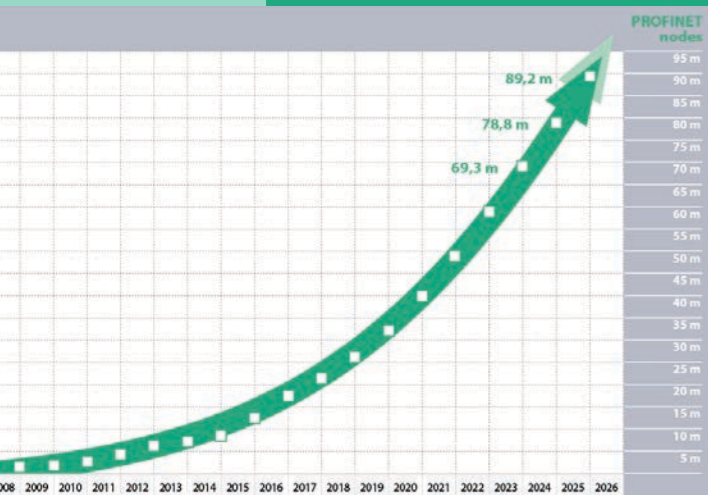


PROFINET Technology

The Easy Way to PROFINET



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/>



Xavier Schmidt
 Chairman PROFIBUS & PROFINET International (PI)

PROFIBUS & PROFINET International (PI) is backed by about 1,800 member companies worldwide. With more than 89 million devices installed by the end of 2025, 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 Security, TSN, SRCI, MTP and 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 24 Regional PI Associations (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:

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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.

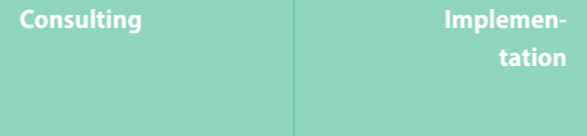
The integration of an industrial communication interface into an automation device begins with the collection of information. This makes it possible to determine the functionality of your industrial networks and to familiarize yourself with the task at hand. PI itself as well as a number of its member 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 PROFI-safe, PROFIdrive and PROFInergy
- › Advanced technologies e.g.
 - › SRCI
 - › APL and SPE
 - › IO-Link
 - › MTP
- › PROFI-safe Standard Functional Safety with Vision Integration of Safety and Standard Communication on One Channel (Black Channel Principle)



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.

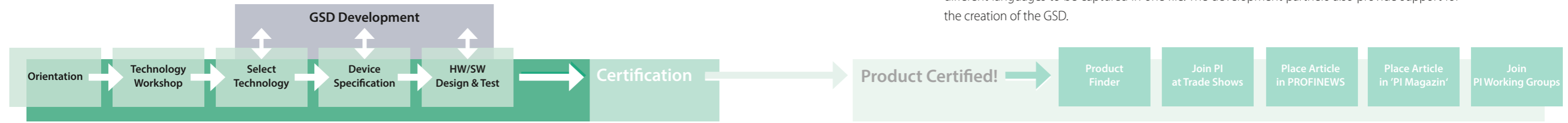
Hardware/software design

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 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.

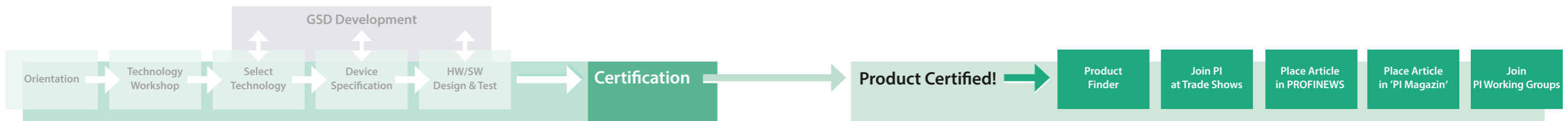
A list of validated PICCs can be found at:

- › 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.



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
- › Device classification
- › Implementation options
- › Development methods

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

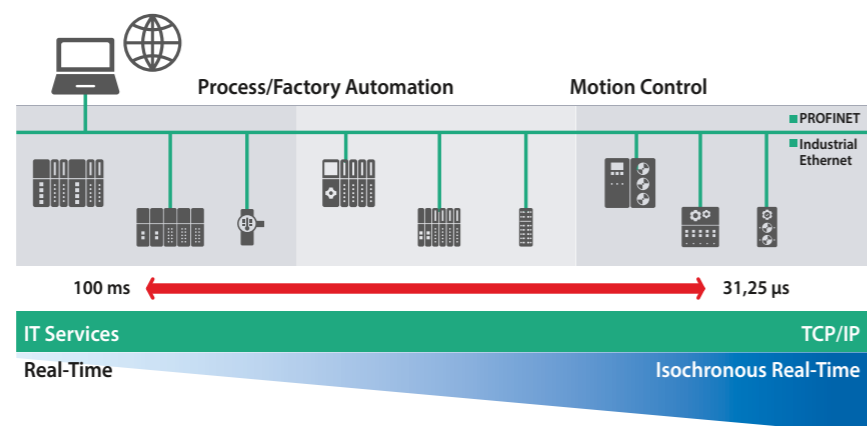
IEEE 802.3 ensures problem-free communication between PROFINET automation devices and among PROFINET automation devices and other standard Ethernet devices. For applications with very stringent real-time requirements, PROFINET offers mechanisms that enable both standard and real-time communication to 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:



Real-Time Requirements

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 (CC) 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.

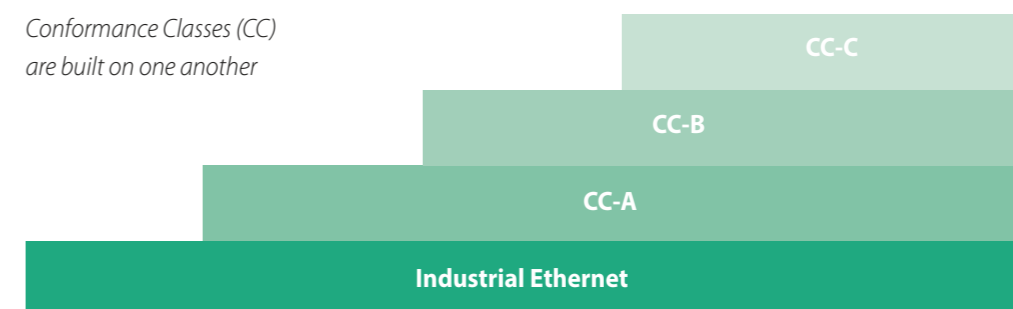
CC-B: The functional scope of CC-B comprises the functions of CC-A, plus it supports easy user-friendly device replacement without the need for an engineering tool. To increase data reliability, a performance-adapted media redundancy protocol is available as an option. All IT services can be used without 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.

PROFINET Specification V2.5 adds further standardized functions, including for time-sensitive-networks. The system will continue to take care of selecting the correct conformance class itself. This is selected automatically based on the configuration of the requirements and optional application classes.

Conformance Classes (CC) are built on one another



PROFINET Device Interface | Development Method

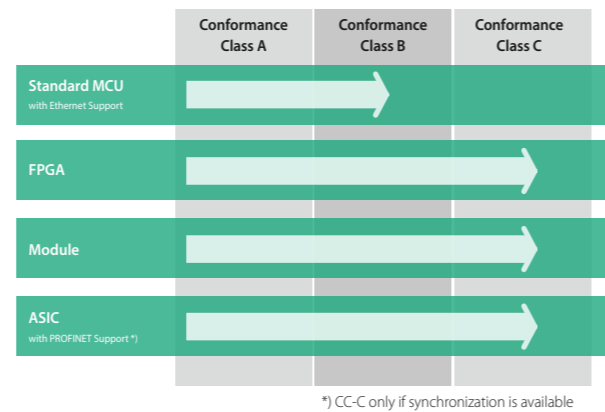
You can choose from different options in order to implement the solution that best suits the details of the automation device:

- 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:



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 25 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
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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 PROFI-safe. 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

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 extent.

In addition, depending on the risk assessment, manufacturers can implement individual or multiple building blocks from the PROFINET Security architecture for secure communication:

› **Secure Cell:**

Network segmentation and access control (cell protection concept) can already be implemented with today's PROFINET installations. Additional hardening measures are available with the PROFINET specification V2.5.

› **Secure Access:**

Direct, secure access to devices from higher-level networks for applications ranging from asset management to artificial intelligence.

› **Secure Realtime:**

Integrity, authentication and, if required, confidentiality through cryptographic protection of acyclic and cyclic real-time communication for critical infrastructures.

And best of all, it's not just theory – it's already part of the standard and ready for future adoption.

PROFINET
Security

Auditable
Events

Ensuring Compliance and Accountability

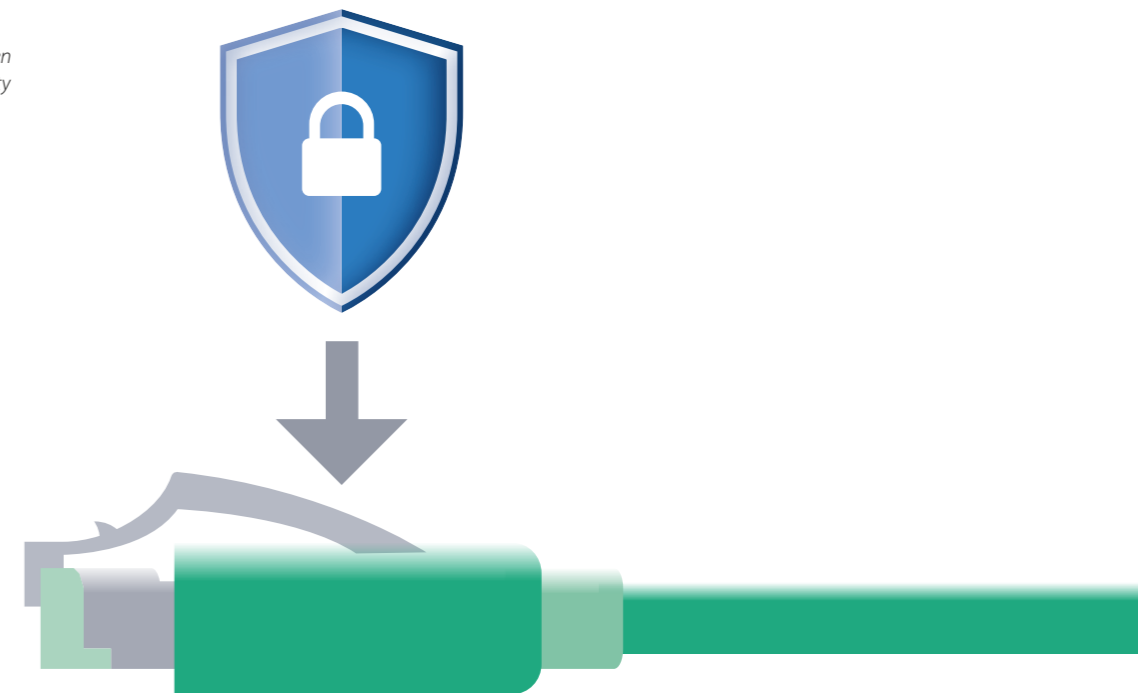
PROFINET also offers a Security Eventing class, accompanied by a comprehensive list of Auditable Events.

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 a 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.



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 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. It is 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 and therefore future proof.

In addition, PI offers a wide range of options for implementation support, interoperability testing and certification. This incorporates the invitation to participate in future profile enhancements and further standardization work.

PROFIdrive is inherently designed to work seamlessly with all other PROFINET profiles, such as PROFIsafe and PROFInergy.

The supported VIK/NAMUR drive interface in accordance with VE34/NE122 offers, in particular, the advantage that no additional commissioning effort on site is required when replacing a device, based on a specially defined and provided VIK/NAMUR profile GSD file.

It is precisely this feature that underscores the general architecture and manufacturer independence of the PROFIdrive architecture and communication structure. In this way, PROFIdrive enables a flexible, manufacturer-specific design of drive products to meet specific 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.

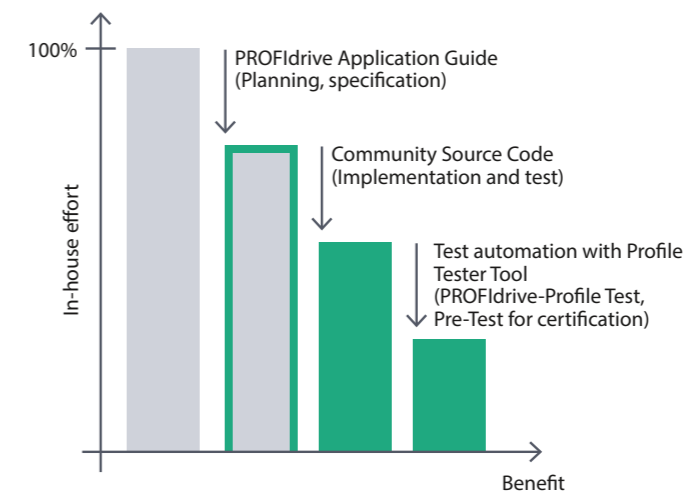
The success of PROFIdrive is based on a mature offering of benefits for many years.

Profile

Implementation

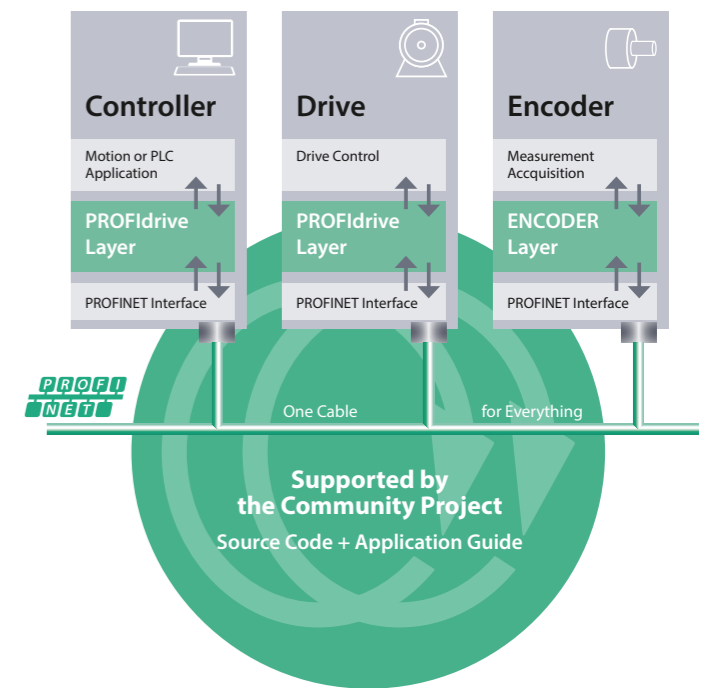
The PROFIdrive Community has founded the working group "PROFIdrive Community Project", with the aim of providing drive manufacturers with the best possible support in implementing their own PROFIdrive architecture.

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.



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 underlying 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

For more information, please refer to:

➤ <https://www.profinet.com/profinet-explained/profidrive>

PROFINET profiles and other technologies

PROFenergy – SUSTAINABILITY. GREEN. PROFINET.

PROFenergy 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.



ONE solution for transparency and acting

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

PROFenergy is a profile of the PROFINET communications protocol that allows ...

- A) the acquisition of measurement data from a 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

PROFenergy 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 PROFenergy commands. For this reason, even complex dependencies regarding the switch-off and switch-on sequences of individual devices can be coordinated. PROFenergy 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?

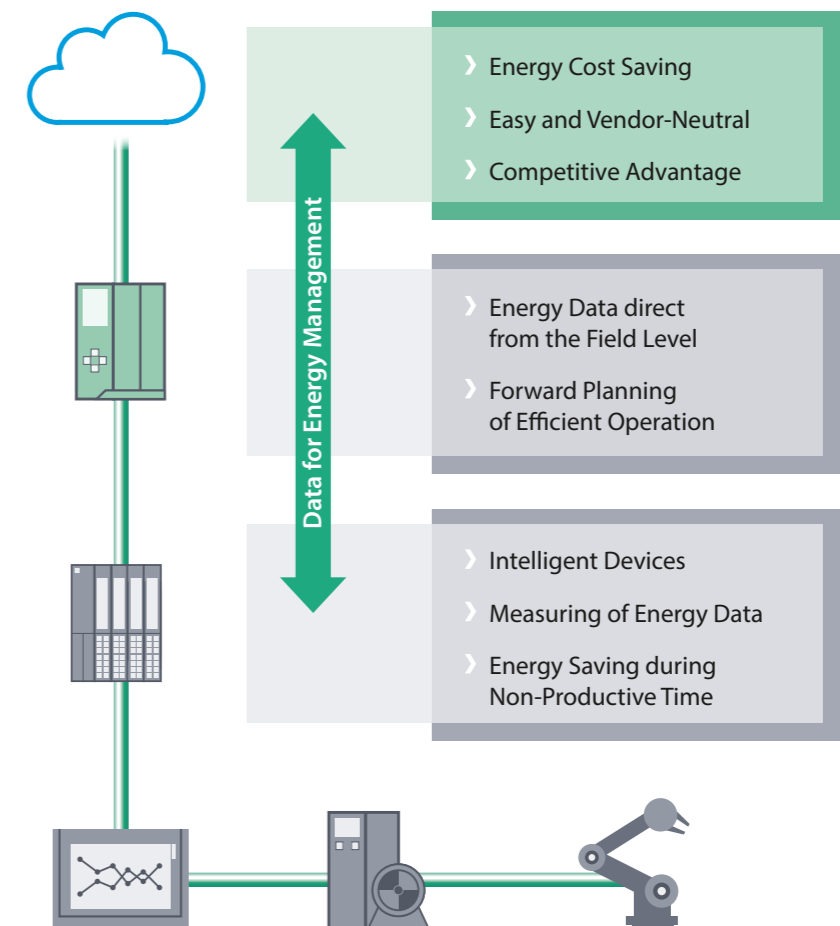
Equipment vendors implement an energy management strategy by embedding a software 'agent' in the equipment firmware. This agent responds to the PROFenergy commands in a way that suits the equipment. For example, a production cell may need a conveyor to be slowed down before a robot can be put into 'sleep' 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.

Profile

Win-win for all

PROFenergy 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/profenergy>

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.

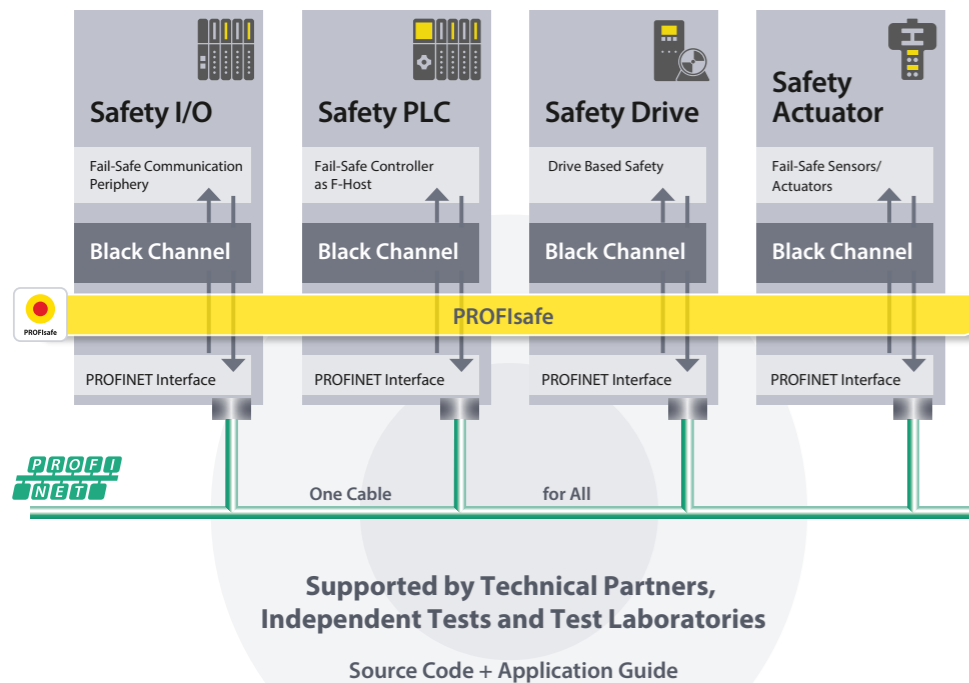


PROFIsafe fulfills the following relevant requirements:

Developed by PROFIBUS & PROFINET International (PI), PROFIsafe is a globally established safety communication technology. It is defined as an international standard in IEC 61784-3-3 and has been positively evaluated by 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/profSAFE>



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.

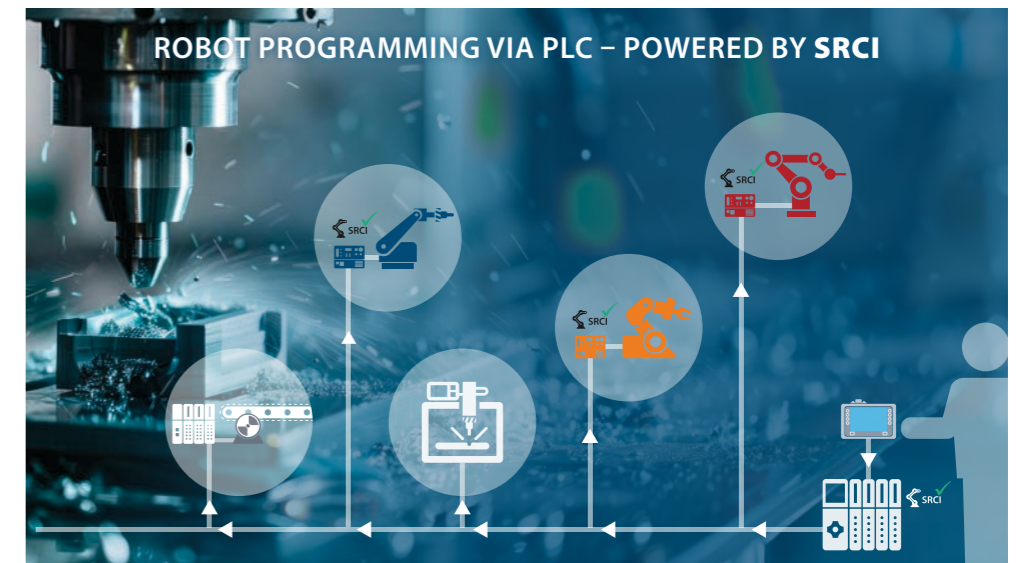
Profile	Profile
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In practical terms, SRCI provides robot commands as function blocks within the PLC programming engineering tool.

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

The goal of digitalization is to improve industrial production through the use of 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.

Approach of PROFIBUS & PROFINET International (PI)

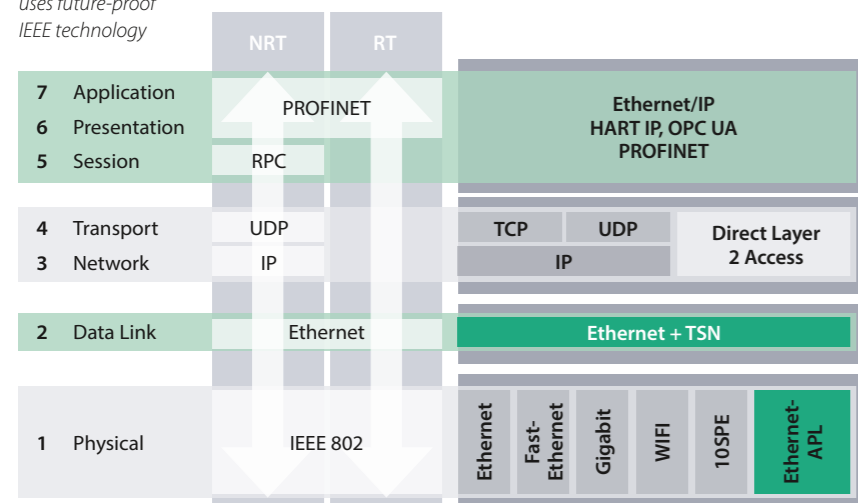
TSN and PROFINET

PROFINET Specification 2.5 includes the integration of Time-Sensitive Networking (TSN) and the introduction of a cross-layer protocol called Service-eXchange Protocol (SXP).

The advantages are:

- Use of future-proof IEEE technology, including Gbit
- Scalable integration
- Application layer remains unchanged
- SXP for standard PROFINET and TCP/IP data traffic, including optional security

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

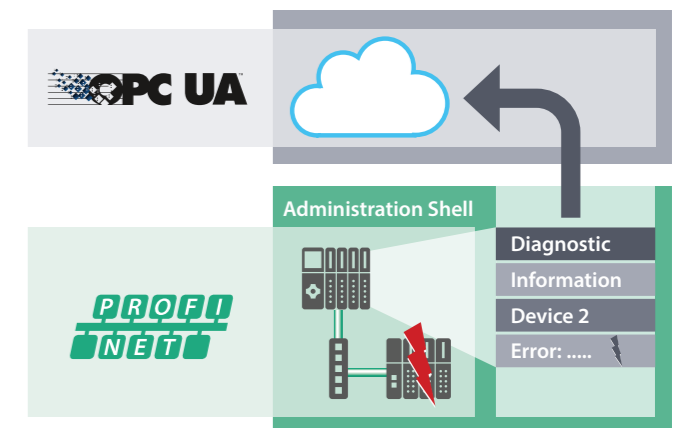
The necessary information is depicted via objects defined in the OPC UA standard and can be used independent of vendor.

Strategy

Implementation

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

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

Sensors that speak Ethernet APL – and therefore PROFINET (e.g. Process Automation), remove the need for gateways to 4-20mA or other technologies and turn a PROFINET installation into a flat hierarchy, where all devices are connected to 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 mixes up these two wires, the device will still work. Also, screw-terminals are supported and are 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 intrinsically 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.



PROFINET profiles and other technologies

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

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. Meanwhile, IO-Link has enabled even the most compact sensors to provide significantly more functions, diagnostics and process data for many years, representing a major step towards modern, powerful field devices. 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 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.

Profile

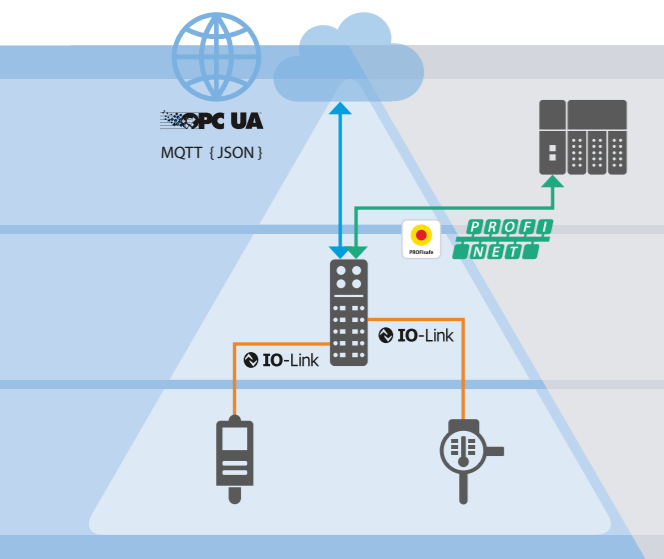
IO-Link is characterized by simple and powerful point-to-point communication

Device description via IODDs

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 15 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.

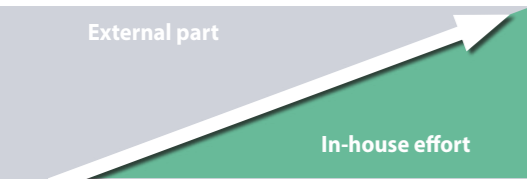
IO-Link is at home everywhere

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

C = Controller D = Device S = Sensor () = 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!



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.

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!
<https://www.hms-networks.com/embedded-network-interfaces>

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.

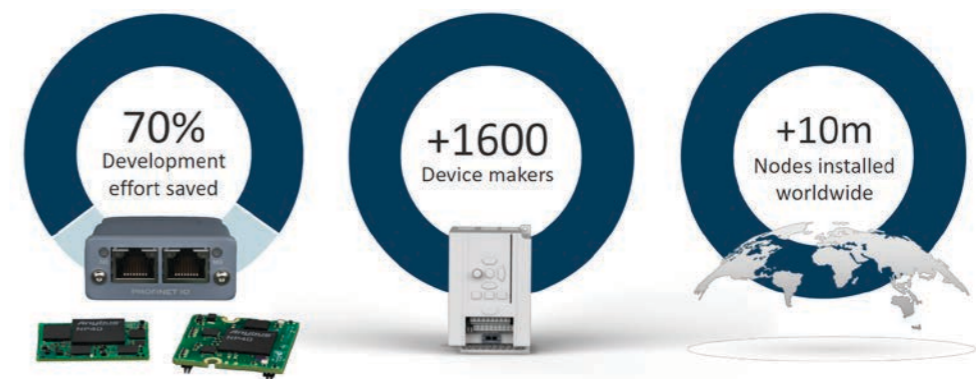
Try before you buy!
<https://www.hms-networks.com/anybus-user-interface>

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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Not only PROFINET

... but scalable multi-protocol device solutions or Industrial Communication

NXP provides mature protocol stack solutions – originally from port industrial automation – bundled directly with NXP silicon. These implementations are designed for low resource consumption and integrate seamlessly into the MCUXpresso ecosystem. As with previous generations, the stacks come with a complete surrounding software environment, including ready-to-run demonstrations that showcase the full solution.

NXP's solutions align with the Cyber Resilience Act and the corresponding IEC 62443 and ISO 27001 frameworks, giving customers confidence that their designs start with a robust, compliance-ready base. In addition to PROFINET, all complementary industrial network protocols are supported in a uniform manner, delivering a consistent experience across the full industrial communication portfolio.

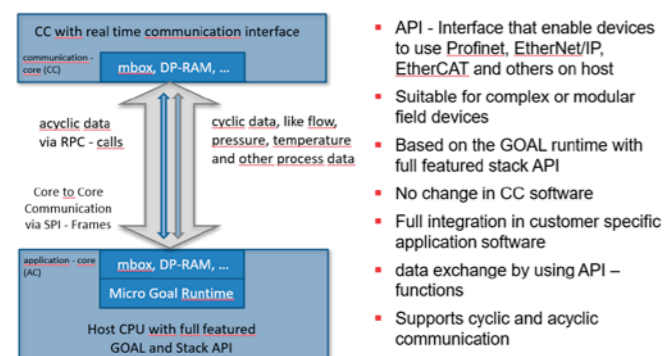
Introduction

The GOAL middleware supplements the protocol stacks and is included as part of the complete delivery. While GOAL is tailored to specific targets – such as the i.MX RT1180 or Linux – its interface toward the protocol stack remains uniform.

GOAL includes a wide range of supporting features, such as LLDP, ACD, DHCP with options 67 and 82, a TCP/IP stack optimized for netload testing and many other enhancements that elevate the protocol stack into a fully compatible fieldbus device. When applicable, GOAL can also manage an internal Layer 2+ switch.

In addition, it supports Core-to-Core Communication (CtCC), enabling industrial communication to run on one processing core while exposing the protocol stack API from another, providing improved isolation and load balancing for complex designs.

Core-to-Core Communication Load balancing and isolated processes



Supported Ethernet Types

- 100Mbit/1Gbit Ethernet
- TSN-based Ethernet (Time Sensitive Networking)
- SPE (Single Pair Ethernet) with its variants
- CAN

Protocols

- PROFINET
- CC-A, CC-B, CC-D (TSN), optional MRP
- EtherNet/IP
- 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 IE Field Basic
- CC-Link IE TSN
- ModbusTCP
- CANopen

Supported Silicon

- Linux for the i.MX applications processors
- NXP i.MX RT1180 crossover MCUs
- NXP i.MX 43 applications processors

The Toolchain makes the difference – our ICC

Providing a protocol library is important, but enabling customers to work efficiently with that library is equally critical.

The Industrial Communication Creator (ICC) addresses this need by allowing users to configure the protocol stack, define all necessary objects and activities, and validate settings before integration.

Once configured, the ICC automatically generates all required artifacts, including protocol stack configuration files, the device description file (EDS) and application stubs that simplify the connection between the customer's application and the protocol stack.

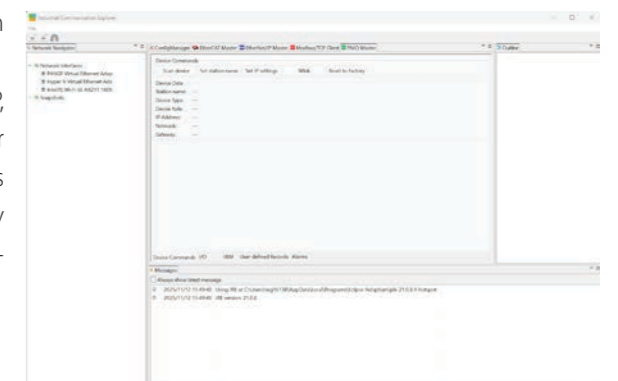
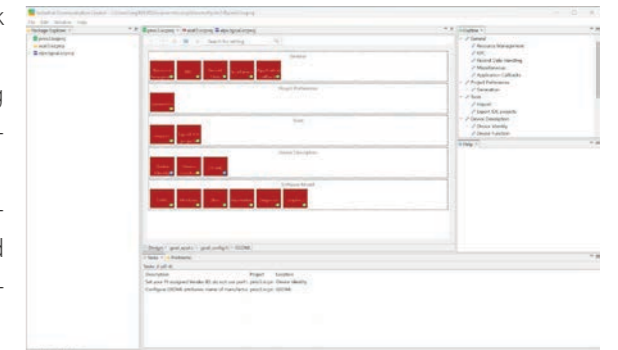
This level of automation not only accelerates development but also improves quality by removing many error-prone manual steps. It ensures that configurations are clean, reproducible, and easy to archive, enabling seamless handovers between engineers.

The ICC's software-supported configuration approach has been recognized by TÜV and other certifying organizations as a valuable quality factor – particularly for functional safety certifications where a proven-in-use software foundation from an ISO9001:2015-certified company can be a key element.

More Toolchain

Once a design reaches the laboratory testing stage, the Industrial Communication Explorer becomes an essential tool. It enables users to quickly detect and communicate with newly created industrial communication devices on a local network.

The Explorer includes simple master applications for PROFINET, EtherNet/IP, EtherCAT, and ModbusTCP/IP and it can read the EDS files generated earlier to establish communication rapidly. Although it is not intended to function as a PLC or to replace official conformance tests, it is extremely valuable for early communication testing, allowing developers to validate their design behavior long before formal certification steps begin.



**NXP Semiconductors –
port industrial automation GmbH**
Regensburger Str. 7b
06132 Halle (Saale) | Germany
E-Mail: nxp.port@nxp.com

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.

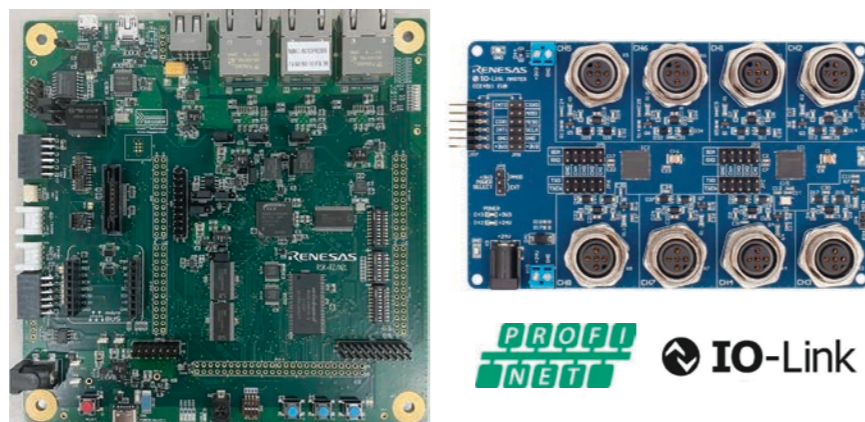
Our product portfolio includes application specific and standard ICs for industrial Ethernet, industrial motor control and power devices. Renesas enables modular architectures comprised of our silicon devices, a rich software ecosystem including a PROFINET RT/IRT SDK, plus other industrial Ethernet software stacks and partner solutions.

Target Application	Remote IO, Network module, Gateway, Equipment with Industrial Ethernet, IO-Link Master			Low-High End Servo & Inverter		Multi-Axis Servo, Robots, PLC/CNC/DCS, Motion Controller	
Product Lineup	RX Series 240MHz RKV3 CPU	RA Series 1GHz Arm Cortex-M85	RZ/N2L Series 400MHz Arm Cortex-R52	RZ/T2L Series 800MHz Arm Cortex-R52	RZ/T2M Series 800MHz 2x Arm Cortex-R52	RZ/T2H Series 1.2GHz 4x Arm Cortex-A55	RZ/N2H Series 1GHz 2x Arm Cortex-R52

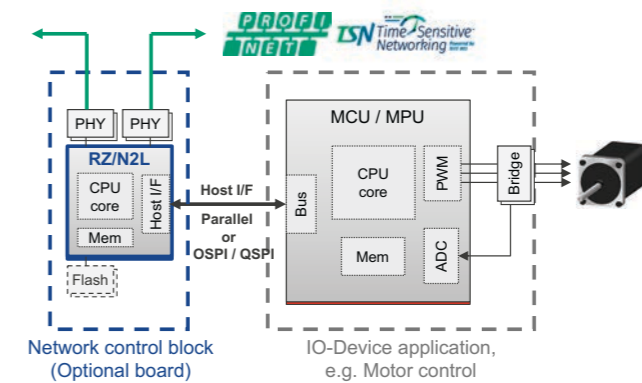
The Arm®-based RZ/T and RZ/N series MPUs deliver fast real-time control and high-performance application processing, with industrial Ethernet communication to build high-performance systems for a wide range of industrial equipment. These families of scalable and performant devices support multiple industrial 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

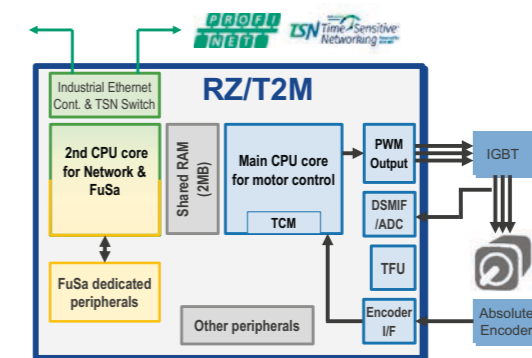


Our Technology enables various use-cases from low-cost sensing applications up to high-performance servo drives. We support two variants to attach applications to Industrial Ethernet networks, the modular and the integrated way. The modular configuration allows for easy copy-paste reuse of the communication 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

PROFINET RT/IRT – From Prototype to Certification in Record Time

Siemens DevKits accelerate the development of PROFINET controllers and devices. Depending on your system architecture, you can rely on PROFINET Drivers or the ERTEC 2100 DevKit. You receive full source code and guidance all the way to certification. For functional safety, an additional PROFIsafe DevKit is available.

Innovative and Proven

As an active PI member, Siemens has been driving PROFINET forward from the very beginning. Our technology components are fieldtested, scalable to your target system, and delivered with full source code – ensuring easy porting and complete integration flexibility. If desired, we support you from the selection phase all the way to successful certification.

Security

Security is an integral part of our DevKits and follows the PI/PNO guidelines for PROFINET Security. After the official release, PROFINET Specification V2.5 will be included in our DevKits. The new ERTEC 2100 offers a highperformance hardware platform with stateoftheart security features. Security is a journey: features evolve incrementally, and certifications progress in parallel. As a technical reference, we consider the component requirements of IEC 6244342.

Hardware/Software: Support for Controller and Device Development

Whether PROFINET controller or PROFINET device – Siemens helps you accelerate and simplify development with suitable development packages. The PROFIsafe Starter Kit and PROFIdrive application examples support you when implementing application profiles as well.

ERTEC Chip Family – Your Path to the Fastest PROFINET

ERTEC (Enhanced RealTime Ethernet Controller) is a chip family developed by Siemens that sets new benchmarks in communication performance. Designed for cycle times as low as 125 µs, it enables all types of field devices. With an integrated ARM CPU and builtin IRT switch (Isochronous Real Time), you can build field devices that meet the highest performance standards. Its compact chip size simplifies integration into small field devices. You can also run custom applications directly on the integrated CPU, making an external host CPU unnecessary. Alternatively, ERTEC can be used as a companion chip and connected to an existing processor via SPI or a 16-/32bit parallel interface.

Key Features

- PROFINET via RT and IRT, including clock synchronization and PROFINET Security
- 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 – RT/IRT as a Software Stack (Controller and/or Device)

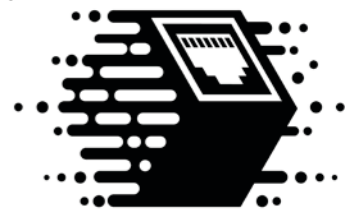
PROFINET Driver is a pure software stack for RT/IRT with no hardware dependency. It runs on powerful standard platforms (e.g., IPCs) and is particularly well suited for Linux. Delivered with full source code, it simplifies porting and integration into existing software.

Depending on your system architecture, the driver can provide controller and/or device functionality. Both roles can run in parallel on the same interface– ideal if a device communicates with a higherlevel controller and simultaneously controls PROFINET devices (incl. IDevice scenarios).

For OEMs and machine builders, this means: continue using your own application logic on standard PC/IPC platforms while adding deterministic PROFINET communication—without special hardware. Perfect for robotics use cases with SRCI.

Supported Options

- PROFINET Controller
- PROFINET Device
- PROFINET Controller and PROFINET Device on the same interface
- Standard Ethernet Chipsets
- SRCI Code Interpreter for robotics



PROFINET Driver

PROFIsafe Starter Kit – Accelerate Development of SafetyRelated Devices

With the PROFIsafe Starter Kit, you can develop devices for safety communication according to the PROFIsafe profile for safety technology (IEC 6178433). The package enables simple integration of FDevices to communicate with an FHost over PROFINET.



PROFIdrive – Implement Drive Concepts Quickly and Easily

PROFIdrive is a standardized drive interface specified for PROFINET. Siemens offers application examples showing how to implement PROFIdrive with ERTEC quickly and efficiently in your drive or encoder device.



Stay Up to Date

When you choose a Siemens development package, you always stay informed about the latest developments. All updates available for your package come at no additional cost.

Benefit From the Reliability of Certified Field Devices

A significant number of PROFINET certifications are handled by the test labs ComDeC in Germany, PIC in the USA, PIC in China, and PI test labs in the Czech Republic. Certification ensures that devices always meet industrial requirements in the field. Device manufacturers benefit from globally deployed PROFINET devices that do not require costly service interventions.

Service and Support – Our Experience Saves You Time and Money

With Siemens, you receive the support you need:

- Individual consulting before purchasing a development package
- Free support during development
- Onsite assistance upon request
- Certification support

Innovative Device Development –
Siemens Technology for Your Success!
Learn more here:

www.siemens.com/profinet-development

www.siemens.com

Industrial Software Solutions

For more than 35 years, TMG Technologie und Engineering GmbH (TMG TE) has been very successfully supporting national and international companies in the conception, specification, implementation and certification of development projects in industrial communication technology.



About us

Our experience makes us one of the leading technology and service providers in the field of industrial communication technology, especially for PROFINET, EtherNet/IP, IO-Link, EtherCAT and PROFIBUS. TMG TE has a large global market share and is the world market leader for IO-Link. Furthermore TMG TE is an accredited competence center for IO-Link, PROFINET and PROFIBUS, as well as an accredited test center for IO-Link. With our products and services, we support you in integrating communication technologies into your products.



Our technology products

We have developed our own technology components, which we make available to our customers. We offer communication stacks for **PROFINET IO (Device), EtherNet/IP (Adapter) and IO-Link (Master/Device incl. IO-Link Safety)**. We work with the leading semiconductor manufacturers to provide reference implementations and starter kits based on our software.

Time to Technology™ / Time to Market

We relieve your experts in our subject areas while you can concentrate on your core competencies. We determine the interface and the division of tasks on a project-specific basis. Together we bundle competencies and additionally achieve a faster market entry.

PROFINET Device Technology

TMG TE has long standing experience in PROFINET technology. We realize protocol stack solutions and integrate PROFINET technology into devices of our customers. We are open and independent in the way of realization and help you to find the best solution for your project plan as well considering the commercial aspects.

The TMG TE **PROFINET IO Device Stack** can be used to realize simple devices like IO modules up to high performance devices like drives. The stack is highly portable and can therefore be used on a wide range of platforms. Option packages such as **IRT, system redundancy S2, Security Class 1 and IO-Link integration** make the solution scalable. The stack is also compact enough to be used on single chip microcontrollers. On the aforementioned platforms or in combination with our IO-Link technology, we also offer solutions with other industrial communication protocols, including Industry 4.0 and IOT.



Key Features

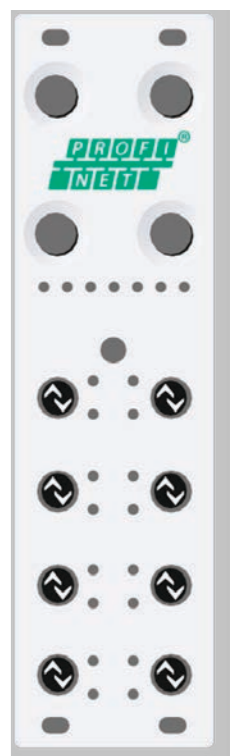
- Compliant with the latest PROFINET specification
- Easily portable to many platforms
- Conformance Class B
- Small Footprint
- Usable for PROFINET over APL devices
- Can be used with profiles such as PROFIsafe or PROFIdrive as well as IO-Link integration
- Prepared for use with PA Profile 4.0 (multi-instances)
- DCP, LLDP, MRP, FSU, Shared Device
- Includes MRP client
- Hardware: Compatible with 32-bit microprocessors (Big Endian, Little Endian)
 - e.g. ARM, Intel, PowerPC, Rx or others
- Portable to any real-time operating system (e.g. Free RTOS, Embos, TI-RTOS, Linux)

Optional Features

- (Available as Option packages):
- PROFINET Security Class 1
 - System Redundancy S2 & Dynamic Reconfiguration
 - Conformance Class C (IRT) for Sitara platforms like AM243x

Evolving with the Future

At TMG TE, we stay ahead by driving innovation and embracing emerging technologies. We offer PROFINET over APL solutions with a portable stack for single-chip microcontrollers and actively contribute to industry working groups – shaping the future with advancements like PROFINET Security.



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