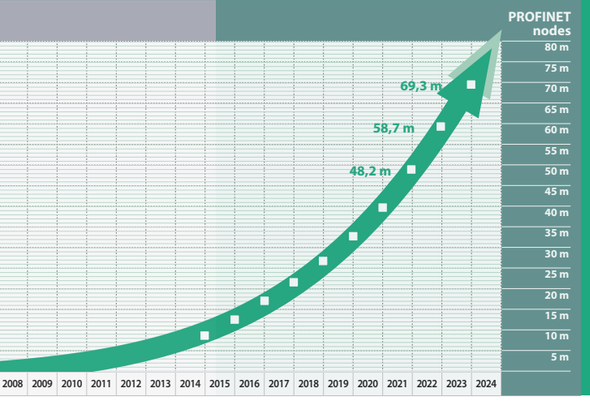
PROFINET Technology

The Easy Way to PROFINET

PROFIBUS • PROFINET

PROFINET Features

PROFINET is the open, cross-vendor Industrial Ethernet standard for production and process automation.



Would you like to …

- *Share in the success of PROFINET?*
- *Equip your automation devices with PROFINET interfaces?*
- *Find out how easy it is to integrate PROFINET into your products?*
- *Learn more about other PROFINET related technologies?*

The information you are looking for is in this brochure.

PROFINET …

- enables consistent communication from the company management level (IT) to the field level (OT).
- offers everything from scalable real-time communication (RT) to isochronous motion control (IRT).
- integrates safety technology for protecting humans, equipment, and the environment (PROFIsafe).
- protects equipment from unauthorized access and data from manipulation (Security).
- provides detailed and meaningful diagnostics.
- enables flexible topologies like star, ring and line structures when using automation devices with an integrated multi-port switch.
- supports a variety of transmission media, e.g., copper, fiber optics, wireless, 5G etc.
- protects sensitive areas with PROFINET over APL.

PROFINET is future-proof …

- through the use of Time Sensitive Networking (TSN) as additional Ethernet technology.
- due to the integration of OPC UA for mapping data to IT services and for controller communication.
- additional optional profiles expand the spectrum and allow customers to optimize their workflows.
- extends functions for security, semantics and other requirements for the digitalization.
- and offers a simple migration path.

With these features, PROFINET fulfills all of the requirements for the use of Ethernet in industrial automation today and tomorrow.

For each point in this document, experts are available in our forum to answer your questions:
https://forum.profinet.com/

Xaver Schmidt
Chairman PROFIBUS & PROFINET International (PI)

PROFIBUS & PROFINET International (PI) is backed by about 1,800 member companies worldwide. With almost 70 million devices installed by the end of 2023, PROFINET has established itself as the leading Industrial Ethernet standard on the market. Due to trends such as digitalization and the Industrial Internet of Things (IIoT), PROFINET will continue to gain in importance, and will become even more powerful with new technologies such as TSN, SRCI, MTP or APL/SPE. For device manufacturers, many questions arise today on the use of PROFINET. Through our technology providers and competence centers, we offer comprehensive support ranging from consulting services and hardware and firmware integration to certification. A wide range of available options for ready-to-use PROFINET basic technology makes it very easy for all companies to implement PROFINET quickly and cost-effectively.

Our Community

The industry organization PROFIBUS & PROFINET International (PI) promotes the widespread use and further development of PROFIBUS and PROFINET and provides worldwide support.
With about 24 Regional PI Asscociations (RPAs) in every international market and nearly 1,800 international member companies, PI is the world leading community of interest for industrial communications. It covers every key market of industrial automation, ranging from production automation and process automation to motion control and safety applications.
More Information about the RPAs: **www.profibus.com/aboutus/regional-pi-associations**
An overview of the product diversity and the strong position in the market can be found in the online PI Product Finder **www.profibus.com/products/product-finder/**. The ECLASS-based data allows customers to easily search for devices and shows them important functions.
We support you during the actual product development with specifications and technical support. You are up to date on the technology and have shorter development cycles and time to market. You can have your innovations certified to international standards.

Contents

This brochure focuses on the development and integration of PROFINET products.

In the rest of the brochure, you will find more information on the following topics:

TABLE OF CONTENTS

Cycle Consulting | Implementation

Every device development project undergoes a product development cycle. An example of this process for PROFINET is presented here.
This advice is followed by identification of implementation options, an explanation of certification activities and a service & support offer.

The integration of an industrial communication interface into an automation device begins with the collection of information. This makes it possible to determine the functionality of your industrial networks and to familiarize yourself with the task at hand. PI itself as well as a number of its member companies can provide you with comprehensive information here. Advice is available from various **PI Competence Centers (PICC)**, vendors, books, brochures, seminars, and workshops for getting to know PROFINET.

Individual consulting services support you, as a manufacturer, in every phase of implementation. Here are some typical questions: What benefits does PROFINET offer for my products? Which features (Conformance Classes) must be implemented for the specific automation device? What technologies and support are available for implementing PROFINET?

Specialized training is available for developers and product managers of device manufacturers, who are looking for a quick, yet solid, introduction to PROFINET technology. PI can also provide support for certification and other topics. Your employees are also supported. For example, you can train to become a Certified Network Engineer or Certified Installer at **PI Training Centers (PITC)**.

Among other things, this training covers the following:

- Basics of data transmission with Industrial Ethernet
- PROFINET basics
- PROFINET field devices and PROFINET communication models
- Development packages for construction of PROFINET field devices
- Engineering
- Device description file (GSD file)
- Explanations of Conformance Classes
- Security measures
- Certification supported technologies like PROFIsafe, PROFIdrive and PROFIenergy

- Advanced technologies e.g.
  - SRCI
  - APL and SPE
  - IO-Link
  - MTP

PROFIsafe Standard Functional Safety with Vision Integration of Safety and Standard Communication on One Channel (Black Channel Principle)

Consulting | **Implementation**

Development proceeds faster to our goal „if we don't have to reinvent the wheel".
In order to bring PROFINET into automation devices quickly and efficiently, the expertise of PI members on the following topics is available:

- Implementation methods
- Hardware/software design
- Development environments
- GSD file

Implementation options

Depending on the functionality required (Conformance Class), it is essential to select the suitable type of implementation for each individual case. The available development capacity, company expertise, expected costs to produce the interface, and the time to market also play a large role. Whether a pure PROFINET interface is to be implemented or a universal interface that is also suitable for communication via PROFIBUS should also be considered. The companies listed in this brochure have many years of experience in the design of communication interfaces and will support you in finding the optimum solution.

Development environment

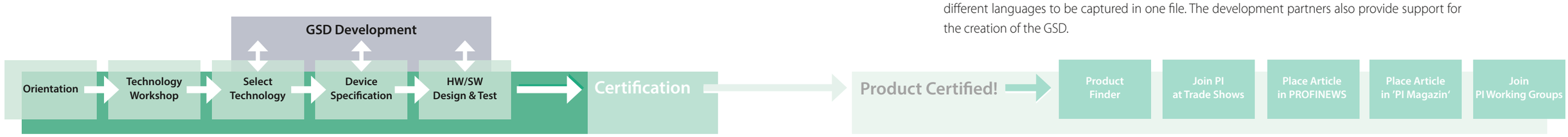
A variety of starter kits and evaluation boards are available for almost every implementation method. These complete sets enable a quick introduction to development activities and often contain a complete development environment, as well. Included sample programs, block diagrams, and sample circuits can be especially helpful. The development packages also include the certifiable PROFINET stack of the corresponding provider and detailed documentation.

Hardware/software design

The plan of action and expenditure required for hardware and software design depend heavily on the selected implementation method. Here, you can carry out the development work fully and independently or work collaboratively with a development or technology partner. Independent development requires well-grounded PROFINET expertise and your own hardware and software development resources. To unburden your development resources, PI member companies can provide complete development packages, ready-to-install PROFINET communication modules, and a host of development services that give you, the device manufacturer, the support you need from the design phase to hardware and software development to certification.

Device description file (GSD file)

To enable fast and easy configuration of an automation system, manufacturers of field devices must provide a PROFINET device description file.
This so-called „General Station Description file" (GSD file) contains all information needed to configure a device. The GSD files for PROFINET are XML-based and enable multiple product variants and different languages to be captured in one file. The development partners also provide support for the creation of the GSD.



Certification | Support & Service

PROFINET communication in industrial plants is based on IEC 61158 and IEC 61784. In addition, IEC 62061/ ISO 13849-1 apply to safety modules and devices. To ensure interoperability and conformity of automation devices from different manufacturers, device certification by a validated **PI Test Laboratory (PITL)** is mandatory for PROFINET. As a result, end customers are guaranteed a high level of plant availability, and the risk of cost intensive service calls is significantly reduced for you, the device manufacturer. As part of the certification process, a check is made to determine whether automation devices comply with standards, thus ensuring their problem free interaction within an automation system.
Even though every PROFINET device must be certified, the effort required for successful certification varies depending on the technology used. When pre certified technologies are used, you do not have to be familiar with all details of the PROFINET standard. This significantly reduces the risk that problems will be found during the certification test. Therefore, it is useful to consider certification aspects in advance when choosing a technology.

Certification process
For you, the manufacturer, certification is as easy as can be: The fully developed PROFINET device is tested by a validated test laboratory. After successful testing you, the manufacturer, can apply for a certificate from the PI, using the test report as a basis.

Tests required as part of PROFINET certification include, but are not limited to:
- Hardware tests
- Load tests
- State machine tests
- Fault responses
- Behavior on the network
- Alarm tests
- Testing of the GSD file
- Netload Robustness for Security

Certification

Certification is especially easy when pre-certified technologies are used. In this case, the technology supplier guarantees compliance with the PROFINET standard, which enables a significant reduction in the effort required for the certification test.
As preparation, the majority of automated tests can be performed in advance with the help of the **PROFINET Test Bundle**, which is available to PI members at no charge.

For more information, go to:
- **www.profibus.com/certification**

Experienced contact persons are available to provide you with support during the entire certification process. They can offer suggestions in advance and answer any questions.
There are test laboratories worldwide and on almost every continent.

For more information, go to:
- **www.profibus.com/pitl**

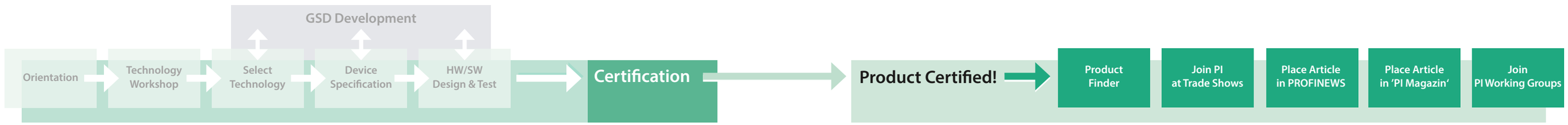
Support & Service

Across the globe, there are currently a lot of validated PICCs available to answer your technical questions. This includes a comprehensive range of services for device manufacturers and users throughout every product life cycle phase.
The quality of the PICC services is guaranteed by a Quality of Service (QoS) Agreement. Regular meetings also ensure a uniformly high level of employee qualifications and knowledge, transfer of expertise and, naturally, the exchange of experiences as well.

A list of validated PICCs can be found at:
- **www.profinet.com/picc**

The PI organization supports the marketing of devices through:
- Entry in the Product Finder
- Presentation at joint trade fair booths
- Publications in the PI Newsletter or advertisements

The offices of the PI organization are happy to advise you on this.



Implementation Options

Real-Time Requirement | Conformance Classes

Device manufacturers wanting to equip an automation device with a PROFINET interface have different options for implementation. Before deciding on a specific implementation method, it's important to first determine which functions are to be supported by the PROFINET automation device:

- *In-house development or partnership based on the criteria of expertise, time to market, etc.*
- *Real-time requirements*
- *Implementation options*
- *Device classification*
- *Development methods*

The technical and commercial decision-making criteria are explored in more detail in the following.

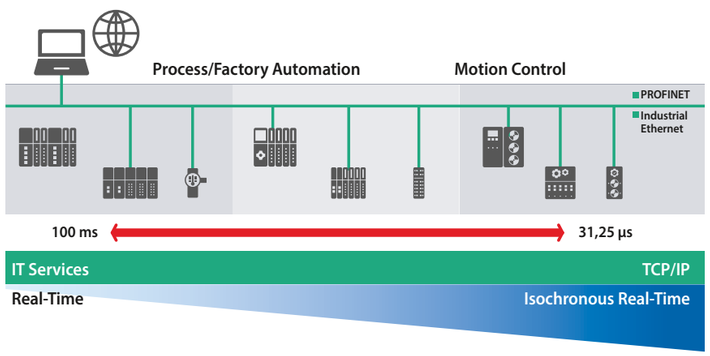
Real-Time Requirements

IEEE 802.3 ensures problem-free communication between PROFINET automation devices and among PROFINET automation devices and other standard Ethernet devices. For applications with very stringent real-time requirements, PROFINET offers mechanisms that enable both standard and real-time communication to take place in parallel. Communication with PROFINET can therefore be scaled using three different performance levels, which build on each other:

- The transmission of engineering data and **non-time-critical data** occurs over TCP/IP. This standard communication is possible between all automation devices.
- The real-time (RT) channel is available for the transmission of **process data**.
- For **isochronous applications** like motion control, isochronous real-time communication (IRT) is used. This enables a clock rate of < 1 ms and a jitter of < 1 µs.

IRT capability is based on hardware support in the device. Special ASICs, microcontrollers, and FPGAs are available for this purpose. Commercial switch ASICs without IRT hardware support are suitable for implementing an automation device with RT capabilities only.
Devices with RT communication can be easily developed based on standard Ethernet components.

PROFINET is designed for all branches of industrial automation engineering:



Conformance Classes

To meet the different requirements of automation systems, three Conformance Classes that build upon one another are defined for PROFINET. Each class has a functional scope determined for the typical area of application. The device manufacturer must consider the required Conformance Class before selecting an implementation option for the PROFINET device interface, as the type of interface implementation affects the Conformance Class that can be achieved.

In the following, only the key functions of the three Conformance Classes and their specific advantages are described:

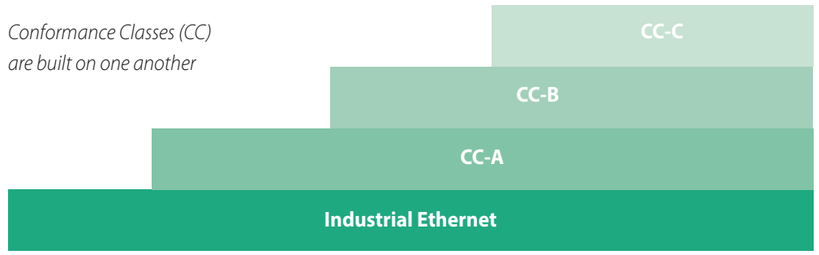
CC-A: Use of the infrastructure of an existing Ethernet network, including integration of basic PROFINET functions. All IT services can be used without restriction. Examples of typical applications are found in building automation and process automation.

CC-B: The functional scope of CC-B comprises the functions of CC-A, plus it supports easy user-friendly device replacement without the need for an engineering tool. Furthermore, Simple Network Management Protocol (SNMP) supports extended device diagnostics of network functions, such as port status messages. To increase data reliability, a performance-adapted media redundancy protocol is available as an option. All IT services can be used without restriction. Typical applications can be found in automation systems with higher-level machine control with a deterministic, but not isochronous, data cycle.

CC-C: The functional scope of CC-C comprises all the functions of CC-B, plus it supports high-precision and deterministic data transmission, including isochronous applications. The integrated optional media redundancy enables smooth switchover of the I/O data traffic if a fault occurs. All IT services can be used without restriction. Typical applications are in the field of motion control.

In addition, optional services such as Fast Start Up are possible for even faster startup of participants.

Conformance Classes (CC) are built on one another



For a detailed description, go to:

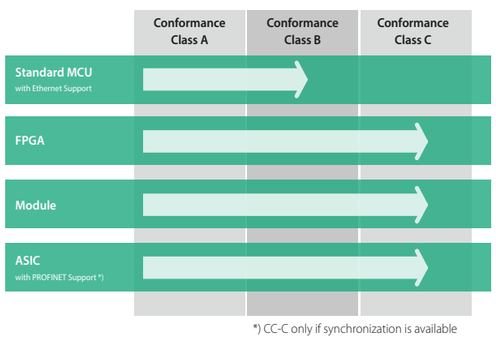
- **www.profibus.com/pncc**

PROFINET Device Interface | Development Method

You can choose from different options in order to implement the solution that best suits the details of the automation device:
› Design › Degree of protection › Connection method › Application
› Integrated multi-port switch › Real-time properties

In principle, the following options are also available:
1: Standard microcontroller unit (MCU) with integrated or external standard Ethernet controller or FPGA
2: FPGA with internal or external standard or IRT-capable switch
3: Module with standard microcontroller or with microcontroller with IRT hardware support
4: ASIC with IRT hardware support and IRT-capable switch

The graphic shows these implementation options in relation to the Conformance Classes:



*) CC-C only if synchronization is available

The following table shows the PROFINET functions that can be achieved with the implementation methods described above.

	Single Port	Multi Port
Conformance Class A	X	X
Conformance Class B	X	X
Conformance Class C		X

The table shows the minimum options.
For example, variants 2 and 3 also provide the option of implementing a single-port interface, but special attention should be paid to the economic viability of the solution.
Various basic technology components (hardware/software) are available for each of the implementation methods shown in the table. Components offered by PI member companies for this purpose are described in ample detail starting on page 14 of this brochure. For Conformance Classes A and B, standard Ethernet components can generally be used. In combination with a suitable PROFINET stack, it is possible to implement a high-performance PROFINET interface for applications in this range without special PROFINET ASICs.
However, for automation devices in Conformance Class C with IRT functions, special PROFINET ASICs or FPGAs are essential.

Implementation Options for the PROFINET Device Interface | **Development Paths**

Each of the implementation methods described before can be realized in a different way. When selecting the most suitable method for the particular case in question, the expected production costs, the development time, and the resulting time to market must be considered. Consideration must also be given to PROFIsafe. Three different methods are described in the following:

Customer-specific/individual design:
In this method, the implemented PROFINET interface is embedded in a hardware and software design that has been optimized with regard to development expenditure and time to market using commercially available software solutions and standardized discrete or FPGA-based hardware design schemes.

Embedded module design:
Here, the implemented PROFINET interface is embedded in a design that has been optimized for flexibility and time to market based on preassembled commercially available communication modules.

External couplers:
With this solution, the PROFINET interface is implemented without accessing the device electronics based on external couplers and using an adapter connected in series.

	Development costs	Production costs (per unit)	Time to market
Individual design	High	Low	Long
Communication module	Medium	Medium	Medium
External couplers	Low	High	Short

Security

The security of our data becomes more important every year.

In addition to local data, it is primarily about the transportation of this data. Regardless of the device and its location in the world, it must be ensured that the information reaches the recipient quickly, securely and unchanged from the sender.
It must also be ensured that it is always the right person or device and that no one is impersonating them.

PROFINET employs a comprehensive defence-in-depth approach to safeguard your production plant from external threats. This multi-layered approach includes:

- **Perimeter Protection:** Utilizing firewalls to create a secure boundary around the plant.
- **Zonal Defence:** Enhancing internal security by segmenting the plant into zones, each protected by additional firewalls.
- **Component Testing:** Ensuring PROFINET components are resilient to overloads to a certain extend.

PROFINET Security Classes

In addition, PROFINET offers three security classes, to protect within the cell addressing the increasing complexity and connectivity of modern production environments:

- **Security Class 1:** Robustness – Enhances security for DCP & SNMP protocols and safeguards GSD files. This includes network segmentation, access control, and defense-in-depth measures. SNMP can be hardened, DCP set-commands disabled, and GSD files protected with digital signatures (GSDX).
- **Security Class 2:** Integrity and Authenticity – Enhances Security Class 1 by ensuring data integrity and authenticity. This includes cryptographic protection of PROFINET messages and X.509 certificate-based authentication, verifying that only authenticated and authorized entities, such as devices, controllers, and engineering stations, can communicate.
- **Security Class 3:** Confidentiality – Extends the capabilities of Security Class 2 by specifying the confidentiality of data. Authenticated encryption prevents unauthorized parties from reading the transmitted data, which is essential for protecting operational secrets. Additionally, it provides role-based access control and event logging to track and manage user permissions and actions within the system

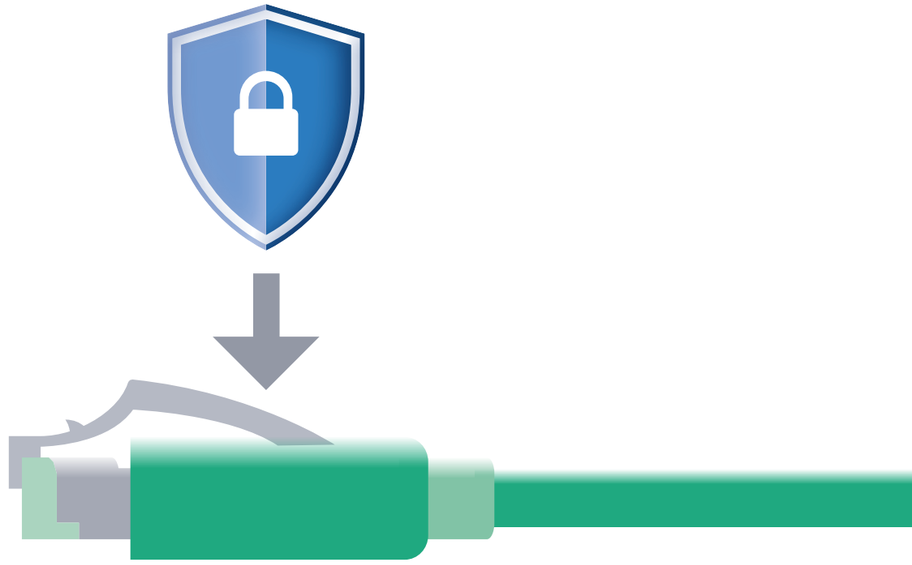
A security class is not a mode of operation. It is a classification of the options and capabilities for protecting your data. And best of all, it's not just theory – it's already part of the standard and ready for future adoption..

Auditable Events

Ensuring Compliance and Accountability
PROFINET also offers a Security Eventing class, accompanied by a comprehensive list of Auditable Events.
This feature addresses the growing need for compliance with stringent security standards like IEC 62443. You now have a structured and detailed approach to identifying and documenting security events within the PROFINET network. The ability to audit and trace actions ensures accountability and aids in forensic analysis, should security breaches occur.

Designed for Seamless Integration
Then, as now, the same requirements apply: It is not enough to simply protect plant networks and automation components – the protection mechanisms and concepts used must also not disrupt ongoing production operations. PROFINET security was designed with this principle in mind, ensuring robust protection without compromising operational efficiency.

PROFINET has been integrating security features



PROFINET profiles and other technologies

PROFIdrive

PROFIdrive is the standard profile for drive technology in conjunction with the PROFIBUS and PROFINET communication systems. PROFIdrive is a powerful and mature drive control profile for any kind of application and industry usage related to motion control.

PROFIdrive

Profile

This profile is standardized in IEC 61800-7 (Generic interface and use of profiles for power drive systems) as well as GB/T 25740 and hosted by PROFIBUS & PROFINET International (PI), which guarantees international present professional support around the globe.
Due to its modular structure and manufacturer-independent device profile, PROFIdrive is easy to handle, highly scalable by its granular six-level structure and defined to achieve an utmost interoperability level. Safeguarded by well-defined certification tests, support and procedures.

Another huge advantage is the complete upper OSI layer implementation (level 5-7), which makes this profile independent from any changes at lower layers technology and therefore real future proof. In addition, PI offers a wide range of options for implementation support, interoperability test and certification options. This incorporates the invitation to participate in future profile enhancements and further standardization work.

By nature PROFIdrive comes always along with perfect interplay of all other PROFINET profiles like PROFIsafe and PROFIenergy.
The supported VIK/NAMUR drive interface according to VE34/NE122 offers in particular the advantage of a "device exchange without engineering interaction" based on a specifically defined and provided VIK/NAMUR profile GSD file.
Especially this feature underlines the general architecture and vendor independent nature of PROFIdrive architecture and communication structure. In this way, PROFIdrive allows flexible, manufacturer-specific design of drive products to meet particular market requirements.

The PROFIdrive profile has been specified by a working group made up of numerous device manufacturers under the PI (PROFIBUS & PROFINET International) umbrella. This working group is also responsible for continuous updates and enhancements.
The success of PROFIdrive is based on a mature offering of benefits since many years.

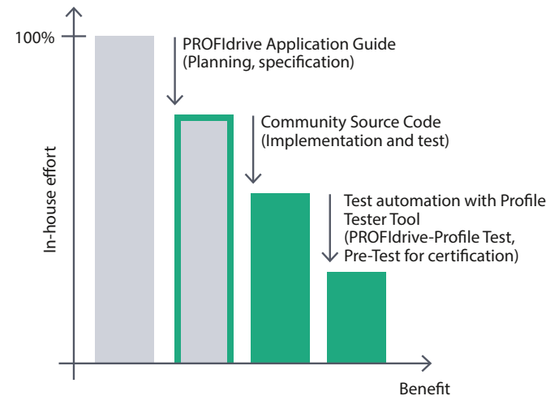
PROFIdrive

Offering

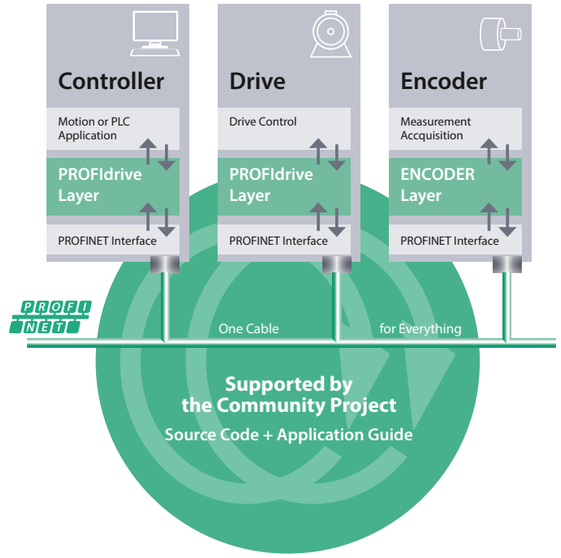
Full interoperability	of products from different manufacturers
Highest precision	requirements can be easily realized
Information transparency	thanks to standardized semantics
Base Model	All these functions are independent of the underlaying communication system
Parameter Model	This is valid for basic fieldbus up to a system-wide Ethernet network with identical application view
Application Model	Drive technology can be linked without exception and without changes to the automation application

Implementation

The PROFIdrive Community has founded the working group "PROFIdrive Community Project", with the aim of providing drive manufacturers with the best possible support in implementing their own PROFIdrive architecture.
The offering of the Community Project heavily reduces the effort for the implementation and avoiding typical pitfalls during development process by providing all members with tried and tested software and hardware components as well as proven implementation guidelines.



A further big benefit is the provision of a PROFIdrive profile test equipment which supports device manufacturers during the development process and at preliminary testing phase.
This powerful tool is a further major cornerstone to achieve a fast, efficient, and systematic implementation of the PROFIdrive profile into own products.



For more information, please refer to:

› **https://www.profinet.com/profinet-explained/profidrive**

PROFINET profiles and other technologies

PROFIenergy – SUSTAINABILITY. GREEN. PROFINET.

PROFIenergy enables the active and effective energy management of automation equipment – based on PROFINET.
It offers interoperable interfaces and standardized information models for Power Consumption Management and Power Measurement in production.
By intelligently switching off unneeded consumers over the network, energy demand and, thus, energy costs can be drastically reduced.

PROFIenergy

Profile

ONE solution for transparency and acting

- Measuring and visualization of the energy load
- Energy savings during planned or unscheduled pauses

PROFIenergy is a profile of the PROFINET communications protocol that allows …

A) the acquisition of measurement data from the PROFINET device, either directly or implicitly, which is needed because knowledge of when, where and how much energy is required.

B) the power consumption of automation equipment in manufacturing to be managed over a PROFINET network. It controls energy usage during planned and unplanned breaks in production. No external hard-wired systems are required.

Easy to use

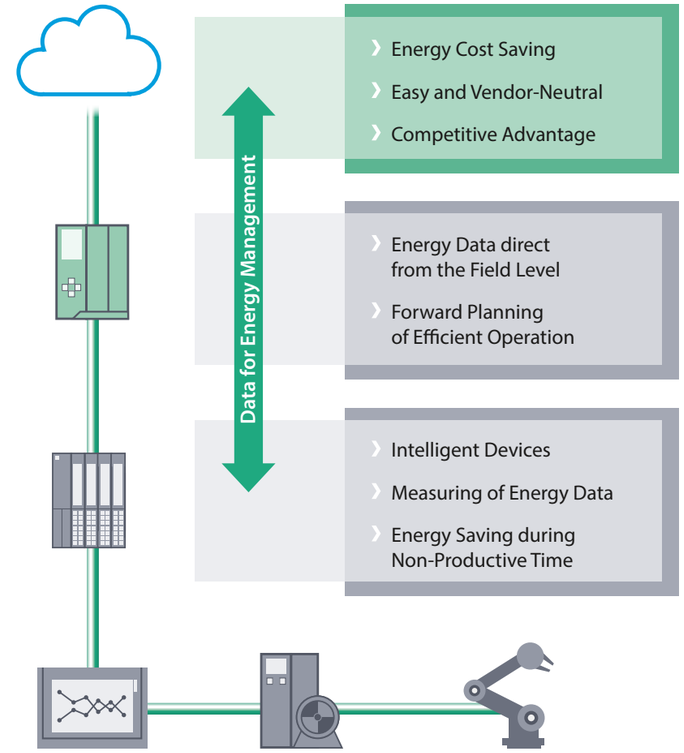
PROFIenergy uses the acyclic mechanisms of the PROFINET communications protocol and does not interfere with co-existing automation processes.
An integrated switching function in field equipment enables energy savings not only during long pauses but also during short and extremely short pauses. Devices are remotely controlled by PROFIenergy commands. For this reason, even complex dependencies regarding the switch-off and switch-on sequences of individual devices can be coordinated. PROFIenergy guarantees absolute reliability of plant availability because all equipment is fully ready to operate at the end of the pause.

How to get it done?

Equipment vendors implement an energy management strategy by embedding a software 'agent' in the equipment firmware. This agent responds to the PROFIenergy commands in a way that suits the equipment. For example, a production cell may need a conveyor to be slowed down before a robot can be put into 'sleep' mode. If the duration of a pause is long enough, perhaps the conveyor can be completely disconnected. To be ready to restart on demand, its conveyor must be restarted in advance. Multi-level 'sleep modes' are also feasible.

Win-win for all

PROFIenergy is an innovative way of optimizing energy efficiency over a PROFINET network. It uses the automation components themselves to facilitate 'smart' energy management strategies and reduce operating costs.
It can transmit power demand information back to the controller to support more sophisticated energy savings schemes, including peak load management. Other, non-electrical, energy-consuming equipment could also be managed. And cutting power consumption reduces carbon footprints and helps support the 'green' strategies needed to meet your environmental obligations.



For more information, please refer to:
https://www.profinet.com/profinet-explained/profienergy

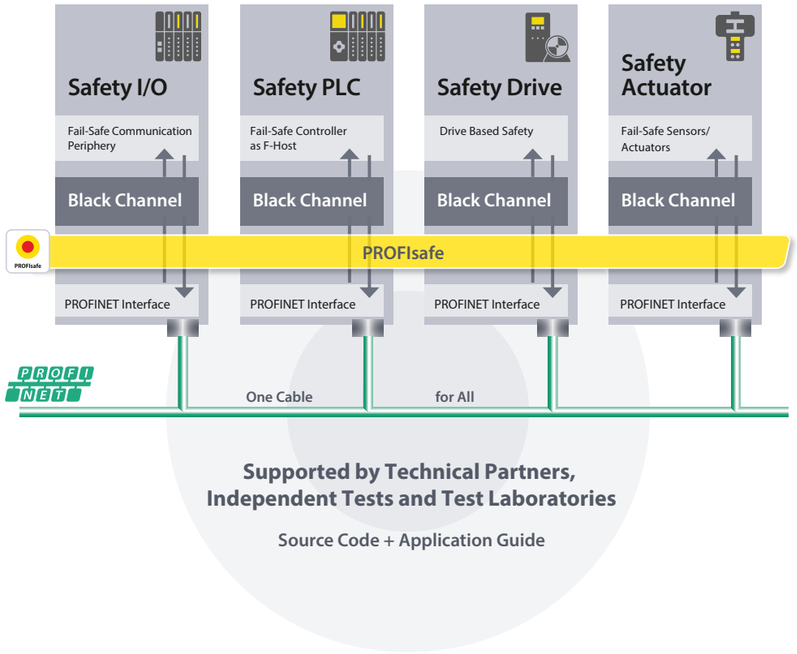
PROFINET profiles and other technologies

PROFIsafe

PROFIsafe is the leading technology for discrete manufacturing and process automation in the exchange of functional safety-relevant data. With several million nodes installed, PROFIsafe technology has proven itself as the leading technology for communication with functional safety on the market.

PROFIsafe fulfills the following relevant requirements:
The IEC 61784-3 compliant technology was developed by PROFIBUS & PROFINET International (PI) and is established worldwide. PROFIsafe has developed into an international standard (IEC 61784-3-3) and has been positively evaluated by the German TÜV.

PROFIsafe offers overall advantages for all branches of industry:
Compliance with strict safety requirements: up to SIL 3 (Safety Integrity Level) according to IEC 61508, IEC 61511 and IEC 62061, also up to PL e (Performance Level) and Category 4 according to ISO 13849.



For more information, please refer to:
https://www.profinet.com/profinet-explained/profisafe

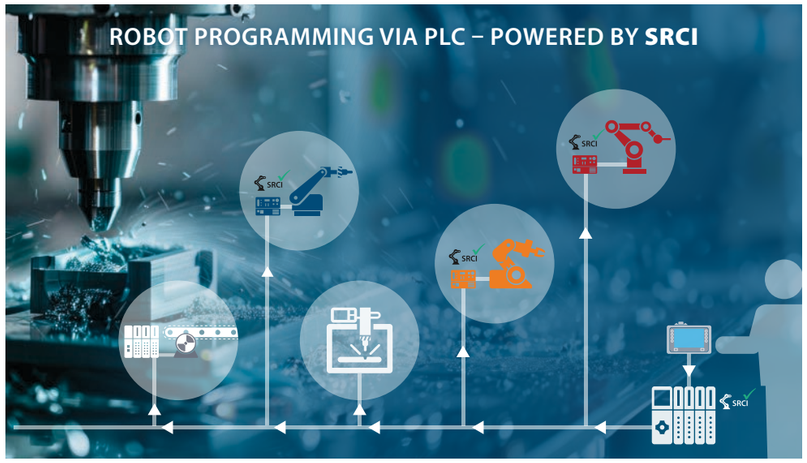
Profile	Profile

SRCI – Standard Robot Command Interface

SRCI is an open standard designed for robot programming and operation within a PLC environment. It facilitates standardized programming and operation of both industrial and collaborative robots, regardless of the specific PLC or robot manufacturers involved. SRCI achieves this by standardizing communication between the robot controller and the PLC.

In practical terms, SRCI provides robot commands as function blocks within the PLC programming engineering tool.
This means that customers can program their entire machine, including the robot program, within the same engineering environment. Additionally, SRCI-based systems empower users to create their own customized operation screens, which significantly enhance the user experience for both operation and maintenance staff.

SRCI brings various advantages
Robotics users will be able to find many more robot programmers much more easily.
Simultaneously, it streamlines training efforts, making robotics more accessible than ever before.



For more information, please refer to:
https://www.profinet.com/profinet-explained/srci-standard-robot-command-interface
https://www.profibus.de/robotics-srci-standard-robot-command-interface

Digitalization

Strategy

The aim of digitalization is to improve the digitization of industrial production through the use of the state-of-the-art communication technologies. Intelligently networked systems should facilitate production that is as self-organizing as possible. Furthermore, the entire life cycle of a product will be recorded from idea, development, production and maintenance to recycling. Forming the basis are internationally standardized communication technologies, interfaces and object descriptions. The networking of machines, devices, sensors, actuators and people is extremely important.
For standardized communication to take place between machines, with higher level systems and the cloud, uniform international communication standards are necessary. OPC UA and TSN are two components for meeting this goal.

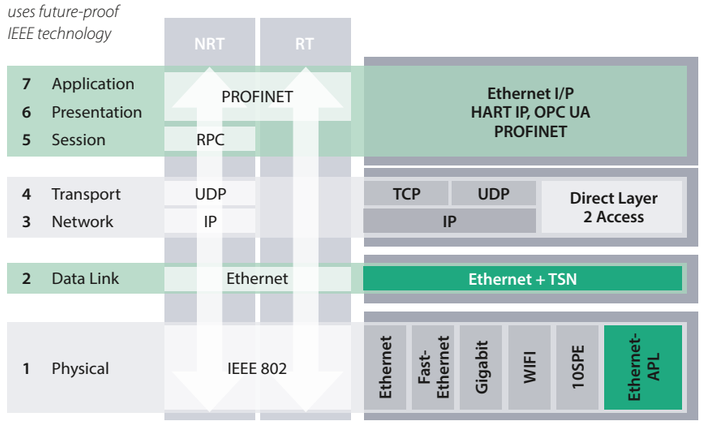
Implementation

Approach of PROFIBUS & PROFINET International (PI)

- **TSN and PROFINET**

PI is currently working on the use of TSN for PROFINET.
The advantages are:

- Use of future-proof IEEE technology, including Gbit
- Scalable integration
- Application layer remains unchanged



TSN integration in PROFINET
uses future-proof IEEE technology

With respect to the ISO/OSI model, another real-time capable substructure is being developed with TSN that can be used by upper protocol layers. The PROFINET protocol can thereby also use TSN as a substructure. The proven PROFINET user view of data, configuration, diagnosis and the profiles such as PROFIsafe or PROFIdrive can, as result, be used unchanged.

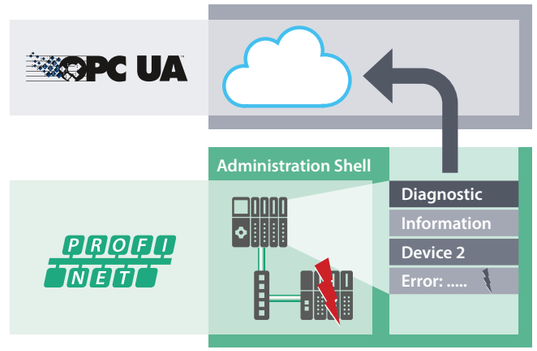
- **OPC UA and PROFINET**

Thanks to its open system structure, OPC UA and PROFINET can use the same network and form an optimum combination for digitalization.
Typical applications include:

- Delivery of asset management and diagnostic information
- Controller-controller communication
- Vertical communication

The necessary information is depicted via objects defined in the OPC UA standard and can be used independent of vendor.

Furthermore, PI is leveraging its profiles in a joint working group with the OPC Foundation with the aim of creating open information models. These can easily be made available to IT systems via OPC UA.
Companion specifications for OPC UA are created here using PI's application expertise. Companion specifications describe the data-related objects and sequences for specific application fields, comparable to PROFINET profile definitions. The first companion specifications describe the mapping of diagnostic and asset management information and handle the topic of PROFIsafe via OPC UA for controller-controller communication.



PROFINET and OPC UA
From Data to Information

Implementation

- **PROFINET over APL**

The Advanced Physical Layer is an intrinsic safe, 10Mbit/s, long range Single Pair Ethernet (SPE) physical layer designed for the process industry.

ethernet-apl
advanced physical layer

It turns the vision of Industry 4.0 into and digitalization reality for Process Automation.
Sensors that speak Ethernet APL – and therefore PROFINET, remove the need for gateways to 4-20mA or other technologies and turn a PA PROFINET installation into a flat hierarchy, where all devices are connected to the one Ethernet network. From quick software updates over device webpages to integration with NOA, everything is easier with Ethernet APL.

And APL is, just like PROFINET, easy to use. Ethernet and power are transported via a single twisted pair of wires. The pairs are polarity agnostic. Therefore, no worries if someone mix up these two wires, the device will still work. Also, screw-terminals are supported and the preferred way to interconnect APL. All it takes is a screwdriver!

One of the many key features of APL is the support of intrinsic safety. APL brings PROFINET not only into the field, but it also delivers PROFINET performance at the sensors and actuators within the most demanding intrinsic safe zones. And that over 200m.

PROFINET was the first Industrial Ethernet protocol to certify dedicated PROFINET APL devices and is leading the industry on this exciting journey.

IO-Link

PROFINET profiles and other technologies

Seamless communication down to the last meter: the point-to-point interface

Profile

As an open interface, IO-Link can be integrated into all common fieldbus and automation systems, including PROFINET. Consistent interoperability ensures a high level of investment protection.
The powerful point-to-point communication is based on the long-established 3-wire 24-volt sensor connection without any additional requirements for the cable material. IO-Link therefore does not require shielded cables.

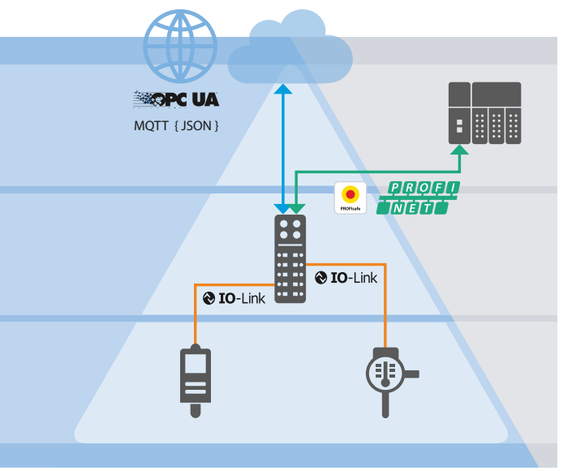
Due to the very low implementation and component costs, the integration of an IO-Link interface is easily possible even in price-sensitive or very small components. To use IO-Link, the classic input/output module is simply replaced by an IO-Link master, which then transfers the information to the user software via all common fieldbuses or directly via the backplane bus of the control system. Replacing devices with IO-Link requires neither tools nor expert knowledge, as the parameterization is stored on the master and is automatically restored.
Thanks to the existing mappings from IO-Link to PROFINET, data can be exchanged seamlessly between PROFINET and IO-Link. This perfect integration is also available for applications with functional safety with IO-Link Safety and PROFIsafe.

Today, IO-Link and PROFINET form the best duo for transporting data "easy to use" between the field level and the control level. Data can also be used efficiently between the control field level and the IT world using standardized mappings such as JSON REST or OPC UA.

Device description via IODDs

***IO-Link** is characterized by simple and powerful point-to-point communication*

The IODD (IO Device Description), which describes all functionalities in a machine-readable XML format, serves as the basis for device communication. Every IO-Link device manufacturer is obliged to provide corresponding IODDs for their IO-Link devices. These can be downloaded manually from the common **IODD-Finder-Database** or automatically by tools. The IODD is uniquely assigned to the device and its properties via the IO-Link device's own vendor ID and device ID.



IO-Link master for communication with the control system

The IO-Link master performs two essential tasks: It supplies the connected IO-Link devices with operating current and ensures the implementation of IO-Link communication in the direction of the controller or fieldbus. It therefore works as a gateway and replaces the function of the previous input/output module. There is a wide variety of IO-Link masters from different manufacturers, both in the control cabinet and for use in the field.

The IO-Link ecosystem is growing

IO-Link has now been in use worldwide for over 10 years and has been continuously developed further. To name just two examples:

- IO-Link Wireless is a wireless communication system that allows process data to be exchanged with the controller in real time. Classic interfaces such as Bluetooth or WiFi, which originate from the consumer sector, do not offer such possibilities. IO-Link Wireless is also 100% compatible with IO-Link in terms of software, so that nothing changes from the programmer's point of view. Wireless IO-Link sensors can, for example, check the transported products on conveyor belts without any major cabling effort. And in hygienically demanding applications, wireless applications with IO-Link avoid any possibility of contamination.
- IO-Link Safety expands the IO-Link ecosystem to include functional safety up to performance level PLe / SIL3 in accordance with IEC 61784-3. IO-Link Safety makes it possible to safely record several analog measurements and then let the safety controller decide whether to switch off or safely stop. This enables, for example, the connection of smart safety light grids, emergency stop devices or other safety-relevant devices. The IO-Link safety specification also defines a possible 2-channel OSSD interface for connection to classic safety relays.

IO-Link as a data source for Industry 4.0 / IoT

In addition to the fieldbus interface, many IO-Link masters have implemented additional IT protocols and services. For example, IO-Link data can be written directly to cloud databases using MQTT. These multi-protocol options, i.e. a combination of real-time (OT) plus IoT interface, make it possible to communicate with the same IO-Link device in both the IT and OT worlds.

IO-Link is at home everywhere

IO-Link is a very robust, digital communication interface for fast data exchange between industrial controllers (PLCs) and sensors, even in harsh industrial environments. IO-Link has established itself extremely quickly on the market. IO-Link is now used in almost all industries. To name just a few examples:

- In tool machine, many signals are collected in a very small space via IO-Link modules. Smart IO-Link sensors monitor hydraulic units and spindles.
- In conveyor technology, decentralized IO-Link valve terminals are used to control lift tables and switches. Smart drives for roller conveyors can be controlled decentrally via IO-Link.
- In warehouse logistics, RFID readers with IO-Link are used to record incoming and outgoing goods.
- In process technology, smart IO-Link sensors are replacing previous analog sensors that were prone to faults.
- In robotics, smart IO-Link grippers in conjunction with IO-Link wireless save a lot of copper cables and therefore weight.

For more information, please refer to:
https://ioddfinder.io-link.com

In-House Development or Development Partnership

Implementation is possible by the device manufacturer themself or together with an external technology or development partner. The basic technology of the device or system plays no role when making this fundamental choice.

The advantage of collaborating with an external technology or development partner when developing a PROFINET interface is that the device manufacturer can concentrate on its core areas of expertise. This reduces development risks and time to market. The experience of the external specialists helps to ensure that the design of the automation device is competitive and technically feasible with respect to its communication technology. In many cases, project-specific training courses and/or workshops are offered so that the device manufacturer can build up PROFINET expertise quickly and efficiently and use its own resources in a targeted way for development, support, and product management.

PI member companies offer a wide range of services during the development phase.

	Internally required PROFINET expertise	Time to market	Requirement for internal capacity/resources
In-house development	Thorough expertise must exist internally	Long	High
Cooperation with a technology or development partner	Partner helps to bridge expertise gaps	Medium	Medium
Complete assignment of development to a development service provider	Only limited internal expertise required	Short	Low

Range of Services of Member Companies

Phases		HMS	Molex	Port	Renesas	Siemens	Sokratel	
1 Consulting								
Implementation Consulting		D	C/D	D	–	C/D	C/D	
Technology Training		C/D	C/D	–	–	C/D	C/D	
Application Consulting		D	C/D	D	–	C/D	C/D	
2 Supported Development Method								
Individual Design								
Stack Development and Integration		–	C/D	D	–	C/D	C/D	
Development Services		D	C/D	D	–	C/D	C/D	
Modular Design								
Embedded Modules		D	–	D	–	C/D	D	
External Coupling								
Protocol Implementation		D	C/D	D	–	–	–	
SPE/APL		(D)	()	D	–	–	–	
Profiles								
PROFIsafe		D	C	–	D	D	–	
PROFIdrive		D	–	–	D	C/D	–	
PROFIenergy		D	–	D	–	C/D	–	
PA-Profile		–	–	D	–	–	–	
3 Supplier for								
Embedded Modules		D	C/D	D	–	–	–	
PC Cards		D	C/D	–	–	C	–	
External Couplers		D	–	–	–	–	–	
Chips/ASICs/FPGA/Microcontrollers		D	C/D	D	C/D	C/D	D	
Starter and Evaluation Kits		D	C/D	D	C/D	C/D	D	
4 Certification & Support								
Competence Center		D	–	–	–	C/D	–	
Test Laboratory		–	–	–	–	C/D	–	
Certification Support		D	–	D	–	C/D	C/D	

C = Controller D = Device ( ) = in preparation

Making industrial connectivity easier for you

HMS Networks simplifies industrial connectivity with a wide range of ready-made products. Easily connect PROFINET networks or devices to any major Fieldbus or Industrial Ethernet network, or interconnect PROFINET networks. With products supporting all major industrial networks, HMS Networks enables you to connect your device to any network, anywhere in the world.

- *Simplify your path to PROFINET*
- *Reduce the time to market for new products*
- *Easily expand your market*

Focus on what you do best – leave the connectivity to HMS Networks!

Integrate PROFINET communication interfaces in your device

The **Anybus CompactCom** is a family of embedded communication interfaces designed to add multi-network capabilities in your devices. The Anybus common API makes it easy for engineers to exchange data with any industrial network, without needing detailed protocol knowledge.

- **Certified for PROFINET IRT**: Meets the highest conformance class (Class C) and network load class (Netload Class III).
- **Versatile Connectivity**: Available in versions supporting copper, fiber optic cables, and IIoT protocols OPC UA and MQTT.
- **Future-Proof Expansion**: Easily add connectivity to other industrial protocols and compatibility with emerging technologies, such as SPE or TSN.

Anybus CompactCom also supports **PROFIsafe** and can be used in combination with the **IXXAT Safe T100** safety module for a complete safety solution.

Learn more about the Anybus CompactCom!
www.hms-networks.com/embedded-network-solutions

External Gateways

HMS offers an extensive lineup of certified, ready to use Anybus Gateways to add external PROFINET connectivity to your equipment.

- Protocol converters: Enable seamless communication between PROFINET and other Fieldbus or Industrial Ethernet networks.
- Couplers: Interconnect PROFINET networks to segment your device from external networks and boost security.

Featuring an intuitive, web-based user interface, Anybus Gateways allow you to configure network communication in just minutes - no additional software required.

Try before you buy!
www.hms-networks.com/anybus-user-interface

Best-in-Class Cybersecurity

Anybus has been recognized with the IEC 62443-4-1 Maturity Level 3 (ML3) certification, demonstrating secure product development lifecycle processes. Anybus products also include key cybersecurity features such as:

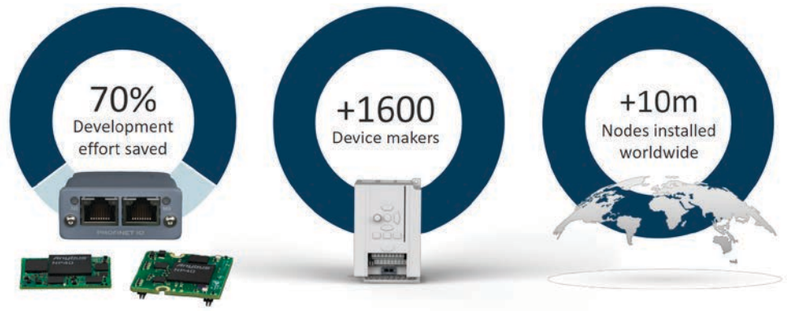
- **Anybus CompactCom**: All versions include IT security mechanisms, such as mandatory software signatures and encryption to protect against unauthorized software and copying. The Anybus CompactCom 40 IIoT Secure variants offer even more advanced cybersecurity features including compliance with 802.1AR: Secure Device Identity, a security chip, secure boot and root of trust.
- **Anybus Gateways**: Equipped with hardware security chips, signed firmware, and physical switches to lock configurations.

HMS Networks – A Lifelong Partner

With over 30 years of industrial connectivity expertise, HMS Networks offers solutions you can trust:

- **Lifecycle Management**: HMS maintains products throughout their lifecycle, handling updates to hardware, protocols, and certifications.
- **R&D Commitment**: By staying at the forefront of industry trends, HMS ensures you remain ahead of the competition.
- **Consulting and Support**: HMS is an accredited PROFINET Competence Center, supporting device manufacturers as a partner in all phases of development. Services include developer training, consulting services, development support, and preparatory tests for certification.

Choose HMS Networks as your connectivity partner and focus on what you do best!



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Complete PROFINET Solutions from Molex

As pioneers in industrial communication and functional safety, Molex is dedicated to help automation manufacturers & end-users creating value from their factories with technology and products.

Company Background

Providing more than connectors, Molex delivers complete interconnect solutions for several markets, including industrial automation, automotive and commercial transportation, consumer electronics, data communications, and medical markets.

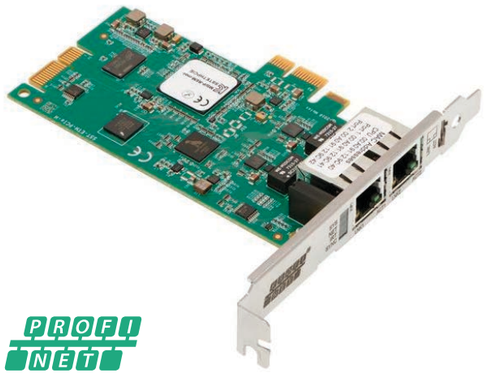
Aiming to advance global Industry 4.0 initiatives, Molex Industrial Automation Solutions add communication and networking to the production process and support the drive toward smarter machines and factories.

Molex PROFINET Solutions

Molex portfolio provides solutions for Automation manufacturers, Machine Builders, Line Builders or End customers to communicate and setup PROFINET infrastructures.

Molex Ethernet Network Interface cards provide powerful and reliable real time data exchange over PROFINET protocol. This solution enables PC based control systems like machine or robotic control systems to quickly integrate a certified communication interface with easy commissioning through Molex Network engineering software.

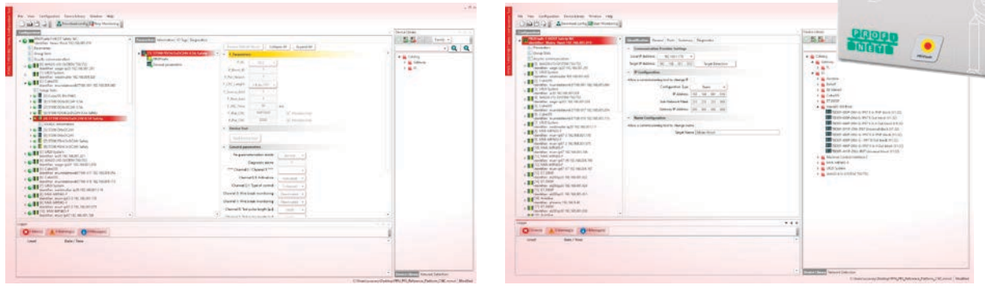
Ethernet switches, cordsets and connectivity products are PROFINET certified and complete the network infrastructure offering.



PROFINET Technology and Services

The Molex PROFINET expertise is supplied as PROFINET I/O Development Kits (also called stacks) for automation manufacturers to develop and integrate PROFINET protocol support in their products. Molex PROFINET stacks are supplied in source code and neutral from any operating system or hardware platform to be adapted to most of the existing device with Ethernet interfaces. PROFIsafe support as F-Host is complementing the Molex technology package.

The full featured Software (PCT) enables our customers to configure and diagnose a PROFINET & PROFIsafe network while integrating the tool inside their own software suite due to its high degree of customization and interfaces to export memory mapping and tags.

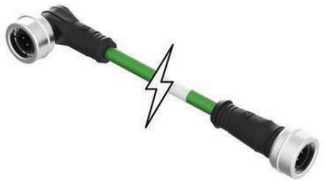


PROFINET IO-Controller Configuration tool, customizable to OEMs requirements

Molex's PROFINET connectivity solutions

To connect the PROFNET devices to a switch or a controller, Molex offers a broad portfolio on M12 push/pull as well as RJ45 receptacles and connectors in different protection grads (e.g. IP20 to IP67). Molex pre-assembled cable solutions make the commissioning process in the field easy and convenient.

The new Molex Single-Pair Ethernet Standard (SPE) products allow data communication with up to 10Gbit as well as power transmission (up to 50W) via just two wires. The smaller SPE cables (AWG26) and SPE connectors will provide a cost optimized solution for the future of PROFINET.



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E-Mail: **fieldbus-sdk@molex.com**

Not only PROFINET

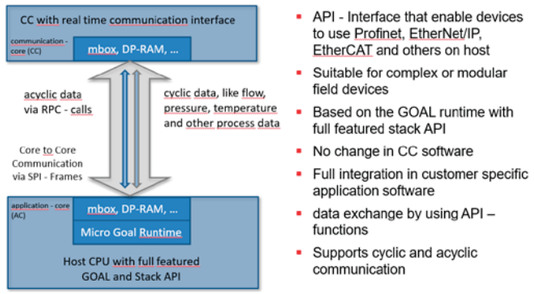
… but Multi Protocol Device Kits for Industrial Communication

Port provides Industrial Automation solutions since 1990 and is a well known provider for Protocol Stacks , formally called Protocol Libraries.
Here we support not only one protocol – we always aim to enable the customer to use Multiple Protocols within one software project by using our Middleware GOAL.
Port's Protocol Stacks are not only the Stacks itself – the middleware GOAL extends the Protocol Stack to a complete solution – to a Device Kit.
We blend in with the Semiconductor's eco-system to provide even more added value.
Our aim is as well to blend in with the customer's project as an added-value building block.

Introduction

Port provides it's Protocol Stacks with the Middleware GOAL. GOAL adapts to a specific platform (Silicone) – bare metal, RTOS or Linux based and blends in with the by the Semiconductor Manufacturer given resp. used eco-system. This way GOAL supplements the existing solutions without erecting roadblocks.
While GOAL is specific to the target – it is uniform towards the Protocol Stack.
GOAL carries accessories like LLDP, ACD, DHCP (supporting options 67 and 82), a Netload Test optimized TCP/IP Stack and many more added value features – converting the Protocol Stack into a fully compatible Fieldbus Device: A Device Kit.
If applicable even Switch Management for an internal or external Layer 2+ managed Ethernet Switch Controller is provided.
GOAL is equipped to handle Core-to-Core-Communication (CtCC) – running the Industrial Communication in one Core while providing the Protocol Stack API in another Core (DPRAM, Mailbox and other's – on chip) or SPI for dedicated MCUs/CPUs.

Core-to-Core Communication
Load balancing and isolated processes



- API - Interface that enable devices to use Profinet, EtherNet/IP, EtherCAT and others on host
- Suitable for complex or modular field devices
- Based on the GOAL runtime with full featured stack API
- No change in CC software
- Full integration in customer specific application software
- data exchange by using API – functions
- Supports cyclic and acyclic communication

Ethernet Types

We support:
- The well established 100Mbit/1GBit Ethernet
- TSN-based Ethernet (Time Sensitive Networking)
- SPE (Single Pair Ethernet) with it's variations
- CAN

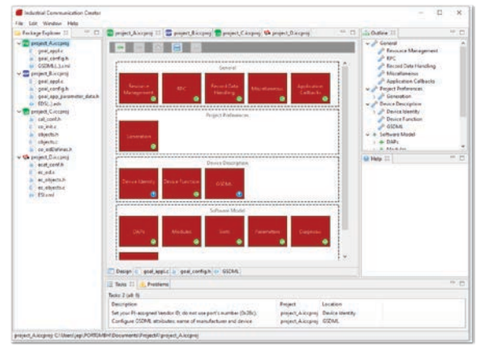
Protocols

- PROFINET, PROFINET and PROFINET, optional with PA-Profile 4.02
  - CC-A, CC-B, CC-D (TSN), optional MRP
- EtherNet/IP
  - Plain CIP, optional beacon and announced based DLR
- EtherCAT (Beckhoff SSC independent)
- POWERLINK
- OPC-UA
  - Own and independent OPC-UA Micro+ Nano Implementation for bare metal / RTOS platforms
  - open62541 supported in GOAL for Linux and RaspberryPI
- CC-Link
  - CC-Link IE Field Basic
  - CC-Link IE TSN
- ModbusTCP
- CANopen

Supported Silicone

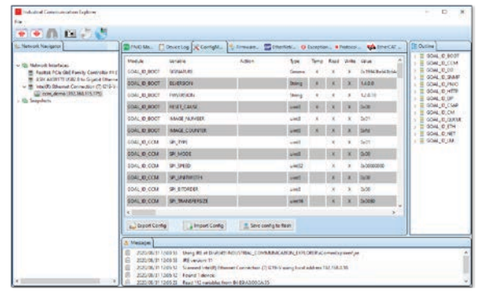
- Linux (generic Linux and RaspberryPI based)
- NXP RT1180
- Renesas R-IN32_m3-EC, RZ/N-1 -S /-D / -L, RZ/N-2L, RZT-1, RZT-2M
- STMicro STM32 Family

The Toolchain makes the difference – our ICC



Providing to the customer a Protocol Library is certainly important – at least the same importance applies to enable the customer to handle this Protocol Library.
Here the tool Industrial Communication Creator (ICC) scores: The ICC is being used to configure the Protocol Library, to define all objects (and corresponding activities) and to sanity-check these settings.
Once the settings are made the ICC Tool creates the corresponding configuration files for the Protocol Stack, creates the corresponding Device Description File (EDS File) and creates the application stubs for the customer's application to interface with the Protocol Stack.
This tool does not only speed up the development process in a priceless manner – it also improves the quality since error-prone manual activities are automated and a clean and reproduceable configuration can then be saved and archived. Another engineer can take over the work later on without handling too much code.
A headless version (command line based) is available for use in automated build environments.
The automated and software supported configuration has been considered a valuable quality factor by TÜV and other organizations when our product was accepted for Black Channel as a Proven-in-Use software of an ISO9001:2015 certified company. This can be a key during Functional Safety certifications and considerations in conjunction with Functional Safety Stacks of other suppliers.

More Toolchain



Once the design has proceeded to be tested in the laboratory our next tool Industrial Communication Explorer provides again priceless help.
This tool is suitable to find and talk to your newly created Industrial Communication device in your local laboratory network.
It comes with simple Master applications for PROFINET, EtherNet/IP, EtherCAT and ModbusTCP. It reads your recently created EDS File and you can establish a simple communication.
Although it's not designed to be a PLC and not designed to replace the Confomance Tests – it's a very valuable help for the first sanity tests.

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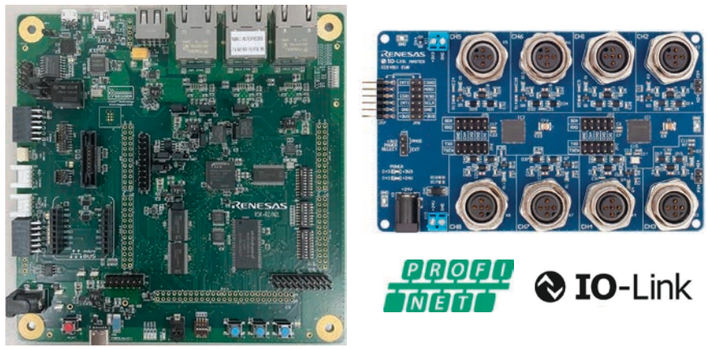
E-Mail: **service@port.de**

Multiprotocol Industrial Ethernet Devices for all Performance Classes and Applications

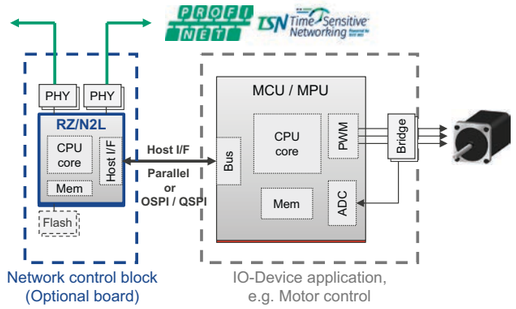
Renesas Electronics offers optimized solutions for factory automation applications that help to pave the path to Industry 4.0 and Industrial Internet of Things (IIoT) applications.
Our product portfolio includes application specific and standard ICs for industrial Ethernet, industrial motor control and power devices. Renesas enables modular architectures comprised of our silicon devices, a rich software ecosystem including a PROFINET RT/IRT SDK, plus other industrial Ethernet software stacks and partner solutions.

The Arm®-based RZ/T and RZ/N series MPUs deliver fast real-time control and high-performance application processing, with industrial Ethernet communication to build high-performance systems for a wide range of industrial equipment. These families of scalable and performant devices support multiple industrial Ethernet protocols including TSN, and redundant network technologies for industrial systems.
The devices are equipped with a Gigabit TSN switch and support various application needs in Industrial Ethernet including PROFINET RT/IRT, EtherNet/IP™, EtherCAT and next-generation TSN. The RX and RA MCU product families provide large, embedded RAM and nonvolatile memories and CPU cores powerful enough to support PROFINET RT applications. The TPS-1 device is a matured companion chip supporting Profinet RT/IRT.

Easy solution composition by modular design concept: PROFINET IO-Link Master demo with RZ/N2L RSK and CCE4511 EVB

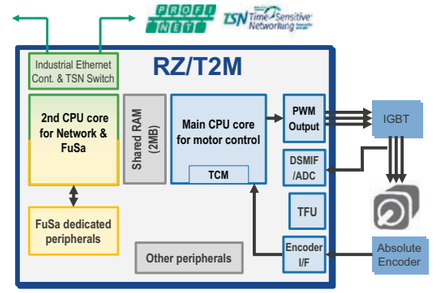


Our Technology enables various use-cases from low-cost sensing applications up to high-performance servo drives. We support two variants to attach applications to Industrial Ethernet networks, the modular and the integrated way. The modular configuration allows for easy copy-paste reuse of the communication circuit across various products, or it enables design of a reusable plug-in module for adding Ethernet connectivity.



Modular connection to Industrial Ethernet

The integrated configuration combines the communication function and real time control applications in a single chip. It has the advantage of optimized board space, high-performance internal data exchange and lower bill of material compared to the modular solution.



Integrated Industrial Ethernet Solution

Thanks to the modular structure of the Renesas solutions, developers can easily port their application between both configuration variants by choosing the most appropriate device out of our wide portfolio saving development time, reducing risk and optimizing maintenance cost.

For more information, please visit
www.renesas.com/applications/industrial/industrial-automation

SIEMENS

Efficient development of RT/IRT controller and device

You want to integrate PROFINET into your field devices as easily as possible and achieve top-tier performance? PROFINET technology from Siemens offers you maximum performance and can be scaled exactly to your requirements. In addition, you receive full support throughout the entire product development cycle: from individual support to certification.

Innovative and well proven

In its role as a PI member, Siemens has been actively driving PROFINET development since the very beginning. Siemens' technology components benefit from this collective knowledge. They have also been proven in countless products in the field, they help to maximize performance, and they can be scaled to your specific requirements. Moreover, Siemens will advise you in choosing the right technology component for your device, offer training opportunities, and support you throughout the entire development period all the way to successful certification.
All Siemens development kits are supplied in source code. This ensures easy portability. You also have complete freedom during integration and can react quickly to your own needs.

Hardware/software: Support for controller and device development

Whether PROFINET controllers or devices - with Siemens you can accelerate and simplify the development of your PROFINET devices with ready-made hardware and software components such as PROFINET stack, PROFINET Driver, communication modules, development kits, APIs or ERTEC ASICs and suitable development packages. PROFIsafe starter kit and PROFIdrive application examples also offer you support when using application profiles.

ERTEC chip family – the path to the fastest PROFINET

ERTEC (Enhanced Real-Time Ethernet Controller) is a chip developed by Siemens. It is setting new standards in communication. Designed for cycle times of only 125 µs, all types of field devices can be solved. With its integrated ARM CPU and an integrated IRT (isochronous real-time) switch, field devices can thus be implemented that meet the highest performance standards. The chip size simplifies integration into compact field devices. In addition, the CPU lets you integrate your own applications, eliminating the need for an external host CPU. On the other hand, ERTEC can also be used perfectly as a companion chip and connected to an existing processor via SPI or parallel interface (16 or 32 bit).

Functions

- PROFINET over RT and PROFINET over IRT including Isochronous Mode
- Integrated 2-port switch
- Shared device to 4 PROFINET controllers
- S2 system redundancy
- PROFINET performance upgrade with a minimum cycle time of 125 µs (DFP, Dynamic Frame Packing)
- MRP/MRPD
- The latest technology certificate

PROFINET Driver – easy development of RT/IRT controller and/or device

In series machine manufacturing, users frequently employ self-developed control software on standard PCs. PROFINET Driver eliminates the need for any special hardware. It supports both PROFINET controller and I-Device functions on the same interface, enabling a device to communicate with a higher-level controller while also controlling PROFINET devices.

Functions

- PROFINET Controller
- PROFINET Device
- PROFINET Controller and PROFIENT Device on the same interface
- PROFINET over RT on Standard Ethernet Chips
- PROFINET over IRT with Communication card "CP1625"

PROFINET Driver

PROFIsafe Starterkit – Accelerate the Development of Fail-Safe Field Devices

With PROFIsafe Starterkit, devices can be developed for safety communication in accordance with the „PROFIsafe Profile for Safety Technology (IEC61784-3-3)". The package facilitates the easy integration of F-Slaves to communicate with an F-Host via PROFINET.

PROFIsafe

PROFIdrive – Implement Drive Concepts Quickly and Easily

PROFIdrive is a standardized drive interface specified for PROFINET. Siemens offers application examples that illustrate how to quickly and efficiently integrate PROFIdrive with ERTEC into your drive device or encoder.

PROFIdrive

Stay up to date

When you choose a development package from Siemens you will always stay up to date on the latest developments. You will receive all updates available for your development package free of charge.

Benefit from the reliability of certified field devices

A significant portion of PROFINET certifications come from the test labs ComDeC in Germany, PIC in the USA, PIC in China, and an Testlabs in the Czech Republic. The certification ensures that devices in the field always conform to the demands of industrial environments. Device manufacturers are thus assured that their PROFINET devices installed worldwide do not require expensive service calls.

Service and Support – Our experience saves you time and money

With Siemens you receive the support you want:

- Individual consulting before purchasing a development package
- Free support during development
- On-site support by arrangement
- Support for certification

Innovative Device Development –
Siemens Technology for Your Success!
Learn more here:
www.siemens.com/profinet-development

TSN-Ready PROFINET Solution for Your Intelligent Field Devices in Industry 4.0

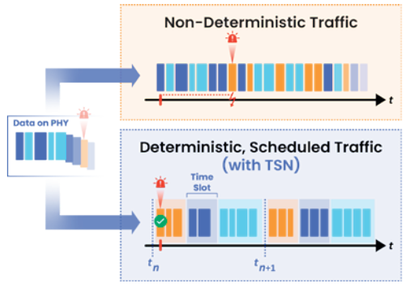
The fastest way to bring PROFINET to your Embedded System!

Sokratel takes your PROFINET network to the next level. To achieve this, we rely on hard real-time determinism by means of TSN. In addition, we can reduce communication jitter to a minimum by using Arm® Cortex®-R processors. We are committed to future-proof technologies and therefore focus on the PROFINET Security Specification. Our SIRIUS OS platform opens up the possibilities of modern model-based software development, while providing interfaces to various IIoT platforms. This turns your field device into a genuine Industry 4.0 device.

The fastest and easiest way: Flexibility through hardware independence

Whether you are starting a new project or upgrading your field device, we can provide you with a PROFINET solution tailored to your needs. Our flexible software is largely hardware independent and allows seamless integration into your system. All common CPU, processor and SoC types (such as Arm® Cortex®-A and -R, AMD Zynq™ and Zynq™ UltraScale+™) are supported.

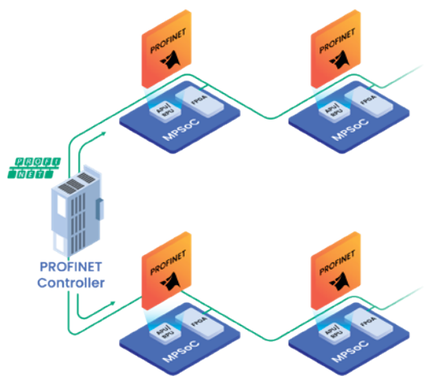
Our software solution can also be used with various operating systems such as Linux, Zephyr, FreeRTOS or simply baremetal. Commissioning is often possible with a simple software update in existing PROFINET networks.



Maximum Quality: TSN (Time-Sensitive Networking)

The introduction of TSN brings a level of determinism to standard Ethernet networks that was previously only possible with PROFINET IRT. In addition, TSN enhances network convergence, making it possible to transmit time-critical and non-time-critical data over the same network.

We enable the most important TSN functions ‚time synchronisation' and ‚scheduled traffic' for hard real-time requirements and determinism in your network. We also deliver the lowest jitter by running our software on Arm® Cortex®-R processors, which are optimised for low-latency communications.



Future proof: PROFINET Security

We are committed to future-proofing our technologies.

The need for cyber security is growing worldwide. Our software is used in critical infrastructure and is therefore exposed to particular threats from the Internet.

This is why we rely on the future-proof PROFINET Security Specification, not least to meet the CRA (Cyber Resilience Act) requirements for our customers.

Our software is constantly being developed and adapted to meet the latest requirements. We can integrate it seamlessly, ensuring that your PROFINET devices are always ready for the future.

So that you can focus on the essentials: SIRIUS OS

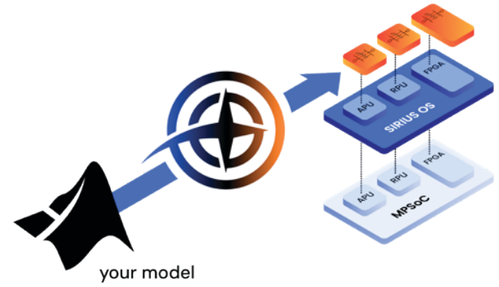
SIRIUS OS is our real-time embedded platform developed specifically for your intelligent field device.

SIRIUS OS enables you to use modern model-based development methods with MATLAB® and Simulink®.

Our platform provides a comprehensive ecosystem with all the core functionality required for industrial automation applications. It helps you accelerate time-to-market and massively reduce development costs.

The most important industrial protocols (e.g. PROFINET, OPC-UA, CAN, Modbus) are already integrated in the SIRIUS OS platform.

Everything, so you can focus on the essentials: Developing your applications.



What you can expect from Sokratel:

Full range of services

You do not need any prior knowledge of PROFINET or network standards. With our many years of experience in the service business, we offer you close support and a comprehensive full range of services.

Of course, we support you from the initial requirement to the finished product, including certification. Beyond that, we also offer long-term support. Our dedicated team is at your side with expertise and passion.

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Notes

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