

# PROFINET Protocol Stack

## Overview

PROFINET is realtime-enabled. It uses IT standards like TCP/IP and makes an integration into fieldbus systems possible. PROFINET was standardized by the IEC specifications IEC 61158 and IEC 61784. port offers an implementation of the PROFINET stack for slave devices with conformance class A together with realtime class 1 and realtime class UDP. Our solution is featured of

- resource-conserving
- usable with or without an operating system
- portable
- conform to PROFINET specification version 2.3
- has best requirements to fulfill the PNO conformance test
- distribution with integrated  $\mu$ IP UDP/IP Stack

Whether development support or customer specific adaptations: As desired our experienced developers will support you from the first evaluation of the stack to it's the certification. Per abstraction layer one can make some adaptations for a specific platform or environment.

## Application

The PROFINET Protocol Stack provides all required services for a PROFINET IO compliant communication according to the IEC standards IEC 61158 and IEC 61784. It facilitates easy and fast development of PROFINET IO devices.

Access to the hardware is carried out via a hardware abstraction layer. Drivers are available for different CPU- and Ethernet controller with and without operating system. For fast bus access the Ethernet drivers are highly optimized.

With *port's* multiprotocol FPGA solution also other Industrial Ethernet Protocols, e.g. EtherCAT, EtherNet/IP and POWERLINK can be integrated. An uniform user interface makes it easy to implement different protocols.

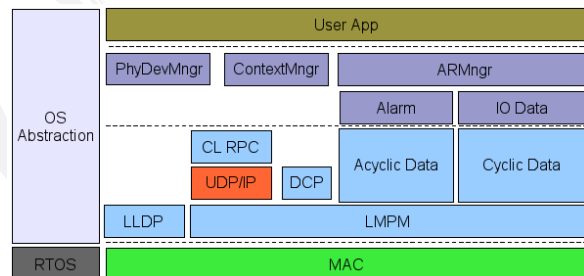
The PROFINET Protocol Stack is completely written in ANSI-C and can be compiled with every ANSI-C compliant compiler. Depending on the required scope of functionality the PROFINET Protocol Stack is available in different expansion stages. All versions of the PROFINET Protocol Stack are compatible to each other and are constantly tested with the current conformance test of the PNO for compliance with the

standard.

The user application communicates with the PROFINET Protocol Stack through function calls and call-back functions.

Configuration and scaling of the PROFINET Protocol Stack is done with the help of the PROFINET Design Tool. With it the PROFINET Protocol Stack can be tailored to an optimum to the available resources of the application. Besides the creation of the object directory all settings for the hardware can be carried out with it.

## Description



### The Realtime-Classes

Profinet allows the communication of application-data either in a direct manner using standard ethernet-frames or using UDP/IP. This depends on the needed realtime requirements. To classify such requirements the PNO has defined four different Realtime-Classes:

#### RT\_Class\_1:

Within a subnet the unsynchronized ethernet-frames based RT-communication is used. It is mandatory to implement the communication into the device. Data must be sent within a time window (pre-defined by the controller).

#### RT\_Class\_2:

Devices which do support this RT-class allow both a synchronized and a unsynchronized RT communication. Using the synchronized communication the IO-controller defines the beginning of a bus cycle of the IO-device. This leads to a predictable worst case scenario for the transmission delay of frames from IO-device to IO-controller. The bus cycles will be synchronized by the so called Precision Clock Transport Protocol (PTCP).

### RT\_Class\_3:

This class extends the synchronized data transmission. This is reached by using a scheduling which defines the transmission times of every single participants of the network. The IO-controller allocates a pre-defined transmission time to every participant. Additionally all arbiter nodes (switches) ensure available transmission paths for a message. The avoidance of ethernet's CDMA-process ensures a lag-free transmission of data. This class requires hardware with special needs and isn't realizable using standard ethernet-controller.

### RT\_Class\_UDP:

This class transmits data between different subnets per UDP.

### The Conformance Classes

Profinet defines following conformance classes:

#### CC-A:

simple device with support of Profinet-IO-Basecommunication (alerts, diagnosis, cyclic RT-communication, names resolution etc.) and a simple neighbor identification.

#### CC-B:

Like CC-A but with an additional media redundancy and SNMP. Plus some functions for device exchange. Media redundancy is realized by using a MRP client.

#### CC-C:

Additional support for RT\_Class\_3 plus a wide-ranging support of media redundancy.

### Overview

PROFINET IO Device functionality	yes
PROFINET IO Controller functionality	-
Support for modular devices	yes
Supported Conformance Class	A
Supported Realtime Class	1
Realtime Class UDP	yes
IRT support	-
Usage of nonvolatile memory	yes
State Machine	yes
Object dictionary	yes
Record Data	yes
IO Data	yes
Diagnosis	yes
Alarm	yes
Isochronous Mode	-
Physical Device Manager	yes

## Licensing conditions (excerpt)

For the PROFINET Protocol Stack a one-off license fee is charged in form of the purchase price. Further license fees do not arise from the deployment of the software within the same company (no runtime licenses).

Handing over the software and the implementation, respectively, towards a third party is not allowed.

## Ordering Information

0210/10 PROFINET Protocol Stack


### Engineering Services

*port* is providing engineering services and trainings for our business activities:

- CAN and CAN-based protocols: CANopen, J1939, DeviceNet
- Industrial Ethernet Protocols: POWERLINK, EtherNet/IP, EtherCAT PROFINET
- Implementation of devices according to CANopen device profiles
- VHDL based solutions for industrial applications
- application specific implementations or enhancements
- embedded LINUX projects

### Notice

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