



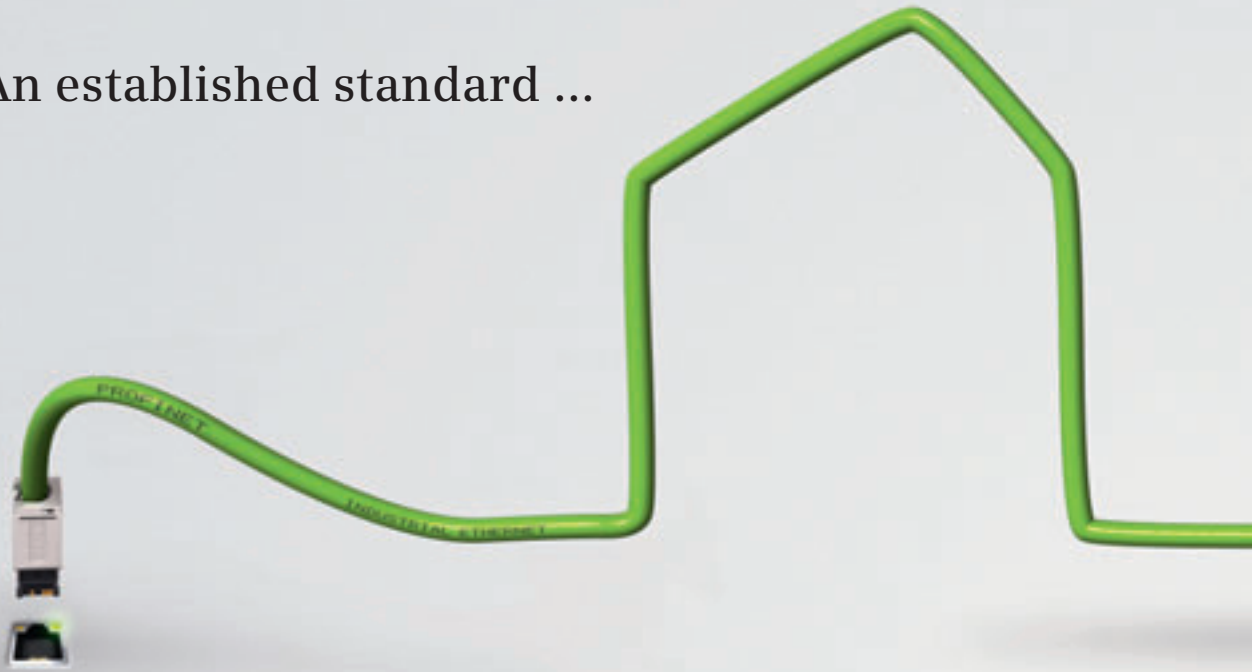
Automate with the leading
Industrial Ethernet standard and profit now.

PROFINET

Answers for industry.

SIEMENS

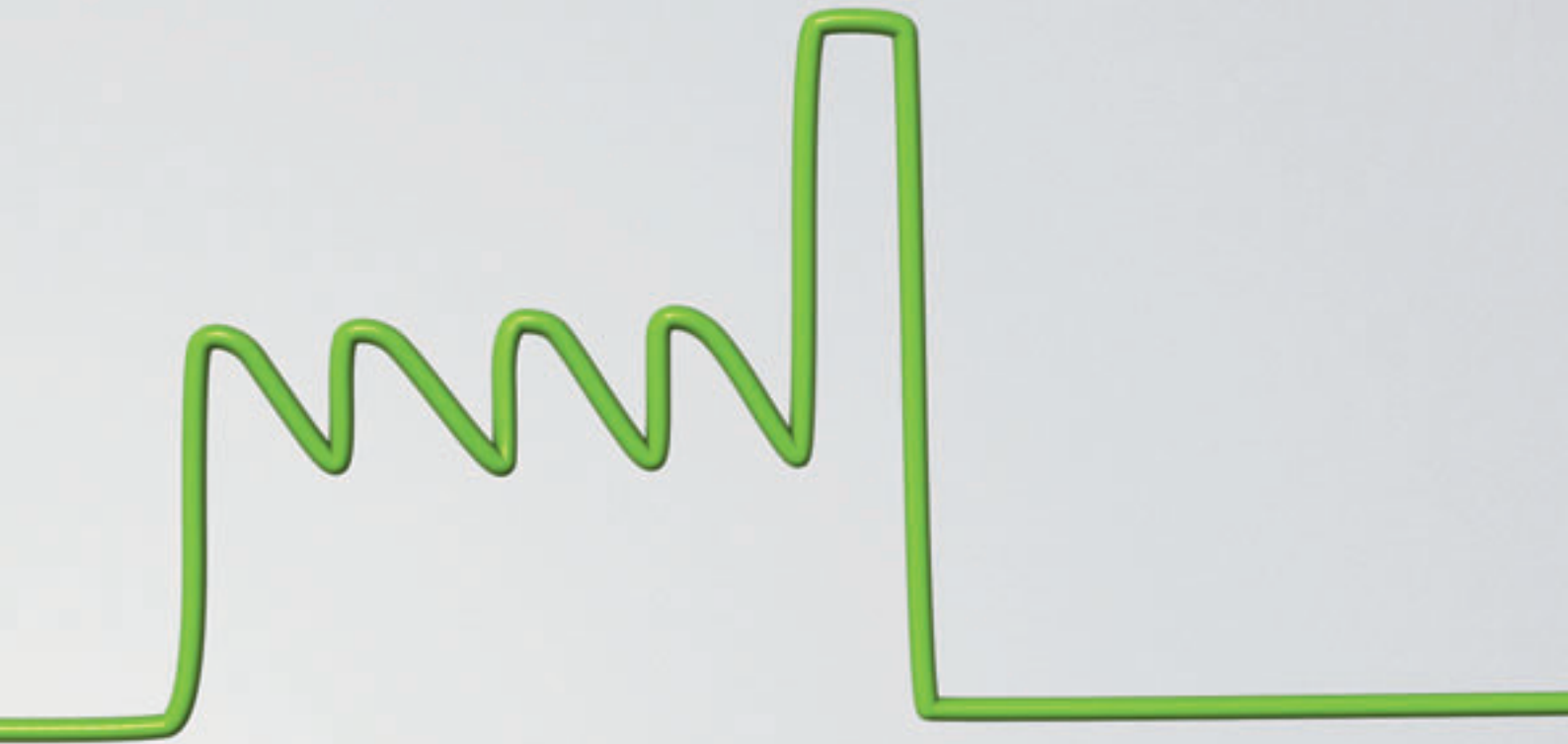
An established standard ...



All goals accomplished, now and in the future ...

The success of your plant is crucially dependent on reliable processes, flexibility, and fast reactions. Raising productivity is always a number one priority.

The unbroken advance of globalization has resulted in ever more intense competition. To survive in this fiercely contested arena, you must be able to count on the permanent availability of your plant. Increasingly frequent product changes and shorter lifecycles call for exceptionally flexible processes as an essential precondition of prompt reactions to specific customer requirements. In the twenty-first century, future-proof investments are also vitally important. The answer to these complex challenges lies in an open automation standard for flexibility, reliability, and performance: PROFINET.



... from office to production.

... with PROFINET, the leading Industrial Ethernet standard.

Industrial communication plays an important role in all areas of automation technology. PROFINET, the leading Industrial Ethernet standard, offers outstanding advantages that improve the response capability and reliability of your processes. Modular machine concepts and maximum flexibility when creating automation structures are the key to shorter response times. Fast baud rates and applications based on Industrial Wireless LANs help boost the performance of your plant. With an integrated diagnostics concept and a safety solution for fail-safe communication, plant availability is permanently assured. PROFINET – oriented toward established IT

standards – supports TCP/IP without any restrictions and enables direct access from the corporate management level all the way down to the field level. Vertical and horizontal integration are guaranteed.

Secure investment: simple integration of existing systems

Integrating your existing systems and networks is not a problem with PROFINET. For instance, PROFINET supports the continued use of other PROFIBUS networks or other fieldbus systems like AS-Interface that are already installed. This means maximum protection for investments in existing systems while paving the way for a gradual migration to PROFINET.

The optimum basis for PROFINET: Industrial Ethernet

Ethernet has established itself as the standard bus system in the office world. Thanks to its huge market acceptance, Ethernet development (e.g. transmission rate improvement) is continuing unabated. Siemens has been offering Industrial Ethernet as a standard-based network for rough industrial environments for more than 20 years now. PROFINET utilizes this basis to interface devices from the field to the management level, thus combining industrial performance with the uniformity, continuity and transparency of corporate communication.

One solution for all requirements.



Industry-standard installation technology, real-time capability, the integration of distributed field devices, drives, isochronous Motion Control applications, simple network administration and diagnostics, protection against unauthorized access, efficient vendor-independent engineering and a high degree of machine and plant availability: all of these demands are fulfilled by PROFINET, the leading cross-vendor Industrial Ethernet standard.

Safety Integrated

PROFINET meets all necessary requirements for an inclusive safety concept for personnel, machines and the environment. Using PROFIsafe enables a single network for standard and fail-safe communication – all on the same cable and even wireless with Industrial Wireless LAN (IWLAN).

IT Standards & Security

PROFINET provides all the functions required for optimum configuration and diagnostics. All relevant data can be accessed online from anywhere, worldwide. PROFINET also fulfills the increased requirements for data and network security.

Network installation

PROFINET relies consistently on 100 Mbit/s switching technology and, in addition to the star topologies commonly used in Ethernet, also supports line and ring topologies. This minimizes cabling overhead and ensures maximum flexibility. Wireless communication with IWLAN opens up new applications in industry – even wireless HMI is now possible.

Process

PROFINET is designed as a comprehensive standard for all automation tasks. Special requirements for its use in industrial plants and for interfacing process instrumentation and analyzers are currently being dealt with within the standardization process. PROFINET has also already been successfully used in a number of secondary processes.

Real-Time Communication

PROFINET fulfills all the real-time demands relevant to the automation world, including isochronous ones. PROFINET is also well-suited for especially sophisticated applications, such as those in Motion Control.

Distributed Field Devices

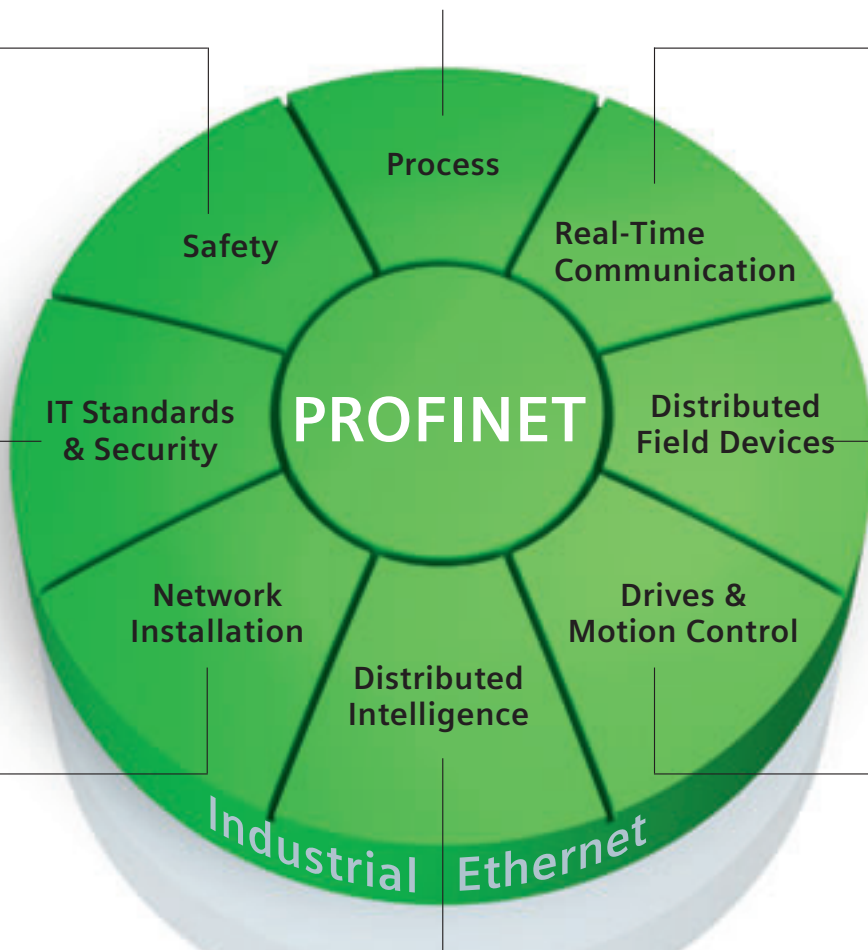
Distributed field devices can be directly interfaced to Industrial Ethernet via PROFINET. This enables high-speed data exchange between the IO and controllers and facilitates considerably improved diagnostics.

Drives & Motion Control

PROFINET offers an integrated communication solution for drives – ranging from simple tasks such as the control of pumps and fans to high-performance, isochronous motion control applications.

Distributed Intelligence

PROFINET offers new potential for implementing distributed automation structures: consistent modularization and easy machine-to-machine communication with plant-wide engineering – thanks to Component Based Automation.





PROFINET: a standard wins through.

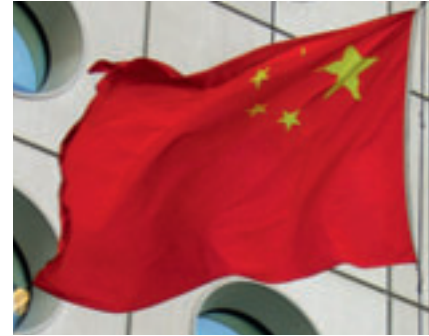
As a part of IEC 61158, PROFINET is based on the international Ethernet standard (IEEE 802.3) as well as Fast Ethernet (100 Mbit/s) and switching technology. Two special PROFINET features, the integrated use of real-time and TCP-based communication on one line as well as scalable real-time communication for controllers, distributed IO and Motion Control facilitate short response times and continuity from the field level all the way up to the corporate management level – even wirelessly with Industrial WLAN.

PROFINET is supported by PROFIBUS & PROFINET International, the largest fieldbus organization in the world with more than 1,400 members. They include leading providers of automation technology and users – from the field of both production and process engineering. With 2.1 million nodes installed worldwide (at year end 2009), PROFINET is the world's leading Industrial Ethernet standard. The architecture of PROFINET is developed by 35 working groups whose members come from the staff of 70 different companies. More than 300 PROFINET products from around 50 companies are already on the market.

Ten accredited testing laboratories and 16 training centers have been set up for certifying the products. The global network of more than 40 PROFIBUS Competence Centers can also provide answers to any of your questions concerning PROFINET. Furthermore, you can get support from the Siemens Competence Centers:

ComDeC, Germany. Contact:
comdec@siemens.com

PIC, USA, Contact:
profibus.sea@siemens.com



Successful application in China ...

Since PROFIBUS is the only fieldbus to date that meets the stringent demands of a national Chinese standard (GB/T 20540.1-2006 – GB/T 20540.6-2006), the Chinese standardization authorities have also nominated PROFINET for the status of a preliminary standard type GB/Z. Work is currently under way on the revision of this standard. The objective is to guarantee that the current versions of PROFINET are always standardized in China. This standardization success story serves as a firm basis for the further spread of these two technologies as general standards.

... and in the German auto industry

One of the reasons why PROFINET has developed into a leading Industrial Ethernet standard worldwide is the Automation Initiative of German Automobile Manufacturers (AIDA) that in 2004 argued for the support and introduction of PROFINET in the automation of its production systems. PROFINET solutions have since become the declared standard for new plants in these companies.

Especially the aspects of continuity and integration are assessed as very positive by AIDA. An integrated bus system for all requirements results in faster commissioning and shorter retooling times. With PROFIsafe, you can also integrate additional safety components into the production line quickly and easily – even wirelessly.

En route to the green factory: PROFInergy

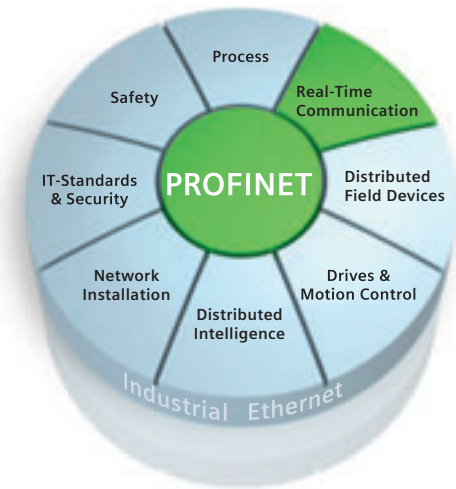
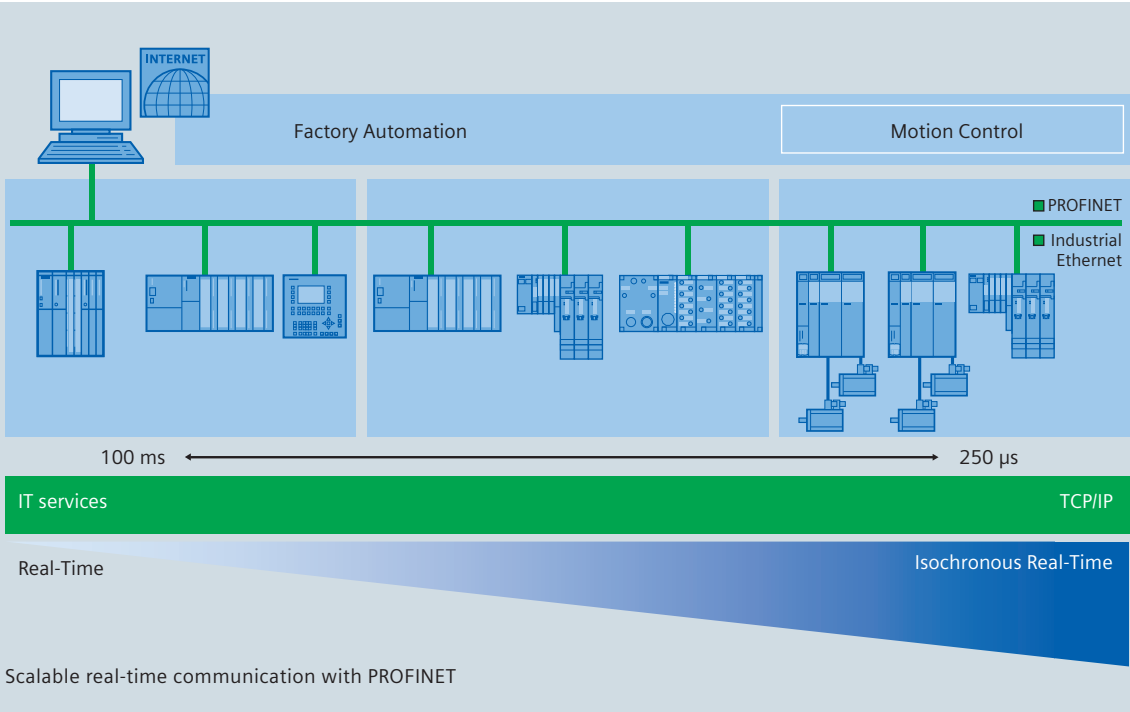
PROFInergy is a profile that provides functions and mechanisms for PROFINET field devices to support energy-efficient production. The cross-vendor profile defined by PROFIBUS International is independent of devices and enables the user to reduce energy consumption and costs significantly: PROFInergy enables specific loads that are not required to be switched off. This noticeably reduces energy costs during breaks in production.

PROFInergy facilitates simple automated activation and deactivation of technologically related plant sections. Central coordination is by means of a higher-level controller and the networking is realized via PROFINET. This means that during long pauses, as much energy as possible is saved. Plant sections that are switched off for short periods contribute to the even distribution and most efficient use of energy.

The use of PROFInergy is made easier for the machine builder by its integration into well-known series of products. In addition, PROFInergy is defined in such a way that the necessary function blocks can be integrated into existing automation systems at a later date.

Siemens already offers various components that support PROFInergy.

Real-Time Communication



Real-Time Communication

PROFINET covers the entire range of automation applications and differentiates between three basic communication properties:

- Non-Real-Time such as TCP/IP and UDP/IP communication
- Real-Time (RT) and
- Isochronous Real-Time (IRT)

TCP/IP and UDP/IP communication

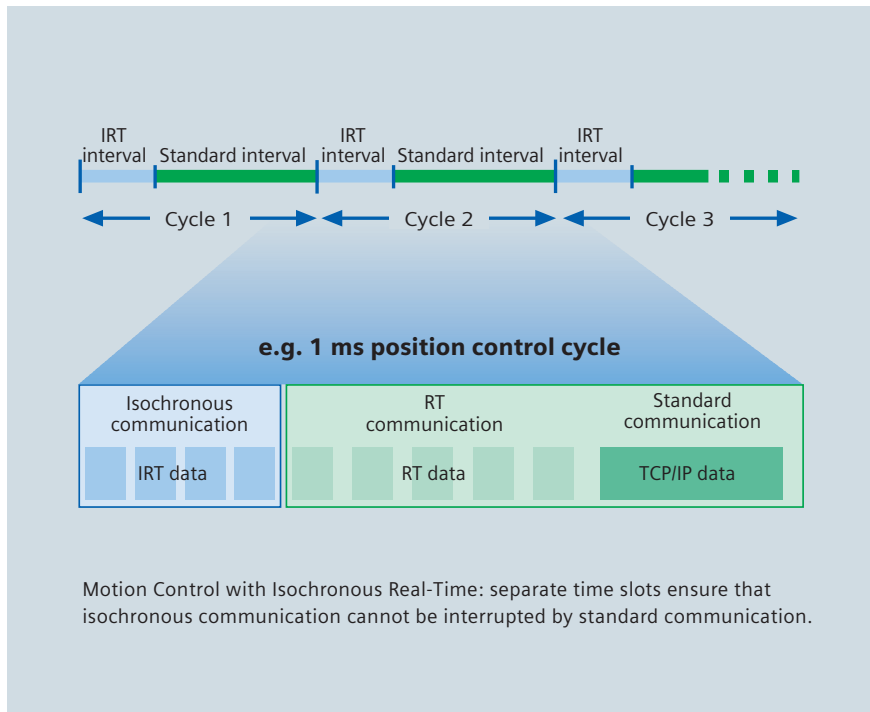
Non-time-critical data transmission with TCP/IP and UDP/IP constitutes the communication basis for parameterization and configuration, for example. In the IT landscape, TCP/IP is a de-facto standard.

Real-Time (RT)

Real-Time is used for time-critical process data, i.e. for cyclical user data or event-driven interrupts. PROFINET uses an optimized real-time communication channel for the real-time requirements of automation engineering. This minimizes cycle times and results in increased performance for updating process data. The performance exceeds that of conventional fieldbuses and permits response times in the range of micro-seconds. At the same time, the processor

performance required in the device is significantly reduced. Standard network components designed for industry can be used for this solution.

SIMATIC NET switches additionally permit optimized data transfer. The data packages are prioritized according to IEEE 802.1Q. The network components control the data flow between the devices on the basis of these priorities. Priority 6, the second highest level, is used as the standard priority for real-time data. This ensures priority treatment compared to other applications which are assigned lower priority levels. RT is real-time communication for standard applications and is used to connect field devices such as distributed IOs and drives or to implement distributed automation structures with PROFINET CBA and it is therefore standard in SIMATIC.



Isochronous Real-Time (IRT)

The hardware-supported real-time communication known as Isochronous Real-Time (IRT) is suitable for particularly sophisticated Motion Control and high-performance applications in factory automation, for example. IRT permits cycle times of up to 250 μ s with less than 1 μ s jitter. To achieve this, the communications cycle is divided into a deterministic part and an open part by reserving bandwidths, then specified to the other stations in the network by a sync master. Both types of data transmission exist side by side – without mutual interference. This means that users can connect a notebook computer to any location in the plant in order to access the device data without any adverse effects on isochronous control or productive communication.

In the case of IRT, the isochronous communication on the bus is processed synchronously in the controllers and devices. This is a must for Motion Control applications.

IRT enables SIMATIC controllers to reliably master high-speed processes for:

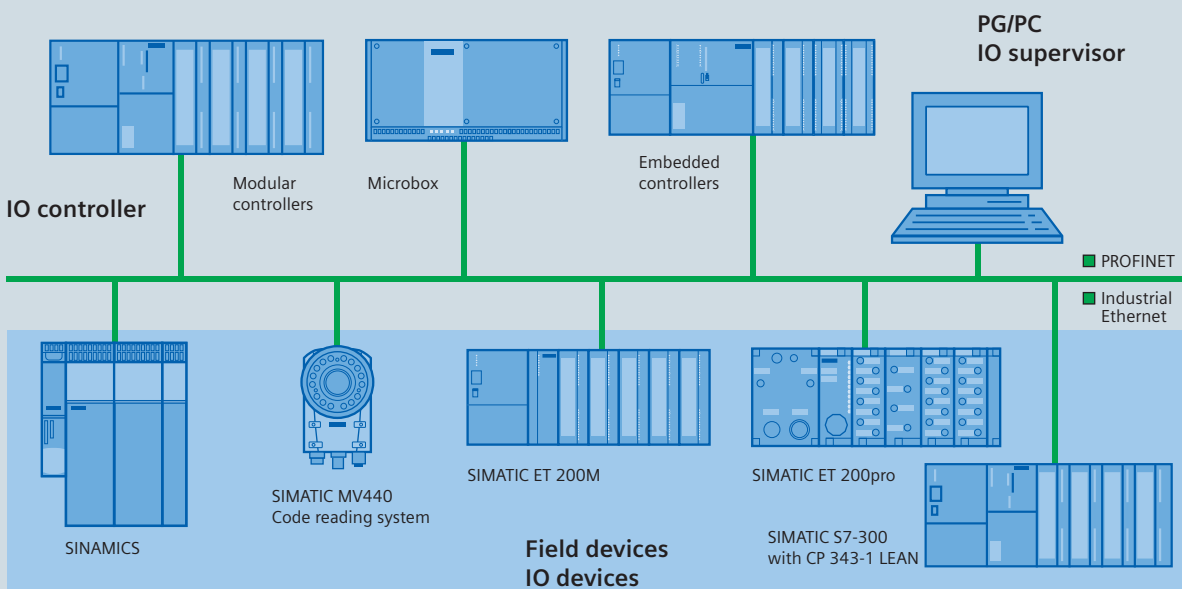
- Network usage for process data and standard Ethernet data involving high data volumes (e.g. Vision or SCADA systems) without interfering with the process data
- Machine/plant structures with a large number of linearly connected stations and short refresh times.

Reliable processing of high-speed processes is facilitated by the fact that IRT capable devices guarantee very short throughput times – often up to 30% faster – and SIMATIC controllers with IRT support isochronous bus communication. Isochronous processing directly in the application is also in preparation.

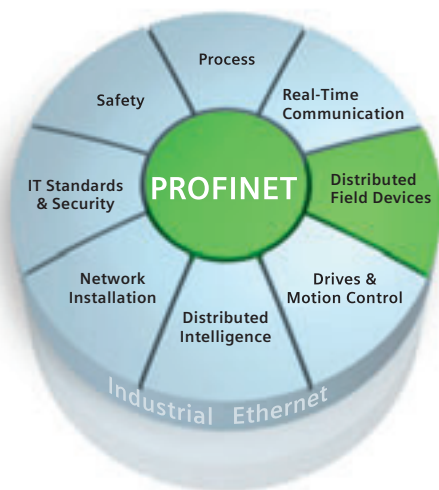
ERTEC (Enhanced Real-Time Ethernet Controller)

The ASIC family ERTEC supports PROFINET real-time communication (RT and IRT). End-to-end system solutions with PROFINET are based on this technology. The ERTEC 400 is integrated in controllers and network components, while the ERTEC 200 is installed in simple field devices (IOs, drives). "Development Kits" and "Competence Centers" support you in developing your own devices.

Distributed field devices



The interaction of IO devices and IO controllers



The following device types are defined for PROFINET IO in the PROFIBUS & PROFINET International standard:

- IO controller: controller in which the automation program is executed
- IO device: distributed field device assigned to an IO controller
- IO supervisor: programming device/ PC with commissioning and diagnostic functions or HMI device

The IO device reads the IO signals and transmits them to the IO controller, which processes these signals and transmits output signals back to the IO device.

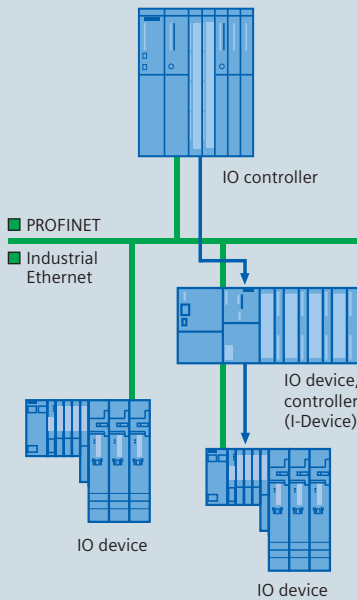
Distributed field devices

PROFIBUS & PROFINET International have defined the PROFINET IO standard for directly interfacing distributed field devices to Industrial Ethernet. Field devices transmit their data cyclically to the process image of the associated control unit via this standard. PROFINET supports 1440 bytes/message frame per field device in this process, thus exceeding the data volumes transmittable via fieldbus. Furthermore, PROFINET also enables IT services such as online commissioning or network diagnostics via Simple Network Management Protocol (SNMP) to be used for field devices.

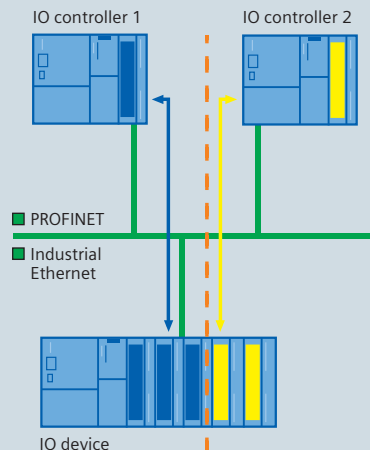
PROFINET supports a provider/consumer model for interaction between controllers and distributed IO. The provider sends its data to the consumer without a request from the communication partner. The consumer processes the data. The assignment of providers to consumers is determined in the configuration. In addition to star, tree and ring structures, PROFINET continues to consistently support the line structures characteristic of the established fieldbuses. Through the integration of switch functionalities into the devices

such as the SIMATIC ET 200S, ET 200M or ET 200pro distributed field devices, the user can build in the usual manner line structures that are directly oriented towards the machine and system structure. This leads to savings in terms of the wiring effort and the number of components required, such as external switches, is reduced.

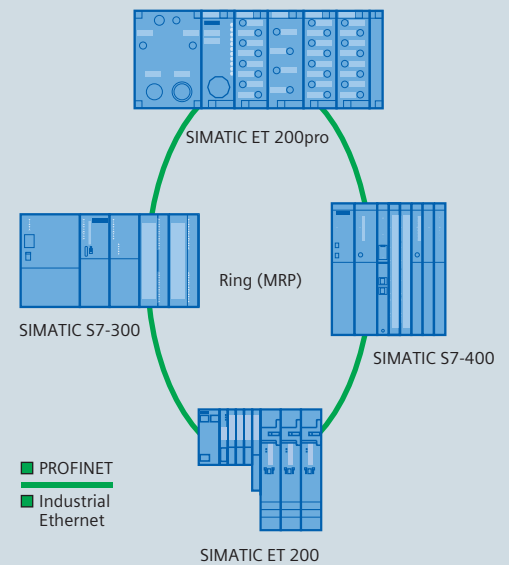
A wide range of SIMATIC controllers is available for connecting distributed field devices, including the classic modular controllers in the SIMATIC S7-300 and SIMATIC S7-400 series and the PROFINET CPU for the SIMATIC ET 200S. And if you prefer embedded or PC-based automation structures, you can still profit from PROFINET's advanced capabilities and high performance. SIMATIC Embedded Automation products like the new SIMATIC S7 modular Embedded Controller take advantage of the openness of PC-based systems and are also extremely robust. The SIMATIC WinAC 2008 RTX is a SIMATIC PC-based controller that runs on a standard PC system.



With I-Device modular control and topology architecture become leaner and more flexible



With Shared Device, several controllers can use the same IO device



Sample configuration for media redundancy protocol (MRP)

Device description and configuration

Configuration and programming of the IO devices correspond to that of distributed IO devices on the PROFIBUS DP. This is implemented in the usual manner in STEP 7. The devices are described unambiguously by General Station Description (GSD) files. These GSD files are imported into the configuration tool.

Fast start-up (FSU)

This function allows PROFINET IO devices connected to SIMATIC controllers to be powered up in less than a second. It optimizes the time-controlled connection of robot applications, for instance in order to speed up tool changes on body shop robots in a car factory.

Intelligent device (I-Device)

With this functionality, PROFINET in a typical automation solution with several networked controllers not only permits communication with subordinate devices as an IO controller, but also IO communication with other higher-level or central controllers as an IO device. This communication takes place at the same time on the same bus. Thanks to I-Device, the topology architecture becomes leaner and more flexible. It permits the simple connection of controllers from different projects in just the same way as the integration of Siemens controllers and third-party controllers within a single communication network.

Shared device

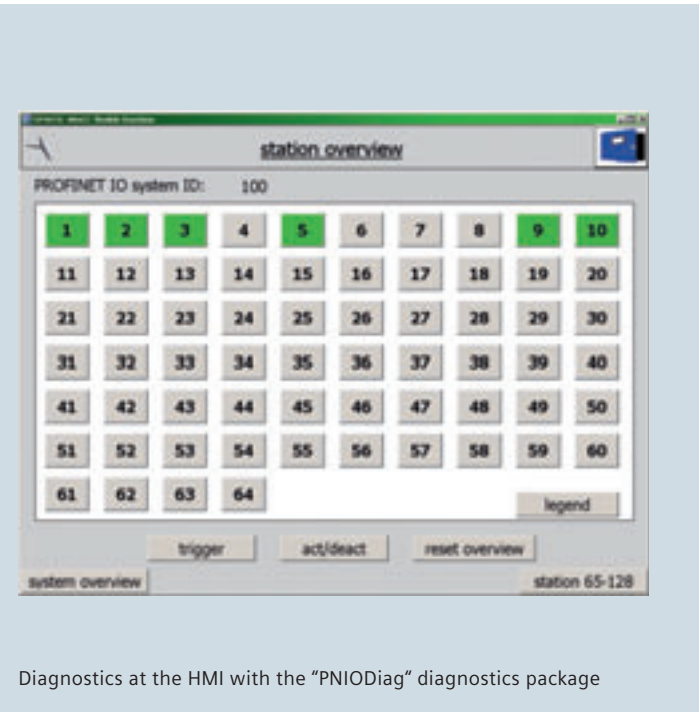
With this functionality, several SIMATIC controllers can use the same PROFINET IO device, resulting in a simple and economical system configuration. This is true for applications in which the standard CPU runs separately from the fail-safe CPU, for example.

Fewer remote devices have to be installed in the field, as a complete "remote head" can be addressed by different CPUs. In addition, channels and modules can be flexibly assigned.

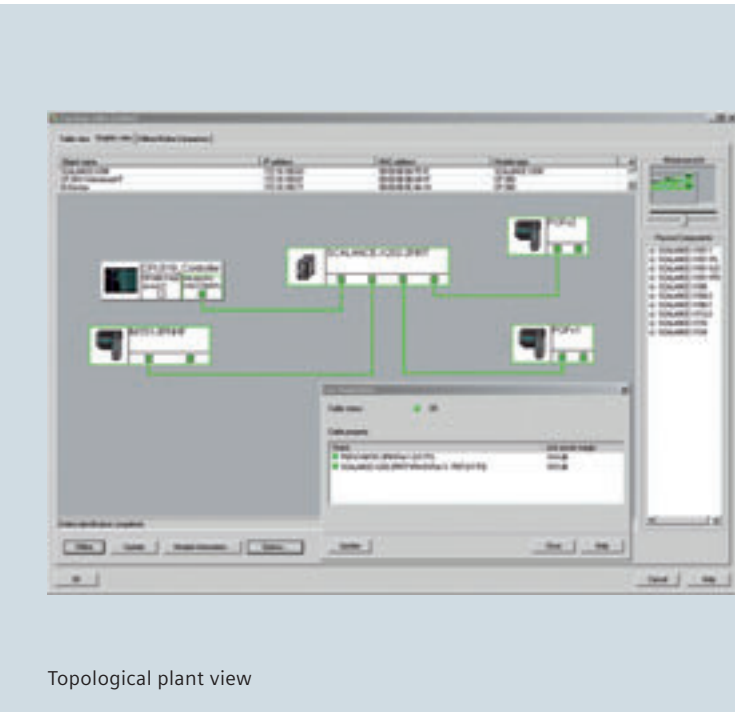
Media Redundancy Protocol (MRP)

Greater plant availability can be achieved with a redundant installation (ring topology). Media redundancy can be created on the one hand with the help of switches, and on the other hand directly by means of integrated PROFINET interfaces to SIMATIC controllers and distributed IOs. Thanks to the MRP, reconfiguration times of just 200 ms can be achieved. In the event of a break in communication in just one part of the ring installation this means that a plant standstill is prevented and necessary maintenance and repair work can be performed without the pressure of deadlines.

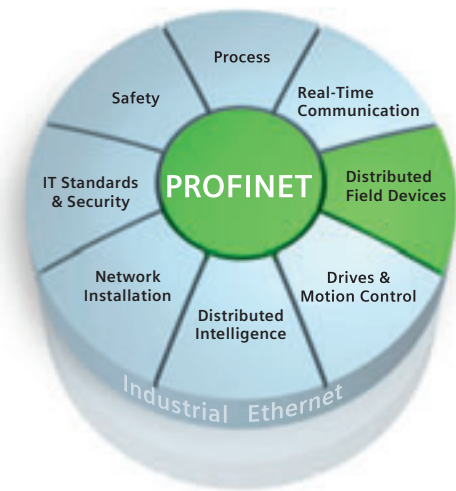
Distributed field devices



Diagnostics at the HMI with the “PNIODiag” diagnostics package



Topological plant view



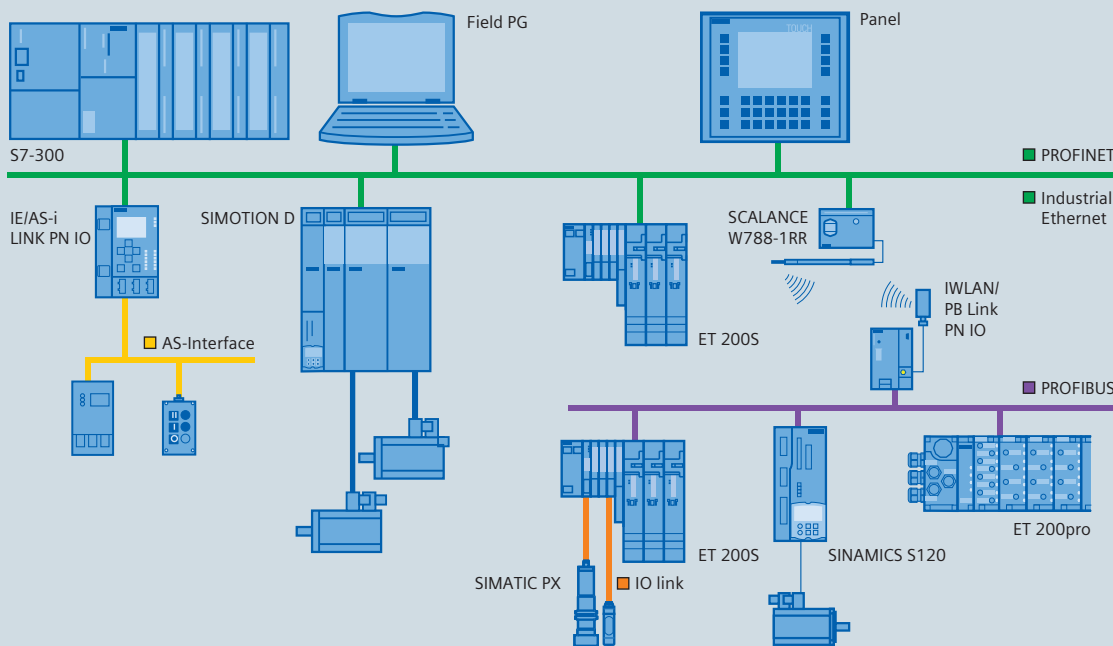
Diagnostics

PROFINET IO supports a consistent diagnostics concept for the efficient location and repair of possible faults down to single channel. If a fault occurs, the defective IO device sends a diagnostic interrupt to the IO controller which responds by calling a corresponding program routine in the user program. Alternatively, the diagnostics information can be read directly from the IO device and displayed. An acknowledgement mechanism ensures that sequential fault processing is possible.

Network technology such as switches is also integrated into this system solution. To simplify the diagnostic evaluation of distributed IO modules in conjunction with SIMATIC S7, Siemens offers the PNIODiag visual diagnostics package, available for download free of charge on the Internet: www.siemens.com/automation/service&support. This integral functionality offers advantages during the engineering and commissioning phases and while the plant is operating.

Topological plant view for greater transparency

For PROFINET networks, the Topology Editor in the engineering tool gives you the option of displaying the port interconnections of the devices in a simple graphical format. The editor is started by double-clicking on the corresponding PROFINET segment in HW-Config or by a direct program call. The communicating ports are identified by means of an off-line/online comparison and represented in a table or diagram. A simple view of the topology is also available in the web view of the SIMATIC S7 controller. By identifying, mapping and monitoring the physical connections between devices on PROFINET IO, even complex networks can be monitored more easily. In addition, the Topology Editor provides a detailed diagnosis of all components currently operating and supports the plant documentation.



Integration of PROFIBUS and AS-Interface via proxies



No PG or removable medium required for device replacements

The above-mentioned topology information can be used to replace a faulty device by specifying a desired topology or determining it directly online. If a failed device is exchanged, its replacement must be installed in the same position with the same port wiring. The device can then be automatically enabled for productive communication by the IO controller based on the available information.

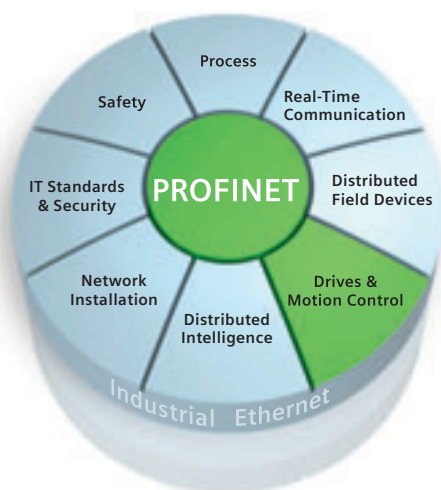
Integration of fieldbuses

PROFINET supports the integration of existing PROFIBUS networks and other fieldbus systems such as AS-Interface. This allows mixed systems to be set up consisting of fieldbus-based and Ethernet-based subsystems, as well as a step-by-step conversion to PROFINET. The proxy concept simplifies the integration of existing fieldbus systems while ensuring a high degree of transparency. The proxy on the Ethernet represents one or more fieldbus devices (e.g. on the PROFIBUS). It provides transparent transfer of communication

between networks (no tunneling of the protocols) and passes, for example, the cyclic data on to the fieldbus devices.

As a PROFIBUS master, the proxy coordinates data exchange between the PROFIBUS stations. At the same time, it is itself an Ethernet station with PROFINET communication. Proxies can be implemented as controllers or pure routers. The same principle is used for integrating AS-Interface systems. In addition to hardwired proxies on the Industrial Ethernet, SIMATIC NET also offers proxies with an Industrial Wireless LAN connection.

PROFINET also simplifies the integration of IO link. The innovative actuator-sensor interface is the new communication standard. The devices are connected via a master with integrated IO link ports.



Drives & Motion Control

PROFINET connects drives

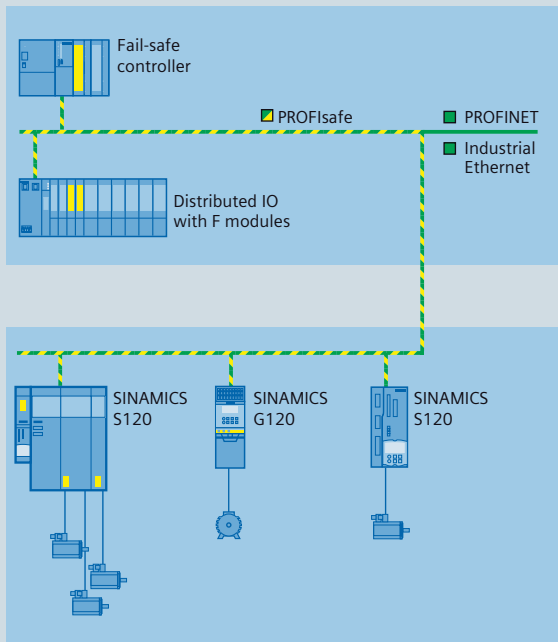
From a basic single drive to coordinated drives to multi-axis and motion control drives for demanding tasks: SINAMICS drives with PROFINET are suitable for every industry – and thanks to their high degree of flexibility and scalability they are the perfect answer for the ever increasing diversity of versions in machine and plant construction. Their seamless integration in Totally Integrated Automation provides users with countless benefits throughout the entire life cycle – from configuration and commissioning to maintenance and expansion. Just some of these benefits are: diagnostics from any location without the need for additional programming, less time and cost when replacing devices, and standardized engineering for the controller, the human-machine interface (HMI) and the drives.

PROFINET minimizes the amount of cabling required. Whether control, operation, remote access for diagnostics and service, parameter assignment and com-

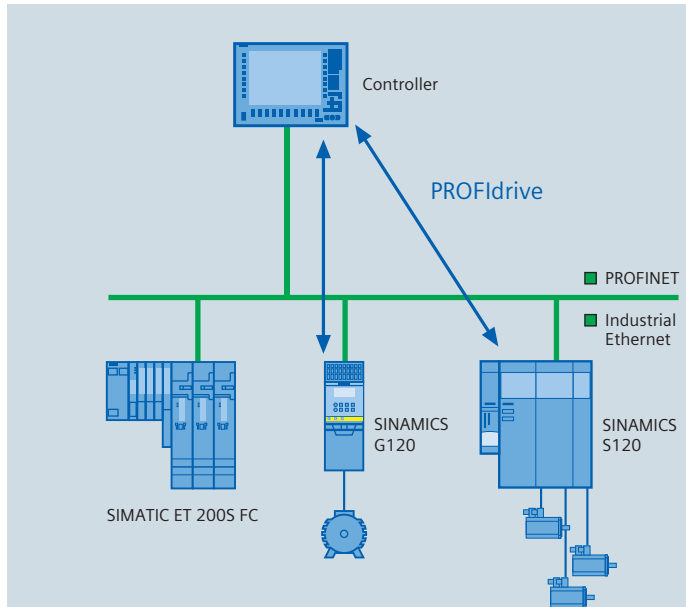
missioning, or safety-related applications: every task can be performed over one cable that also enables process values to be integrated in MES and ERP systems. The resulting benefits are huge, for instance where power management and preventive maintenance are concerned.

What is more, PROFINET permits wireless communication on the basis of common WLAN standards. This means that moving drive solutions such as overhead conveyors or automated guided vehicle systems can be implemented easily and efficiently, also in combination with integrated safety engineering via PROFIsafe.

PROFINET drive technology enables users to participate in future innovations and benefit at the same time from the time-proven advantages that characterize drives with PROFIBUS – and these advantages have been consistently transferred to and continued with PROFINET. This also applies to the standards PROFIdrive, PROFIsafe and in future also PROFInergy.



Integrated safety for drives



PROFINET also uses PROFIdrive, the proven application profile between controller and device.

More safety with PROFINET and safe drives

Electrically driven assemblies and machine components often pose a huge potential risk which is why safety functions are increasingly being integrated in modern drives. Using drives with integrated safety engineering therefore means that previously required electro-mechanical components and their associated wiring can be omitted. On SINAMICS converters safety-related signals are transferred with PROFINET and PROFIsafe. This reduces the complexity and overhead of the wiring and greatly simplifies the implementation of safety concepts which, in terms of their functionality and performance, are considerably more powerful. What is more, the certified integrated safety functions not only simplify the verification of the safety category required for a machine, they also prevent subsequent manipulation of an accepted system.

The international, standardized drive interface

PROFIdrive is the vendor-independent interface between the controller and the drive specified by the PI user organization. This future-proof standard that has been laid down in IEC 61800-7 defines the device behavior and access procedure to drive data for electrical drives with PROFIBUS and PROFINET, from simple frequency converters to high-performance servo controllers. PROFIdrive has already been fully implemented in our SINAMICS converters and in our SIMATIC, SIMOTION and SINUMERIK control systems. PROFINET users that already operate drives on PROFIBUS benefit from PROFIdrive as the user program does not have to be changed when switching from PROFIBUS to PROFINET. The internationally recognized profile is extremely flexible: it permits the cross-vendor use of drives while parameterized interfaces and technology blocks can continue to be used.

Drives with profile – standardized for every application

The PROFIdrive profile defines different classes to which most drive applications can be attributed: for the connection of standard drives for pumps, fans and compressors and for motion control drives with distributed motion control intelligence integrated in the drive. PROFIdrive also harmonizes perfectly with PROFIsafe and PROFInergy. The advantages are: no overhead for additional safe communication and wiring and the use of energy-efficient states in the drives.

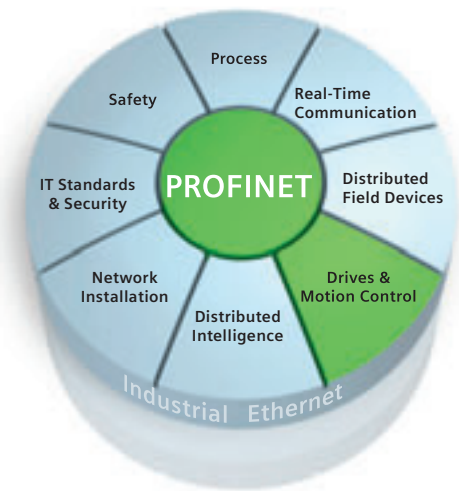


Cycle time	1ms	500 μ s	250 μ s
Number of stations*	272	128	56
Jitter	< 1 μ s	< 1 μ s	< 1 μ s
Reserves for open communication with IT standard protocols	50%	50%	50%

* Number of devices with 40 byte input data and 40 byte output data each on one controller with 4 ports. The limits of a specific controller regarding IO range, cycle time and number of stations must be taken into consideration.

Whether the automation architecture is distributed or centralized: PROFINET enables a significant increase in performance.

Packed with ingenious details – ready to handle any challenge.



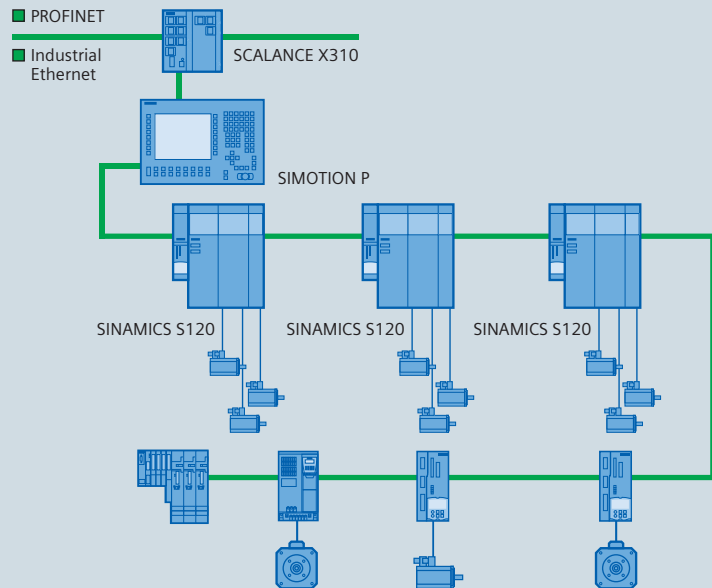
Maximum performance – irrespective of the automation architecture

PROFINET even significantly surpasses the already large quantity structures for PROFIBUS. In principle, there is no restriction on the number of nodes, a message frame can transport up to 1440 bytes of process data, and data sets can even be up to four gigabytes. This means for instance that images of a product to be machined can be transferred to the image processing system that then calculates the cam for the motion from the contour of the product. In the foreseeable future the performance capacities of PROFINET are more than adequate, which is impressively proved by the following example: for the closed-loop control of hydraulic axes cycle times of 250 μ s can be achieved – with unrestricted openness for IT communication.

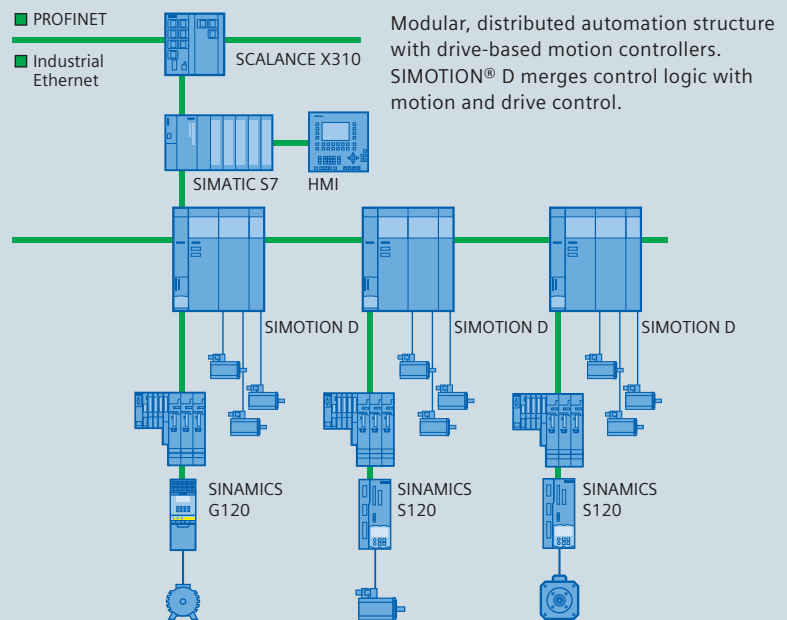
Universal for all automation concepts

In modular systems PROFINET permits isochronous communication between the controllers in the isochronous channel. This enables, for instance, applications with distributed synchronous operation to be easily implemented. PROFINET can be used uniformly for all automation structures, as distributed automation solutions with modular automation components can be supported in the same way as central architectures with a centralized controller.

Flexible topologies and the resulting best possible adaptation to the system or machine are supported by the switch technology integrated in the PROFINET devices. The technology also allows switching from one media to another.



Central automation structure with line topology and integrated switches in the devices



Modular, distributed automation structure with drive-based motion controllers. SIMOTION® D merges control logic with motion and drive control.

Deterministics of Motion Control

To assure the necessary deterministics in communication for Motion Control applications, the set points and actual values must be exchanged at fixed intervals (isochronously), so that dynamic control loops are closed via the bus. High-quality isochronous communication is only possible if all the stations in a network, including the network nodes, are exactly synchronized – especially if a large number of components are cascaded. PROFINET's IRT mechanism achieves this by measuring all the time parameters in the controlled system precisely, so that all switches are absolutely synchronous with the start of the cycle – and jitter is reduced to less than a microsecond.

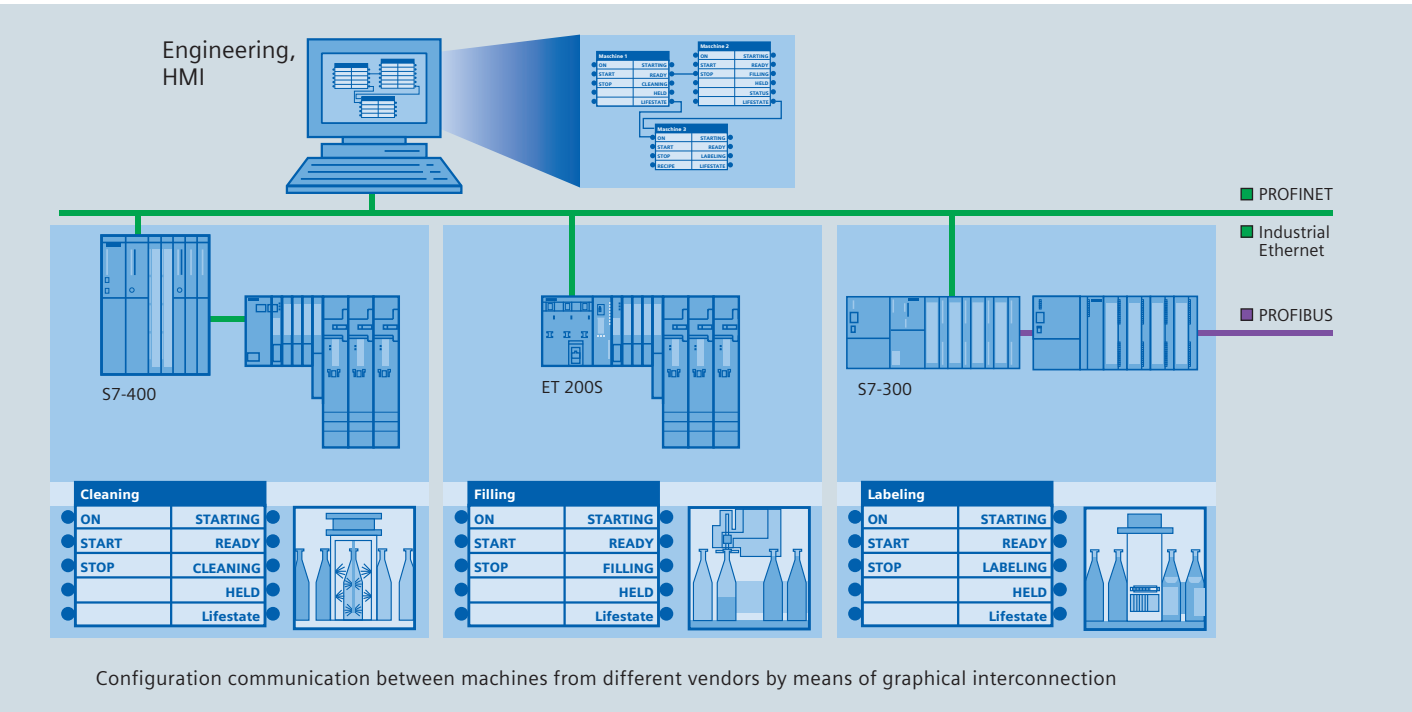
Isochronous communication cycle – PROFINET with IRT

When making an electronic shaft, for instance, it is necessary to synchronize a large number of servo drives. PROFINET with IRT splits the communication cycle into several chronologically arranged intervals. Part of the cycle is reserved for isochronous real-time communication (IRT). The IRT telegrams are implicitly determined and the corresponding configuration data generated when the application is designed. The optimal chronological order of the individual telegrams is calculated for each network section using a special algorithm. This information is used to specify which telegram must be received by which station and when – as well as the station to which it must be forwarded separately – for each switch. Each telegram is transmitted without a delay thanks to this optimized cut-through method.

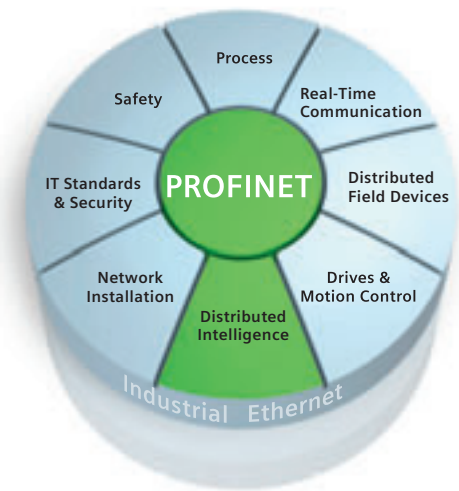
Added flexibility through modular and mechatronic machine concepts

The idea behind modular machine concepts is as simple as it is efficient: to use just a small number of standardized modules that can be adapted to specific requirements with minimal overhead. Taking these modules as a basis, you can then create a whole series of customized machine versions. This has the advantage that the machines can be commissioned much faster, while the plant as a whole is more flexible. In contrast to rigid mechanical components, mechatronic concepts enable machines to be upgraded simply by reparameterizing the software – without having to modify or replace the mechanics. Distributed motion controllers are increasingly integrated in powerful networks.

Distributed intelligence

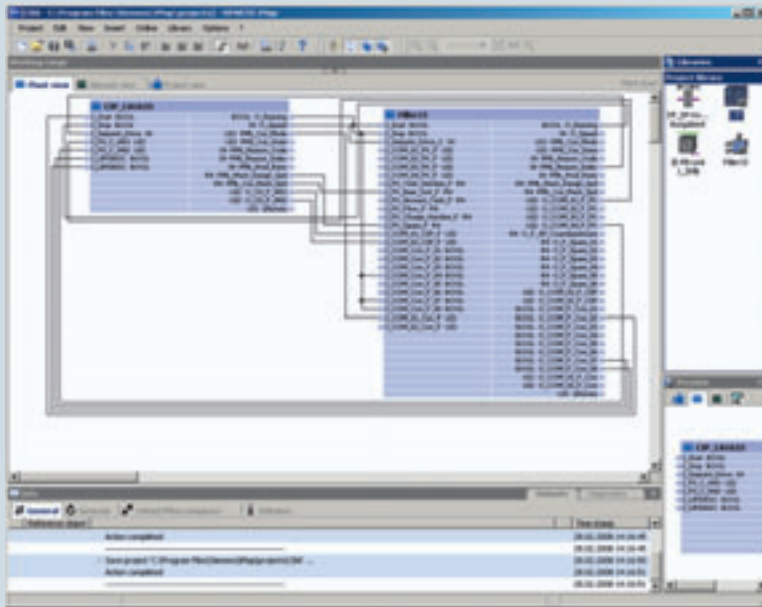


Distributed intelligence with Component Based Automation



PROFIBUS & PROFINET International have defined a standard for implementing modular plant structures: PROFINET CBA (Component Based Automation). Positive experiences have already been made in machine and plant engineering: parts that are needed more often are pre-fabricated and can be easily assembled into an individual unit upon receipt of an order. PROFINET CBA enables modularization to be expanded to the plant's automation technology with the help of software components. The standardized engineering model differentiates between programming the controller logic of the individual intelligent modules, generating components and configuring the entire plant by interconnecting the components.

Flexible software components
Software components consist of encapsulated, reusable software functions. This can include technological functions such as controllers just as well as the user program of an entire machine. Like modules, they may be flexibly combined and easily reused, independent of how they are programmed internally. Software components communicate exclusively via component interfaces. Only the variables required to interact with other components are accessible externally on these interfaces.



Simple graphical configuring of communications with SIMATIC iMap

Clear arguments in favor of Component Based Automation:

- Shortened commissioning phase – initial start-up of various technological units can take place simultaneously
- Reliable planning – brief commissioning that can be planned creates reliability for the next operating phase
- Increased flexibility – easy adaptation and expansion of plants
- Easy configuration of machine-to-machine communication

Programming the control logic and component generation

Mechanical or plant engineers generate the components, and they use the relevant vendor-specific tool to program and configure the device, which is STEP 7 in the SIMATIC world. Then the user software is packaged in the form of a PROFINET component. The software must have the associated function for this. This is applicable in STEP 7. During the “packaging,” a PROFINET Component Description (PCD) is generated and imported into the library of the interconnection editor. With SIMATIC iMap, Siemens has launched the first vendor-independent interconnection editor for PROFINET CBA on the market.

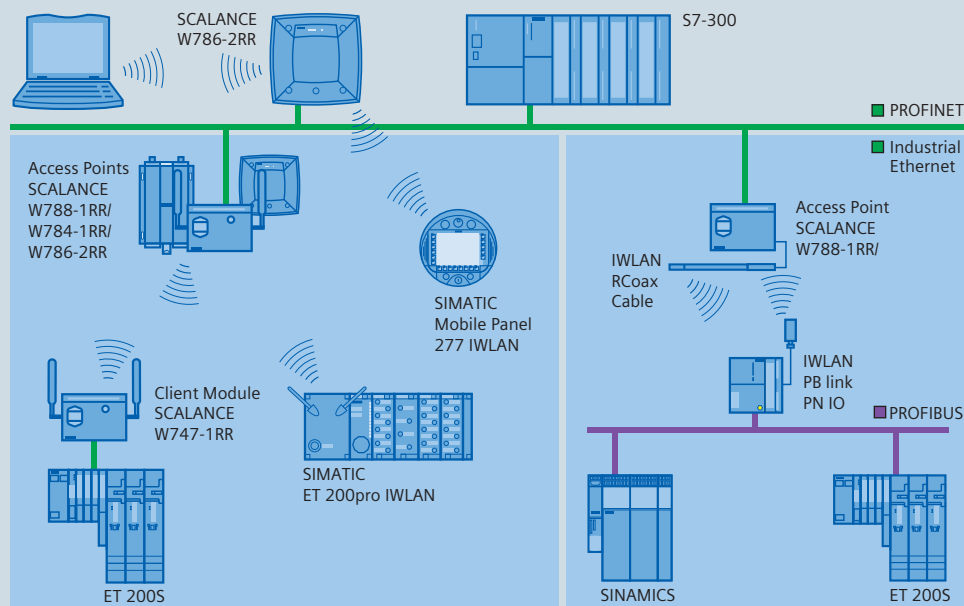
Component interconnection with SIMATIC iMap

The generated PROFINET components are connected into an application using SIMATIC iMap by means of simple graphic configuration. Thus, complex programming of communication links is a thing of the past. SIMATIC iMap combines the distributed applications throughout the plant, and interconnects PROFINET components from any vendors. The communication links between components are established in this manner. Detailed knowledge concerning integration and execution of communication functions in the device is not required.

Integration of fieldbus applications

PROFINET CBA enables a complete fieldbus application to be mapped as a PROFINET component. This is always important if an existing plant is to be expanded by PROFINET. It is irrelevant which fieldbus was used to automate the subsystem. To permit communication between the existing plant and PROFINET, the master of the fieldbus application to be integrated must be PROFINET-capable. Existing SIMATIC S7-300, S7-400 or SINUMERIK 840D powerline controllers can be expanded with the PROFINET functionality using communications processors. Therefore, the existing fieldbus mechanisms (e.g. PROFIBUS DP) are used within the components – and outside the PROFINET mechanisms. This migration facility protects the investments made in existing plants to a high degree.

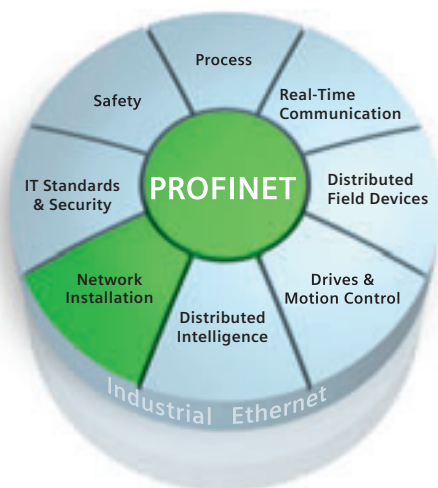
Network installation



Various options for the application of wireless communication



Network installation



The international standard ISO/IEC 11801 as well as its European equivalent EN 50173 define an application-independent, standard IT network for the office world. Since the requirements for a network in an industrial environment are higher than in the office world, the PROFINET guideline "Cabling and Interconnection Technology" specifies the passive infrastructure within and between automation cells for Fast Ethernet with PROFINET:

- Plugs and cables for copper and fiber-optic data networks
- Plugs for 24 V power supply
- Plugs for 400 V power supply

It also specifies the corresponding test and examination conditions for the individual components.

Set specifications for all passive components required for a PROFINET network make it possible to ensure perfect interaction between the individual passive components.

Switching technology

PROFINET is based on 100 Mbit/s switching technology. In contrast to other processes, switching technology allows all stations to transmit at any time. There is always an open point-to-point link to the next switch. This is even possible in both directions (sending and receiving) simultaneously, and therefore it has a bandwidth of 200 Mbit/s. The advantage: stations or network areas which do not need the message frame do not receive it, resulting in reduced load.

Network topologies

Network topologies are configured according to the requirements of the equipment to be networked. The most frequent structures include star, linear, tree and ring topologies. A plant usually includes mixed structures. They can be implemented using copper or fiber-optic (FO) cables. With the FastConnect system you can assemble both copper and glass fiber-optic cables yourself.

Plastic fiber-optic cables such as polymer optical fibers (POF) or polymer clad fibers (PCF) are an easy, do-it-yourself alternative for short distances. Industrial Ethernet switches and media converters, as well as distributed field devices with integral POF/PCF interfaces are available for PROFINET.



Star

A characteristic of the star structure is a central switch with individual connections to all data terminals in the network. Applications for star topologies include areas with high device density and short distances, for example, small production cells or a single production machine.

Tree

The tree structure results from the connection of several stars in one network, possibly with mixing of FO and twisted pair cabling. This structure is used when dividing complex plants into subsystems.

Linear

A linear structure can be implemented by a switch close to the data terminal to be connected, or by a switch integrated in the data terminal. A linear structure is preferably used in plants with an extensive configuration, for example, conveyor systems, and to connect production cells.

Ring

If the two ends of a line are brought together by an additional connection, a ring structure is created. This is used in plants with high availability requirements to provide protection in the event of a cable break or the failure of a network component. This media redundancy is made possible by implementing the media redundancy protocol (MRP) in controllers, devices and network components and guarantees reconfiguration times of 200 ms.

Wireless communication

Apart from the network topologies mentioned above, PROFINET also supports wireless communication using Industrial Wireless LAN (IWLAN). This means that technologies that are by nature prone to wear – such as contact wires – can be replaced. It also enables automated guided vehicle systems or mobile operating or maintenance devices to be used. Further advantages of these innovative technologies include significantly greater mobility and flexibility in production. The SCALANCE W IWLAN products are based on the current WLAN standards (IEEE 802.11) and are characterized by their rugged design (IP30 or IP65) and integration into STEP 7 (PROFINET diagnostics). Moreover, they offer numerous industrial features (iFeatures) to meet the demands of

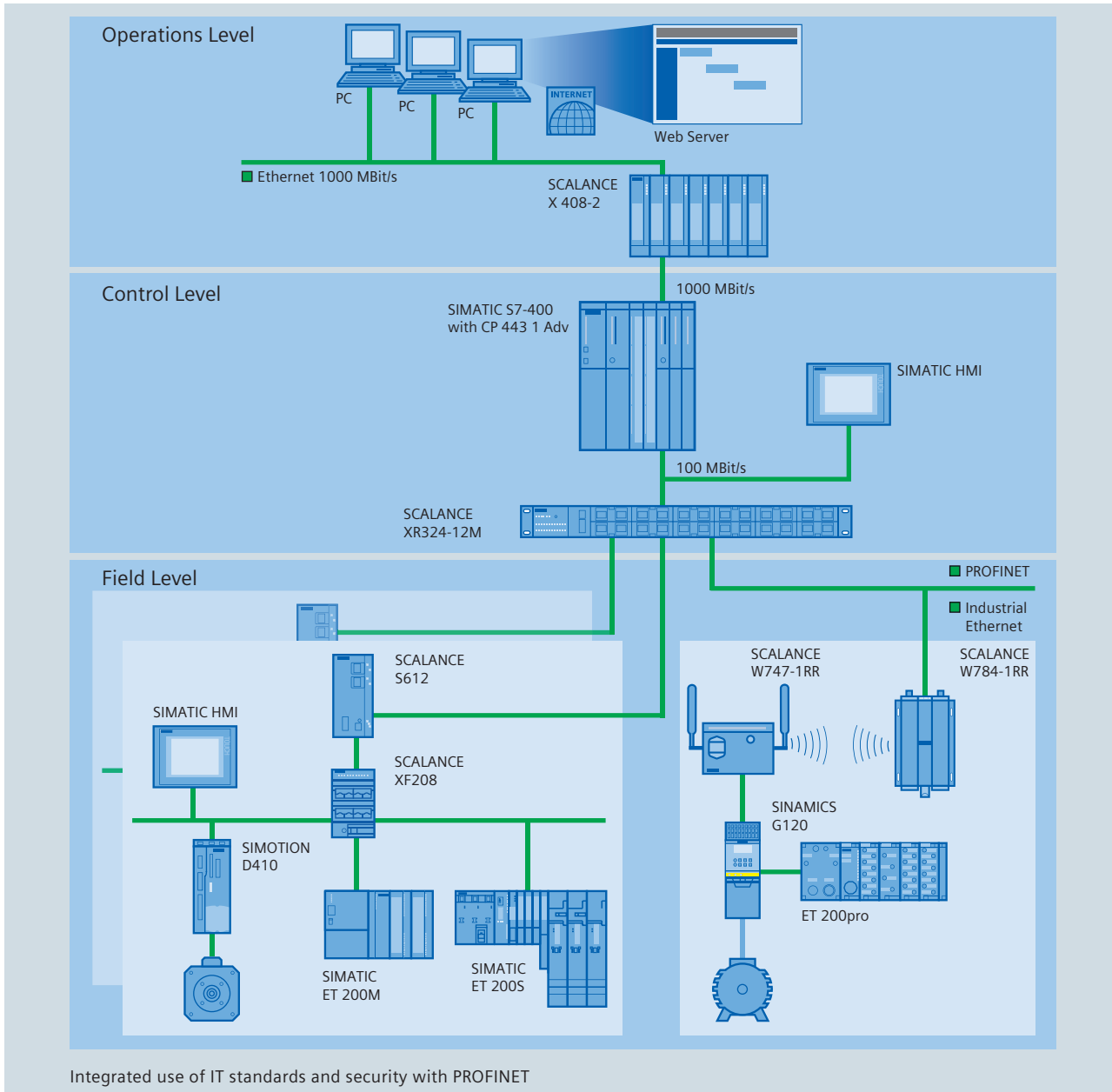
industrial communication and to facilitate deterministic PROFINET communication even on a wireless basis.

iPCF and iPCF-MC

The iPCF (industrial Point Coordination Function) iFeature also permits the use of IWLAN for deterministic PROFINET IO communication with multiple nodes and with very fast update times (16 ms). Rapid roaming (RR) is also possible, ensuring uninterrupted communication when roaming between radio cells. iPCF-MC also makes PROFINET IO communication possible on paths that have not been predefined, and is suitable for mobile panel applications. PROFIsafe functionality (especially Emergency Off) is provided wireless at any point in space via IWLAN and iPCF-MC.

RCoax Cable

The RCoax Cable is a radiating cable which serves as a special antenna for the SCALANCE W access points in sophisticated radio systems. It is designed such that a reliable radio hop is available along the RCoax Cable. This means that the radiating cables are perfectly suited to applications in sophisticated radio systems and any type of rail-guided vehicles.

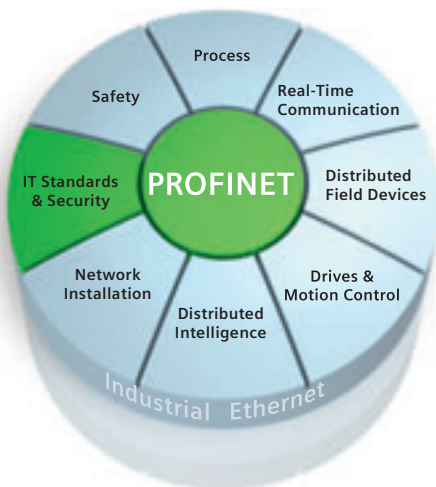


IT standards & security

Based on Industrial Ethernet, PROFINET offers not only scalable real-time communication but also standard TCP/IP communication according to IEEE 802.3 – with not even the slightest compromise. It provides the foundation for end-to-end horizontal and vertical networking, either wired or wireless. Trendsetting functions and established IT standards for network management and diagnostics, web services, security, and higher-level gigabit network connections are supported by PROFINET without any restrictions.

Network management

Compared to fieldbuses, Ethernet offers additional opportunities for network management in association with TCP/IP and UDP/IP. Components of integral network management include the network infrastructure, IP management, network diagnostics and time synchronization aspects. Using network management, the administration and management of Ethernet is simplified by using standard protocols from the IT world.





Diagnostics management

Reliable network operation is the top priority of network management. In existing networks, the Simple Network Management Protocol (SNMP) has asserted itself as the de facto standard for the maintenance and monitoring of network components and their functions. SNMP permits both read access (monitoring, diagnostics) and write access (administration) to a device.

Web services

PROFINET devices can also be accessed using web clients – independently of specific platforms and with standardized tools (browsers such as Netscape, MS Internet Explorer, Opera, or Firefox). This takes place based on standard protocols and languages from the Internet sector such as HTTP, XML, or HTML. Web server integration additionally enables easy and remote access to the diagnostic data of the modules and provides user-friendly support, particularly during testing, commissioning, diagnostics, and maintenance. In addition, the standard web pages can be supplemented with application-specific pages.

Industrial Security

The penetration of Ethernet networks right down to the field level enables integrated networking of all automation levels – as well as direct interfacing to office networks and the Internet.

The result is a wide array of advantages and possibilities. However, this also means that production networks are exposed to the same hazards as office networks – namely failed accesses (internal) or malicious attack (external). Even a brief failure or a minor malfunction could bring production to a halt and cause massive damage.

The automation technology therefore requires a security concept that can reliably protect production networks and automation components – and is perfectly tailored to their specific needs. The PROFINET Security Guideline issued by PROFIBUS & PROFINET International (www.profinet.com) outlines requirements and solution concepts for data and access protection in an industrial environment. These concepts include:

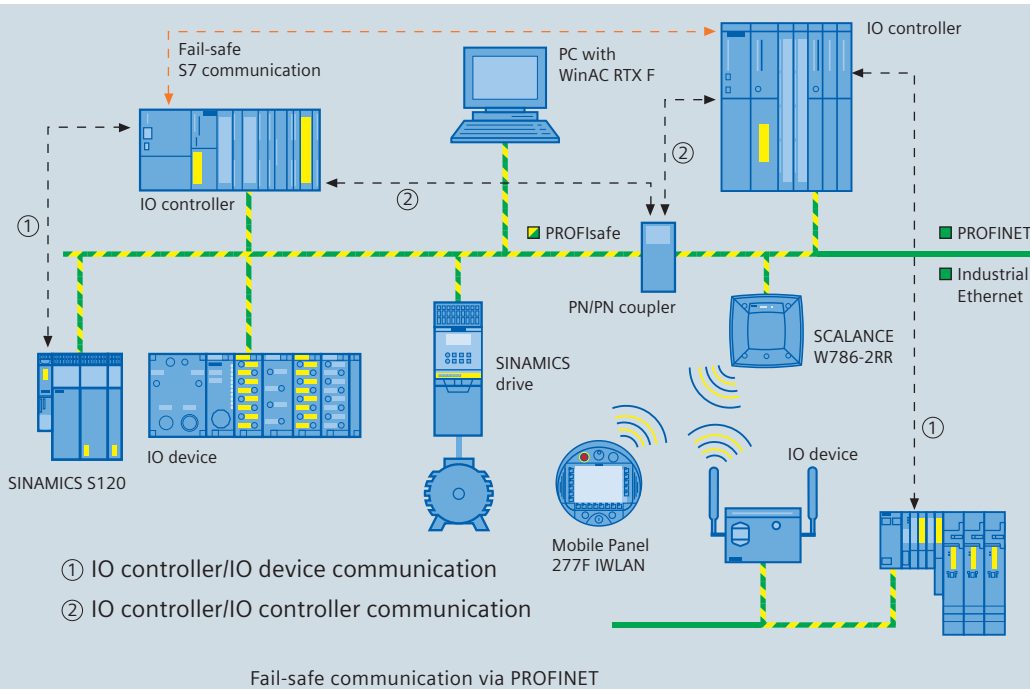
- Access protection for automation cells (cell protection concept)
- Protection from espionage and manipulation
- Secure remote access over unsafe networks.

These security goals can be achieved with PROFINET Security components such as SCALANCE S. Industrial Security meets all the requirements of IEEE 802.11i regarding wireless communications.

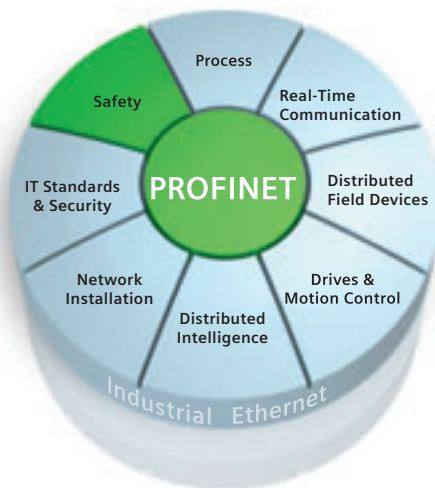
Therefore, these components can be used anywhere high security requirements are called for. This applies to both standard and fail-safe communications via PRO-Flsafe profile.

Gigabit networks

Whereas at the field level short response times and small data message frames are top priorities, the control level and other higher-level network levels are characterized by a steadily growing need for high data throughputs owing to the rapid increase in the number of stations and the use of more data-intensive systems such as HMI, SCADA, and VISION. As a result of this, and the progressive convergence of the operations level with the automation environment, gigabit networks have to be directly and transparently connected from the operations level to the field level. In addition to the gigabit-capable network infrastructure, gigabit-capable system connections for PCs or SIMATIC S7-300/400 are also available for connecting higher-level gigabit networks to PROFINET.



Safety



PROFINET uses the PROFIsafe profile for safety-related communication. PROFIsafe is the first communication standard based on the safety standard IEC 61508 which allows standard and safety-related communication on the same bus cable. The advantages include considerably lower cabling overhead and fewer parts. By using the PROFIsafe profile, which has been tried and tested with PROFIBUS, in PROFINET as well, plant expansions are easily possible.

Open standard

PROFIsafe is the first TÜV-certified profile for fail-safe communication with standard Ethernet. This even permits wireless communication in fail-safe applications with Industrial Wireless LAN.

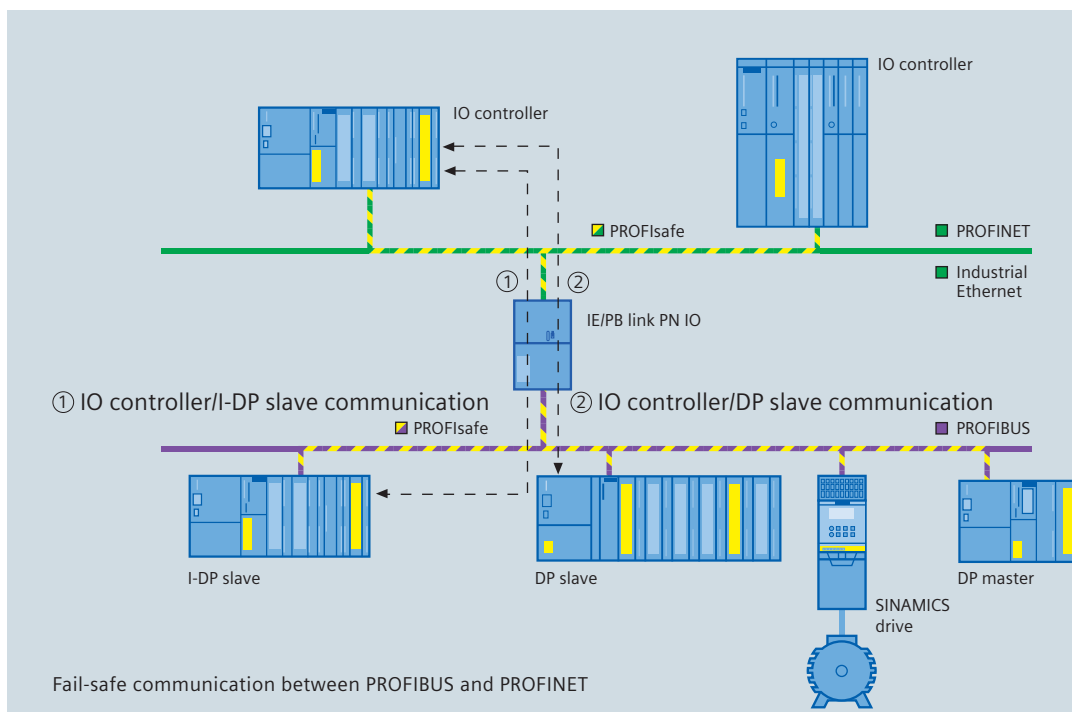
PROFIsafe is an open solution for safety-related communication via standard fieldbuses. In the context of PROFIBUS & PROFINET International, many manufacturers of safety components and end users of safety technology participated in the creation of this open, vendor-independent standard.

As a part of Safety Integrated, PROFIsafe is certified according to IEC 61508 (up to SIL 3), IEC 62061 (up to SIL 3), EN ISO 13849-1:2006 (up to PL e), EN 954 (up to Category 4), NFPA 79-2002, and NFPA 85 as well as for use up to SIL 3 according to EN 62061. It thus meets the extremely exacting requirements of the manufacturing and process industries.

Protection against potential faults

PROFIsafe uses the PROFINET real-time communications (RT or IRT) for fail-safe communication. In addition to user data, status and control information is also exchanged between a fail-safe CPU and a fail-safe field device or drive. No additional hardware is required.

Various potential sources of error exist when transmitting messages, such as invalid addresses, loss, delay, etc. PROFIsafe counteracts these with four special measures:



- Continuous sequential numbering of the PROFIsafe data
- Time monitoring
- Authenticity monitoring using passwords
- Optimized cyclic redundancy check (CRC) security

Existing solutions can be supplemented without changing the cabling.

PROFINET offers the following possibilities for fail-safe communication:

- Communication between IO controllers across subnet work boundaries – for example, between fail-safe CPUs via PN/PN coupler.
- Communication between IO controllers and IO devices in the same subnetwork (even wireless) – for example, fail-safe CPU and the SIMATIC ET 200 distributed I/O with fail-safe modules or directly with frequency converters.
- Support of fail-safe communication via wireless LAN. Cost-effective connection to devices which are remote, difficult to access or in hostile environments.

PC-based applications and drive solutions now also for safety solutions

With the new WinAC RTX F fail-safe SIMATIC S7 software controller, both fail-safe controller and PC applications run on a shared platform. This enables fail-safe and standard systems to be installed on any x86 PC or pre-installed SIMATIC Embedded Automation products to be used. Not only the software controller, but also the Embedded Automation versions contain an integrated PROFINET interface for the fail-safe connection of distributed field devices.

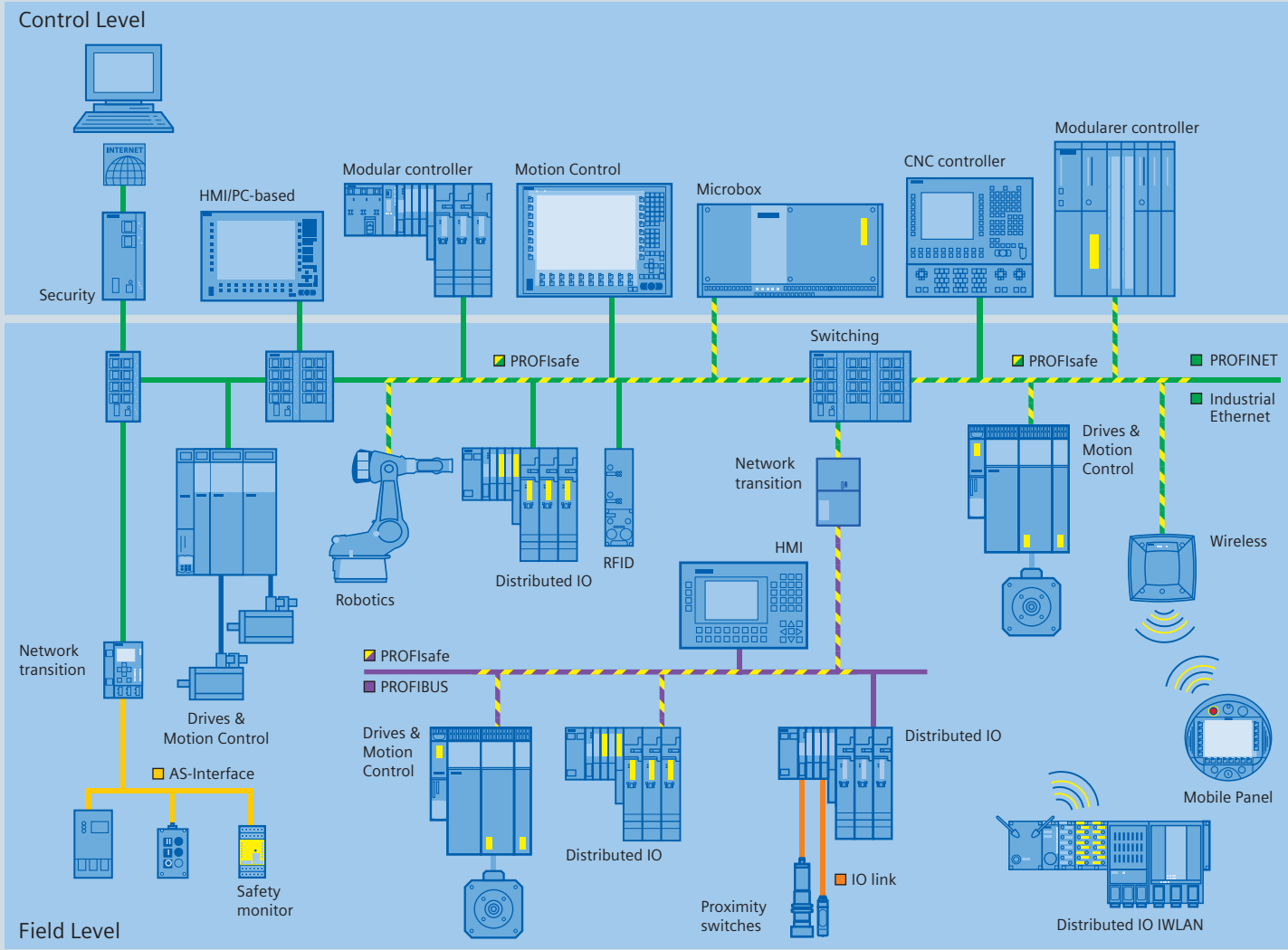
All safety-related functions of the SINAMICS and SIMATIC drives can be activated via PROFIsafe with PROFINET (for example, Safe Torque Off, Safely Limited Speed).

Network transitions enable fail-safe communication between PROFIBUS and PROFINET:

- Communication between IO controller and DP slave across network boundaries – for example, between fail-safe CPU and the SIMATIC ET 200 distributed I/O with fail-safe modules via IE/PB link PN IO or IWLAN/PB link PN IO.
- Master/slave communication between IO controller and intelligent DP slave across network boundaries – for example, between fail-safe CPUs via IE/PB link PN IO or IWLAN/PB link PN IO

Siemens offers an extensive range of products for PROFINET which includes the SIMATIC, SIMOTION and SINUMERIK automation systems as well as PCs and workstations. Distributed field devices from the SIMATIC ET 200 as well as SINAMICS and SIMATIC frequency converters can be directly connected to PROFINET. Existing PROFIBUS devices can also be integrated into a PROFINET solution. The product range is rounded off by a comprehensive range of active and passive network components, security products for the creation of secure Industrial Ethernet networks, and the option of wireless communication with Industrial Wireless LAN.

Products that make your PROFINET applications easier.



Automation systems

Controllers



Product families

SIMATIC S7-1200

Brief description

Using tried and tested TCP/IP standards, the integrated PROFINET interface in SIMATIC S7-1200 can be used for programming as well as communicating with HMI devices and other controllers. In future it will be possible to link distributed field devices with SIMATIC S7-1200 via PROFINET. In addition, the controller will be able to function both as a PROFINET IO device and as a PROFINET IO controller.



SIMATIC S7-300

Modular controllers for system solutions in production automation in the low-end to mid-performance range, with optional fail-safe functionality.



SIMATIC S7-400

Modular controllers for system solutions in production and process automation for the mid- to high-end performance ranges with optional fail-safe functionality.



Systemanschluss für SIMATIC S7 and SINUMERIK

Multiprotocol-enabled communications processors for directly connecting SIMATIC S7-400, S7-300 and/or SINUMERIK 840D powerline to PROFINET/Industrial Ethernet. They relieve the controller CPU of communications tasks, are multiprotocol-enabled, and facilitate vertical integration.

Industrial PCs



Product families

SIMATIC Box PCs

Brief description

SIMATIC Box PCs are particularly rugged and reliable industrial PCs in a compact design for universal installation in machines, control housings and cabinets. They are characterized by their high performance and minimal space requirements, as well as their modular design and ease of servicing. They all feature PROFINET onboard as well as an integrated 3-port switch for the construction of line and tree topologies.



SIMATIC Panel PCs

Rugged industrial PCs with displays in different sizes and performance classes – for machine-level operator control and monitoring in harsh environments. Operator control via keys or touch displays. Configurable with numerous options, e.g. PROFINET connection. Open for further tasks such as open-loop control, closed-loop control, data processing, and motion control. Turnkey systems with pre-installed software for visualization, control (optionally fail-safe), and process visualization are available.



Industrial monitors/Thin Clients

Rugged, durable, and in industry-standard design – choice between the two CD display families SIMATIC Flat Panel monitors or SCD monitors. SIMATIC Thin Clients are a very economical and user-friendly way of operating an operator station on-site at the machine via the network.

HMI devices



SIMATIC Panels

SIMATIC Panels for machine operation and monitoring, in various sizes and performance classes. Compact and rugged for machine-level deployment. Safe, ergonomic operation by means of touch screen and/or keys. Expandable, flexible devices for the integration of several automation tasks on one device, e.g. open-loop control with software PLC. Versatile interface options including integration into PROFINET networks.

Sensor technology

Factory sensors



Product families

Vision Sensors

Brief description

For the inspection of small parts to ensure their flawlessness, integrity or position, the VS120 vision sensor is the perfect choice. The complete packages comprise lighting, processing unit, sensor, and cables. They are installed and commissioned in no time at all. They can be operated as IO Device on PROFINET.

Identification systems



SIMATIC RFID communication modules

SIMATIC RF170C is a communication module for the connection of RFID systems to PROFINET via the SIMATIC ET 200pro distributed IO. Using the RF180C communication module, direct connection to PROFINET is possible. Read/write devices of all RFID systems can be operated on the communication modules. They all offer PROFINET onboard as well as an integrated 3-port switch for the construction of line and tree topologies.



Code reading systems

The SIMATIC VS130-2, SIMATIC MV420 and SIMATIC MV440 intelligent code reading systems for reading and verifying 1D/2D codes can be operated as IO devices on PROFINET.

Software/Engineering

Engineering tools



SIMOTION SCOUT

SIMOTION SCOUT is the engineering tool for the SIMOTION Motion Control system. PROFINET field devices are configured in the familiar way as for PROFIBUS.



SIMATIC S7-mEC

SIMATIC Embedded Controller with standard I/Os, standard PC interfaces and PC expansions. The controller integrates different functionalities such as control, visualization, PC tasks and fail-safe features in a single device.



Embedded Box PC Bundles

Embedded SIMATIC IPC427C for rail mounting (fanless and diskless) with pre-installed Windows Embedded Standard 2009, Software PLC optionally with fail-safe functionality and/or HMI.



Embedded Panel PC Bundles

Embedded Panel PC SIMATIC HMI IPC477C (fanless and diskless) with pre-installed Windows Embedded Standard 2009, Software PLC optionally with fail-safe functionality and/or HMI. Also available as fully enclosed version with IP65 degree of protection.



SIMATIC WinAC Software-PLC

SIMATIC S7 controller as a software PLC for PCs with Windows operating system and real-time expansion. The S7 software controller is also available as a fail-safe version for safety-related applications up to Cat. 4/SIL 3/PL e. The WinAC option ODK (Open Development Kit) permits the user to flexibly integrate technological functions such as measured value acquisition, numerical controls, etc. into the PLC cycle.



System connection for PG/PC software

Communication modules and software for connecting a PG/PC to PROFINET and assuring vertical integration.

Drive technology

Drives



SIMATIC Mobile Panels

Portable operator panels in various sizes and performance classes for HMI on location within sight of the workpiece or process. Ergonomic, compact and lightweight; rugged design for industrial use. Wide variety of interfaces, also as standard for PROFINET connection. Version with Safety Wireless provides safety functions (emergency stop and enabling button) at each point of a machine or plant – wireless with Industrial WLAN.



SINAMICS G120/G120D

Central (IP20 – G120) or distributed (IP65 – G120D) drive system equipped with several communication interfaces (RS485, PROFIBUS, PROFINET, CANopen, Modbus RTU). Modular design with Safety Integrated functionalities. The Efficient Infeed Technology is particularly impressive and contributes significantly to energy savings and reducing the number of components.



SINAMICS S120

Modular, flexible drive system for demanding single- and multi-axis applications with vector and servo functionality, V/f control, and positioning & Safety Integrated functions.

Connection to PROFINET via the CBE20 communication board with integrated 4-port switch (DC/AC drive).



SINAMICS G130/G150/S150/GM150/GL150/SM150

Reliable, compact, and intuitive high-performance drive systems in all voltage, power, and performance classes. SINAMICS G130/G150/GM150 and GL150 are devices for drive tasks without reverse voltage such as pumps, fans, compressors, extruders, mixers, and grinders. SINAMICS S150 and SM150 are designed for demanding drive tasks with reverse voltage such as test stands, centrifuges, hoisting gear, rolling mills, and mine winder systems.



SIRIUS M200D motor starters

The intelligent, highly versatile M200D motor starters for PROFINET start and protect motors and consumer loads up to 5.5 kW. They are available as direct or reversing starters, in mechanically or electrically switching versions – the electronic version also has a soft start function. The devices are characterized by a large number of flexibly parameterizable functions. This makes them ideal for demanding distributed drive solutions with a high degree of automation.

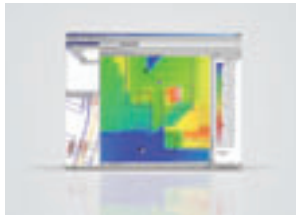
Technology

Technology components



SIMATIC iMap

SIMATIC iMap is the engineering tool for Component based Automation. It unites distributed cross-vendor applications on a plant-wide basis. Simple machine-machine communication is also possible – enabling communication to be configured instead of programmed.



SINEMA E

SINEMA E (SIMATIC Network Manager Engineering) is a software tool for the efficient planning, configuration, simulation and site surveys of industrial WLAN applications in compliance with Standard 802.11 a/b/g/h for use both indoors and outdoors. The planned and surveyed network can be fully documented.



SIMATIC STEP 7






The most widely recognized and used programming software for industrial automation in the world. Easy transition from PROFIBUS to PROFINET thanks to standardized engineering and diagnostics.








ERTEC/Development Kits for ERTEC and PROFINET IO






High-performance ASIC for the integration of PROFINET real-time communication (RT and IRT) in the ERTEC 200 version with 2-port switch and ERTEC 400 with 4-port switch.



Development Kits for the development of your own PROFINET IO devices on the basis of ERTEC and standard Ethernet controllers. PROFIsafe Starter Kit, including sample application for ERTEC 200.

	Motion Control systems			CNC systems
				
<p>SIMATIC ET 200 interface modules with CPU</p> <p>IM 151-8(F) PN/DP CPU for SIMATIC ET 200S: Discretely modular, multifunctional IO system with local intelligence in IP20 degree of protection, optionally with fail-safe functionality.</p> <p>IM 154-8(F) CPU for SIMATIC ET 200pro: Compact, multi-functional IO system with local intelligence in IP65/67 degrees of protection also available as a fail-safe version.</p>	<p>SIMOTION D</p> <p>Drive-based, flexible and scalable Motion Control system. Motion Control functionality is directly integrated into the control module of the SINAMICS S120 drive system. Connects the SIMOTION D4x5 to PROFINET via an optional CBE30 communication board with integrated 4-port switch.</p>	<p>SIMOTION C</p> <p>Motion Controller in the tried and tested design of the S7-300, particularly suitable for connecting a wide variety of drive types, enabling analog, stepper and PROFIBUS drives to be controlled. The C240 PN permits the operation of drives via its PROFIBUS and PROFINET interfaces, via which the ET 200S High Speed PROFINET IO can be connected for applications with the shortest response times.</p>	<p>SIMOTION P</p> <p>PC-based motion control system in two versions: Industrial Box PC SIMOTION P350 with Windows XP Professional operating system and Embedded PC SIMOTION P320 with pre-installed Windows Embedded Standard.</p>	<p>SINUMERIK solution line</p> <p>Drive-based, digital CNC system for the mid- to high-end performance range with integrated PROFINET interface. In combination with SINAMICS S120, the controller sets benchmarks in terms of scalability, flexibility, and openness.</p>

Industrial communication				
Industrial Ethernet switches and Media Converters	Cabling technology	Network transitions		
				
<p>SCALANCE X and Compact Switch Modules CSM</p> <p>SCALANCE X is the product family of industrial Ethernet switches and media converters for copper and fiber-optic conductors with degrees of protection IP20, IP30 and IP65. It is supplemented by the Compact Switch Modules for integrating a switch in SIMATIC. Different designs are offered (e.g. ultra-slim XF-200 and 19" rack switches XR-300) so that there is a suitable switch available for any application.</p>	<p>FastConnect for electrical and optical networks</p> <p>A comprehensive portfolio of optical transmission media is also available in addition to the copper-based FastConnect system – featuring a wide range of industrial installation cables, outlets, plugs (RJ45, M12, and push-pull), and patch cables.</p>	<p>to PROFIBUS</p> <p>Network gateways between Industrial Ethernet/PROFINET or Industrial Wireless LAN and PROFIBUS for wired and wireless connection. Configured using STEP 7.</p>	<p>to AS-Interface</p> <p>Network gateway between Industrial Ethernet or PROFINET and AS-Interface via link, controllers or PC. Configured using STEP 7.</p>	<p>PROFINET to PROFINET</p> <p>The "PN/PN coupler" is a module on PROFINET for cross-system, fast and deterministic IO data coupling between two PROFINET networks using simple means and oriented towards the functionality of the DP/DP coupler.</p>

More information:
www.siemens.com/profinet

Distributed IO				Industrial PCs
				
SIMATIC ET 200S	SIMATIC ET 200M	SIMATIC ET 200eco PN	SIMATIC ET 200pro	SIMATIC Rack PCs
Multifunctional and highly modular IO system in IP20 degree of protection. Interface modules with copper or fiber-optic connection and integrated 2-port switch. Ready for standard and/or fail-safe communication. Integrated drive technology (motor starter and frequency converter).	Modular IO system in IP20 degree of protection – the multichannel S7-300 IO. Interface module with copper connection and integrated 2-port switch.	Compact block IO for cabinetless installation directly on the machine. The modules are particularly robust, thanks to their fully sealed cast-zinc housing. The SIMATIC ET 200eco PN is also available with 8 or 16 digital inputs/outputs (also parameterizable) and as an IO link master. Two different sizes (30 x 200 mm and 60 x 175 mm) are available.	Modular, very robust and powerful IO system in IP65/67 degree of protection for cabinet-free solutions. Interface module with copper connection and integrated 2-port switch. The use of standard and/or fail-safe communication is possible, as well as wireless. Integrated drive technology (motor starter and frequency converter).	SIMATIC Rack PCs are flexible industrial PC systems in 19" format with a high level of system availability. Thanks to their low-profile design they are ideal for the implementation of high-speed computing and visualization tasks, making optimum use of the space in standard control cabinets (from 500 mm in depth). They feature a PROFINET onboard switch with 3 ports for the construction of line and tree topologies.

Industrial Security				
				
SCALANCE S and Software Security	SCALANCE W-780 Access Points	SCALANCE W-740 Client Modules	Wireless Devices	Radiating cables
SCALANCE S security modules specially developed for industrial automation: firewall protects from unauthorized access, VPN (virtual private network) for secure authentication and encrypted data transmission, remote access possible (e.g. over the Internet via DSL). The SOFTNET Security Client provides secure access for PCs/ notebooks to automation devices protected by SCALANCE S.	Reliable, rugged and secure Industrial Wireless LAN access points for tough industrial use, supporting numerous industrial features (iFeatures) in addition to the WLAN standards compliant with IEEE 802.11. Facilitate wireless, deterministic PROFINET IO communication, even for safety-oriented applications.	SCALANCE W-740 Client Modules are ideal for connecting stations with a PROFINET/Industrial Ethernet port (such as ET 200S), which are intended for integration into IWLAN wireless networks and a PROFINET environment.	By combining industry-standard wireless devices with SCALANCE W Access Points, IWLAN becomes the IWLAN solution from Siemens Industry.	Radiating cables are special antennas for SCALANCE W access points in demanding wireless environments.



Strohtmann – Germany

Challenge

The Westfalian company W. Strohtmann GmbH supplied the basis for retrofitting a transfer press line for a modern automobile manufacturing plant operated by Chery Automobile in Wuhu, China. The customer demanded an integrated system solution, the easy operation and a central controller for 30 axes on one PC. Press feeders between five pressing stations were implemented for Chery Automobile.

Solution

The Strohtmann plant construction company commissioned to carry out the retrofit supplied an automation solution for the feeders featuring a fail-safe SIMATIC S7-317F PN/DP for the safety-oriented functions. This controller communicates with a SIMOTION P350 controller via the only remaining PROFIBUS interface within the plant. The SIMOTION runtime software for controlling all ET 200S and ET 200F IO devices as well as the SINAMICS S120 drives with CU320 control unit runs on the SIMOTION Panel PC. The drives forward the motion instructions to 1FT7 servo motors. PROFINET IRT (isochronous real-time) is used for quasi-real-time communication in the plant and for the synchronization of the feeders at the individual stages in the region of a millisecond. The CBE20 communication boards with integral ERTEC switch also give the SINAMICS converters a "talent" for high-speed perception.

Benefits

Thanks to the uniform bus structure from the plant controller down to the drives and IO systems, Chery has been able to make considerable savings. This is because the entire plant runs on a shared platform which results in lower costs for engineering, commissioning, maintenance and operating production. Another important factor for this dynamically expanding manufacturer is that, based on PROFINET, a state-of-the-art, open system is available which can be upgraded at any time.



Samsonite – Belgium

Challenge

In its logistics center in the Belgian town of Oudenaarde, Samsonite constructed a new warehouse in order to improve the management of the growing portfolio of the company's products. The intention was that the personnel, a manned forklift truck and several automated guided vehicle (AGV) systems would be able to operate in parallel and that the semi-autonomous warehouse should be able to manage without permanently assigned personnel. The company was looking for a solution for the automation and communication, with which safety systems and both stationary and mobile stations could be integrated safely and with a secure future.

Solution

A fail-safe controller with a SIMATIC S7-319F CPU communicates with the stations in the field via PROFINET and Industrial Wireless LAN. Numerous SCALANCE W access points integrate the AGVs into the automation, each of which is equipped with a SIMATIC ET 200S IO device with a fail-safe CPU. For operation on site, SIMATIC Panel PCs with SIMATIC WinCC flexible are installed in the warehouse. The stationary systems at the field level are connected via PROFINET and SIMATIC ET 200S systems to standard and fail-safe IO modules. Hazardous zones are protected by means of SIMATIC light curtains.

Benefits

This PROFINET-based automation solution is already the second PROFINET solution that Samsonite has installed. Some time ago, a sorting system was also successfully automated using PROFINET. Thanks to the integrated solution, Samsonite benefits from integrated communication for both mobile and stationary systems and for safety-related as well as standard communication. At peak times PROFINET enables the company to deploy personnel, even from other logistics areas, in addition to manned and unmanned vehicles safely in the same warehouse. This means that Samsonite can respond flexibly to the latest orders and optimize costs and space requirements for the logistics.



Arcelor – Steel industry, France

Challenge

With 320,000 employees in over 60 countries, Arcelor Mittal is the global leader in the steel industry. The company, established in 2007 following a successful merger bid, unites the worldwide operations of two steel giants – Arcelor and Mittal Steel. Arcelor Mittal will be at the head of major global markets, including the automobile, construction, household appliance and packaging industries. Arcelor Mittal is a leader in R&D and technology and offers an impressive inventory of its own raw materials and excellent marketing networks. For one of its factories in France, Arcelor Mittal was planning the introduction of a cost-effective transport system that would feature maximum safety and reliability while contributing to a reduction in general maintenance costs. Further specifications called for fast installation and commissioning as well as a link to the MES level.

Solution

The system integrator hired to implement the project, 4IT, chose a wireless Siemens solution based on PROFINET. Two automated transport cranes as well as automated guided vehicles (AGV) are linked wirelessly to SCALANCE W components. The mobile units are equipped with SIMATIC CPU 317-2 PN/DP as IO controller and SIMATIC ET 200S as distributed IO, as well as a TP 170A touchpanel for HMI on site. SCALANCE X-208 switches serve as the network infrastructure.

Benefits

The new solution is compelling in every way, offering a maximum degree of flexibility and plant availability. The extremely reliable industrial SCALANCE W WLAN components enabled fast installation and commissioning of the solution which was easy to connect to the controller and MES level due to the completely integrated use of Ethernet. Thanks to the excellent performance of the transport system, the system integrator is already working on more new projects based on the same technology: PROFINET and IWLAN.



Xuzhou – Tobacco industry, China

Challenge

The tobacco factory Xuzhou, located in the Eastern province of Jiangsu and founded in 1939, is one of the largest tobacco factories in China with plant assets totaling 1.7 billion RMB (\$125,120,428) and an annual output of 0.5 million cartons of cigarettes. The cigarette manufacturer was interested in implementing an innovative automation solution which would provide greater flexibility in manufacturing a larger number of product versions. Further system requirements stipulated by the customer included easy traceability of the production processes and an overall reduction in production costs.

Solution

The customer decided to go with the modular system solution with PROFINET CBA (Component based Automation) which offered the necessary level of flexibility in production. The solution by Siemens comprises more than 10 SIMATIC S7-400 CPUs with SIMATIC NET CP 443-1 Advanced communications processors and more than 60 SIMATIC ET 200S IO devices with an integrated PROFINET interface. Other equipment used includes HMI stations with WinCC, based on SIMATIC Panel PCs and CP 1616. SCALANCE X-400 industrial switches form the backbone of the system.

Benefits

By reducing production time, the new solution has cut costs considerably. The increase in system flexibility enabled by the modular design of PROFINET CBA allows the production process to adapt more quickly to market demands. Furthermore, running production processes can be recorded by the system in real time.



Iaco Agrícola – Brazil

Challenge

The trend towards green energy sources continues to develop and demand for more ecological fuels, such as bioethanol, is increasing. In order to meet this demand, Iaco Agrícola decided to invest in a sugar and bioethanol plant, a greenfield located in the town of Chapadão do Sul in the state of Mato Grosso do Sul in Brazil, with a milling capacity of 2.2 million tons of sugarcane for the 2010/2011 harvest. To ensure safe and reliable operation of the plant with minimum downtime, Iaco Agrícola was looking for an automation and communication solution that would enable quick diagnosis of problems and speedy troubleshooting.

Solution

To improve plant performance and facilitate maintenance and servicing, Iaco Agrícola contracted Siemens to supply state-of-the-art automation products and systems based on PROFINET communication. PROFINET is the modern and comprehensive protocol that allows advanced diagnostic features (also accessible via the Web environment) and easily integrates the field and information technology worlds. A powerful SIMATIC S7-400 system controls operations in the plant. Management and operation of industrial production are centralized in a single Integrated Operations Center (IOC), where the SIMATIC WinCC visualization system runs, while access to the system is allowed from any point in the plant via Web-based WinCC WebNavigator. Via SIMATIC WinCC with thin client technology, field operators can also use handheld computers (PDAs) to control, open, and close maintenance orders while in the facility.

Benefits

The IOC combines maintenance, production, and operations management and enables the control of all stages of the process and rapid intervention when needed. The system architecture speeds up diagnostics and plant maintenance. PROFINET provides transparent integration, ensures reliable communication, and effectively supports system diagnostics. The automation system, with only 0.28 percent downtime over 3,576 hours of start-up and operation during the first production period, has proven to be extremely robust even under the harsh conditions present in the bioethanol industry. PROFINET makes its contribution to green fuel and to the environment.



Berndorf Band GmbH – Austria

Challenge

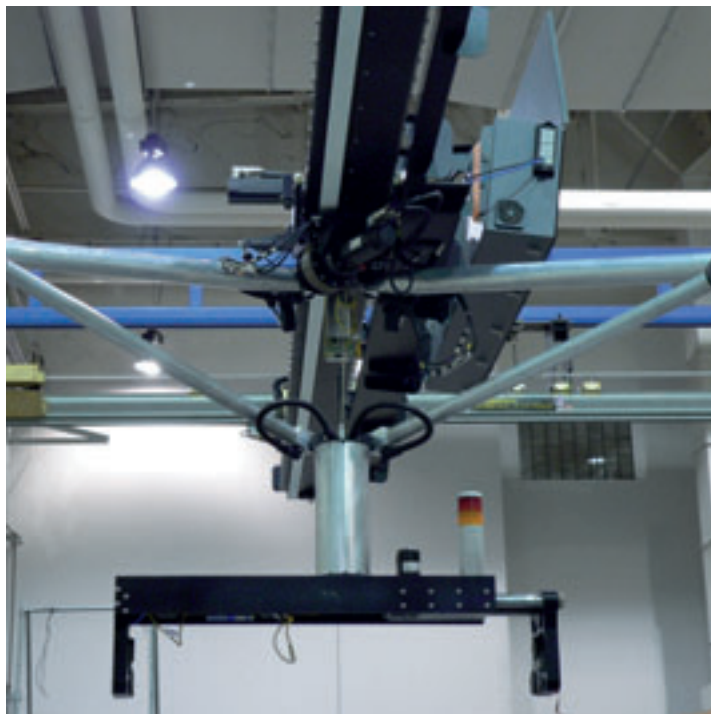
Berndorf Band GmbH, a subsidiary of the international Berndorf AG company, offers production and servicing of transport and process conveyors for many sectors of industry. With over 80 years of experience and a global export business, the company is regarded as a specialist in conveyor systems as well as for endless steel belts for transport and process conveyors. The new, and at that time largest, production hall, affectionately known as “Great Bear” was to be equipped with a comprehensive automation system. Special requirements included the length of the hall, the flexible positioning of plant components and an emergency-stop function, regardless of the position of the plant components.

Solution

An IWLAN application with safety functionality was installed in the production hall. Efficient radio communication was achieved by means of rugged access points and clients from the SCALANCE W series. The safety-related PROFIsafe protocol is transmitted wirelessly via PROFINET and the video signal of the monitoring camera via RCOAX, optionally in the 2.4 or 5 GHz frequency band. In addition an energy supply is installed via a conductor wire on the ceiling; this keeps the shopfloor free from cable drag chains.

Benefits

Thanks to the wireless installation, drag chains are no longer required for the exchange of data. This reduces maintenance costs and wear. The installation guarantees consistent wireless Ethernet transmission in a defined and controlled radio field. No additional radio links are required for the emergency-stop signals. The system has been stable since commissioning, safety signals are transmitted reliably by radio. This has considerably increased the reliability and efficiency of the plant.



CAMotion Inc. – Machine building, USA

Challenge

The US systems integrator headquartered in Atlanta, Georgia, realized an innovative safety control network for large overhead crane robot systems for one of its customers – an innovative solution which allows wireless operation with standard and fail-safe communications. The contractor also hoped the new solution would be less expensive than traditional approaches, be highly robust and reliable and minimize risk. Another important aspect was that the solution should represent a safe investment, i.e. be flexible enough to expand and adapt to the latest requirements into the future.

Solution

CAMotion decided to go with – in their own words – the only available solution that could meet their high requirements: a combination of fail-safe Siemens controllers that are linked to the deployed safety components via PROFINET with a PROFIsafe profile. The following components were used: the SIMATIC CPU 315F-2 PN/DP (on the floor) as well as the fail-safe IO SIMATIC ET 200S with safety modules (on the movable crane). Wireless communications were based on the SCALANCE W-788 industrial wireless LAN access points as well as SCALANCE X-208 industrial Ethernet switches.

Benefits

The solution delivered by CAMotion is a real milestone in automation since it is the first time safety and wireless have been married in one application. The contractor is also delighted with the other features of the solution. Since only one network is required for all tasks, CAMotion was able to cut costs drastically. Furthermore, the flexible, expandable and modular solution has been functioning very reliably since commissioning and is easy to service and maintain thanks to user-friendly diagnostic possibilities and efficient troubleshooting.



BMW – Automotive industry, Munich

Challenge

The Munich automotive manufacturer was under pressure to modernize its press line because the availability of certain spare parts could no longer be guaranteed. This upgrading project entailed converting the automation system for the feeder stations to SIMOTION D motion control with SINAMICS S120 drives. Standardized, integrated communication between the different machines is vital for complex production processes in the automotive industry to enable manufacturing workflows to be efficiently controlled, monitored, optimized, diagnosed, and maintained.

Solution

The modernization of the Munich press line marked the advent of PROFINET – both in the field level and for horizontal integration. The automation functions on the press line are now locally controlled – each of the installed function groups has its own controller. Cyclic communication in the field level is implemented using PROFINET with RT (real-time), which replaced the old fieldbus. The press line's individual SIMOTION D445 CPUs are linked together by a PROFINET line with IRT (isochronous real-time) capability. This ensures first that the position control cycles of all CPUs are synchronized, and second that the feeders are coordinated using the SIMOTION “distributed synchronization” function. As a result, horizontal integration is completely seamless. Thanks to the open PROFINET standard, any non-PROFINET capable components in the press can be easily integrated with the help of interface modules.

Benefits

The use of PROFINET in complex automation solutions, such as the BMW press line in Munich, makes the complete process more reliable, leading to optimized efficiency, enhanced productivity, and increased output. The decision by BMW, one of the world's most innovative car manufacturers, in favor of the PROFINET standard has already given it a clear productivity and competitive lead for the future.

More information

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