Workshop – PROFINET in Process Automation
Workshop: **PROFINET in Process Automation**

**Agenda**

- PROFINET in Process Automation
  - Requirements of the Process Industrie
  - PROFINET - One solution for all applications
  - Highest availability and scalability with PROFINET
  - Investment protection over the whole life cycle of the plant
  - Benefits of PROFINET in Process Automation

- Migration of PROFIBUS-DP to PROFINET
  - Live Demo

- PROFINET System Redundancy
  - Live Demo

- PROFINET Roadmap
Requirements of PROFINET in Process Automation
The requirements of the Process Automation are significantly different to the requirements of Factory Automation.

- **Higher availability and scalability required**
  - Operating time 24 hours per day and 365 days per year
  - Changes in Run
- **Life cycle of the plant 20 years and more**
  - Investment protection
- **Higher quantity**
  - Plants up to 100,000 I/O-Signals
- **Connection of Field devices**
  - 2-wire
  - Bus powered
  - Intrinsic safe (hazardous area)
Highest availability and scalability with PROFINET

System Redundancy

**Functionality:**

The PROFINET device builds up more than one Application Relationship (AR) to the redundant controller. The support of System Redundancy is defined for PROFINET devices, which are used in PA, as mandatory in the CC-B (PA).

**Advantages by using PROFINET System Redundancy**

- Higher availability
- Higher scalability
Highest availability and scalability with PROFINET

System Redundancy in a non redundant PROFINET network

- Redundant PROFINET Controller with single PROFINET interface
- PROFINET Device with single PROFINET interface (S2 System Redundancy)
- PROFINET Device with redundant PROFINET interface (R1 System Redundancy)
Highest availability and scalability with PROFINET

System Redundancy in a redundant PROFINET network

- Redundant PROFINET Controller with single PROFINET interface
- PROFINET Device with redundant PROFINET interface (R1 System Redundancy)
Highest availability and scalability with PROFINET

System Redundancy in a redundant PROFINET network

- Redundant PROFINET Controller with redundant PROFINET interface
- PROFINET Device with single PROFINET interface (S2 System Redundancy)
- PROFINET Device with redundant PROFINET interface (R1 System Redundancy)
- PROFINET Device with redundant PROFINET interface (R2 System Redundancy)

No connection between the networks
Highest availability and scalability with PROFINET

**Media Redundancy**

**Functionality:**
The PROFINET device has more than one physical connection to the controller.

It is not necessary for the PROFINET device to build up more than one Application Relationship (AR) to the PN controller.

**Advantages by using PROFINET Media Redundancy**
- Electrical Ring installation
- No additional HW necessary
- Combination with System Redundancy possible
Highest availability and scalability with PROFINET

Configuration in Run

- Add, Remove and Replace of Devices
- Add, Remove and Replace of Modules
- Change of parameters

Functionality

The production process is not influenced by the Changes in Run!
Investment protection over the whole life cycle of the plant

... by integration of existing fieldbus technologies via proxys!
Investment protection over the whole life cycle of the plant

Proxy-Technology

Functionality
The proxy is a Device on PROFINET and for example a DP-Master on PROFIBUS-DP (PN/DP-Proxy)

Advantages by using Proxy-Technology
- Openness by integration of existing fieldbuses and installed bases
- 100% investment protection for device manufacturer and end user.
- More than 244 Byte possible, because of that higher device count possible
- Allows step-by-step change from PROFIBUS to PROFINET
# Benefits of PROFINET in Process Automation

<table>
<thead>
<tr>
<th>PROFINET is a worldwide established standard in the industry – based on standard Ethernet</th>
<th>100% investment protection for the future due to integration of existing fieldbus technologies (Proxies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROFINET is well proven since many of years in factory automation and motion control</td>
<td>Higher scalability of the system redundancy</td>
</tr>
<tr>
<td>Seamless Integration from ERP/MES level to field level (horizontal integration)</td>
<td>Higher performance with higher data rate (100Mbit)</td>
</tr>
<tr>
<td>Detailed diagnostic and easier commissioning due to Ethernet mechanisms (Plug &amp; Play)</td>
<td>Higher robustness</td>
</tr>
<tr>
<td>Complete Commissioning by automatic naming and addressing – Easier and faster device exchange</td>
<td>More flexible topologies (Line, Star, Tree and Ring)</td>
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</tbody>
</table>

PROFINET is the future system backbone for PCS 7
Migration of PROFIBUS-DP to PROFINET
Same concept, new names

Low cost of adoption and investment protection!
What PROFIBUS DP can, PROFINET can do too…

<table>
<thead>
<tr>
<th>PROFIBUS DP</th>
<th>Functionality</th>
<th>PROFINET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only one defined channel between master and slave</td>
<td>Data channel</td>
<td>Several communication channels between Controller/ Supervisor and Device possible</td>
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<td>Same priority of communication</td>
<td>Data prioritization</td>
<td>Flexible parameterization of the data rate</td>
</tr>
<tr>
<td>Min. 300µs</td>
<td>Cycle time</td>
<td>Min. 31,25µs</td>
</tr>
<tr>
<td>244 Byte I/O</td>
<td>Consistent Data per Device</td>
<td>1440 Byte I/O</td>
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<tr>
<td>Not possible</td>
<td>IT-Service</td>
<td>Integration without limitation possible</td>
</tr>
<tr>
<td>Only one priority possible</td>
<td>Alarms and diagnostic</td>
<td>Different priorities possible</td>
</tr>
<tr>
<td>Manually DIP-Switches or via telegram</td>
<td>Addressing</td>
<td>Automatic by controller or manual by engineering system (device exchange without engineering station)</td>
</tr>
<tr>
<td>Max. 12 Mbit/s (Token)</td>
<td>Data rate</td>
<td>100 Mbit/s (full-duplex)</td>
</tr>
<tr>
<td>Normally: Line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited: Tree and Ring</td>
<td></td>
<td></td>
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<tr>
<td>Termination necessary</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Topology</td>
<td>Line, Star, Tree, Ring and combination possible</td>
</tr>
</tbody>
</table>

... and much more!
Live Demo: PROFIBUS-DP Installation

Operator Station / Engineering Station

Controller
CPU410-5H

Industrial Ethernet

Controller
CPU410-5H

PROFIBUS DP

工业以太网

ET 200M-IM
HART

REMOTE I/O

Pressure Transmitter
SITRANS P DSIII

DP/PA-Proxy

Junction Box
AFDI S

Temperature Transmitter
SITRANS T3K

> 100m


DP/PA-Link
PA-Koppler
Live Demo: Migration from PROFIBUS-DP to PROFINET
Example of an application

Possible uses of the VD module:

1. Use of Ethernet cables distances >100m
2. Retrofit
3. Use of existing two-wire cables in VD mode
4. Use of Ethernet cables in standard mode
Benefit

- Connection of remote stations, where a connection via fiber optic cable is too expensive, or where the use of an Ethernet copper cable is not possible due to its maximum range of 100 m
  - PROFINET connection at 100 Mbps up to 300 m using standard Industrial Ethernet FC installation cable (IE FC Cable 2x2 / Cat5 AWG22)

- Use of already laid communications cables, e.g. PROFIBUS or two-wire cables
  - use case Migration from PROFIBUS to PROFINET to connect Remote IOs (e.g. ET200, SIMOCODE) special in Application PROFINET in PA
  - Reduction of the installation costs by using already installed cables

- Non-reactive connection of stations to an Ethernet network
- Easy integration into existing systems thanks to SCALANCE X-300 media module design
- Universal module utilization, as it automatically checks whether a two-wire cable or a standard Ethernet cable is connected
Live Demo: Migration from PROFIBUS-DP to PROFINET

Operator Station / Engineering Station

Controller
CPU410-5H

Industrial Ethernet, plant bus

New

PROFINET

Controller
CPU410-5H

Industrial Ethernet, plant bus

New

PROFINET

Remote I/O

PN/PA-Proxy

Junction Box
AFDIS

Temperature Transmitter
SITRANS T3K

Pressure Transmitter
SITRANS P DSIII

Switch
X308-2M + MM992-2VD

Profinet

IE/PB-Link
PA-Koppler

ET 200M-IM
HART

IE/PB-Link
PA-Koppler

Pressure Transmitter
SITRANS P DSIII

Temperature Transmitter
SITRANS T3K

Bestehende PROFIBUS-DP Verkabelung

> 100m

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> 100m

PROFINET System Redundancy
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Functionality:
The PROFINET device builds up more than one Application Relationship (AR) to the redundant controller.

The support of System Redundancy is defined for PROFINET devices, which are used in PA, as mandatory in the CC-B (PA)

Advantages by using PROFINET System Redundancy
- Higher availability
- Higher scalability
Live Demo: PROFINET System Redundancy S2

- Operator Station / Engineering Station
- Industrial Ethernet, plant bus
- Redundant Controller
  - CPU410-5H
- PROFIBUS
- Integrated drives
  - SIMOCODE pro V
- ET 200M-IM HART
- Remote I/O
  - HART
- Pressure Transmitter
  - SITRANS P DSIII
**SIMOCODE pro V with PROFINET System Redundancy**

- Significant increased plant availability thanks to uninterrupted communication with an H-CPU in case of
  - Cable break
  - Controller failure
  - Field device failure

SIMOCODE pro V PN System Redundancy
SIMOCODE pro V with PROFINET System Redundancy

- **Sales release**
  January 2015

- **Delivery release**
  February 2015

- **SIMOCODE pro V PN with System Redundancy** will be delivered with **new** Firmware-Version V1.2
Roadmap
Roadmap - PROFINET in Process Automation
Ready to ship 2014

- Cost effective architecture for system redundancy (Red. Controller, Single IM)
- 100% investment protection and backward compatibility for fieldbus installations (reuse of I/O modules)
- PROFIBUS & PROFINET in one System
- Second PROFINET IO Controller on CPU410-5H (without CP443-1 -> optimized costs)
- Complete integration of ET 200SP HF (Replacing of ET 200S)
- Complete integration of SIMOCODE with PROFINET System Redundancy S2
Roadmap - PROFINET in Process Automation
Goal for next major Step (Sneak Preview to V9.x)

- Configuration Changes in Run with PROFINET
- Scalable system redundancy (from Low cost to High end)
- Growing product portfolio for PROFINET
  - Replacement of PROFIBUS DP
- ET 20iSP: Zone 1 Remote I/O with PROFINET (fiber optical redundant IM)
- ET 200SP HA: Zone 2 Remote I/O with PROFINET state-of-the-art incl. IO-Red.
- PN/PA-Link: Seamless Integration of PROFIBUS PA in PROFINET
Thank you for attention