acknowledgment Options
- [RFC 5681](#): TCP Congestion Control
- [RFC 6298](#): Computing TCP's Retransmission Timer
- [RFC 6528](#): Defending against Sequence Number Attacks

### Application Layer

- [RFC 959](#): File Transfer Protocol (FTP)
- [RFC 1035](#): Domain Names - Implementation and Specification
- [RFC 1157](#): A Simple Network Management Protocol (SNMP)
- [RFC 1213](#): Management Information Base for Network Management of TCP/IP-based internets (MIB-II)
- [RFC 1350](#): The TFTP Protocol (Revision 2)
- [RFC 1769](#): Simple Network Time Protocol (SNTP)
- [RFC 1905](#): Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2)
- [RFC 1945](#): Hypertext Transfer Protocol - HTTP/1.0
- [RFC 2131](#): Dynamic Host Configuration Protocol
- [RFC 2132](#): DHCP Options and BOOTP Vendor Extensions
- [RFC 2616](#): Hypertext Transfer Protocol - HTTP/1.1
- [RFC 2617](#): HTTP Authentication: Basic and Digest Access Authentication
- [RFC 2818](#): HTTP Over TLS
- [RFC 2863](#): The Interfaces Group MIB
- [RFC 3207](#): SMTP Service Extension for Secure SMTP over Transport Layer Security
- [RFC 3315](#): Dynamic Host Configuration Protocol for IPv6 (DHCPv6)
- [RFC 3410](#): Introduction and Applicability Statements for Internet Standard Management Framework
- [RFC 3411](#): An Architecture for Describing SNMP Management Frameworks
- [RFC 3412](#): Message Processing and Dispatching for the SNMP
- [RFC 3413](#): Simple Network Management Protocol (SNMP) Applications
- [RFC 3414](#): User-based Security Model (USM) for version 3 of the Simple Network Management Protocol (SNMPv3)
- [RFC 3415](#): View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)
- [RFC 3418](#): Management Information Base (MIB) for the Simple Network Management Protocol (SNMP)
- [RFC 3584](#): Coexistence between Version 1, Version 2, and Version 3 of SNMP Framework
- [RFC 3646](#): DNS Configuration options for DHCPv6
- [RFC 3826](#): AES Cipher Algorithm in the SNMP User-based Security Model
- [RFC 4022](#): MIB for the Transmission Control Protocol (TCP)
- [RFC 4113](#): MIB for the User Datagram Protocol (UDP)
- [RFC 4293](#): MIB for the Internet Protocol (IP)
- [RFC 4795](#): Link-local Multicast Name Resolution (LLMNR)
- [RFC 4954](#): SMTP Service Extension for Authentication
- [RFC 5321](#): Simple Mail Transfer Protocol
- [RFC 6455](#): The WebSocket Protocol
- [RFC 6762](#): Multicast DNS
- [RFC 6763](#): DNS-Based Service Discovery
- [RFC 7252](#): The Constrained Application Protocol (CoAP)
- [RFC 7540](#): Hypertext Transfer Protocol Version 2 (HTTP/2)
- [RFC 7541](#): HPACK Header Compression for HTTP/2
- [RFC 7641](#): Observing Resources in the Constrained Application Protocol (CoAP)
- [RFC 7860](#): HMAC-SHA-2 Authentication Protocols in the User-based Security Model
- [RFC 7959](#): Block-Wise Transfers in the Constrained Application Protocol (CoAP)