PROFINET

The leading

Industrial

Ethernet

Standard

The Benefits of PROFINET
PROFINET: The best of two worlds
PROFIBUS + Ethernet

Network standard Ethernet
- High transmission rate
- Wireless
- Flexible topologies

Fieldbus standard PROFIBUS
- High-speed IO communication
- Safety
- Diagnostics
Positioning Overview of industrial communication systems

- Conventional wiring
- AS-i
- IO-Link
- PROFIBUS
- PROFINET

Information volume / device

Functionalities quantities

- Small
- Medium
- Large
Advantages to using PROFINET

Protects your investment
- Seamless integration of existing fieldbuses
- Easy conversion of existing devices
- No additional tools or training needed

Saves costs
- Uses existing Ethernet networks

Uniformity
- Uniform physical network concept

Saves time
- Reduces engineering and testing time
- Cuts time needed for migration

Summary
Minimizes the time and expense of setting up your system with or migrating to PROFINET.
Leverage your PROFIBUS know-how

Low cost of adoption, investment protection by the transition to PROFINET!
PROFINET is Ethernet

- Ethernet is the established standard in the IT world for fast exchange of data (IEEE 802.3)
- PROFINET is always full duplex → simultaneous communication in two directions
- PROFINET is always "switched Ethernet"
  - Distribution of network load can be influenced using topology

As comparison: PROFIBUS

- One line to which all nodes are connected
  - Performance directly dependent on number of nodes

PROFINET completely uses all possibilities offered by Ethernet
PROFINET technology at a glance: Ethernet

PROFINET is 100% switched Ethernet

PROFINET uses IT standards such as TCP/IP

PROFINET is real-time and deterministic
PROFINET based on standard Ethernet

- Wireless communications in compliance with IEEE standard possible
- Industrial WLAN (IEEE 802.11)
  - Cyclic and acyclic data transmission
  - Supervision of wireless connection
  - Redundant wireless operation over 2 separate wave bands for raised availability
  - PROFIsafe over WLAN
- Bluetooth (IEEE 802.15.2)
  - Coexistence with WLAN
- Fast commissioning
- Easy diagnostics

Using established standards for innovative applications
PROFINET is ... more Flexibility

Maximum flexibility enables tailor-made machine and plant concepts

Flexibility

- Tailor-made plant concepts
  - Industrial Wireless LAN
  - Safety
  - Flexible topologies
  - Open standard
  - Web tools
  - Expandability

Wireless communication (IWLAN)

(Topologies: Line, Redundant ring, Star, Tree)
PROFINET is Standard Ethernet

Switching technology

- Simultaneous sending/receiving
- Parallel communications paths
- Unlimited number of devices
- Ultra short response times
- 1,440 bytes per frame

Parallel communications

PROFINET – innovative and future-proof
Addressing in the Commissioning

Individual addressing in each station

Simple name designation through Controller with support of Engineering System

Complete commissioning through automatic name designation
Simpler and faster device replacement
PROFINET features standard TCP/IP communications in compliance with IEEE 802.3 and real-time communications.
PROFINET is Real-time Ethernet

Permits parallel...

- ... direct online access to field devices
- ... location-independent maintenance and service (including remote)
- ... savings in the recording of production/quality data

Scalable Real-time with simultaneous, unrestricted IT communication
PROFINET with IRT, how does it work? The fast lane for motion control

- Fast Ethernet with switching technology
- Time synchronization of the switches
- Deterministic communication cycle
- Reservation of time areas

→ Fast simultaneous exchange of setpoint and actual values (100 Mbit/s)
→ Requirement for Isochronous mode
→ Essential for motion control
→ Guaranteed performance for motion & IT

PROFINET with IRT (Isochronous Real-time)
PROFINET is Real-time Ethernet

Bandwidth reservation for isochronous communication

IRT permits high-precision synchronization

Hardest Real-time by means of Isochronous Real-time (IRT)
PROFIdrive

- Is the application profile for drives on PROFIBUS and PROFINET
- Is cross-vendor and ensures interoperability between drives and controllers
- Offers the same application view as with PROFIBUS and PROFINET
- Is standardized through PROFIBUS & PROFINET International (PI)

Worldwide standard communications for drives
One bus for standard and failsafe automation

- Meets the highest safety categories
- Safety Integrity Level 3 / PL e / Cat. 4
- Uniform diagnostics and uniform user interface
- Reduce the number of types, parts and interfaces

Save time, space and money with Safety Integrated!
Using PROFIsafe and PROFINET can satisfy all requirements when it comes to ensuring complete safety for humans, equipment, and the environment.

First communications standard developed in accordance with safety standard IEC 61508

Developed to IEC 61784-3-3, PROFIsafe is the international standard

PROFIsafe handles potential faults (e.g. invalid addresses, delays, data loss) by means of
- Serial numbering
- Time monitoring
- Authenticity monitoring
- Additional CRC backup

Evaluated by

Drive technology also fits in seamlessly here with the integrated safety functions according to IEC 61800-5-2.
Diagnostics requests

**Lifecycle**
- Development
- Commissioning
- Operation

- Appropriate information in all phases of the lifecycle
- Extra details as required

**Type/location of fault**
- Detection of all faults
  - Cabling
  - Station
  - Module
  - Channel,
  - Display of fault location

**Local access**
- Diagnostics information where it is required

**IT integration**
- Remote access
- Network management

**Simple and fast diagnostics**
- Support of all requirements
  - by means of suitable standardized mechanisms
Web tools

Easy and fast diagnostics access

- Direct access to diagnostic information using standard Web browser (without Step7)
- Quicker access to diagnostic information results in shorter downtimes
- Individually adaptable maintenance concepts thanks to user-defined Web pages
- Remote machines are simple to maintain per remote access

Use of tools from the IT world

- Integration of Web servers in Siemens PROFINET controller
- Access to Web server using standard browser (e.g. Internet Explorer)
- Security modules of the SCALANCE S range securely separate subnets using proven IT technology

Standard Web tools can be used with PROFINET to directly access device information
Easy integration of existing fieldbus systems through proxy functionality

Benefits and added value for our customers

- Including gateways for PROFIBUS, Interbus, AS-Interface and other fieldbuses
- Including controllers with PROFINET and PROFIBUS interface

Transparent communications between PROFINET and PROFIBUS

Protects your investment

Transparent integration without programming
Fast device replacement

**Easy and fast device replacement**

- During servicing and maintenance, no programming tools or engineering personnel are needed for replacing devices
- Reduction in downtime because only a new device from the warehouse must be used to put a machine or plant back into operation
- No more settings necessary on the device

**Device replacement without PG**

- Optional swap media (e.g. MMC, C-Plug) permit fast and easy replacement of devices without programming device
- Device exchange with PROFINET on basis of known topology can also be carried out without swap media
- iPar server in order to transfer dynamic device parameters automatically to the new device

**Diagram**

- Controller
- Automatic device configuration (name, IP address)
- Dynamic parameters
- Device

**Automatic reconfiguration following device replacement without engineering and without memory card**
High performance with media redundancy

- Increase in plant and machine availability
- Media redundancy is integrated in PROFINET and can easily be utilized without added costs
- Diagnostics for fast troubleshooting also possible with network fault

Media redundancy integrated in PROFINET

- The media redundancy can be implemented both with the help of external switches and direct via integral PROFINET interfaces
- Device failures in the ring topology have no effect on the plant availability
- Troubleshooting is accelerated even with a network fault

High plant availability due to media redundancy
MRP - Ring configuration with Devices

- **PROFINET devices possess MRP**
  - Improved plant availability
  - More flexibility
  - Lower costs since less equipment required

- **No closing of IE switches or ring management necessary**

- **One of the devices automatically takes on the role of the ring manager**

- **MRP via integral PROFINET ports**
  - Easy cabling
  - Offener Standard
  - Medienredundanz
  - Ein Kabel für alles
  - Geräte-/Netzdiagnose
  - Energieeffizienz
  - Große Mengengerüste
  - Hohe Datenrate
  - Geschwindigkeit
  - Hohe Präzision
  - Maßgeschneiderte Anlagenkonzepte
  - Optimale Nutzung von Ressourcen
  - Höhere Produktivität
  - Effizienz
  - Performance
  - Schneller Gerätaustausch
  - Robustheit/Stabilität
  - Easy cabling
  - Einfache Verkabelung
  - Schneller Hochlauf
  - Flexibilität
  - Effizienz
  - Performance

- **Innovation for simplification of system architecture**
In the event of a fault in the segment or ring node, communication is restored again.

A second communication path through the network is opened by the ring manager.

Communication is routed over this alternate path.

The failure is limited to the damaged segment or node.
MRP - media redundancy protocol
Properties

- IEC 61158-5-10
  Issue 1.0 2007-12

- Based on ring topology

- Max. 50 nodes in the ring
  - PROFINET IO-Controller
  - PROFINET IO-Devices
  - Components of the network infrastructure (IE switches)

- Configuration and diagnostics in STEP7

- 200 ms reconfiguration time
Machines from different OEMs
- OEMs implement different automation architectures
- Machines controlled by different PLCs

PROFINET Marketing - Benefits
Configuration of communications instead of programming and troubleshooting

Flexibility in configuring and reconfiguring production flow

Modification or exchange of machines without any adverse affects on communications or integration of the other systems

Integrated plant-wide system diagnostics

Standardized machine data interfaces for plant operators

Summary

For increased productivity and plant availability
What’s in for me?

- PROFINET is the first field bus worldwide with a standardized profile for efficient energy management.

- PROFINET is a synonym for innovation. Requirements from customer side are taken seriously and implemented very fast.

- PROFIenergy generates additional value to your products and safes your business in the long term.

Use PROFIenergy, to save energy and costs!
An example from the Automotive Industry

Energy consumption during breaks appr. 60%!

With PROFIenergy up to 80% savings!

Typical Energy Consumption (kWh, 15min)

Energy consumption in breaks appr. 60%
<table>
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<tr>
<td>... more continuity and uniform structures</td>
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<tr>
<td>... more nodes and better performance</td>
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<tr>
<td>... seamless integration of existing systems</td>
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<tr>
<td>... new, innovative applications</td>
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<td>... continuous enhancements</td>
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