picoTCP

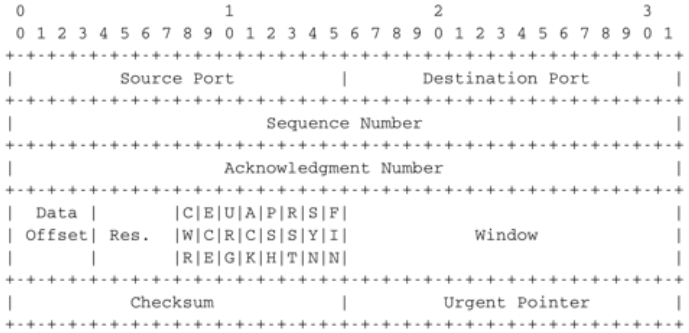
Technical Introduction

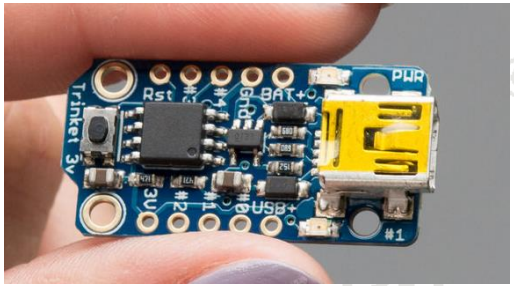
Toon Peters - Intelligent Systems / Altran

picoTCP

A fully featured, highly portable **TCP/IP stack** designed for **small footprint** **embedded systems**

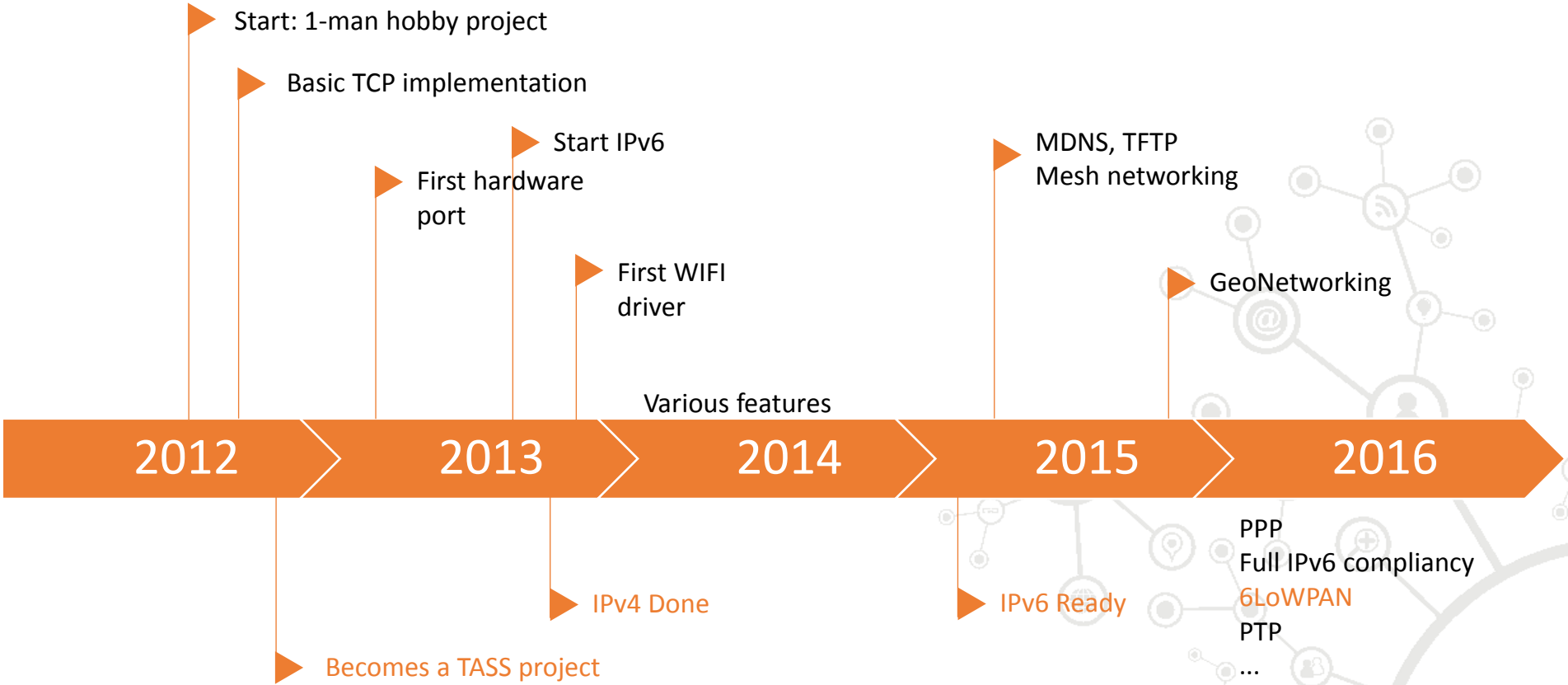
picoTCP


0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
Source Port
Destination Port
Sequence Number
Acknowledgment Number
Data Offset
Res.
C E U A P R S F
W C R C S S Y I
R E G K H T N N
Window
Checksum
Urgent Pointer


Rst
Gnd
BAT+
PWR
Trinket 3v
3V
USB+
#1

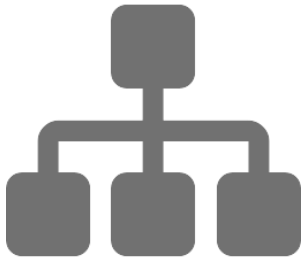
C

picoTCP History

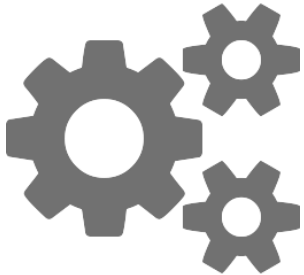


picoTCP

Modularity

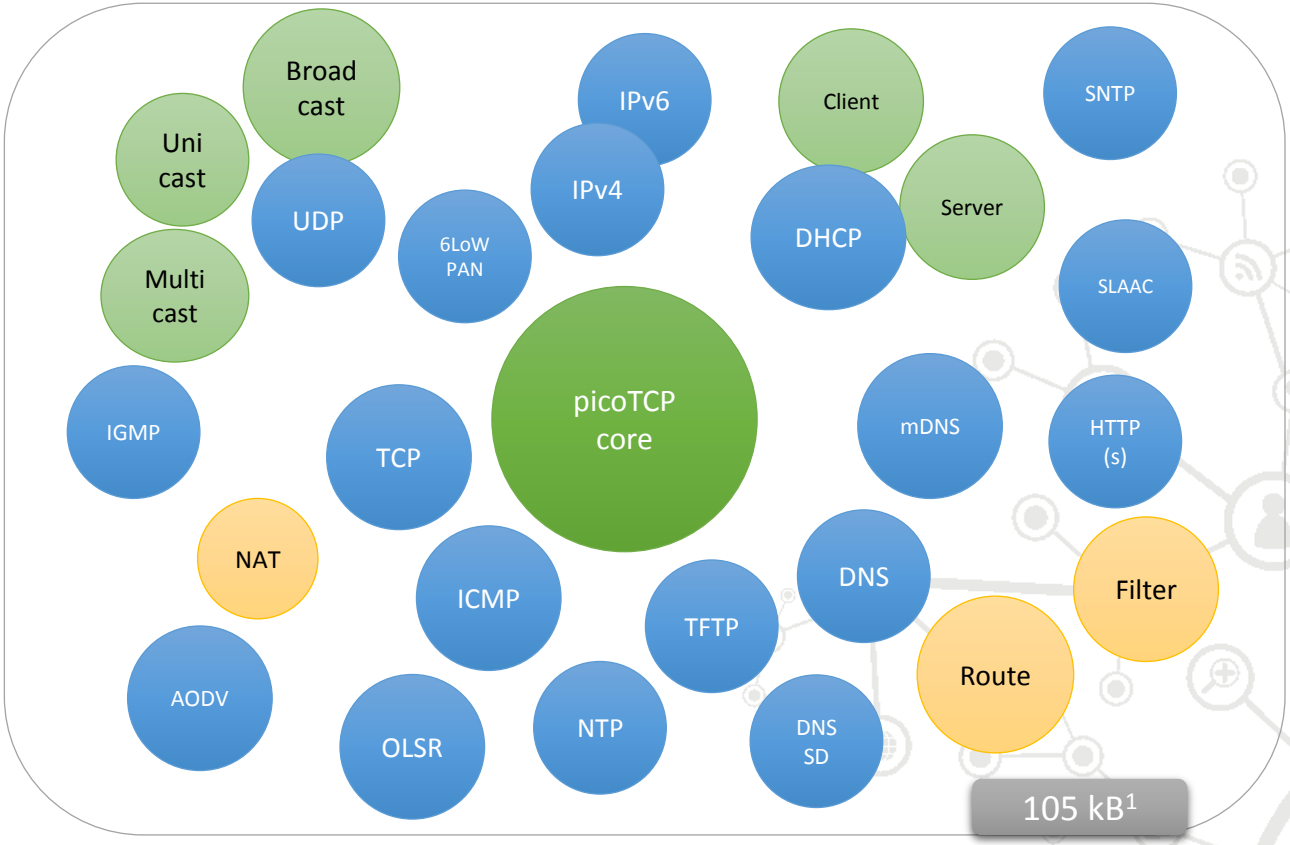


Portability



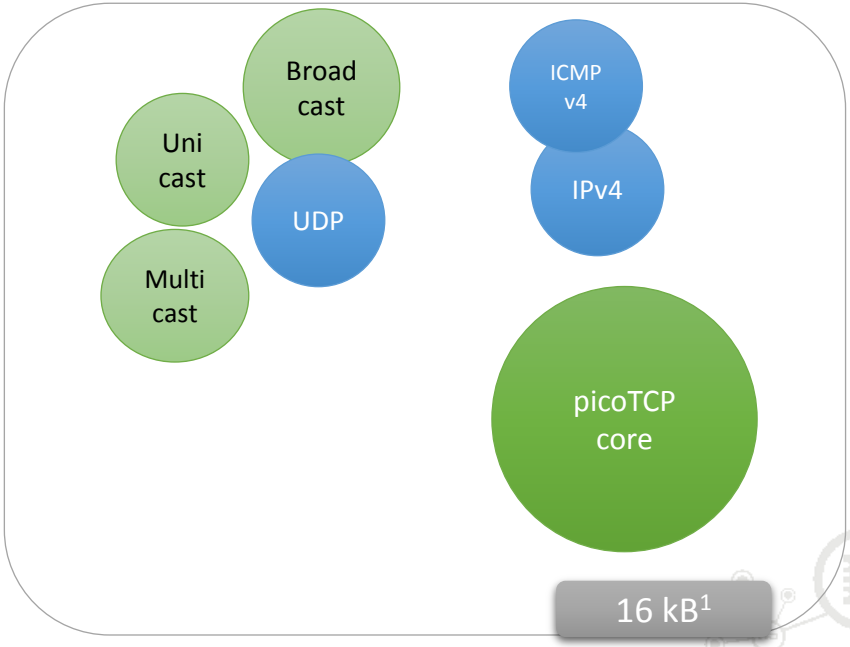
Quality

Modularity



[1] Figures for ARM Cortex M4 & GCC

Modularity



[1] Figures for ARM Cortex M4 & GCC

Modularity


```
$> make ARCH=lpc43xx CROSS_COMPILE=arm-none-eabi- \
       TCP=1 UDP=1 IPV4=1 IPFRAG=0 NAT=0 ICMP4=0 \
       MCAST=0 DEVLOOP=0 PING=0 DHCP_CLIENT=0 \
       DHCP_SERVER=0 DNS_CLIENT=0 IPFILTER=0 \
       CRC=0 OLSR=0 SLAACV4=0 STRIP=1 DEBUG=0 PERF=0
  [CC] ...
  [CC] ...
  [AR] ./build/lib/libpicotcp.a
  [RANLIB] ./build/lib/libpicotcp.a
  [STRIP] ./build/lib/libpicotcp.a
  [LIBSIZE] 70240     ./build/lib/libpicotcp.a
  ...
  text     data     bss     dec     hex filename
  24261     370     568   28199    6e27 (TOTALS)
```

Portability

- ✓ CPU architecture independent
- ✓ 8, 16, 32 & 64 bit. Big or Little endian
- ✓ Bare Metal / Embedded OS / OS / RTOS

Portability

Platforms

- 32 bit
  - ARM variants:
    - NXP: LPC17xx, LPC18xx (Cortex-M3)
    - NXP: LPC43xx (Cortex-M0 + Cortex-M4)
    - ST: STM32F1xx, STM32F2, STM32F4xx
    - TI: Stellaris LM3S
- 16 bit
  - TI: MSP430
  - Microchip: PIC24Fxxxx
- 8 bit
  - AVR: ATmega128

Supported chips

- BCM43362 (IEEE 802.11)
- MRF24WG (IEEE 802.11)
- LPC Ethernet ENET/EMAC (IEEE 802.3)
- Stellaris Ethernet (IEEE 802.3)
- STM32 Ethernet (IEEE 802.3)
- Wiznet W5100 (IEEE 802.3)
- USB CDC-ECM (CDC1.2)
- Virtual drivers
  - TUN/TAP
  - VDE
  - Libpcap
- and more….

Compilers

- GCC (>= 4.7 for warning free compilation)
- Clang
- TCC
- ARM-RCVT
- IAR
- XC-16
- MSP-GCC
- AVR-GCC

Supported RTOSes

- No OS / Bare metal
- FreeRTOS
- mbed-RTOS (CMSIS-RTOS compliant)
- Linux / POSIX

Compatible with

- WolfSSL
- Fossa (Multi-protocol library)
- HTTP native library (server and client)
- ZeroMQ (WIP)
- MQTT
- …

Quality

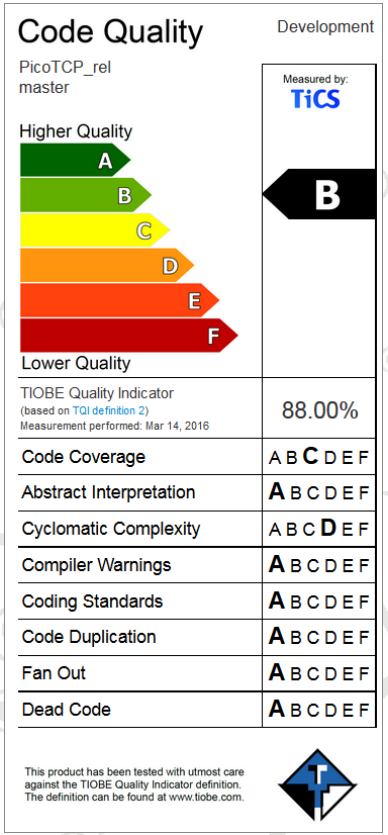
Unit tests

Compiler warning tests

Static analysis

Dynamic analysis

RFC compliance



picoTCP

GitHub

GPLv2

Community Projects

BARE BOX

Community

Projects

Community Projects

Community
Projects

picoTCP
FOR DOS

Community

Projects

Yours?

Let us know info@picotcp.com

Workshop 4pm

```
int main(void) {
    /* Main application */
      uint8_t mac[6] = {0x00,0x00,0x00,0x12,0x34,0x56};
      char ipaddr[]="192.168.2.150";
      struct pico_ip4 my_eth_addr, netmask;
      struct pico_device *pico_dev_eth;
      pico_stack_init();
   /* Setup device */
      pico_dev_eth = (struct pico_device *) pico_eth_create("eth", mac);
      if (!pico_dev_eth)
        while (1);
      pico_string_to_ipv4(ipaddr, &my_eth_addr.addr);
      pico_string_to_ipv4("255.255.255.0", &netmask.addr);
      pico_ipv4_link_add(pico_dev_eth, my_eth_addr, netmask);
    /* Setup socket */
       setup_socket();
    /* Main loop */
      for (;;)
      pico_stack_tick();
}
```

picoTCP

Intelligent Systems / ALTRAN

@phalox
phalox.be
linkedin.com/in/toonpeters
toon.peters@altran.com

@picoTCP
picotcp.com
github.com/tass-belgium/picotcp
info@picotcp.com