



DCS

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Stationary Network Diagnosis on PROFINET

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Agenda

- Types of diagnosis in Industrial Networks
 - Device diagnosis (through PLC)
 - Application diagnosis (through PLC)
 - Network diagnosis in Industrial Networks
(separate diagnosis device, based on captured frames)
- Challenges for network diagnosis in general
- Stationary Network diagnosis on PROFINET
 - Typical reason for failure on PROFINET
 - Quality criteria for stationary diagnosis
- PROFIBUS and PROFINET compare



Network diagnosis in Industrial Networks

Different ways of network diagnosis:

- Passive frame capturing and protocol analysis
- Active polling of devices
- Stationary diagnosis with specific gateways:
Preventive maintenance by permanent monitoring
- Mobile diagnosis with PC tools:
Development of instruments and devices
Commissioning of networks and devices
Troubleshooting, maintenance



Network diagnosis in Industrial Networks

When network diagnosis is recommended?

- During commissioning of the system
e.g.: acceptance report
- Troubleshooting on demand
- Permanent monitoring of operational network
 - Prevention of Production Losses
 - Planning of Preventive Maintenance
- Support new device installation
e.g.: network extension



Challenges for networks diagnosis

- **Switched full-duplex networks:**
Frames are not „visible” from everywhere in the network
(mobile diagnostic tools)
- **Networks with real-time scheduling:**
Frames capturing must not disturb real-time network operation
- **Various protocols running in parallel on network:**
Separate PROFINET frames from other packets
- **High volume of captured frames and data:**
Useful filters and powerful capturing hardware
20pcs PROFINET devices in 1ms cycle time = 2.56MByte/s data
- **Various addressing methods for different tasks:**
e.g.: unicast and multicast MAC address, IP address
Some information from devices only available via active polling



Stationary diagnosis on PROFINET

PROFINET-Monitor from Softing

Features:

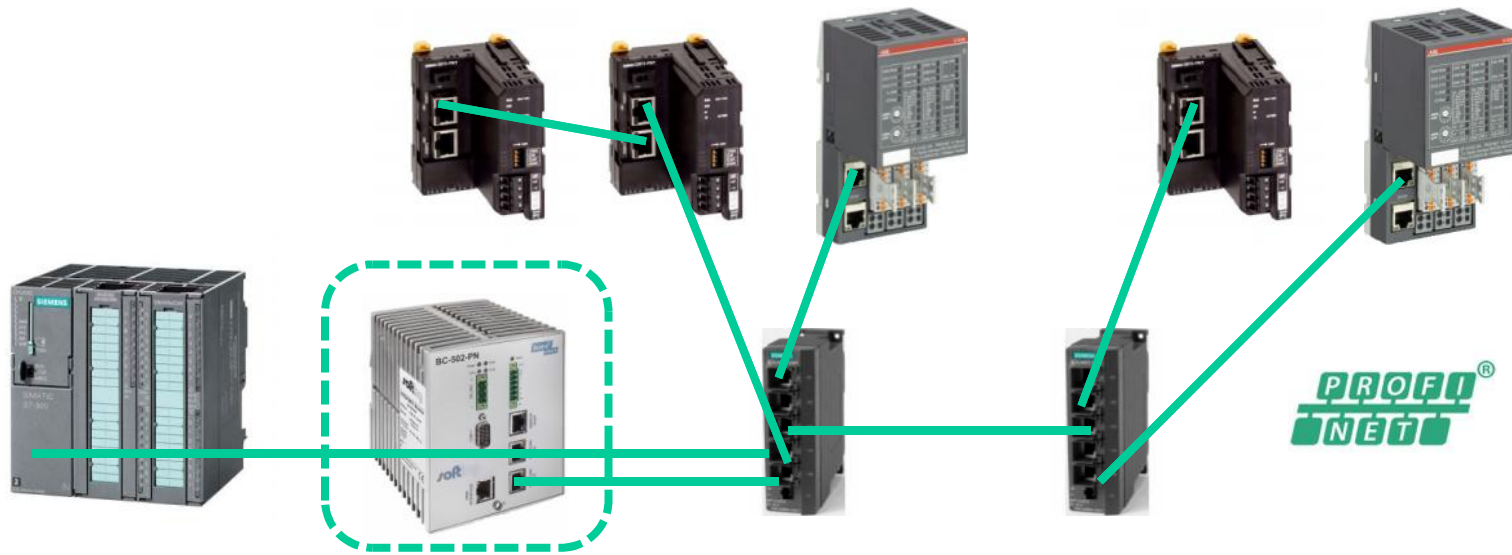
- Continuously passive monitoring of the PROFINET network avoids unscheduled downtimes
- Web based system overview displays all relevant parameters at a glance
- Generates alarms based on typical events
- Snapshots of frames can be saved to find out about the event's reason
- Access to diagnosis data via SNMP



Stationary diagnosis on PROFINET

How to integrate stationary diagnosis tool:

- Install between PLC and first field device
- Does not disturb data exchange (passive)
Frames can pass through in powerless mode



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Typical reasons for failures on PROFINET

- Faulty telegrams
- Deviation on cycle time

**Prevention by permanent statistics on
PROFINET network**

- Defective or corroded connectors
- Sporadic events – unscheduled downtime

- Install new devices

**Stationary network diagnosis useful
for PROFINET network extension**

– wiring errors



Quality criteria for stationary diagnosis

Recommended alarm threshold

- Cyclic data exchange
 - Deviation from defined cycle time (Jitter)
 - Deviation > 100% means frame loss
 - **Recommended < 50 %**
- Cumulative Network load of all protocols
 - **Recommended < 20 %**
- PROFINET network load ratio
 - Ratio between PROFINET RT frames and remaining frames
 - **Recommended > 100:1**



PROFIBUS and PROFINET compare from diagnostic point of view



- RS485
- Line and tree topology
- Closed system
- Max 12 Mbit/s
- Deterministic
- Same priority for all data
- Ethernet
- Star or ring topology
- Open system
- Max 100 Mbit/s, full duplex
- Tries to run deterministic
- Different priorities for data

Questions



Thank you for your attention!