PROFIBUS Diagnostics and Network Monitoring Tools

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Outline of Presentation

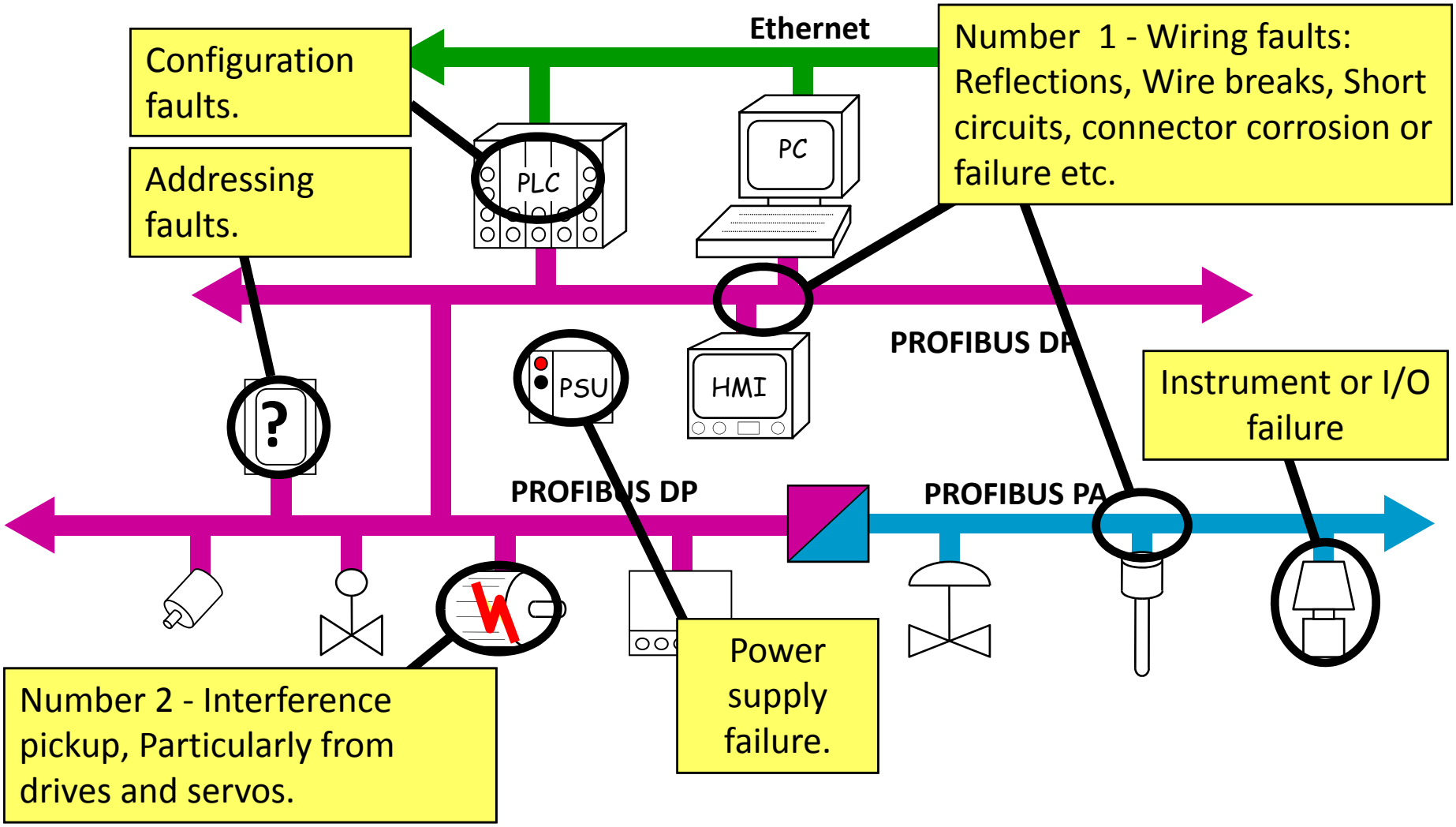
- Briefly look at the types of problems that commonly occur in PROFIBUS systems.
- Examine the need for and benefits of network health checking.
- Briefly explore the types of standardised diagnostics in PROFIBUS systems.
- Dave Tomlin and myself will then discuss various state of the art fault finding and health checking tools from Softing, Pepperl & Fuchs and Procentec.
- You can then spend time exploring these tools and our network using the laptops provided.

PROFIBUS

- PROFIBUS is a very reliable and cost effective technology.
- It is common to find extensive installations comprising thousands of PROFIBUS devices operating on complex networks which are connected together via industrial Ethernet.
- The reliable operation of these networks is essential to maintaining plant productivity.

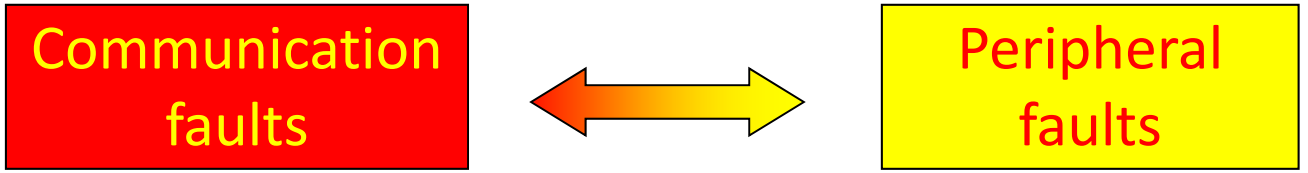
- So, what can go wrong?

The Most Common Netwok Problems



Fault categorisation

- These faults can be categorised in several ways:



- These are “Bus Faults”
- E.g. network wiring errors, interference pickup, reflections etc.
- Communication is disrupted.

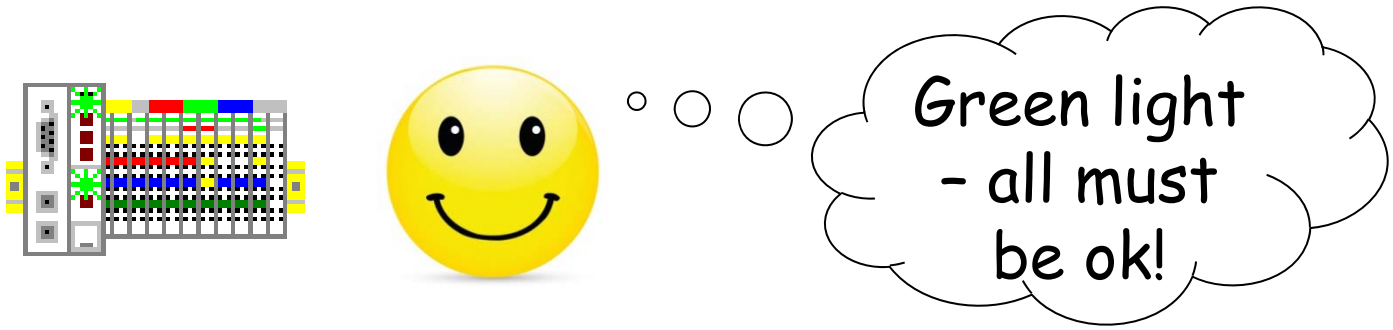
- Concerned with the sensor or actuator.
- E.g. sensor wire break, loss of output power, sticking valve etc.
- Devices are still communicating.

Communication faults

- Communication faults can be diagnosed using tools such as:
  - Protocol analysers and diagnostic tools.
  - Waveform visualisation tools such as oscilloscopes etc.
- Communication errors do not always produce loss of control.
- This is because PROFIBUS is very robust to errors that can corrupt communication data.

Communication faults

- Quite often users are unaware that their system has communication errors because the robustness of PROFIBUS can hide these faults.



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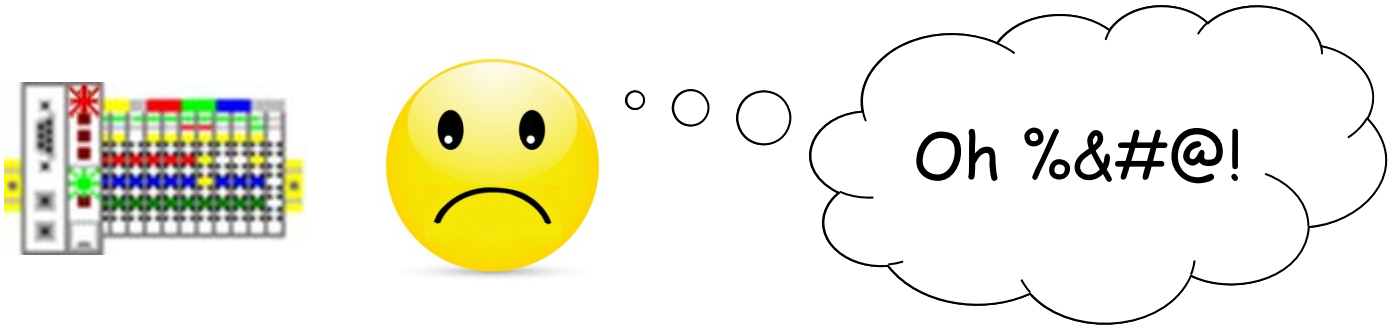


- Only when the rate of data corruption reaches a critical threshold will the fault become visible.
- But then it is too late – we have lost production.

Peripheral faults

- Because the communication remains operational, peripheral faults can often be located and diagnosed using the communications system itself.
- Tools and techniques that are useful for locating peripheral faults on PROFIBUS systems include:
  - Diagnostic reporting using on-line system diagnostics.
  - Engineering tools, protocol analysers, etc.
- Modern intelligent devices incorporate self diagnostic features that can identify and highlight peripheral faults.
- However, tools are still required to access these extended diagnostics.

Intermittent Faults

- Permanent faults are relatively easy to fix.
  - Because the fault disappears when we've fixed it!
- Intermittent faults can be a nightmare!
  - Because we cannot be sure that we have fixed it.
  - We may seem to have cured the problem, but then it comes back again later!
- Intermittent faults require long-term monitoring to check that the fault is cured.
- Statistical reporting over an extended period can be useful.

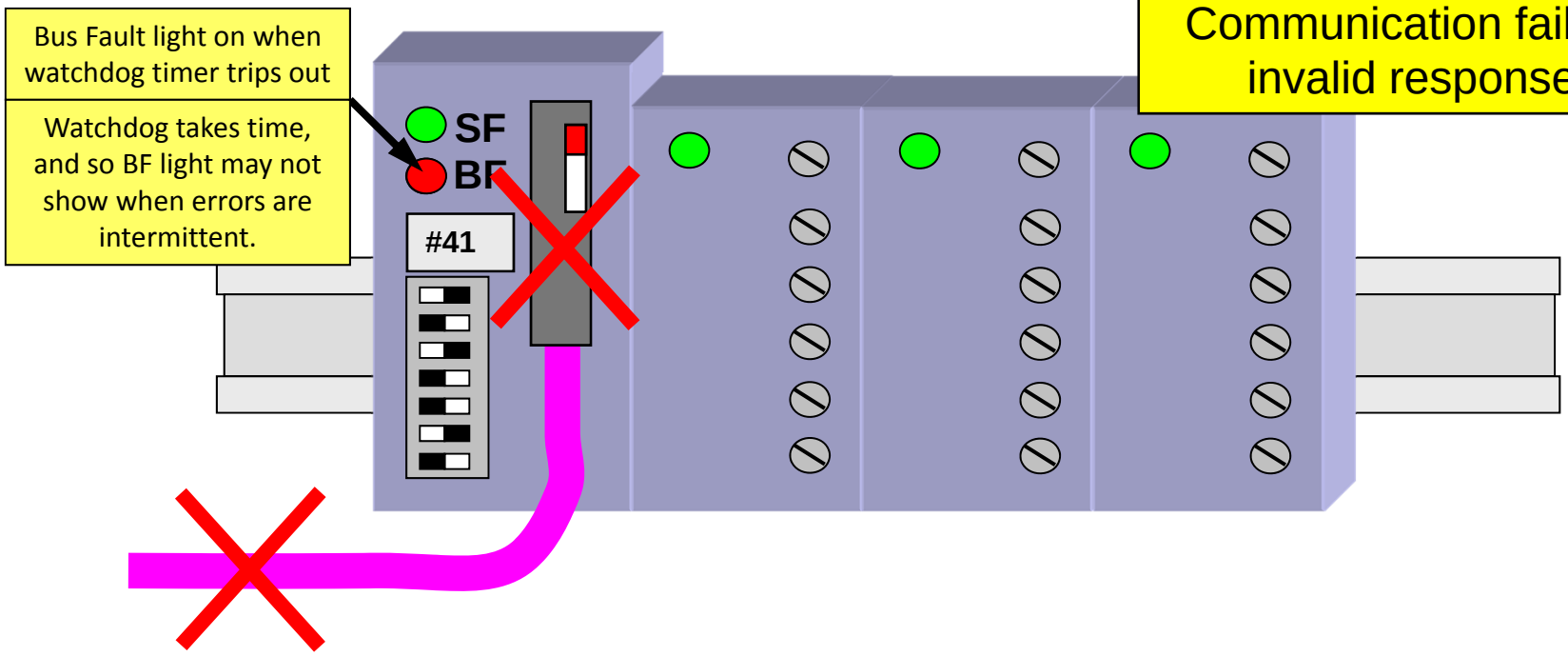
Standard PROFIBUS diagnostics

- Every PROFIBUS device provides a block of standard diagnostics, which provides information on the health of the device.
- Standard diagnostics gives information on the device and the state of communications.
- Standard diagnostics are generally useful for diagnosing communication faults.

Communication Faults

- Mainly caused by poor network wiring or layout or cable/connector deterioration.
- Can be permanent or intermittent.

System diagnostics:
Station 41,
Communication failure,
invalid response.

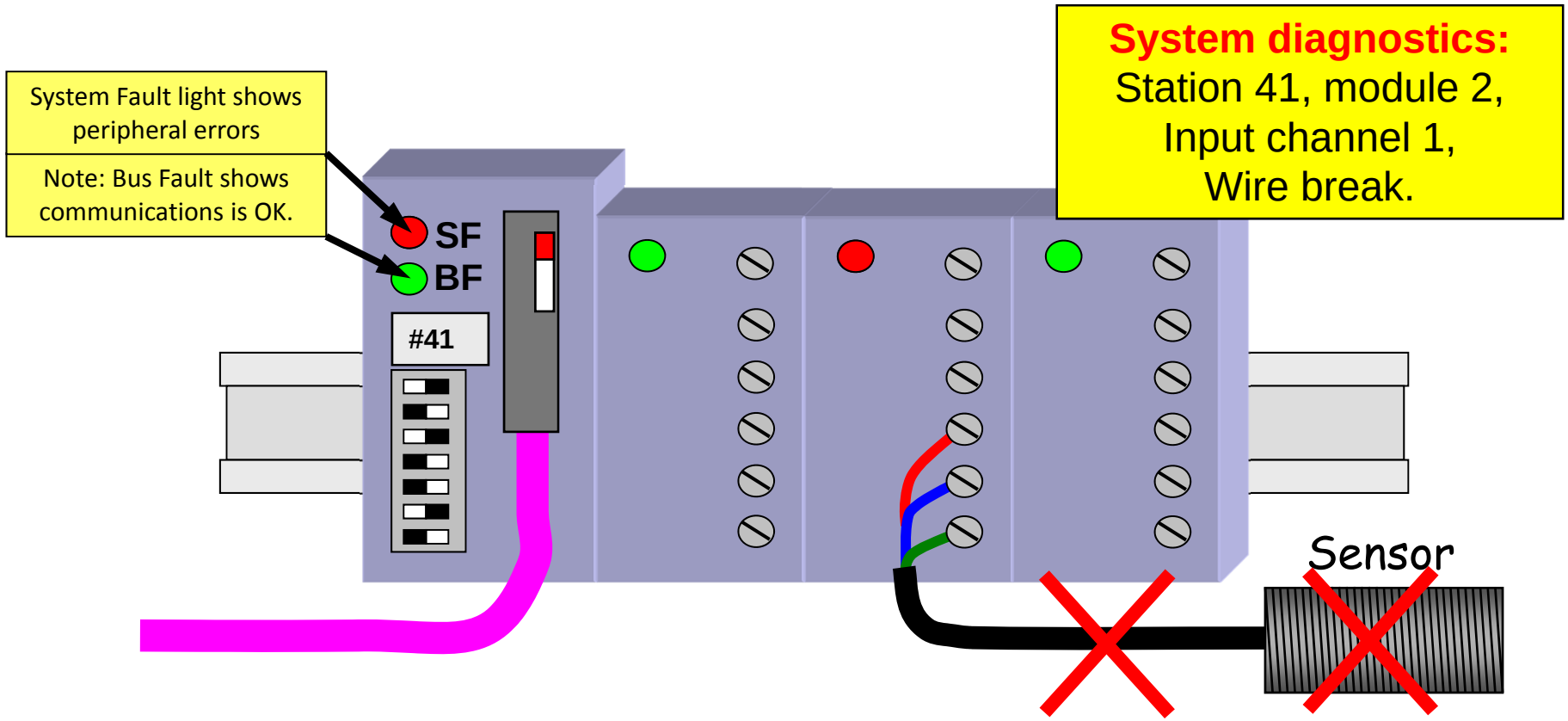


Extended PROFIBUS diagnostics

- Extended diagnostics can provide information on peripheral errors.
- Peripheral diagnostics are an important part of a successful fault finding and maintenance strategy.
- Extended diagnostics are sent together with the standard diagnostics in the same telegram.

Peripheral faults

- Typically caused by sensor/actuator failure or wiring faults.
- Again faults can be intermittent.



System Health Checking

- Health checking is an important part of the commissioning and maintenance strategy for your plant.
- The health check will help to find non-critical and intermittent faults that are not obvious.
- A health check should be carried out immediately after commissioning. We also strongly recommend repeating the health check at intervals.
- How much better to integrate the health checking tools into the network?
  - To give permanent monitoring of system health.
  - Automatically report failures.
  - Give pre-warning of impending failures and performance degradation.

Permanent monitoring tools

- A number of new tools have appeared on the market which are designed to be permanently connected to the network to provide 24/7 network monitoring.

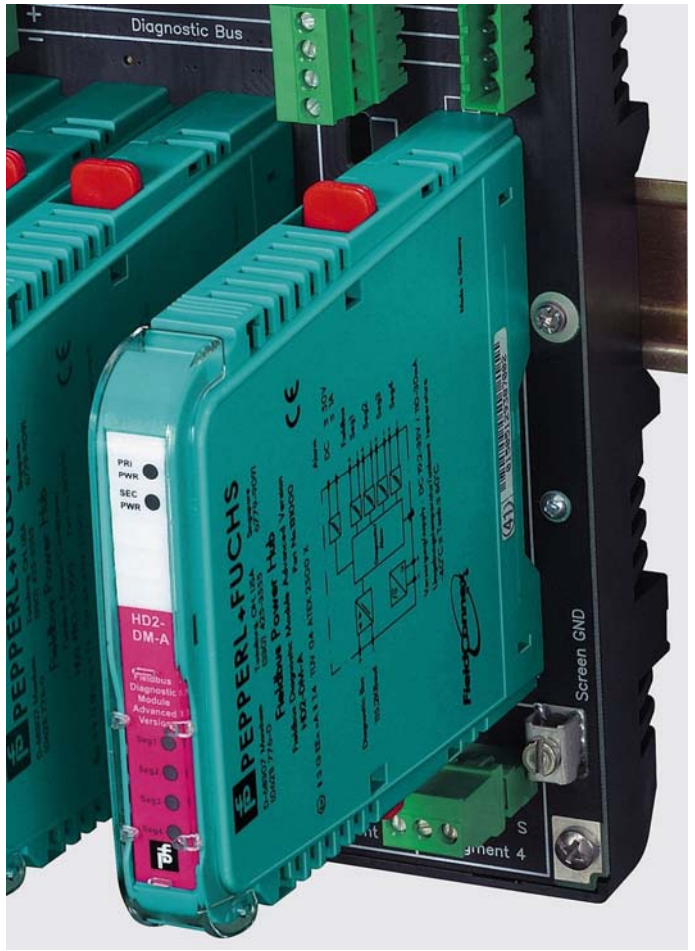
Softing TH LINK
PROFIBUS monitor

Pepperl+Fuchs ADM
PA segment monitor
(up to four segments)

Procentec COMbricks
DP and PA network monitor
(up to four networks, 20 segments)

Pepperl+Fuchs Advanced Diagnostics

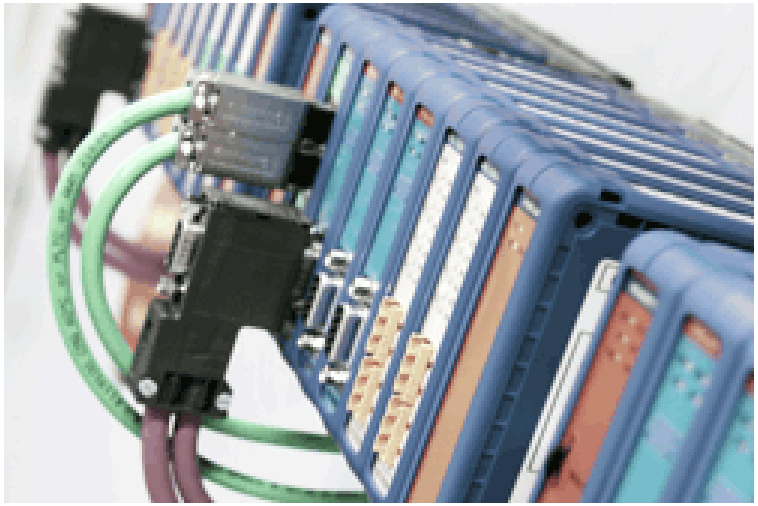
- The ADM provides remote monitoring of PROFIBUS PA communications including waveform visualisation, jitter measurement and statistics.
- Used in conjunction with the P+F modular coupler system, it allows up to four PROFIBUS PA segments to be monitored via FDT tools such as PactWare or FieldCare.



COMbricks

- COMbricks is a modular repeater and gateway system from Procentec with built-in ProfiTrace functionality accessible over Ethernet.
- COMbricks provides:
  - Networking – PROFIBUS DP and PA, PROFINET, Ethernet, copper and fibre-optic.
  - Monitoring - ProfiTrace OE built-in and accessible over Ethernet (web based).
  - Control - Remote IO capability allowing low cost control and plant monitoring over the network.

Networking, Monitoring and Control



COMbricks

The Modules available include:

Head Station with ProfiTrace built in

Repeater modules with optional ‘scope and redundancy

PA module Coupler and/or MBP monitor with ‘scope

Optical link modules (1 or 2 channel)

PROFIBUS DP slave modules

PROFINET IO device modules

IO modules digital, relay, analogue etc

mix and match to produce the required functionality

Example

ProfiTrace Analyser built in to the head station. Can monitor all 4 segments over Ethernet.

Provides diagnostics and health checking via a web browser and plant asset management via FDT tools such as PactWare or FieldCare.

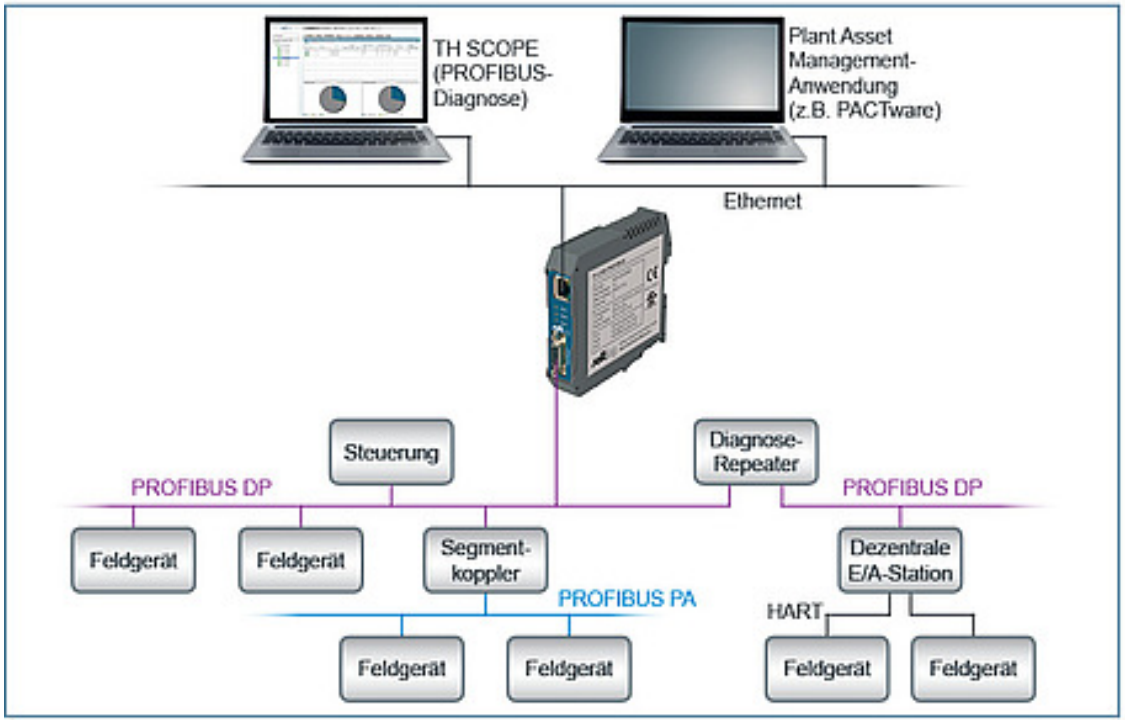
Each of the four segments can have up to 31 devices connected.

But each channel could be connected to a separate network if desired allowing up to 4 networks to be monitored simultaneously.

Each network can run at a different bitrate and can have many DP (RS485), PA (MBP) or Fibre Optic segments.

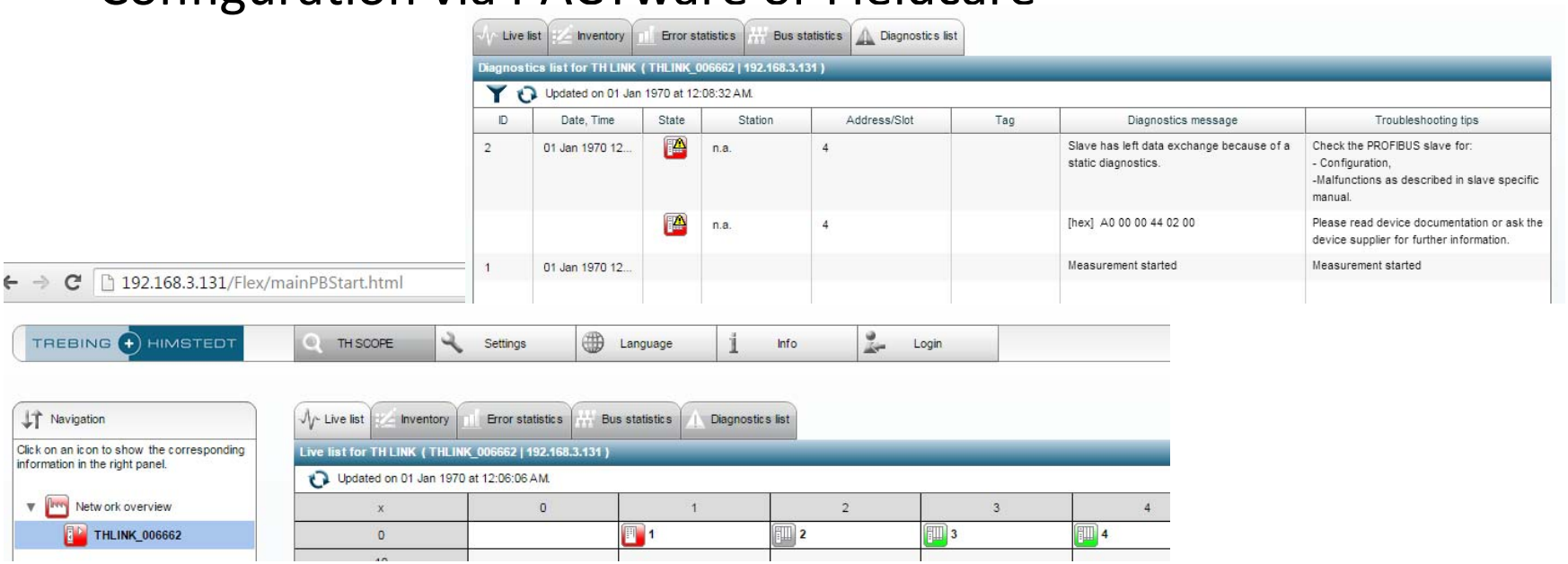
TH Link PROFIBUS

- TH Link provides controller independent access to PROFIBUS networks for plant operation and maintenance staff. Giving both network diagnostics via a web browser and plant asset management via FDT tools such as PactWare or FieldCare.



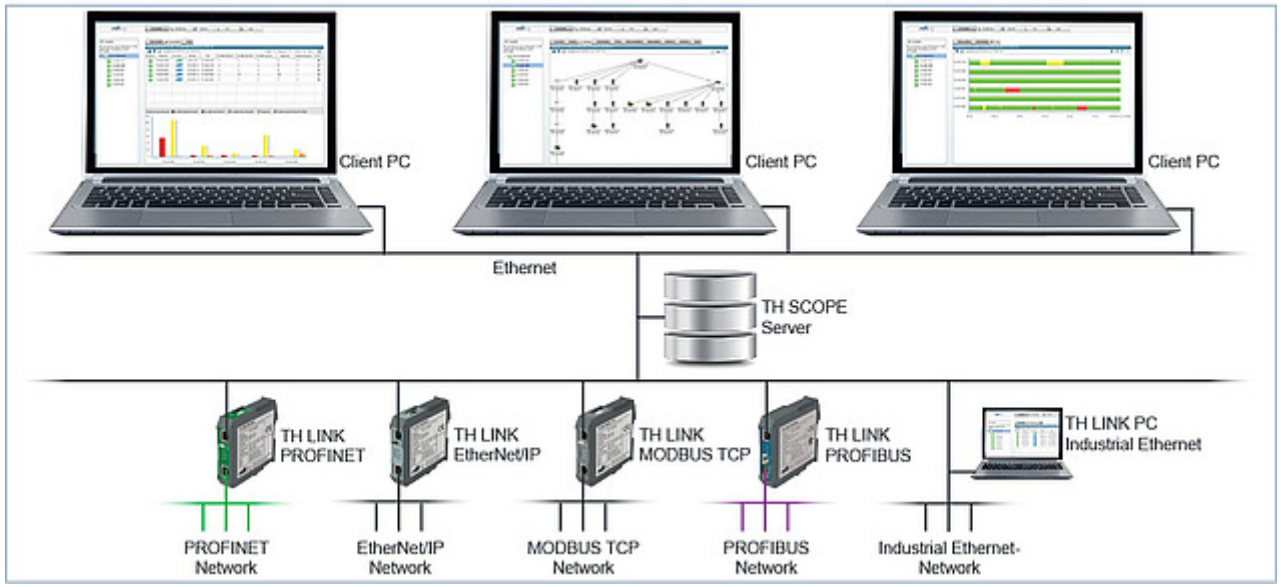
TH Link PROFIBUS

- Live List
- Inventory with particulars of devices for replacement and management
- Diagnostic List with diagnostic suggestions
- Configuration via PACTware or Fieldcare



TH Scope

- Monitor multiple TH Links, for PROFIBUS, PROFINET, Industrial Ethernet, etc.
- Trend analysis
- Live List, Statistics and inventory
- Email updates in case of issues



Our PROFIBUS Network