

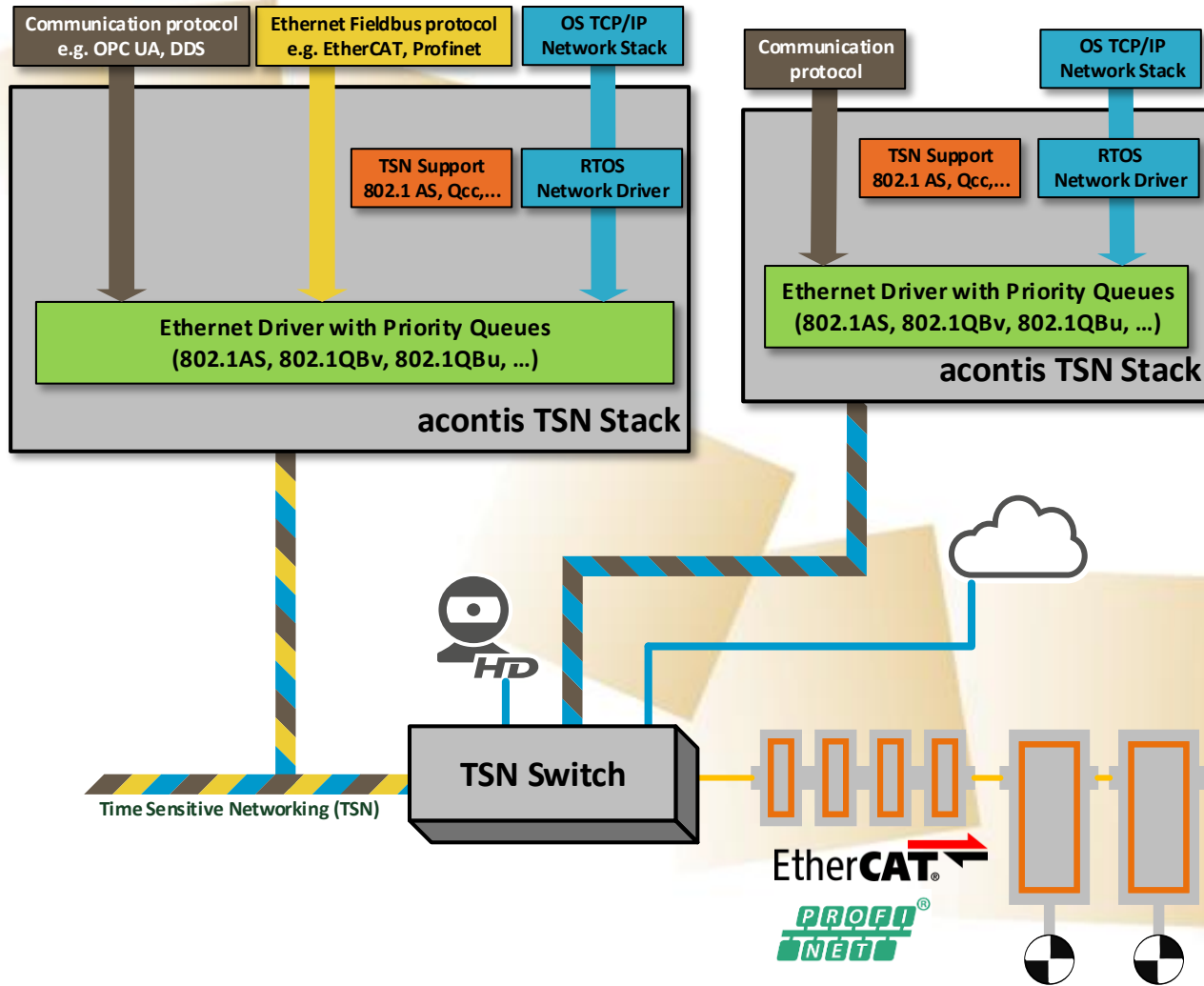


# Acontis TSN Stack

Time Sensitive Networking Stack

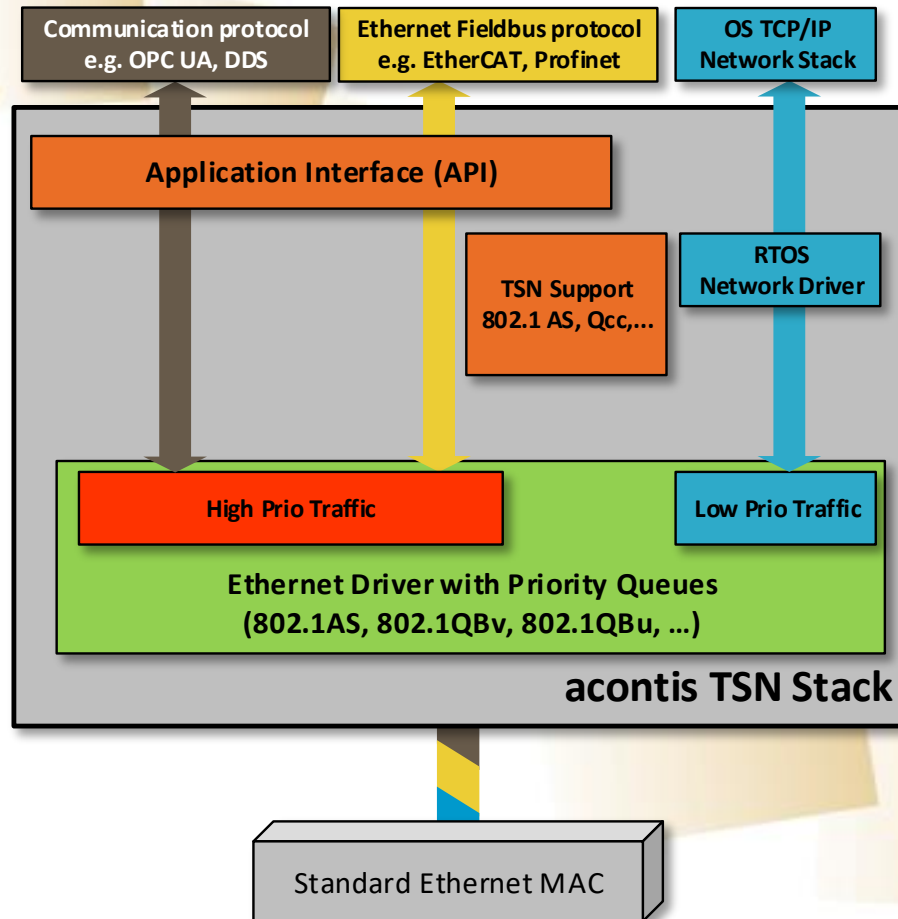
Presentation

# General TSN System Architecture



- TSN = Time Sensitive Networking
- Best effort and time critical traffic on one single Ethernet network
- Minimum Requirements
  - TSN capable switch
  - 802.1ASrev time synchronization
- Requirements for better real-time behavior
  - Critical parameters
    - Cycle time
    - throughput
    - Send/Receive jitter
    - CPU consumption
  - Ethernet controller with support for 802.1ASrev (timestamp unit) and 802.1Qbv (time scheduled send) and 802.1Qbu (frame preemption)
  - Real-time capable and deterministic TSN Software stack

# TSN Stack Architecture



## Application Interface with well defined API

- For higher level protocols (OPC UA PubSub, EtherCAT,...)
- Send/Receive raw Ethernet frames

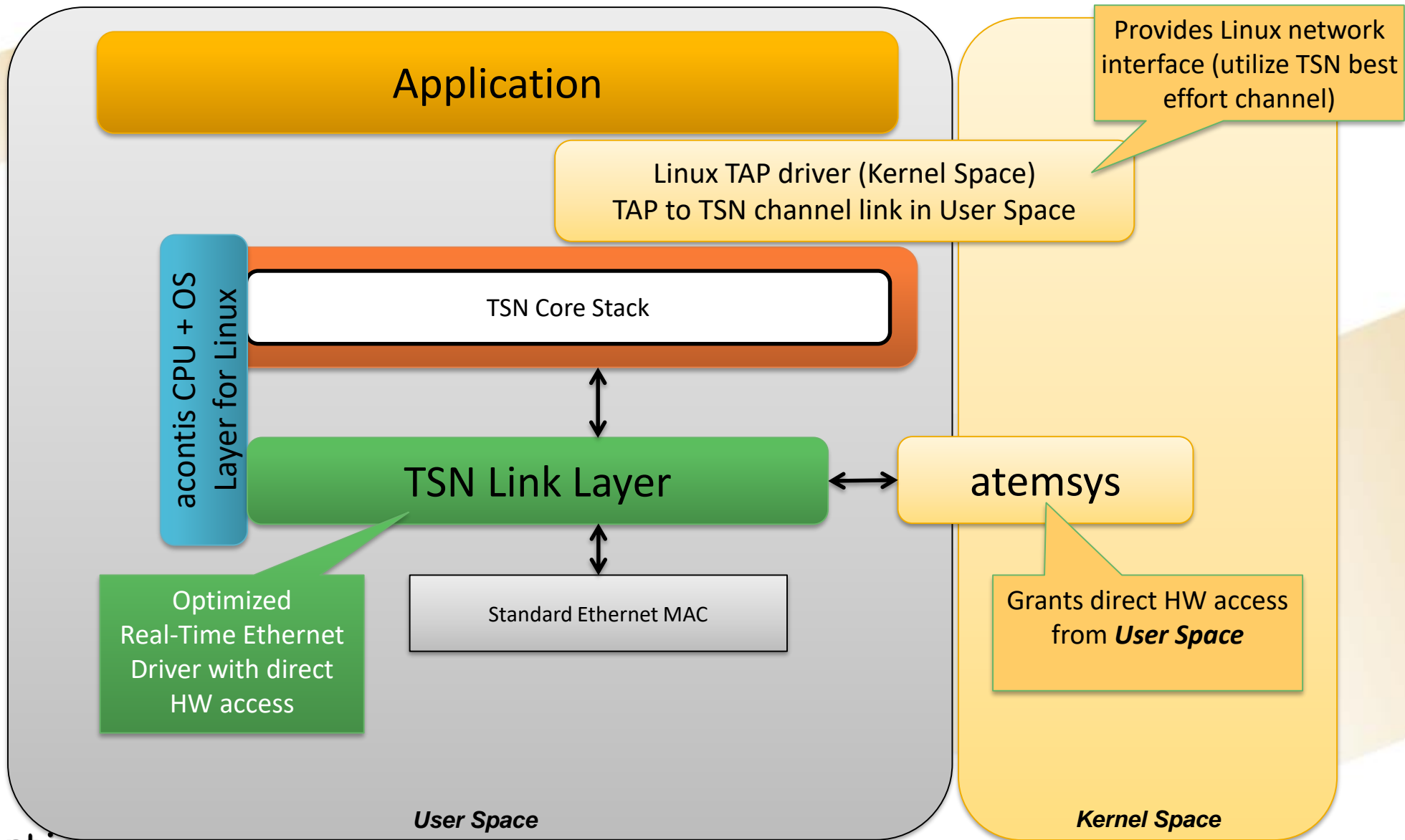
## TSN Support: 802.1 AS, Qcc, ...

## Network Driver for Embedded RTOS (TCP/IP)

## Ethernet Driver

- Standard and prioritized traffic (traffic shaping)
- + 802.1 AS support (Timing and Synchronization)
- + 802.1 Qbv support (Scheduled Traffic)
- + 802.1 Qbu support (Frame preemption)
- + 802.1 Qcc support (Stream Reservation)

# TSN Stack Architecture on Linux



# Application Interface

- TCP/IP traffic (best effort only)
  - use standard operating system sockets (e.g. Linux sockets)
  - Linux: TAP driver provides Linux network interface (original Linux Ethernet drivers NOT used) (raw Ethernet packets transferred via TSN best effort channel)
- Real time traffic
  - API for sending and receiving raw Ethernet frames or raw TSN streams
  - Socket like API for high performance UDP communication (w/wo TSN)
  - Set priority for sending frames (related to Ethernet MAC)
  - Register filter for receiving frames (e.g. Ethertype, UDP Port, ...)
  - 802.1 Qbv (Scheduled Traffic): specify time, when frame shall be sent
  - 802.1 Qbu (Frame Preemption): utilize hardware support if available
  - Linux: User Mode API (TSN stack runs in user mode)
- Additional TSN Support
  - Higher level TSN protocols implemented in separate applications
    - + 802.1 ASrev (timing and synchronization)
    - + 802.1 Qcc support (stream reservation)