PROFINET Technology
the Easy Way to PROFINET

North American Edition

PROFINET Features

PROFINET nodes

- 3,000,000
- 2,100,000
- 1,600,000
- 1,140,000

4 Mio.
3 Mio.
2 Mio.
1 Mio.

2003 2004 2005 2006 2007 2008 2009 2010 2011

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 field devices with PROFINET interfaces?*
- *Find out how easy it is to integrate PROFINET into your products?*

The information you are looking for is in this brochure.

PROFINET …

- Uses TCP/IP and IT standards
- Enables consistent communication from the corporate management level to the field level
- Offers scalable real-time communication up to and including motion control
- Integrates safety technology for protecting humans, equipment, and the environment (safety)
- Protects equipment from unauthorized access (security)
- Allows seamless integration of all fieldbuses
- Provides detailed and meaningful diagnostics
- Supports the energy-saving PROFIenergy profile
- Enables flexible topologies like star and line structures when using field devices with an integrated multi-port switch
- Supports a variety of transmission media, e.g., copper, fiber optics, and wireless

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

PROFINET is backed by more than 1,000 member companies and, with 3 million devices installed at the end of 2010, PROFINET has established itself as the leading Industrial Ethernet standard in the market. PROFIBUS and PROFINET International (PI) actively promotes the worldwide dissemination and integration of PROFINET into products and applications. Our technology providers and competence centers enable us to offer comprehensive support, ranging from consulting services and hardware and firmware integration to certification. The comprehensive availability of development support and ready-to-use PROFINET basic technology makes it very easy for companies to implement PROFINET quickly and cost-effectively.

Michael Bryant | Deputy Chairman of PROFIBUS and PROFINET International (PI) and Executive Director, PI North America

Our Community

The industry organization PROFIBUS and PROFINET International (PI) promotes the widespread use and further development of PROFIBUS and PROFINET and provides worldwide support. With 27 regional PI organizations in every international market, 1,400 member companies, and nearly 2,500 different products, PI is the largest 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. PI North America is the regional PI association covering the US and Canada.

Contents

This brochure focuses on the development of PROFINET IO products, referred to as PROFINET in the following. In the rest of the brochure, you will find more information on the following topics:

Product Development Cycle

Consulting | Implementation

Every device development project undergoes a product development cycle. An example of this process for PROFINET is presented in the following. It starts with the consulting step and continues with the identification of implementation options, an explanation of certification activities, and a Service and Support offering.
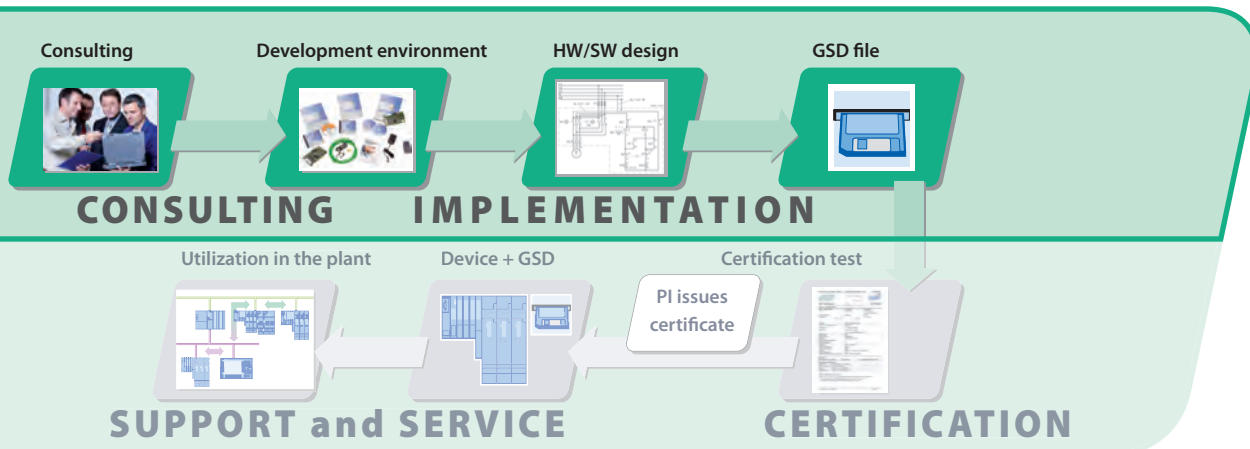
Consulting

Integration of an industrial communication interface into a field device begins with information gathering to determine the functionality of your industrial networks along with familiarization about the task at hand. PI North America itself as well as a number of its member companies can provide you with comprehensive information here. To familiarize yourself with PROFINET, you can take advantage of available consulting services, books, brochures, and training in the form of classes, seminars, and workshops.

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 automatic device? What technologies and support are available for implementing PROFINET?

Specialized training is geared toward developers and product managers of device manufacturers, who are looking for a quick, yet solid, introduction to PROFINET technology. Among other things, this training covers the following:

- Basics of data transmission with Industrial Ethernet
- PROFINET basics
- PROFINET field device and communication models
- Development packages for development of PROFINET field devices

- Engineering
- Device description file (GSD file)
- Explanations of the conformance classes
- Security measures
- Profiles

Some of the training courses are concluded with a test, and participants passing the test are awarded a certificate.

Consulting — Development environment — HW/SW design — GSD file

CONSULTING   IMPLEMENTATION

Utilization in the plant — Device + GSD — PI issues certificate — Certification test

SUPPORT and SERVICE   CERTIFICATION

Implementation

Every development leads us faster to the goal "if we don't have to reinvent the wheel". To implement PROFINET in field devices quickly and efficiently, you can utilize the expertise of PI North America members in these areas:

- Implementation methods
- Hardware/software design
- Development environment
- Device description file (GSD file)

Implementation Methods

Depending on the functionality required (conformance class), it is essential to select the most suitable implementation method 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. Consider whether to implement a pure PROFINET interface or a universal interface that is also suitable for communication via PROFIBUS. 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 (see expertise matrix on page 13, as well as pages 14-39).

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 methods. 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 North America 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.

Product Development Cycle

Implementation | Certification | Support and Service

Device Description File (GSD file)

To configure an automation system quickly and easily, field device manufacturers must have a PROFINET device description file at their disposal. This General Station Description file (GSD file) is a description of the respective PROFINET field device and contains all information needed for configuring a device. This system was tried and tested system for PROFIBUS.

For PROFINET, the GSD files are XML-based. As a result, the description for PROFINET can be comprehensive, even allowing multiple product variants to be included in one GSD file. Multiple languages can also be integrated. This reduces the handling effort for you, the manufacturer, and for your customers.

The expertise matrix on page 13 provides an overview of companies that can provide individual support.
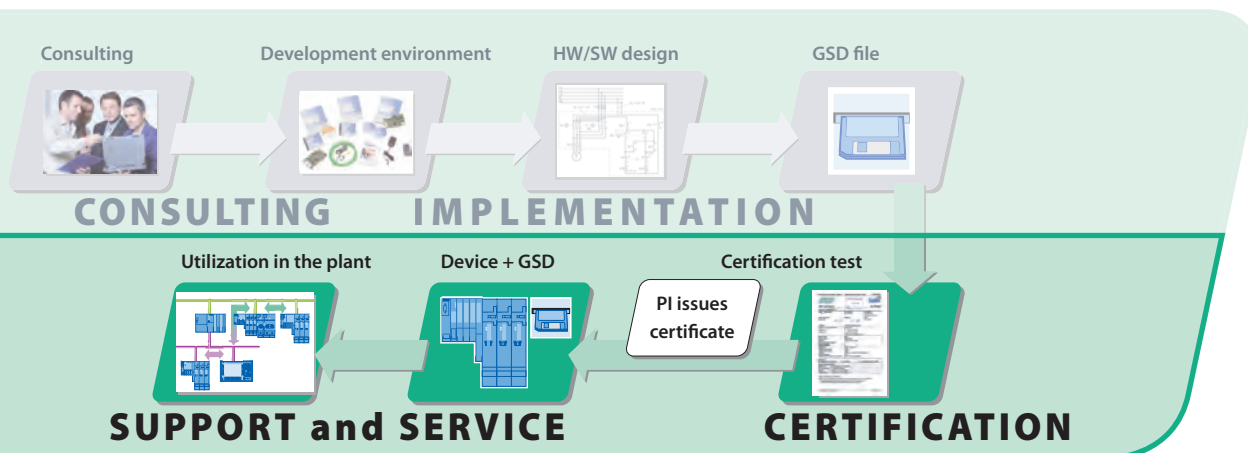
Implementation

PROFINET communication in industrial plants is based on IEC 61158 and IEC 61784. In addition, IEC 61508 and IEC 61784-3 apply to safety modules and devices. To ensure interoperability and conformity of field devices of different manufacturers, device certification by an accredited test laboratory 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 field devices comply with standards, thus ensuring their problem-free interaction within an automation system.

Certification

Prior to Certification

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 testing. Therefore, it is useful to consider certification aspects in advance when choosing a technology.

Consulting | Development environment | HW/SW design | GSD file

CONSULTING   **IMPLEMENTATION**

Utilization in the plant | Device + GSD | Certification test

PI issues certificate

SUPPORT and SERVICE   **CERTIFICATION**

Certification Process

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

Tests required as part of PROFINET certification include, but are not limited to:

- Hardware tests
- State machine tests
- Behavior on the network
- Testing of the GSD file
- Load tests
- Fault responses
- Alarm tests

Certification is especially easy when precertified communication modules are used. In this case, the module manufacturer guarantees compliance with the PROFINET standard, which enables a significant reduction in the effort required for the certification test.

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 currently six test laboratories around the world:

- PROFI Interface Center (USA)
- ANF DATA spol s.r.o. (Czech Republic)
- ComDeC (Germany)
- ifak e.V. (Germany)
- itm (Germany)
- Phoenix Contact Competence Center (Germany)

For more information, go to: **www.profinet.com/test-labs/**

Support and Service

Across the globe, there are currently 40 accredited PI Competence Centers (PICCs) available to answer your technical questions. This offer includes a comprehensive range of services for device manufacturers and users throughout every life cycle phase.

The quality of the PICC services is guaranteed by a "quality of service" agreement. Regular meetings also ensure a uniformly high level of employee qualifications and knowledge, transfer of expertise and, naturally, the exchanging of experience as well.

A list of all the accredited PICCs can be found at: **www.profinet.com/competence-centers/**

Implementation Options

Real-time Requirement | Conformance Classes

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

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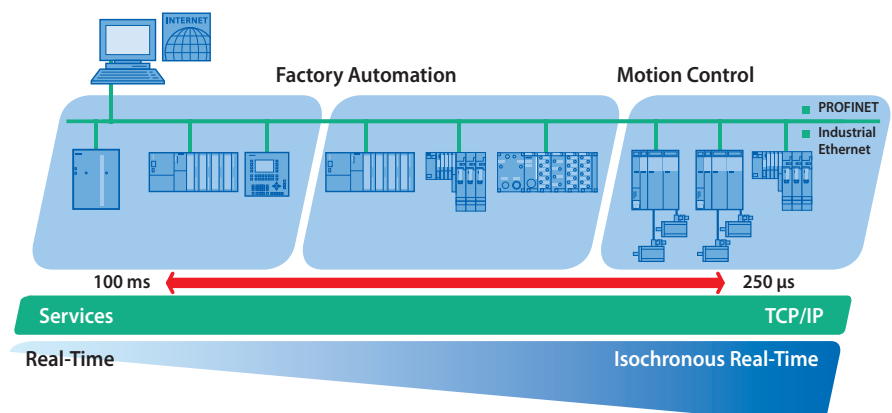- *In-house development or partnership based on the criteria of expertise, time to market, etc.*

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

Real-time Requirement

IEEE 802.3 ensures problem-free communication between PROFINET field devices and among PROFINET field devices and other standard Ethernet devices. For applications where very stringent real-time requirements exist, 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 field devices.
- The real-time (RT) channel is available for the transmission of **IO 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 a field device with RT capability only.

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 were 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.

The more the products are oriented toward conformance class C, the broader the range of applications of the field device.

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, 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 for 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.

Implementation Options

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:
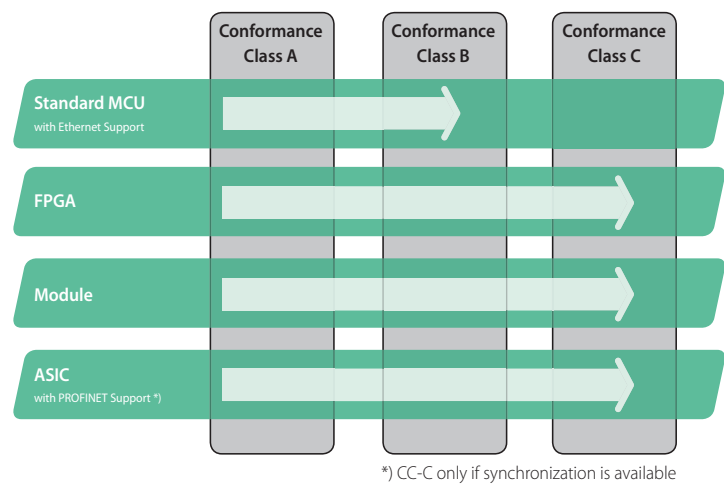
Implementation Options for the PROFINET Device interface

- 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: Microcontroller with IRT hardware support and IRT-capable switch

The graphic below 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.

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 for

Interface	Single Port	Multi Port
Conformance Class A	▮	▮
Conformance Class B	▮	▮
Conformance Class C		▮

the particular case in question. 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 field devices with IRT functions, special PROFINET ASICs or FPGAs are essential.

Development Method Each of the implementation methods described above 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 taken into account. 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	PROFIsafe
Individual Design	+	+++	+	+++
Communication Module	++	++	++	++
External Couplers	+++	+	+++	+

+++ High-benefit | ++ Medium-benefit | + Low-benefit

Implementation Options

In-house Development or Development Partnership

External part

In-house effort

The PROFINET interface can be implemented by the device manufacturer itself or by 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 field 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.

The PI member companies offer a wide range of services during the development phase. For details, see pages 13-39.

	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

Expertise Matrix

Range of Services of Member Companies

Phases	Comtrol	Freescale Technology	Grid Connect	Hilscher	HMS	Innovasic	MESCO	Molex	Phoenix Contact	Real Time Automation	Siemens	Softing
1 Consulting												
Implementation consulting	D	–	C/D	C/D	D	D	C/D	C/D	C/D	D	C/D	C/D
Technology training	–	–	–	–	D	–	C/D	C/D	C/D	–	C/D	C/D
2 Supported Development Method												
Individual Design												
Stack development and integration	D	–	C/D	C/D	–	–	C/D	C/D	C/D	D	D	D
Development services	D	–	C/D	C/D	D	D	C/D	C/D	C/D	D	D	D
Modular Design												
Embedded modules	D	–	C/D	C/D	D	D	D	–	–	D	C/D	C/D
External Coupling												
Protocol implementation	D	–	C/D	C/D	D	D	C/D	C/D	–	D	–	–
Safety												
PROFIsafe	–	–	–	–	–	–	C/D	–	C/D	–	D	D
3 Supplier for												
Embedded modules	D	–	C/D	C/D	D	D	D	–	–	D	C/D	C/D
PC cards	–	–	–	C/D	D	–	–	C/D	–	–	C/D	C/D
External couplers	D	–	–	C/D	D	–	–	C/D	–	D	–	–
Chips/ASICs/FPGA/Microcontrollers	–	C/D	C/D	C/D	D	D	–	C/D	D	–	C/D	C/D
Starter and evaluation kits	D	C/D	C/D	C/D	D	D	D	C/D	D	–	D	D
4 Certification and Support												
Accredited competence center	–	–	–	C/D	D	–	C/D	C/D	D	–	C/D	C/D
Accredited test laboratory	–	–	–	–	–	–	–	–	D	–	C/D	C/D
Certification support	D	–	C/D	C/D	D	D	C/D	C/D	C/D	D	C/D	C/D

C = Controller   **D** = Device   **( )** = in preparation

The Easiest Way to Connect Devices into PROFINET Control Architecture

The DeviceMaster UP Provides PROFINET IO Connectivity to Serial and Ethernet TCP/IP Devices

Comtrol has been supporting PROFINET for over seven years, and was among the first connectivity companies supporting this technology. Comtrol devices are used in a wide variety of industries including food and beverage, oil and gas, power distribution and factory automation with applications including automotive sub-assembly processes, machine building, fastening processes and auto-identification.

External Couplers and Gateways:

The DeviceMaster UP provides connectivity to both serial and Ethernet TCP/IP raw/ASCII devices and provides detailed diagnostic capabilities not found in other gateways. Whether you need to connect your PROFINET IO PLC to a barcode scanner, weigh scale, vision system, RFID reader or RS-422 and RS-485 field loops, serially or from TCP/IP, the DeviceMaster UP will provide the solution.

- Single and two port models
- DB9 connectors or terminal screws
- Integrated 2-port switch
- Din rail
- Support for TCP/IP devices and serial devices
- Cyclic and acyclic communications
- Class A and Class B certifications
- Diagnostic alarms
- Web based diagnostics
- Step 7 trouble shooting tools
- Extended temperature ratings
- 5 year warranty
- Live U.S. based support

Embedded Modules:
- IDC 10 header
- Variable power input
- PROFINET to serial backplanes
- TCP sockets
- UDP sockets
- Telnet, HTTP, LLDP, SNMP, DHCP, RATP, ARP, BOOTP, networking protocols
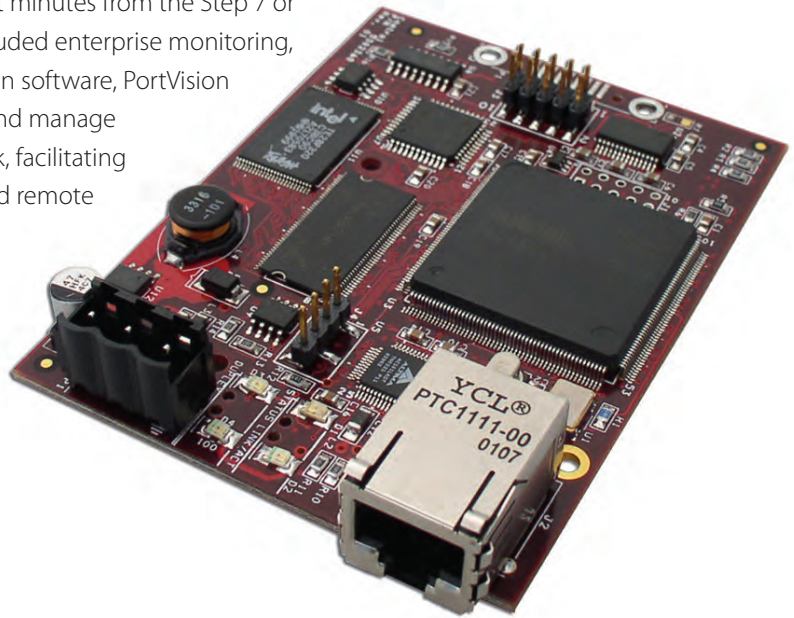- Step 7 based or Web based configuration

Custom Solutions:

We can adapt the DeviceMaster UP to add other custom functionality including:

- Customer brand-labeling in Step 7 and web pages
- Custom bus/backplane interface to meet the needs of any serial device
- Custom PCB layouts
- M12 or custom connectors

The DeviceMaster UP configures in just minutes from the Step 7 or via the device's web interface. The included enterprise monitoring, remote management and configuration software, PortVision Plus, makes it a simple task to detect and manage every DeviceMaster UP on the network, facilitating firmware updates, troubleshooting, and remote administration.

connect. communicate. control.

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Freescale Processors for PROFINET

Freescale Semiconductor is headquartered in Austin, Texas with design, research, development, manufacturing and sales operations in more than 20 countries. Our global team of 20,000+ employees offers embedded processor solutions carefully engineered to meet the environmental, longevity and energy-efficiency requirements of connected industrial applications.

Many Freescale processors simultaneously run the control application while converting between PROFINET, PROFIBUS and other popular industrial protocols–with a single-chip solution! These are supported by PROFINET solutions from leading protocol providers such as MOLEX, Inc. and IXXAT Automation GmbH, together with industrial-grade safety-certified real-time operating systems from Green Hills Software, QNX Software Systems and others.

Rugged. Reliable. Reusable.

We continually innovate to develop more intelligent and cost-effective solutions for industrial control, networking and human machine interface (HMI) applications. Our safe and secure systems can withstand hacking, cloning, tampering and soft errors in the harsh environments typical of manufacturing and process applications. In addition, Freescale industrial control and networking processors offer:

- Scalable system performance from 100 to 30,000+ million instructions per second (MIPS)
- Reduced system cost, with highly integrated processors starting below US$6 (manufacturer's suggested price)
- Fanless operation at 85°C, with 800 MIPS solutions consuming less than 1.5 watts and 1920 MIPS solutions consuming less than 3 watts
- Rugged devices with long life and reliability
  - Industrial or automotive qualification from -40°C to +85°C ambient
  - Stability of a 10 or 15 year product longevity statement

Product Longevity Program

Freescale recognizes that industrial applications need long-term product support. We have a longstanding record of providing long-term production support for our processors, and now offer a formal product longevity program which makes a broad range of devices available for a minimum of 10 or 15 years from the time of launch. Participating products, terms and conditions are described at **www.freescale.com/productlongevity.**
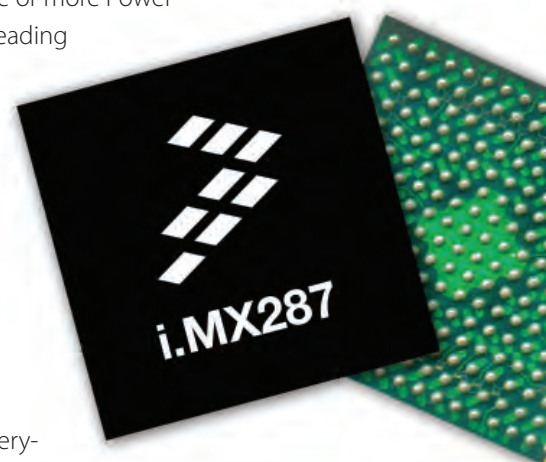
Freescale 32-bit Processors for PROFINET

QorIQ™, PowerQUICC®, ColdFire® and i.MX 32-bit processors integrate a processing unit with one or more Ethernet MACs and many other peripherals used in PROFINET-connected control applications.

QorIQ communications processors evolved from the long-lived, industry-leading PowerQUICC communications processors. Both high-performance processor families integrate extensive on-chip connectivity with one or more Power Architecture® cores, to offer the broadest scalability and leading MIPS/watt from 100 to 30,000+ DMIPS:

- Single core at 800 MHz (1,920 DMIPS) consumes less than 3 watts
- Eight cores at 1.5 GHz/core (30,000 DMIPS) consume less than 30 watts
- Multiple 10/100/1000 Ethernet MACs, CAN® controllers, UARTs, SPI, USBs with PHY, GPIO
- Network packet processing offload
- On-chip security processors

i.MX applications processors evolved from handheld battery-operated devices to become very popular industrial control and HMI processors. These ARM® processor-based products consume less than a watt for applications up to 1600 MIPS (800 MHz), while integrating extensive connectivity and HMI features:

- Scalability from ARM9™ to ARM Cortex™-A8 microprocessors
- Multiple connectivity options including 10/100 Ethernet MACs, CAN controllers, UARTs, SPI, SDIO, USB with PHY, GPIO
- Integrated power management and companion PMIC solutions optimized for energy efficiency and easy implementation
- High resolution color LCD controller with touch screen capability to provide a richer user interface
- Hardware-accelerated video processing and graphics rendering to provide personality and interactivity
- Camera interface

ColdFire microprocessors and microcontrollers have long been an industrial workhorse, offering up to 300 MIPS with flash memory, extensive connectivity and peripherals, and free MQX™ RTOS or Linux® OS support.

For more information, please visit "Industrial Network and Fieldbus Protocols" at www.freescale.com/connectivity

Embedded Solutions

Grid Connect provides a complete set of embedded industrial Ethernet products including:

- ◢ **chips**
- ◢ **software stacks**
- ◢ **modules**
- ◢ **integrated adapters using these devices.**

The core of our PROFINET technology is the PROFINET IO software stack and embedded chips. The PROFINET RJ45 and embedded modules use the core technology. The PROFINET RJ45 is a popular product as it integrates an Ethernet RJ45 connector with the chip and stack technology inside. Otherwise, we can provide you a complete chip/stack solution including a complete development environment.

The Grid Connect solutions support PROFINET IO (slave) devices and support the Real-time modes of PROFINET IO. The Grid Connect embedded chips provide a complete system on chip (SOC) environment and have the CPU, memory, Ethernet controller, interrupt controller, serial ports, flash support, SPI, I2C and many other features on chip. The SOC integration allows for very small and cost effective designs. As part of the software development kit, a royalty fee real-time operating system is provided for high performance applications. The PROFINET IO stack is also a one-time purchase item with no royalties.

Grid Connect engineers can also provide you a reference design and sample PROFINET IO application with the purchase of the PROFINET IO stack. You can next add our vendor specific information and interface to your devices. Our engineers will support you through your design phase.

Grid Connect is also available for custom modules and custom software PROFINET IO development to your specific requirements. For example if your device uses a custom protocol we can implement the protocol to communicate with the PROFINET IO stack.

Grid Connect is your complete PROFINET IO supplier, give us a call and you will be glad you did!

Grid Connect Inc.
1630 W. Diehl Road | Naperville, IL 60563
Phone: (630) 245-1445
Fax: (630) 245-1717
E-Mail: **sales@gridconnect.com**
www.gridconnect.com

Your Partner in PROFINET

Flexible Controller Solutions. Exceptional Engineering Support.

netX Features
- **Four individually configurable communication channels (Real-Time Ethernet or Fieldbus)**
- **32-Bit/200 MHz ARM 926 with200 MIPs computing power**
- **IEEE 1588 Clock, Integrated Ethernet Hub and Switch functions**
- **Dual-Port-Memory ■ AD converter ■ Built-in I/O**
- **Encoder interface ■ PWM interface ■ LCD controller**
- **Guaranteed 10-year availability**

Hilscher is the perfect partner on your path to PROFINET. Our netX network industrial controllers meet industry requirements for a wide range of PROFINET applications, including Isochronous Real Time IRT and Conformance Class C automation installations.

The netX family of controllers offers comprehensive peripheral functions with a computing capacity of 200 MIPS (based-on industry standard ARM architecture). Plus, our innovative product design allows communication and application executions on a single chip, reducing costs without sacrificing performance. Every netX controller is fully documented and features a flexible open technology platform and a host of features that deliver value-added solutions. The netX network controller family supports all fieldbuses and real-time Ethernet systems.

Designed With Your Application in Mind
At Hilscher, we know our equipment right down to the individual gate cell because we develop the ASICs ourselves. Our equipment features our protocol stacks for controllers and devices that are capable of fast startups and IRT. It runs as an RT stack on our certified PC card, based on a FDT/DTM technology using SYCON net. This can be embedded as a plug-in or contained in communication DTMs that can be used individually and adapted to your specifications.
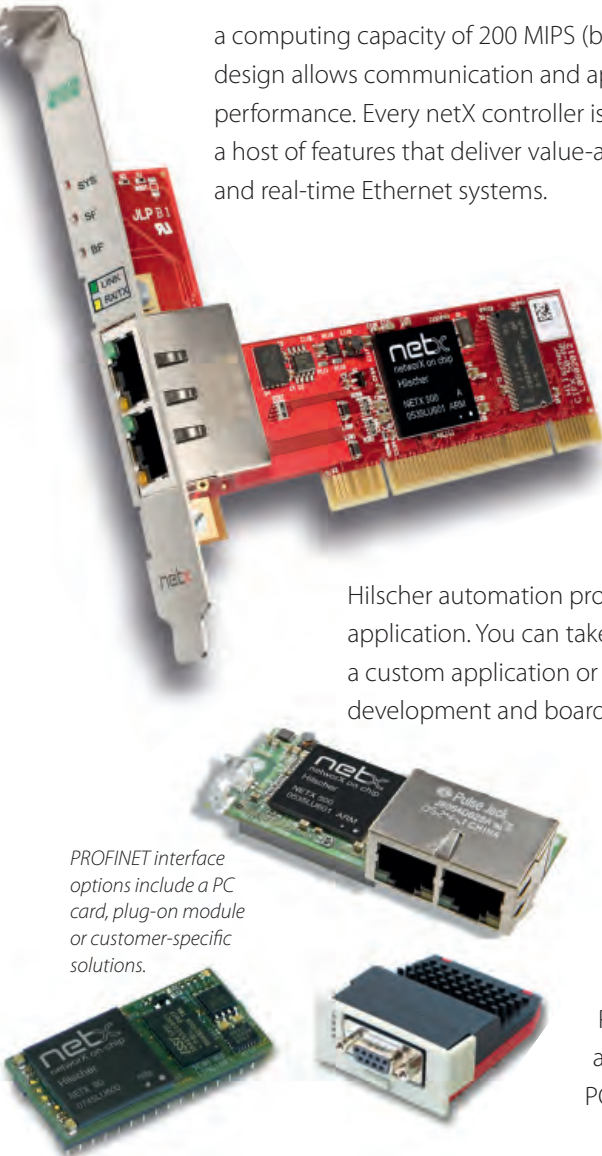
Hilscher automation products are designed to work in harmony with other components in your application. You can take advantage of our open interface and source code to match controllers to a custom application or you can select a standardized Design In Service controller to enjoy fixed development and board costs. It's powerful flexibility that gives you options in automation control.

PROFINET interface options include a PC card, plug-on module or customer-specific solutions.
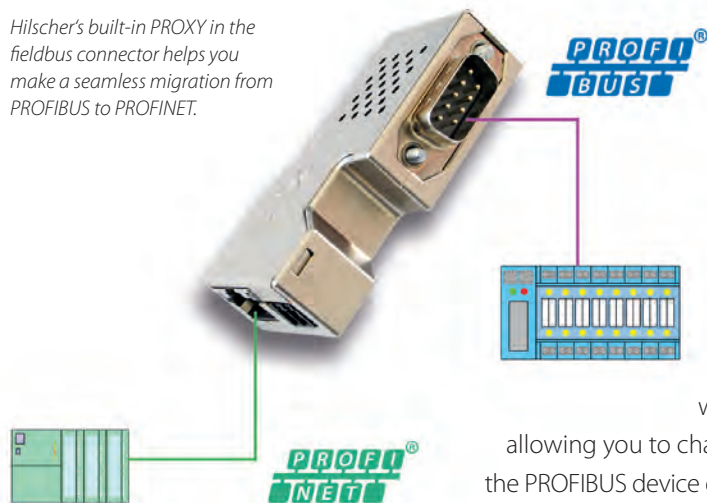
Integrated Solutions. Optimized Performance.
Hilscher's straightforward solutions offer plug-and-play modules with serial or parallel (Dual-Port Memory) host interfaces. Using additional firmware, you can easily modify these modules to the specific needs of your application. For those who prefer to integrate modules with industrial PCs, we offer PCI and PCI express options with available upgrades for PCI 104 and Compact PCI solutions.

For more information, visit **www.hilscher.com**, pricing information and bookings can be obtained by calling **(630) 505-5301 x225**

Hilscher's built-in PROXY in the fieldbus connector helps you make a seamless migration from PROFIBUS to PROFINET.

Hilscher gateways using netX controllers can be freely configured to connect to PROFINET and IO-Link or other networks as PROFINET proxies. Our PROFIBUS connector with integrated proxy adds flexibility to your installation allowing you to change from PROFIBUS slave to PROFINET. In this application, the PROFIBUS device converts from GSD to PROFINET GSDML format automatically. It's easy to plug in, load the conversion and run with PROFINET.

Manufactured to Your Specifications

Hilscher's netX controllers are manufactured exclusively by Renesas to assure superior craftsmanship and a ten-year supply guarantee. We can also design and manufacture your PROFINET interface using modern SMD lines.
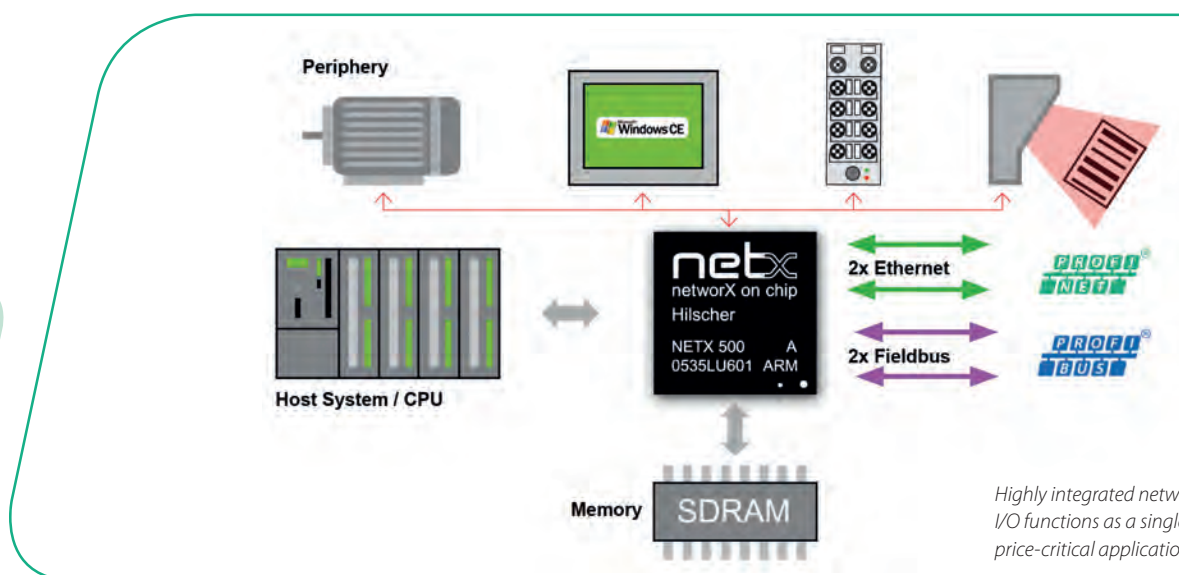
netX on Chip	netX 10	netX 50	netX 100	netX 500
CPU with	ARM 966-S / 100mhz xPIC / 100 mhz each with 8K data / 8K TCM commands	ARM 966E-S / 200 Mhz 8K Data / 8K TCM Commands	ARM 926EJ-S / 200 Mhz 8 / 16K Data / Command Cache 8K Data TCM	ARM 926EJ-S / 200 Mhz 8 / 16K Data / Command Cache 8K Data TCM
Internal Memory	296L SRAM / 64K ROM	96K SRAM / 64K ROM	144K SRAM / 32K ROM	144K SRAM / 32K ROM
Memory Bus External Storage	SDRAM / SRAM / Flash alternative to DPM	SDRAM / SRAM / Flash	SDRAM / SRAM / Flash	SDRAM / SRAM / Flash
Integrated Communication Channels	1 Fieldbus or Ethernet with Built in PHY's/IEEE 1588	2 Fieldbus or Ethernet with Built in PHY's/IEEE 1588/Switch/Hub	3 Fieldbus or 1+2 Ethernet with Built in PHY's/IEEE 1588/Switch/Hub	4 Fieldbus or 2+2 Ethernet with Built in PHY's/IEEE 1588/Switch/Hub
Host Interface	8 / 16 Bit DPM SPI	8 / 16 / 32 Bit DPM or 16 Bit Extension Bus	8 / 16 Bit DPM or 16 Bit Extension Bus	8 / 16 Bit DPM or 16 Bit Extension Bus
Peripherals	USB / UART / I2C / SPI PWM / Encoder / ADC IO-Link Controller	USB / UART / I2C / SPI IO-Link Controller CCD Controller	USB / UART / I2C / SPI PWM / Encoder / ADC	USB / UART / I2C / SPI PWM / Encoder / ADC Graphic controller
Housing	FBGA 13x13 197 pins / 0.8mm grid	PBGA 19x19 324 pins / 1mm grid	PBGA 22x22 mm 345 pins / 1mm grid	PBGA 22x22 mm 345 pins / 1mm grid
Power Supply Voltage Operating Temperature	1.5 V / 3.3 V Tbd -40…+85C	1.5 V / 3.3 V 1.2 W -40…+85C	1.5 V / 3.3 V 1.5 W -40…+85C	1.5 V / 3.3 V 1.5 W -40…+85C
Typical Application	Network co-processor, System on Chip	Network co-processor, System on Chip, IO-Link Master	Network co-processor, System on Chip / EA Gateway / Motion	Network co-processor, System on Chip, HMI

netX network controller family for all fieldbuses and real-time Ethernet systems

Our AOI system and Flying Probe Tester guarantee your quality requirements. In fact, our netX products come with international references from the largest PLC manufacturers and leading sensor and drive manufacturers. So you can feel confident in the quality of Hilscher products.

Custom Engineering Services

At Hilscher, we're experts in industrial communication. In addition to our extensive product line, we also offer a wide variety of development, production, operation and support services to assist you on your path to PROFINET. For more information on how you can put our company's engineering expertise to work for you, contact us.

Highly integrated network controller netX with I/O functions as a single chip solution for price-critical applications

From Zero to PROFINET in 14 Days

PROFINET Connectivity Without Long, Drawn-out Development Work

For PROFINET device interface implementation, HMS provides a wide range of certified base technologies and services to accompany development. What all of these solutions have in common is that the device manufacturer does not need to concern himself with the details of PROFINET protocols and stacks. Instead, they can implement their communication interface using tried-and-tested Anybus technology components. Thanks to the modular design and a universal communication interface, connection options to many industrial networks can be created in a single step.

PROFINET protocol converters link field devices to PROFINET using their serial interfaces. This allows field devices to be integrated into PROFINET without any hardware or software changes to the field device.

External Gateways

The use of an external protocol converter is advisable if the field device does not have a serial interface and the PROFINET connection cannot be integrated. The communicator (Figure 2) is connected to the serial interface of the field device and changes its protocol to PROFINET. Here, neither the hardware nor software of the field device needs to be changed.
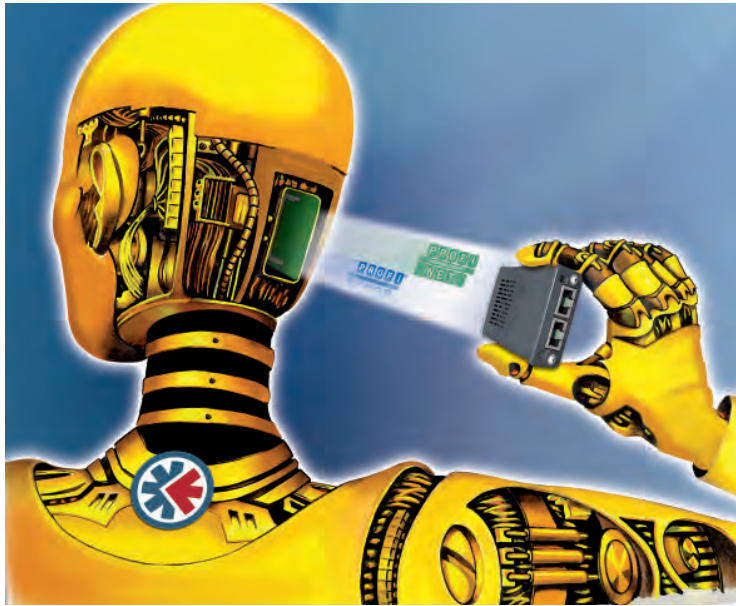
Ready to Install Communication Modules

HMS offers ready-to-install communication modules (Figure 3) for device-internal implementation of the PROFINET interface. They handle the entire protocol themselves, without loading the device processor. All hardware components of the PROFINET interface, including the integrated two-port switch, are found on the module. Development is reduced to connection of the module to the device electronics, which occurs via a serial or parallel dual port RAM interface. The modular solution is characterized by minimal development costs and short development times. An additional advantage is that function-compatible modules for almost all other industrial Ethernet versions and fieldbuses are available. All modules have a uniform hardware and software interface so that the device software can be implemented largely independently of the respective bus system used.
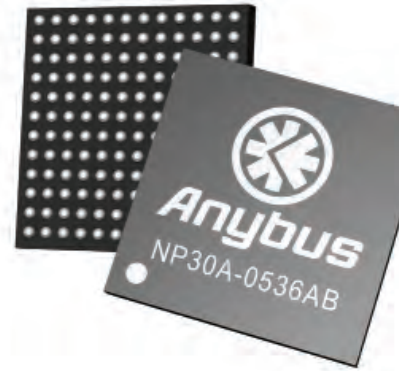

Embedded communication modules implement the entire PROFINET interface in hardware and software. The modules are available in various standard versions and as customer-specific solutions.

Embedded Anybus communication modules simplify the implementation of a PROFINET IO device interface. The modules save up to 70% of development costs and reduces the time to market.

The NP30 communication processor from HMS is tailored to the requirements of field devices with regard to size, power consumption and functionality.

Single-chip Interface

For compact field devices, HMS offers a complete PROFINET solution with the Anybus IC in the form of a 32-pin DIL socket. The IC implements an entire PROFINET interface on just 9 cm2. Connection to the device electronics occurs via a serial UART interface. The IC is also suitable for field devices without a microprocessor, as up to 128 I/O signals can be operated directly through the use of shift registers.

Customer Specific Solutions

To supplement standard modules, HMS also offers customer-specific solutions based on the NP30 Anybus processor. The individual solutions are based on the tried-and-tested Anybus technology and are always used when requirements must be met which cannot be fulfilled by a standard module, e.g. stringent protection classes (IP 65), individual designs, special connections, specialized power supply etc. Customer-specific modules have the same software interface as the standard modules. By using tried-and-tested technology, customers profit from a short development time, minimal development risk and fixed development costs, which also include continual software updates by HMS.

HMS Industrial Networks, Inc.
35 E. Wacker Drive, Suite 1700
Chicago, IL 60601
Phone: (312) 829-0601
Fax: (312) 738-5873
www.anybus.com

Consulting and Support

HMS is an accredited PROFINET expertise center and supports device manufacturers as a partner in all phases of development. The service offering includes developer training, consultation, development accompaniment, adaptation of GSD files and preparatory tests for certification.

Overview of PROFINET interfaces from HMS

Product family	Achievable conformance classes	Design	Recommended for annual quantity	Integrated two-port switch	IRT hardware support
Communicator	A	External coupler Top-hat rail mounting	Small, up to 100	No	No
Anybus-S	A,B,C	Standard module Credit card format	Medium, up to 1,000	Yes	Yes
Anybus-IC	A	Standard module DIL-32 socket	Medium, up to 1,000	No	No
Anybus-CC	A,B,C=planned	Standard module CompactFlash format	High, up to 5,000	Yes	Planned
Custom	A,B,C	Individual solution Design as per customer requirement	Very high, up to 20,000	Possible	Possible

Innovasic Semiconductor

PROFINET Your Way, for the Life of *Your* Product

Innovasic Semiconductor is a global supplier of electronic components for companies with long product life-cycles including industrial, transportation, instrumentation, and medical applications. The company has been supplying critical communications and processor chips to the world's leading Industrial OEMs for nearly 20 years and has shipped millions of devices without a field failure. Our breadth of experience and commitment to the Industrial market has resulted in the RapID™ Platform—a long-life, deterministic PROFINET connectivity solution.

More Than a Chip

As an independent semiconductor supplier, Innovasic provides the freedom to choose any type of PROFINET implementation. However, those choices can be mind-boggling, and all you want to do is get your product to market fast, at the lowest cost possible, and know your product can meet PROFINET performance requirements.

The RapID Platform brings all of these features together regardless of whether you want to use a module, embed the design, or completely customize a solution. At the heart of the RapID™ Platform is the Innovasic fido1100 Communication Controller. This powerful chip manages all network traffic as well as TCP/IP and PROFINET stack processes. You can use the fido1100 in conjunction with another host processor, connecting via a memory bus or serial interface. The host then executes the application and is not burdened with the network and stack processes. Alternatively, for simple devices the entire application can run on the fido1100 for the lowest possible system cost.
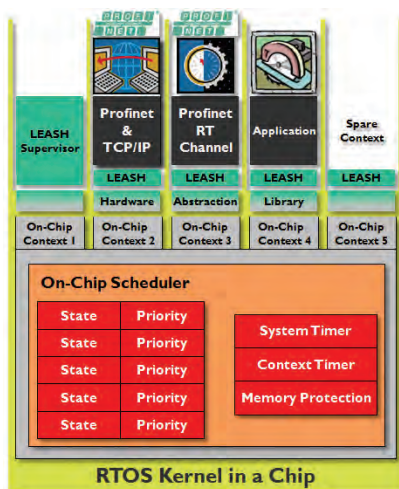
Architected for Determinism

Let's face it, getting to market quickly or having the lowest cost solution means nothing if you can't meet the demanding performance of PROFINET. The fido1100 chip architecture guarantees cyclic data on the PROFINET RT channel can be delivered at a 1 ms rate. This means an application using the fido1100 can process PROFINET messages and get the payload to and from an application's I/O at a rate of 1 ms. All of this happens for 32 slots/subslots and the processor still has over 50% spare throughput.

How is this possible? The answer lies in the unique fido1100 chip architecture. Real-time traffic can be separated into high and low priority data paths using on-chip contexts. Plus, critical RTOS functions are implemented in the chip so there is more time for the application to execute.
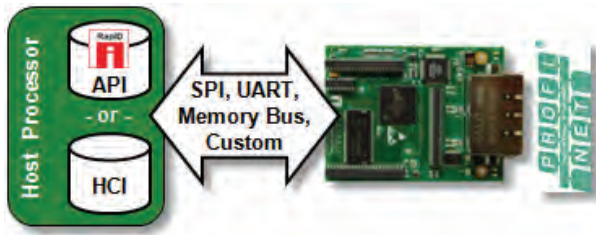
Too complicated? Don't worry. Innovasic takes care of the details with a PROFINET solution in whatever implementation you need.

The RapID Platform Gives You PROFINET, Your Way

Your application is unique, and you want a PROFINET solution with the flexibility to keep it that way. What you really want is flexibility without getting trapped in the myriad of details in the protocol, processor, and certification. With this in mind, Innovasic has developed the RapID Platform. For applications that have low volume, the RapID Platform comes in the form of a *module* that plugs into your board. For applications that are space constrained or where volumes are high, the RapID Platform comes in the form of an *embedded design* that can be integrated into your board. And for applications that require customization, the RapID Platform comes in the form of a *developer solution* with all of the hardware and software to tailor to your needs.

The RapID Platform interfaces to your application hardware with SPI, or UART, or Memory Bus. The serial interfaces have transfer rates up to 1.5 Mbits/sec, and the Memory Bus interface can transfer data up to 25 Mbytes/sec. It is also possible to interface your hardware to a custom/proprietary protocol or with simple GPIO.

The RapID Platform interfaces to your application software in one of two ways. One way is to utilize the RapID Application Programming Interface (API). This API provides easy access to cyclic, acyclic, and alarm capabilities in PROFINET. The second way is to utilize the interface commands native to the host, referred to as the Host Command Inte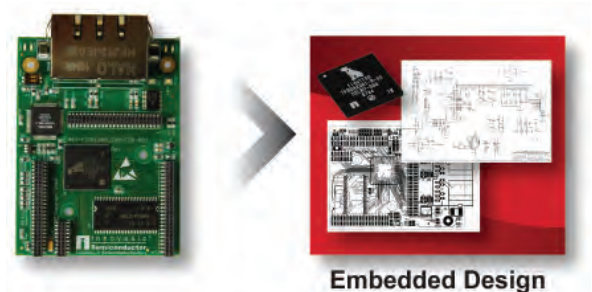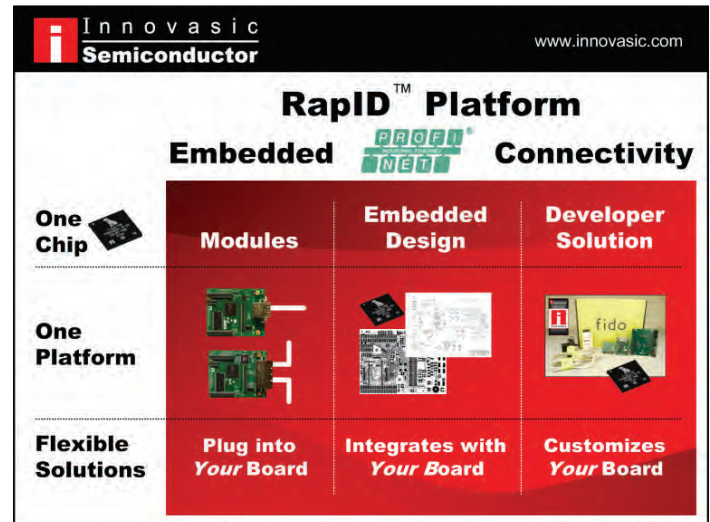rface (HCI). With this approach, the RapID Platform is configured to understand the commands sent from your application's serial or memory bus interface—there is no need to change your host side software.

Seamless Migration From Module to Embedded Design

As an independent semiconductor supplier, we are interested in providing you chips, not competing with your business. If at any time you find it is more cost effective to migrate from a module to an embedded design, you are free to do so.

No Cost, No Risk Evaluation

The best way to find out how to get PROFINET your way is to download the RapID Platform. There is no obligation and we will be there to help every step of the way.

Please visit us at: **www.innovasic.com**
Download the RapID Platform at:
www.innovasic.com/products/in

Hardware and Software Development

by the MESCO PROFINET and PROFIsafe Competence Center

Hardware development and embedded software development

- **Communication and fieldbus systems**
- **Functional safety**
- **Explosion protection**
- **Measurement engineering**

The Company

MESCO is your partner for innovative product development in the area of process and factory automation. Our core competency is the development of industrial communication hardware and software. Functional safety and explosion protection are our strengths.

Since 1990 we are offering to our customers —worldwide—up-to-date interbranch know-how, integrated solutions, and a comprehensive service. Here an honest, transparent and partnership-like cooperation comes first.

Make use of our experience and know-how for your products.

MESCO is a Fully Accredited PI Competence Center for PROFINET, PROFIsafe, and PROFIBUS PA.

PROFINET Developments

MESCO develops your PROFINET product according to the state of the art. We are happy to accommodate requirements for functional safety, including integration of PROFIsafe. MESCO's expertise will give you a head start when you take advantage of our services, ranging from consulting, requirement specifications, and implementation of Ethernet hardware and PROFINET software to certification support—all based on MESCO's active membership in leading organizations and many years of experience in developing fieldbus components.

MESCO Provides Support in All Project Phases

- Technology consulting and creation of requirement specifications
- Hardware and software development of Industrial Ethernet modules with PROFINET RT, IRT
- Ethernet solutions for support of multiple Industrial Ethernet dialects
- Gateway development
- Creation of GSDML
- Support for selection of development environments and tooling
- Device tests in MESCO's own Competence Center Fieldbus laboratory
- Support for certification

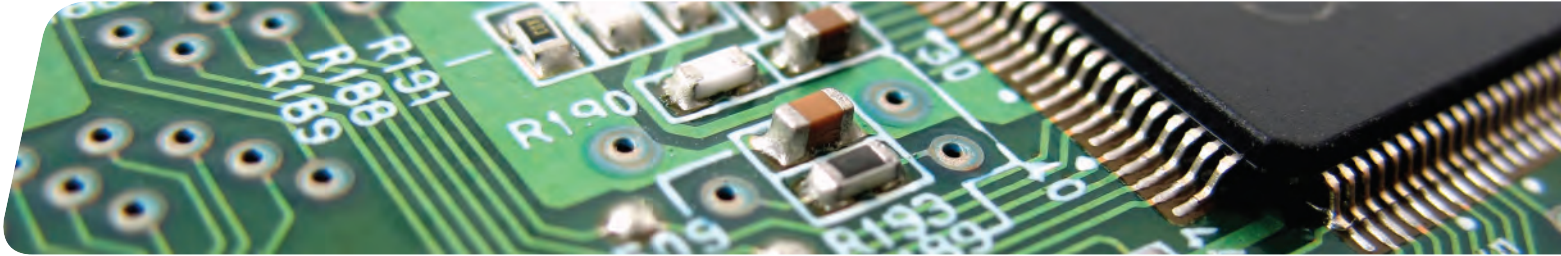hardware development | software development | industrial communication | functional safety | explosion proof devices

...where ideas turn into success!
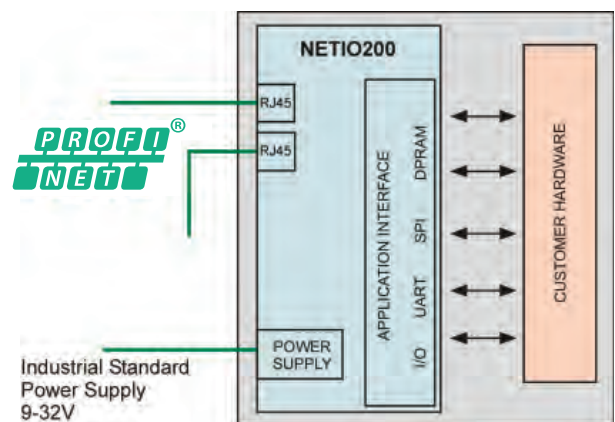
PROFINET IO Design Package as Possible Basic Component

The MESCO PROFINET IO Hardware Design Package is an ideal solution to integrate customer-specific PROFINET. The package consists of the hardware design documentation, schematics, layout, and bill of materials.

PROFINET/PROFIsafe Development

Based on its heavy emphasis on safety (functional safety, explosion protection, safe fieldbus systems), MESCO Engineering also provides the following services in addition to standard development services:

- Creation of Safety Requirements Specifications (SRS)
- Customer-specific hardware and software development SIL2/SIL3 in compliance with IEC 61508, IEC 61511 EN 62061/EN ISO 13849-1, IEC 61800-5-2
- Integration of safe communication with PROFIsafe
- Support for PROFIsafe certification
- Support for safety certification by TÜV or BGIA
- Project processing by TÜV-accredited Functional Safety Engineers

Make Use of Our Experience

Our qualified engineers and technicians will apply their expertise to your task. We excel in terms of flexibility, technical expertise, and cost awareness.

Talk to our specialists—give us a call or send us an e-mail:

Mesco Engineering GmbH
Phone: +49 7621 89031-0
Email: **info@mesco-engineering.com**
www.mesco-engineering.com

Complete PROFINET Solutions from Molex

Company Backgrounder Molex Providing more than connectors, Molex delivers complete interconnect solutions for a number of markets, including data communications, telecommunications, industrial, automotive, medical and consumer electronics. The Molex Industrial division is specialized in harsh-environment technology for factory automation, power distribution, temporary lighting and infrastructure solutions. This includes also Molex Brad® solutions for industrial networks and fieldbus to communicate and gather information through communications software, network interfaces, Ethernet switches, smart gateways, diagnostic tools, cables and connectors.

Products

Brad® HarshIO PROFINET modules provide a reliable solution for connecting industrial controllers to devices in harsh duty environments. Contained in an IP67 rated housing, Brad I/O modules can be machine mounted and are able to withstand areas where liquids, dust or vibration may be present. Thanks to Molex PROFINET I/O Development Kits, the HarshIO PROFINET has successfully passed the PI I/O-Device certification according specifications v2.2.

Molex applicom® I/O Ethernet network interface cards provide powerful and reliable RT data exchange over PROFINET. The provided software "console" is a powerful and easy-to-use engineering tool allowing customers to configure complex (Modular) I/O-Device in a click, with integrated advanced diagnosis.

In order to provide a full PROFINET I/O solution to customers, Molex portfolio includes a range of PROFINET certified cordsets, connectors, pass-throughs and switches for in-cabinet and harsh environments.

Custom Solutions

With Molex Brad PROFINET I/O Development Kits (also called stacks), manufacturers can develop and market PROFINET more quickly. The stacks allow to design PROFINET I/O-Controller products like PLC couplers, C-based interface cards, Panel PC, Robot controllers, or by using the I/O-Device stack to develop slave devices such as I/O modules, robots, field instruments, regulators, etc

PROFINET I/O stacks support any kind of hardware platform (little and big endian memory format) and are compatible with operating systems (real-time or not) like Windows®, VxWorks™, or Linux implementing multithread user applications. The deliverable development kit package includes: ANSI C-source-code, electronic documentation, samples of implementation in various OS, and tech support. Molex stacks also allow manufacturers to develop Media and System Redundancy solutions, as well as PROFIsafe systems.

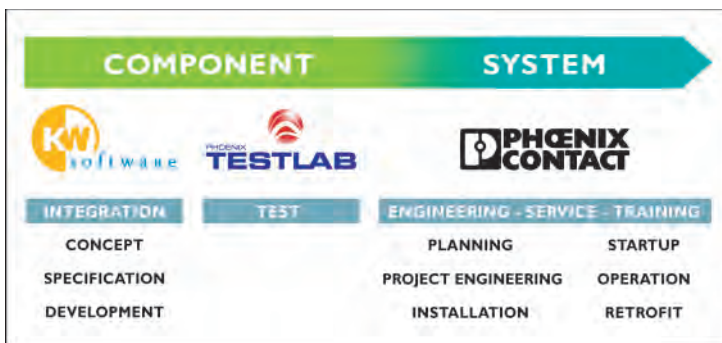*Certified by*

PI

PROFIBUS • PROFINET

Molex, Brad and applicom are registered trademarks of Molex Incorporated. All other products or trademarks are the property of their respective owners.

Services

More than just providing technology packages and products, Molex helps customers to reach the market quickly by allowing access to the PROFINET experts. PROFINET and PROFISAFE certified engineers are participating to the PROFINET specification design and are also available to customers through the accredited Competence Center.

Available worldwide, the Competence Center provides trainings, services and support including trainingns on stack integration. Trainings can be customized depending on customer's needs. The Molex Competence center can fully manage the integration of PROFINET capabilities into the manufacturer target system, providing in this case the benefits of Molex technology expertise. During all your product life cycle, the competence center is your partner to support or consider necessary evolutions of the product by providing you updated technology modules as well as keeping a close relationship.

For more information please contact
profinet@molex.com
or visit the Industrial Products section on
www.molex.com

Concentrated PROFINET Expertise

Phoenix Contact Competence Center

The Phoenix Contact Group is a joint developer of PROFINET technology and a producer of PROFINET components using this technology. In addition, the accredited Phoenix Contact Competence Center (PCCC), together with KW-Software and Phoenix Testlab, offers comprehensive services for all aspects of PROFINET.

The Phoenix Contact Competence Center: a complete range of services over the entire life cycle from the single component up to the whole system.

For continuous propagation of PROFINET and support for PROFINET users Phoenix Contact has combined their own efforts as solution provider for automation technology with those of the independent testing and certification institute Phoenix Testlab as well as the Software house KW-Software with their know-how in PCCC. PCCC is accredited at the PROFIBUS user organization (PUO) as a PROFINET IO Competence Center and for the profiles PROFIsafe and PROFIdrive.

PCCC offers a complete product and service portfolio during the entire life cycle of a device or system—from the specification, technology integration and certificationtests of I/O devices up to planning, start-up and retrofit of complex production systems. In addition, comprehensive training programs are offered.

Specifications and Development

The PROFINET business area from KW-Software in Lemgo supports device manufacturers and solution providers with special products and services during the development phase. High-performance and reliable technological components are offered for the development of PROFINET IO controllers and devices. KW-Software will take on the integration and porting of any special requirements in close consultation with the customer.

The PROFINET IO Controller Stack provides convenient context management of the communication connection (Application Relations, ARs) as well as comprehensive diagnostics functionality. Optional supplementing of a PROFINET IO device component allows quick and direct communication of several PROFINET IO controllers with each other. Typical applications for this are redundant or hierarchically organized automation networks. In order to realize a PROFINET device interface, it is also possible to use only the PROFINET device component without the PROFINET controller functionality.

The PROFINET IO device chip TPS-1 reduces the time and financial implementation effort to an absolute minimum and enables device manufacturers a fast, simple and cost-effective integration of a PROFINET IO Device interface – as single chip solution for the price of a Fieldbus interface. It supports conformance class C and can therefore be used with all PROFINET IO device performance classes.

Concept for a production system: The professionals at the Phoenix Contact Competence Center fully support their customers – starting with qualification measures and continuing with configuration to startup and maintenance of the system

KW-Software will provide support in all project phases during the integration of a PROFINET interface in the form of

- Advice and mutual concept development
- Technology integration on a wide range of platforms
- Support and Maintenance
- Updates and Upgrades

Testing and Certification

As a PUO accredited test lab for PROFINET IO devices, the Phoenix Testlab GmbH in Blomberg provides device manufacturers with a flexible range of services on everything to do with certification. All product requirements are validated according to the relevant standards early on in the specification phase which, in turn reduces the "Time-to-Market".

In order to meet the high quality standards set by the customer, a specially developed controller simulation software will be introduced as a test system. To ensure the interoperability of the certified devices, a multi-vendor wall with different controllers and engineering systems is set up as a test assembly. All specified test cases will be carried out by professional engineers.

The PROFINET IO test based on IEC 61158 certification can be carried out during the development phase or as final test.
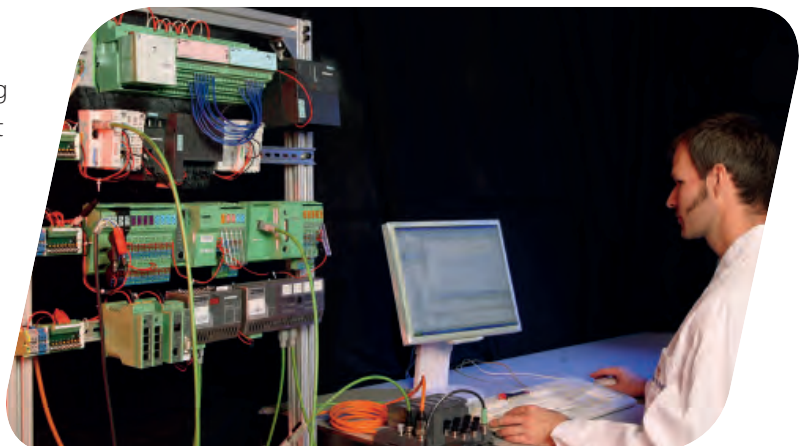
Planning, Operation and Maintenance of Systems

The services offered by Phoenix Contact Electronics in Bad Pyrmont are focused on the application of PROFINET products: from planning and configuration over installation, startup and operation to system modernization. A certified PROFINET Training Center is then qualified as "Certified PROFINET Installer" and "Certified PROFINET Engineer".

Product Links   **www.kw-software.com**
www.phoenix-testlab.com
www.phoenixcontact.com

Protocol testing in the laboratory: the relevant standards form the basis for PROFINET certification tests

Real Time Automation

My engineering manager laughed when I told him I found a knowledgeable, competent source for royalty free, PROFINET IO source code with a small footprint Until I told him about the RTA solution…
(I didn't tell him about the FREE Pie)

I NEED PROFINET AND I NEED IT NOW !!!!

If This is Your Customer, You've Found the Right Solution!

My name is John Rinaldi and I am the CEO, Owner and Chief Technology Officer for Real Time Automation. Our business is Industrial Networking. Been that way for over 22 years now. I started the company with one simple goal. To help developers get network enabled; quickly and easily.

If you need to get one of your automation devices connected to PROFINET IO or need to get your PROFINET devices connected to any of a dozen other networks we're here to help. And I am here to tell you why we are the best.

Question 1: Who is Real Time Automation and Why Don't I Know Them?

We're a pretty small company with a very tight focus on helping guys like you get automation products connected to industrial and building automation networks. There are ten of us at RTA and I like it that way.

We have worked with fortune 50 companies and 3 man shops in over 26 different countries. We have literally network enabled systems from the toilets on French trains to the fountains at the Bellagio Hotel in Las Vegas. Every project is a new adventure for our team.

Question 2: What's Different About the RTA Solution?

I'll be honest with you; you can be successful with any of the solutions in this brochure. All these people have good products and they're good people to work with but RTA offers something special:

- We're US based. Most every company in this brochure is European. Most of their top technical assistance is in Europe so you'll have to deal with the language and time zone barriers. Not a problem for us. We're in the middle of the US—convenient for anyone in North America.

- We're a small company. You can count on your project being more important to us than it is to a $44 Billion dollar company.

- With the vast majority of our solutions you're going to talk to the guy that wrote the code. You won't get that anywhere else.

- We deliver small footprint, Royalty Free ANSI C source code that is RTOS independent, processor independent and endian independent. In fact, you can run our code without an OS at all.

Question 3: What Should I Do Next?

Your next step is to visit our website www.rtaautoamtion.com and schedule a half hour web meeting to learn more about our solutions. On our site you can check out www.rtaautomation.com/profinetio to get a technology overview that I think is pretty good (Disclaimer—I'm a bit biased. I wrote it). Click the CONTACT US link at the top of the page, fill out the form and I'll get in touch with you to schedule your half hour web meeting.

Question 4: OK, What's This About FREE Pie?

Norske Nook Bakery in Osseo Wisconsin is the Official Pie Company of Real Time Automation. As a Special **THANK YOU** for scheduling a PROFINET IO Web meeting you get one of their world famous, award winning pies.

Best Wishes,

John Rinaldi

Real Time Automation
Phone: (262) 439-4999
www.rtaautomation.com

PROFINET Technology From the Experts

Your Only Combined Certified Competence Center, Training Center, and Test Lab in North America

Do you want to connect your field devices and systems to PROFINET quickly and easily? Do you want to gain a technological edge over your competitors in the market? Siemens provides you with all the assistance you need during the entire product development cycle: from free telephone support and local consulting to implementation and certification.

The Right Advice Right From the Start
SIEMENS gives you comprehensive information on PROFINET technology as well as on the PROFINET development environments that are offered. PROFINET training classes are available for interested parties that want to:

▮ Become familiar with PROFINET and the possibilities for using SIEMENS PROFINET IO Development Kits

▮ Learn how to work efficiently with SIEMENS PROFINET IO Development Kits

▮ Get faster results when developing field devices using SIEMENS PROFINET IO Development Kits

These PROFINET knowledge offerings are organized by the PROFI Interface Center (PIC) in North America and by **Com**munication **De**velopment and **C**ertification (ComDeC) in Europe. Take advantage of the opportunity to participate in PROFINET:

▮ Free webinars on demand
▮ Free one day training classes
▮ Week long hands on **P**ROFINET **C**ertified **N**etwork **E**ngineer (PCNE) classes
▮ Development classes
▮ Specific training for your company
▮ Support and more!

Details are available at the PIC online portal at any time.
http://www.ProfiInterfaceCenter.com

The Easy Route to PROFINET Implementation
The PROFINET Development Kits from SIEMENS make it easy to get started. The PROFINET Device and Controller Development Kits contain everything you need to develop your own PROFINET IO devices and/or controllers: PROFINET IO Device Stack, Controller Test Partner and/or Controller software, Device Evaluation Board, hardware components, analytical software, documentation and implementation support.

PROFINET Device Development Kits (DK's) from SIEMENS support diverse technologies:

▮ **Software Based DK** for implementing PROFINET IO field devices with **R**eal **T**ime (RT), for field devices with existing Ethernet interface and standard Ethernet microcontroller.

SIEMENS

■ **Hardware Based DK's** for developing PROFINET IO field devices with RT and **I**sochronous **R**eal **T**ime (IRT) using the **E**nhanced **R**eal **T**ime **E**thernet **C**ontroller, **A**pplication **S**pecific **I**ntegrated **C**ircuit (ERTEC ASIC). The ERTEC supports all PROFINET functions, including high performance, cyclical and isochronous communication and supports two (ERTEC 200) or four (ERTEC 400) Ethernet ports. Get started using PROFINET with the favorably priced ERTEC 200 based Starter Kit!

■ **PC Based DK's** for integration of the PROFINET IO Controller function and/or Device under Windows or Linux using **C**ommunication **P**rocessor (CP) cards. SIEMENS offers a high performance solution using PC cards with onboard ERTEC 400 and consisting of a CP1616 as a plug-in PCI card and a CP1604 in the PC104+ format including a free development kit. OPC Data Access and **A**pplication **P**rogramming **I**nterface (API) functionality is possible using the PC Based DK's. Software solutions via SIEMENS Softnet PROFINET IO under Windows or Linux are also available for IO Controller functionality using a standard Ethernet network card with OPC or API.

To enable you to implement fail-safe field devices, a **PROFIsafe Starter Kit** is available (including PROFIsafe driver software and an example of implementation) based on the PROFINET DK's.

If you decide in favor of PROFINET Development Kits from SIEMENS, you will benefit from the technological advantages offered by SIEMENS and free first class support provided by professional technical consultants.

Profit From a Smooth Certification Process
To ensure interoperability of PROFINET products it is a requirement to certify them before they can be introduced in the market. The PIC is the only accredited test and certification laboratory in North America. Our vast experience with a variety of devices and different implementations is your benefit for the whole process of development and certification. The main goal is to support getting your product ready and available on the market so you can profit now. Get PROFINET!

Service and Support: Our Experience Helps You to Save Both Time and Money
SIEMENS provides device manufacturers with the support they need:
■ Knowledge transfer
■ Development
■ Certification
■ Phone and e-mail support.

Certified by

PI

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ERTEC 200 Development Kit

PROFINET IO controller**
CP 1616 as PROFINET IO controller in the PC* under Linux*/Windows XP*

or SOFTNET PN IO controller under Windows XP*

Development system**
On PC* under Linux*/Windows XP*:
– eCos operating system
– Terminal program
– Eclipse development
  environment

Terminal output

JTAG-Debugger
Programming interface

EB 200 evaluation board

Further PROFINET
IO devices*

The EB 200 evaluation board can be run as a PN IO device outside of a PC.

* Parts are not contained in the development kit.

** PROFINET IO controller and development system can be run on the same PC. An individual PC is only required when operating a CP 1616 under Linux for PROFINET.

— — — = optional

The complete set for speedy development of PROFINET devices

Independent PROFINET Solutions

by Softing—Your Connection to Excellence

Softing has actively participated in the development and implementation of PROFINET from the onset. During this time frame, Softing employees acquired a high-level of sophistication in effectively integrating PROFINET technology into field devices. Numerous companies are trusting in Softing's first-class, industry-hardened technology to gain the competitive advantage that is needed in today's competitive environment. Take advantage of our experience to define the success of your future projects.

PLC and Remote IO with integrated Softing stack

Consulting Services and Training Classes

Softing is an accredited PROFINET Competence and Training Center. Our company offers consulting services as well as other services to manufacturers of PROFINET systems. Our service offer spans from in-depth technology training classes to preliminary certification tests. In addition, Softing offers the official "Certified PROFINET Engineer" training class for commissioning engineers.

Portable Protocol Software—Communication Software for Existing Hardware Platforms

Softing's portable and scalable protocol software stacks strictly conform to the latest PROFINET specification. Customers with existing hardware platforms can integrate these stacks into their products. Softing has developed a sophisticated worksheet to assist software engineers in estimating the integration effort. On request, Softing will assist in evaluating the worksheet to provide further guidance on feasibility and implementation effort.

Certificate for the PROFINET Device Stack with Conformance Class B

The portable, yet high-performance PROFINET communication stack has been implemented in compliance with the official Conformance Class B specification covering the functionality of a Controller, Supervisor, and a Field Device. Conformance to the official protocol specification is critical for a successful integration of any communication stack into a field device. Softing's device stack has been officially tested and has easily passed all conformance test cases. Softing's extensive experience in writing conformant protocol software stacks is accompanied by stringent quality control measures to ensure interoperability. This fact is often pivotal in tipping-the-scale when device vendors are deciding on a reliable supplier.

FPGA-based Communication Interface — A Flexible Solution for Field Devices

A FPGA (Field Programmable Gate Array) is a customizable solution to fit a multitude of requirements by loading appropriate hardware functions (also referred to as intellectual property (IP) cores). Softing has developed IP cores for PROFINET and other industrial protocols. The target platform for these IP cores is the Altera Cyclone FPGA family.

Evaluation Kit for PROFINET Device Stack

Softing offers the FPGA solution in two versions:

1. COTS communications module—This communications module is designed for easy integration into existing devices or for vendors that do not want to invest heavily in developing a new hardware platform. On request, Softing will customize the form factor, hardware interface, etc. according to customer specific requirements.

2. Integration package—Softing offers a complete developers package that includes:
   - Complete tool-chain for the Altera Cyclone FPGA family
   - Evaluation board based on the Altera Cyclone III FPGA
   - Communication IP cores for PROFINET and additional industrial Ethernet protocols
   - IP Core - Implementation of an Ethernet switch
   - IP Core - 32-bit embedded-processor (NIOS II)
   - Sample Code and documentation

PROFINET Controller

Softing's protocol software solution for PROFINET controllers is available for integration as well as on a COTS communication module based on FPGA technology. The offer is complemented with a configuration software package that is also available as a set of software libraries for integration into vendor specific PLC programming software packages.

Integration module with PROFINET Device Stack or Controller Stack

Diagnostic Tools for Industrial Ethernet Protocols

Softing has established itself as a provider of sophisticated diagnostic tools for fieldbus systems. Today, Softing's PROFIBUS diagnostic toolset is the de-facto standard for analyzing PROFIBUS networks.

The next generation of diagnostic tools from Softing will include

- an electrical tester for PROFINET networks that takes PROFINET-specific features into account while analyzing the signal quality and
- a PROFINET protocol analyzer with built-in knowledge needed to decode PROFINET diagnostic information.

Product and Service	Description
PROFINET consulting services	Softing offers technical training classes and consulting services. On request, training classes can be held onsite.
PROFINET protocol software for integration into existing hardware designs	Portable, scalable, and pre-qualified stacks for device, controller, and supervisor functionalities
PROFINET integration into existing devices	Customizable FPGA-based communication modules for use in existing devices
PROFINET controller functionss	Protocol stacks and communication modules with configuration software as stand-alone application of as a set of libraries for integration into existing PLC programming software packages.
PROFINET diagnostic	Electrical tester and protocol analyzers

Product and Service Summary

For more information please visit our web page at www.softing.us or contact us:

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Additional Resources

Resources Just for Developers

Webinar: The Rapid Way to PROFINET
The path to PROFINET is straightforward but not well-known. This webinar makes the path known. It covers PROFINET device types, Conformance Classes, features, and the development process.

Additional Developer Webinars
Some of the tool providers in this brochure have recorded webinars to assist you. Find them at **www.us.profibus.com** under Training, Past Webinars.

European Version of This Brochure
The European edition of *The Easy Way to PROFINET* is at **http://www.profibus.com/nc/downloads/downloads/the-easy-way-to-profinet-technology/display/** under Downloads. Although there is an overlap in providers in this brochure and the European one, each contains some providers unique to their geography.

In addition to the companies presented in this brochure, websites, newsletters, social media, and forums are among your resources for PROFINET development. Your most important resource is the people at these companies and at the Competence Centers, Test Labs, Training Centers, Regional PI Associations, and in the online community.

PROFINET Resources

Web
www.AllThingsPROFINET.com
All Things PROFINET provides a guided tour based on your company and your role. The Device Maker section contains the information about adding PROFINET to your products.

www.us.profibus.com
The website of PI North America has both PROFIBUS and PROFINET information plus information about the organization.

www.ProfiInterfaceCenter.com
The PROFI Interface Center (PIC) is the certified North American PI Competence Center, PI Training Center, and PI Test Lab for PROFIBUS and PROFINET. They support the Siemens chips and development kits, but also provide consultation of a general nature covering other approaches.

www.profinet.com
PI's global website contains a broad range of downloadable documentation including marketing flyers and in-depth System Descriptions. There are also links to other Regional PI Associations throughout the world, a full membership list, and references to all the PI Competence Centers, PI Training Centers, and PI Test Labs.

Newsletters

PROFInews North American Edition

This bimonthly electronic newsletter features news, events, application stories and new products. Subscribers: 75,000. Archive and subscription form are on **www.us.profibus.com** under the Newsletter menu item.

PIC Connection

This archive of newsletters from the PROFI Interface Center features technical articles and applications.

PROFInews Global Edition

The global electronic newsletter shares content with *PROFInews North American Edition*. *PROFInews North American Edition* focuses more on North America.

Webinars

Our archived webinars cover Industrial Ethernet basics, PROFINET, PROFIsafe, and much more. Find them at **www.us.profibus.com** under Training, Past Webinars.

Free Classes

PI North America offers no-cost one-day training classes throughout North America. For a full schedule, visit **www.us.profibus.com** under Training.

Certification Classes

As a certified PI Training Center, the PROFI Interface Center offers week-long Certified Network Engineer training classes for PROFINET and PROFIBUS. For a full schedule, visit **www.us.profibus.com** under Training.

Book

The definitive book on PROFINET is *Industrial Communication with PROFINET* by Manfred Popp. It is available for sale under the Resources menu at **www.us.profibus.com**.

Forums

Ask questions; get answers. Share information and experience with your peers and experts. At **www.profibus.com** under Community, Forum.

Blog: www.PROFIblog.com

News and Opinion on PROFINET, PROFIBUS, industrial networks and automation is on the PROFIblog.

LinkedIn PROFINET Group

PROFINET news on an ongoing basis plus discussion is on the PROFINET LinkedIn group at **http://www.linkedin.com/groups?about=&gid=3580331**

YouTube

PROFINET videos of trade shows and more are on the PROFIblogger's YouTube channel. Search for "The PROFIblogger."

PI Membership

You are invited to join PI North America. Download documents, get help through the process, get discounts on training, free PROFINET product certificate, and more. After your product is developed, members get help marketing it through the websites and newsletters. At **www.us.profibus.com** under Membership.

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