



# **General Session & 18<sup>th</sup> Annual Meeting of Members**

**February 23, 2017**

# The Ascent of **EtherNet/IP™**

**ODVA™**

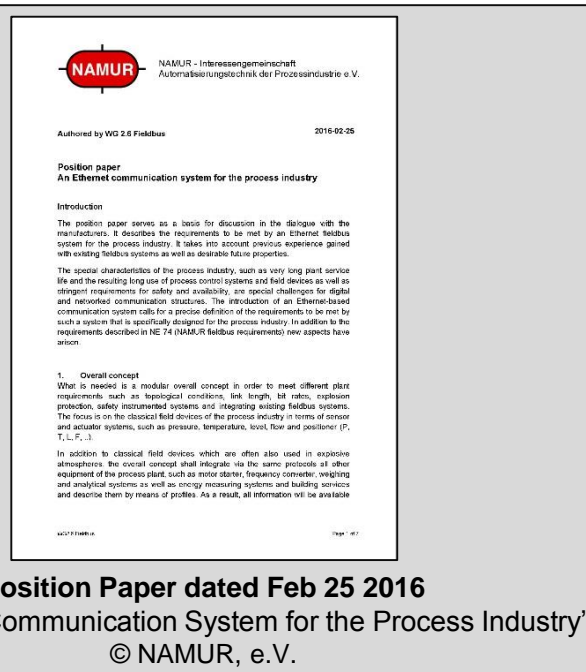
## What are users saying?



*“The aim of NAMUR’s investigation into Ethernet is to extend its application to traditional process field devices. NAMUR believes that effective and easy-to-use Ethernet communication systems between the field level and the higher system levels, such as EtherNet/IP, is a key factor for future applications with modern IoT and Industrie 4.0 solutions in the process industry.”*

**Mr. Michael Pelz, head of NAMUR Working Area 2  
Automation Systems for Processes and Plants.**

## Ascent of EtherNet/IP



## What are users saying?



*“NAMUR is formulating its strategy and requirements to adopt industrial Ethernet in process automation where possible. NAMUR and its fieldbus working group welcome the opportunity to partner with ODVA, as the organization that develops and manages the EtherNet/IP technology and standards, to help accelerate adoption of industrial Ethernet in the process industry.”*

***Mr. Sven Seintsch, chairman of NAMUR Working Group 2.6.***

## Ascent of EtherNet/IP



1. An activity to continue the refinement of formal requirements for an Ethernet communication system for the process industry through joint collaboration between the Working Group 2.6 Fieldbus (WG) and the ODVA Strategic Market Requirements Team for its Process Initiative (SMRt).

**2017 Scope of Cooperation between NAMUR and ODVA**  
“An Ethernet Communication System for the Process Industry”

*What are users saying?*



## IndustriePark Höchst

A center of the European process industry located  
in Frankfurt am Main, Germany

## Ascent of EtherNet/IP



2. The installation of an EtherNet/IP system in the process automation lab at Industriepark Höchst. This system will be a conduit for shared learning between NAMUR and ODVA stakeholders on approaches to optimize the application of industrial Ethernet for the unique requirements of the process industry.

**2017 Scope of Cooperation between NAMUR and ODVA**  
“An Ethernet Communication System for the Process Industry”



## **Lessons Learned - A Day in the Life of Field Device Users**

**Sven Seintsch**

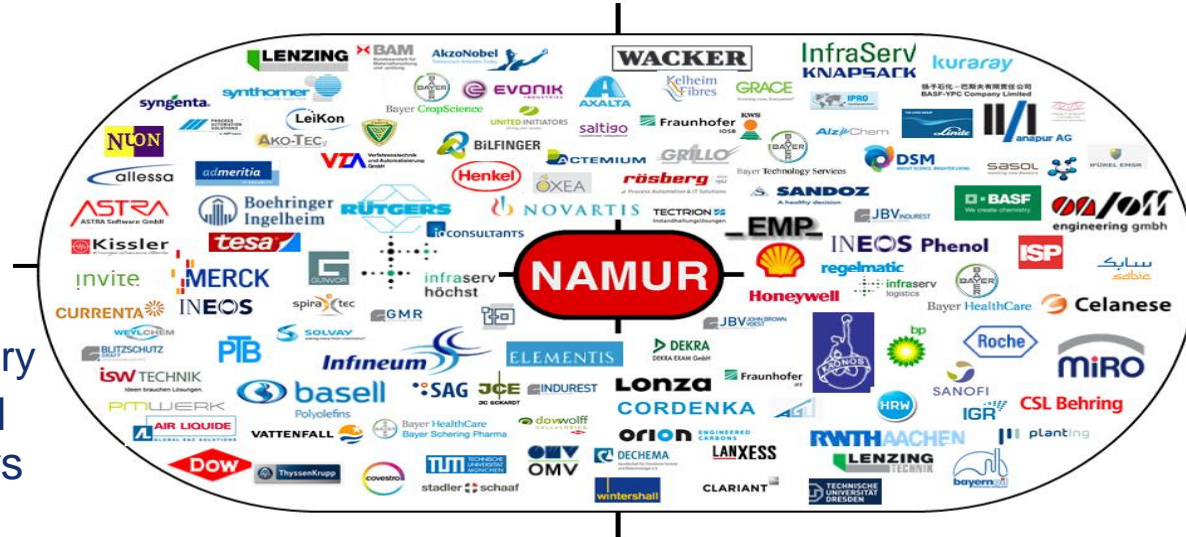
**Bilfinger Maintenance, NAMUR WG 2.6 Fieldbus**

**February 23, 2017**

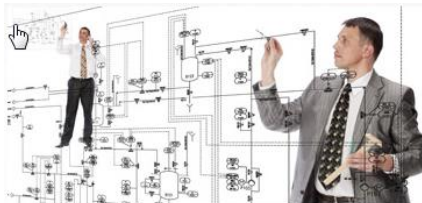
# Introduction to NAMUR

# International User Association of Automation Technology in Process Industries

- Founded 1949
- 146 Member Companies
  - operating process plants
  - offering engineering services
  - represent the interests of operators in the process industry
- NAMUR conducts an open and fair dialogue with manufacturers



NAMUR is a leading international association of automation technology users



### WA 1 Project Planning and Construction

Work area 1 deals with project management, quality management and construction.



### WA 2 Automation Systems for Processes and Plants

Work area 2 deals with solutions and systems for the process and plant control level.



### WA 3 Field Devices

Work Area 3 deals with measurement ("sensor technology" and "actuator technology").



### WA 4 Operation Support and Maintenance

Work Area 4 deals with maintenance, electrical engineering, training for and safety of process control facilities.

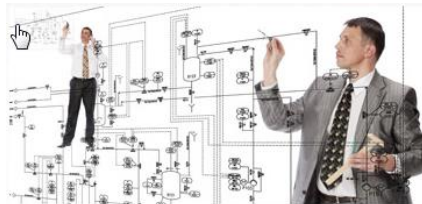
## Introduction to NAMUR

- Exchange of experience, communication of know-how
- Involvement in standardization, representing the interests of users
- User-oriented standardization and communication of best practice
- Supervision of the introduction of new technologies

110+ NAMUR Recommendations and Worksheets are available



<http://www.namur.net/>



### WA 1 Project Planning and Construction

Work area 1 deals with project management, quality management and construction.



### WA 2 Automation Systems for Processes and Plants

Work area 2 deals with solutions and systems for the process and plant control level.

**Home of  
WG 2.6**



### WA 3 Field Devices

Work Area 3 deals with measurement ("sensor technology" and "actuator technology").



### WA 4 Operation Support and Maintenance

Work Area 4 deals with maintenance, electrical engineering, training for and safety of process control facilities.

## Introduction to NAMUR

- Exchange of experience, communication of know-how
- Involvement in standardization, representing the interests of users
- User-oriented standardization and communication of best practice
- Supervision of the introduction of new technologies

110+ NAMUR Recommendations and Worksheets are available



<http://www.namur.net/>

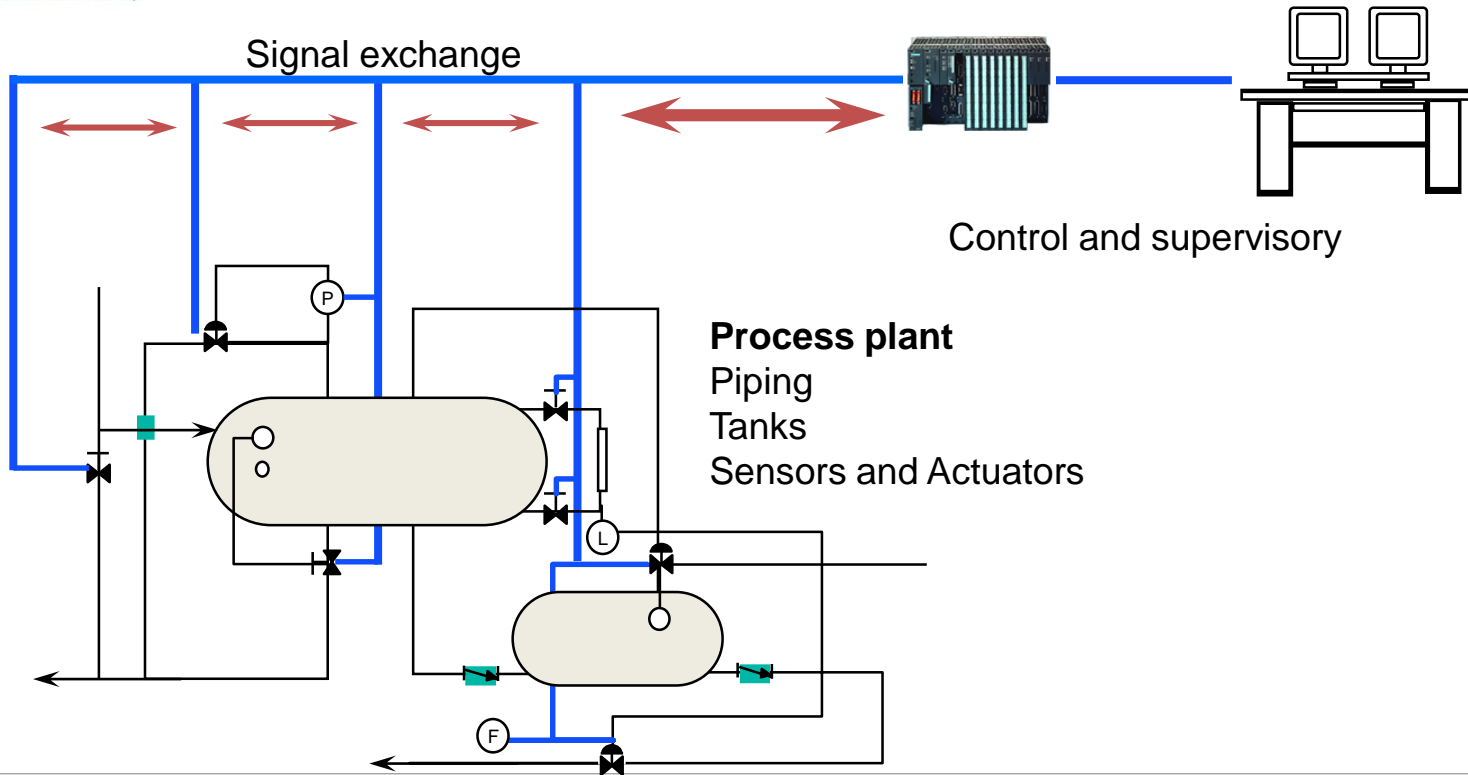
## Test Laboratory Bilfinger Maintenance

- Test of devices, type approvals, EMC-Tests
- Test of interoperability and device Integration
- Practical and theoretical training in fieldbus technology
- Troubleshooting and on-side support
- Test of new technologies for process automation

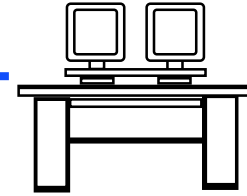
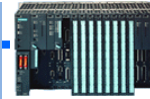
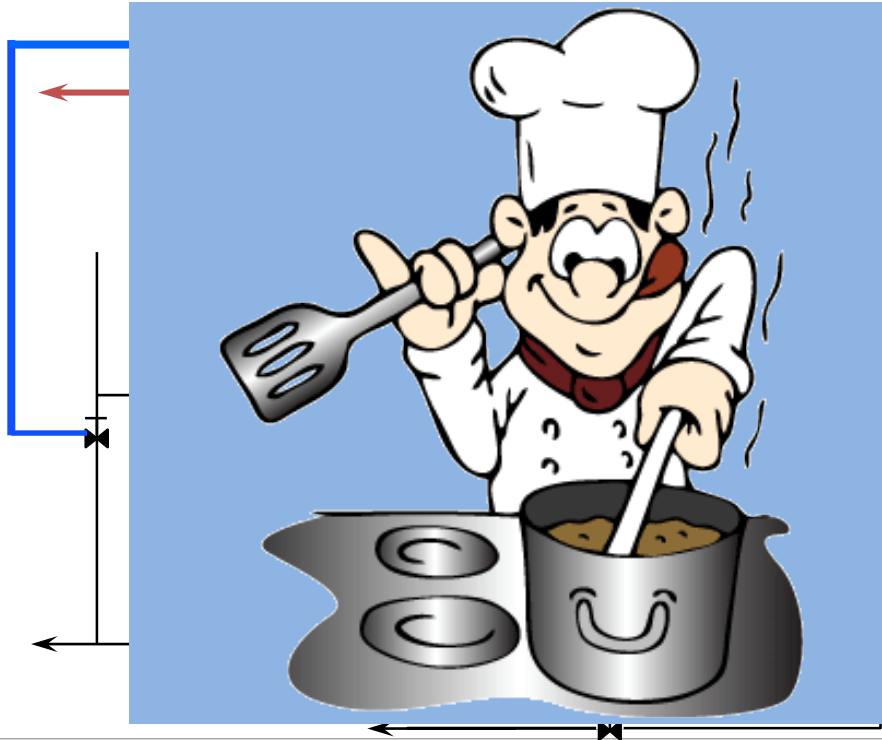


- Conditions and Recommendations in Process Industry
- Functionality of Field devices
- Device Integration
- Device Exchange
- Needs for Ethernet
- Namur Open Architecture (NOA)

# Process Automation



# Process Automation



Control and supervisory

ant

d Actuators

Easy to handle ?

# Process Conditions

- Corrosion
- Vibration
- EMC
- Humidity
- Explosion Proof
- Dust
- Hazardous-Substances
- Special Materials
- Robust Housings
- Wide Temperature Range



## High availability

- Production 24 hours a day, 365 days a year
- Changes and extensions during the running plant

## Complex Actuators and Sensors

- Transmitters for Pressure, Flow, Temperature, Levels
- Analytical Devices
- Valve positioners
- Pumps and engines
- Outdoor installations
- Signal speed 100 msec
- Redundant Systems

- Explosion proof protection
  - Flammable liquids, solvents
  - Special permits for working
  - Special tools
  - No sparks allowed
- Flameproof enclosure
  - Heavy
  - Special cable gland
- Intrinsically safe
  - Low Energy



## Hazardous Area



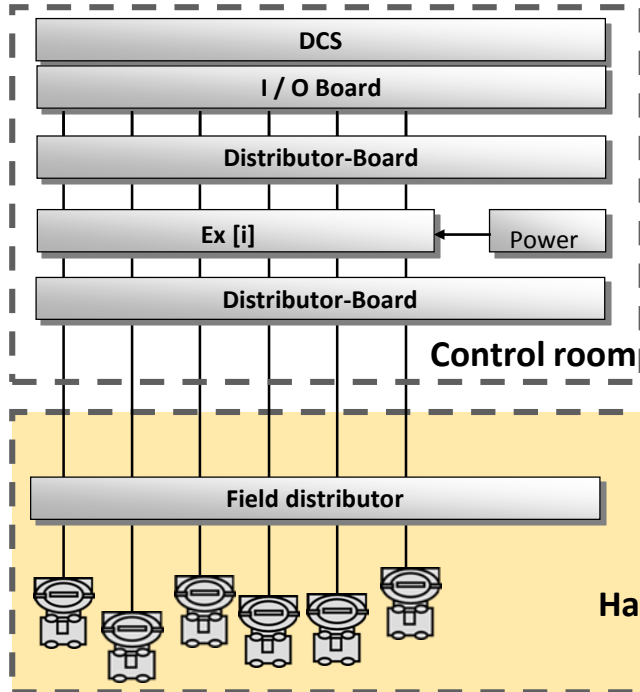
## Plant Lifetime

- Economic goods in process industry are persistent:
- Average plant live time approx. 35 Years
- Change of technical components approx. every 20 Years
- Change of Control equipment approx. 10 – 15 Years
- Strategic investment decisions based on economic calculation over a long period
- Difficult authority approval
  - Legal regulations
  - Environmental protection
  - Safety regulations
- Production over 30 Years the same product with continues improvement
- Production is validated e.g. FDA for pharmaceuticals

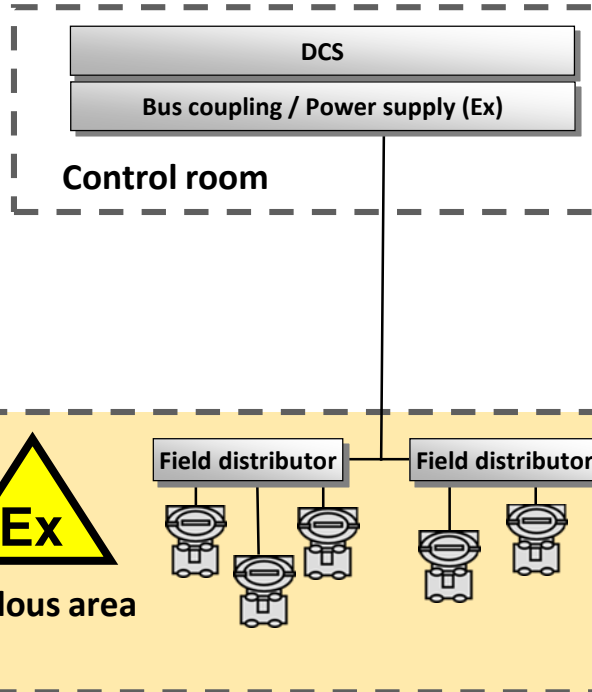


# Installations

## Analogue Installation 4-20 mA



## Fieldbus Installation



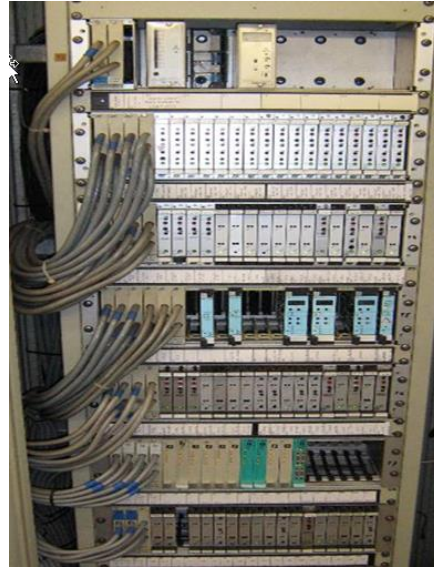
### Advantages with Fieldbus

- Measured Value with unit, Status, no scaling
- Higher accuracy,
- Several values of one transmitter
- Several devices at one line

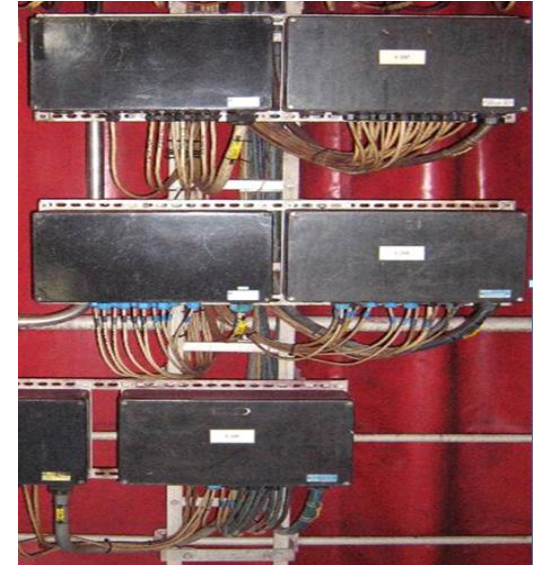
Today both technologies are used, but analogue installations are still the most.

## Device Connection (4-20mA)

Control Room

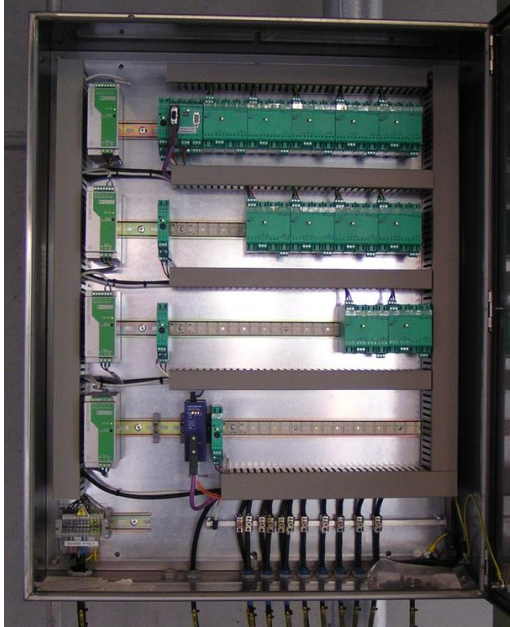


Plant



Infrastructure is complex, high required space, inverted signal lines

## Fieldbus Installation

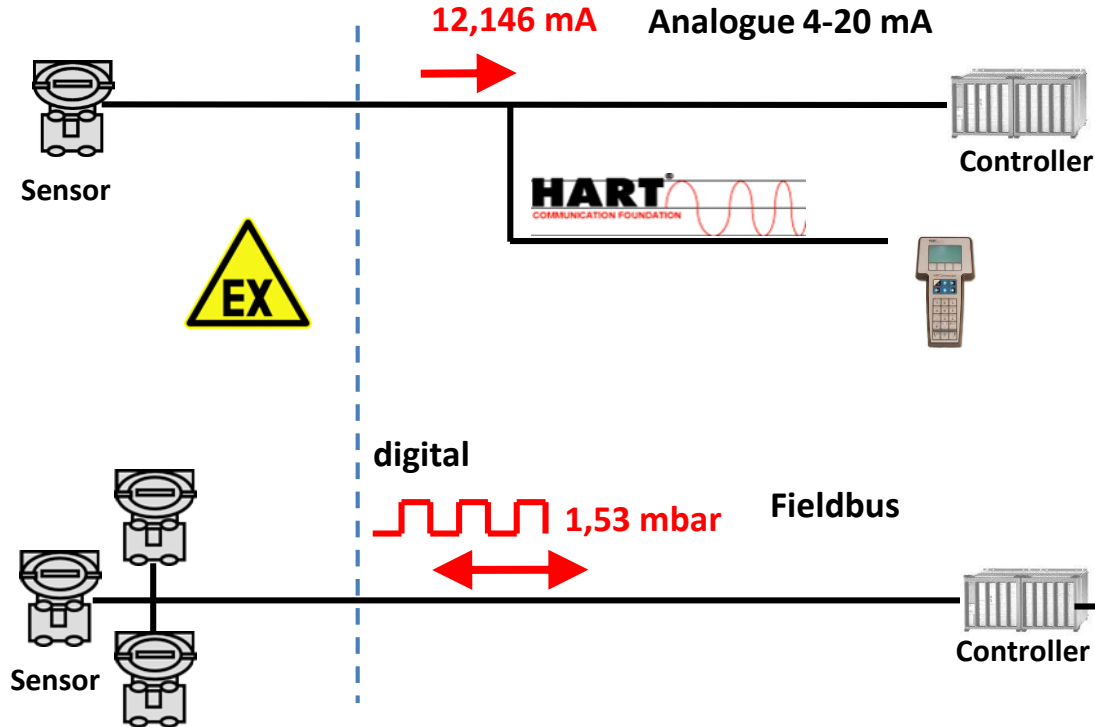


Cabinet



Field installation

# Signal transmission



- Analogue Signal for control
- On-Modulated signal for device configuration
- Point to Point connection to one device
- HART Modem or Handheld necessary

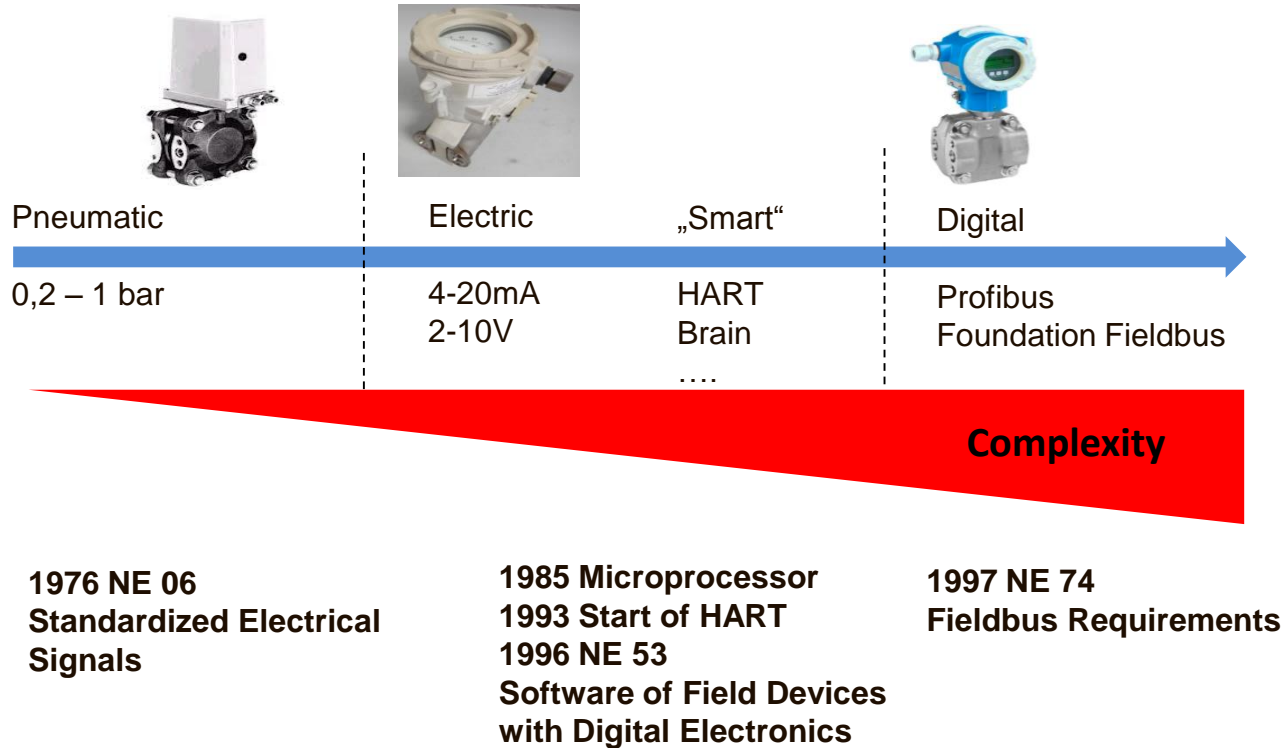
- Digital Signal for control (cyclic) and for configuration (acyclic)
- Connection to multiple devices

## Basic Requirements and practical experience:

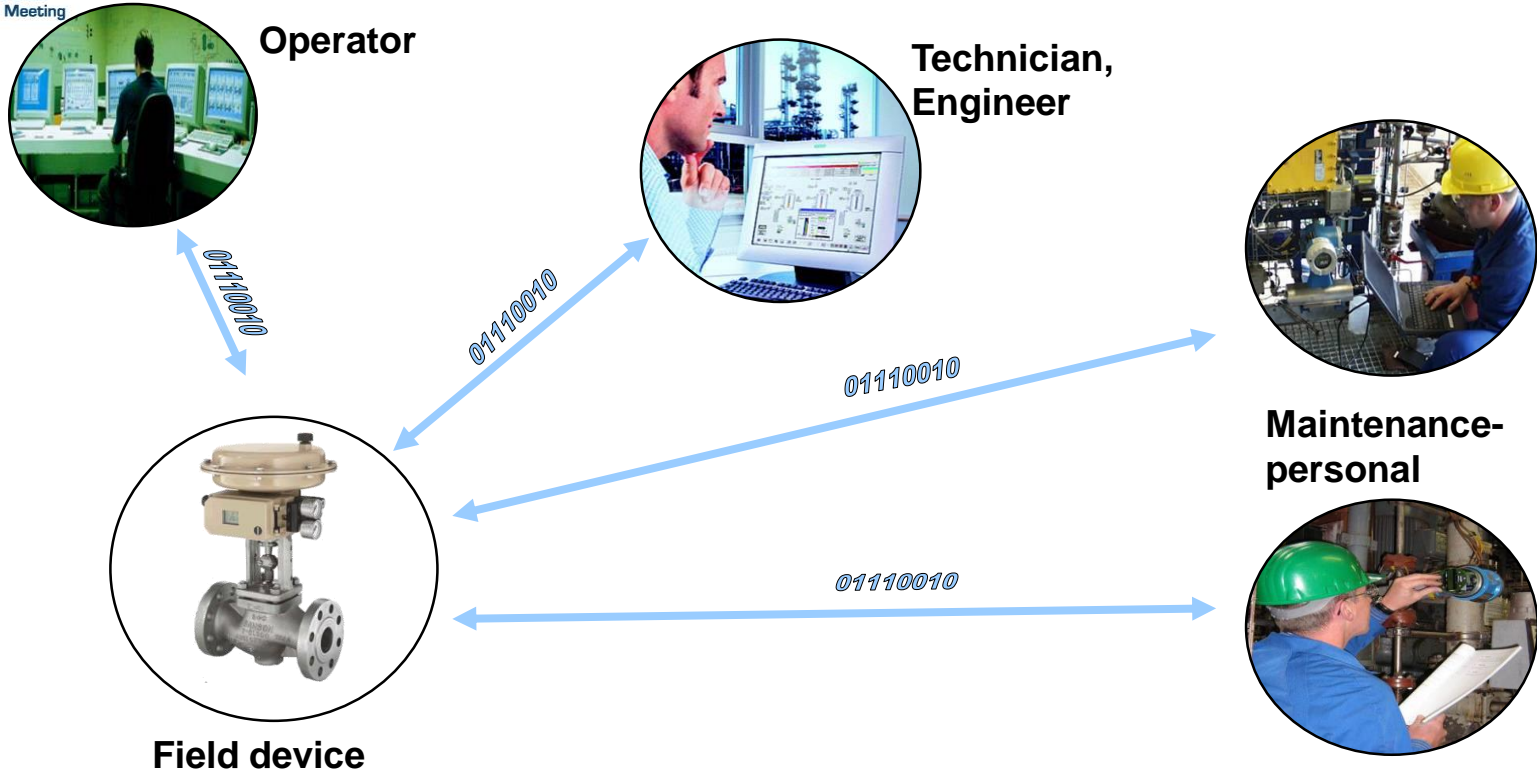


- Device functionality is easy to use
- Device integration is independent from communication and manufacture
- Device exchange is easy and version independent
- Device information is a source for Asset management

# Field interface



## Field device as information source



# Information flood



Configuration	Input / Output	Alarm configuration	Classification device
Condensed state			
Status 'Standstill outside the end positions'	Maintenance demanded		
Status 'Left end position without demand'	Maintenance demanded		
Status 'Limit movement counter exceeded'	Maintenance required		
Status 'Temperature limits exceeded'	Maintenance required		
Status 'Transit time switching demand manipulated'	Maintenance demanded		
Status 'No valve movement on switching demand'	Maintenance demanded		
Status 'PST: Tolerance band not reached'	Maintenance demanded		
Status 'PST: Tolerance band exceeded'	Maintenance demanded		
Status 'PST: Solenoid valve not activated'	Out of specification		
Status 'PST: Timeout PST'	Maintenance demanded		

Process - Process Alarm			
Date	Message		
10-Oct-12 15:41:37	I0001_MAO	IN1_V = 0	CNF
10-Oct-12 15:41:42	I0001_MAO	IN1_V = 0	CNF Recover
10-Oct-12 15:42:25	I0001_MAO	IN1_V = 0	CNF
10-Oct-12 15:42:30	I0001_MAO	IN1_V = 0	CNF Recover
16-Oct-12 10:16:09	8800	PV = 0.0 m3/h IOP	
16-Oct-12 10:16:15	FT101DP	PV = -0 mBar IOP	
16-Oct-12 10:16:15	FT101SP	PV = 1.0 mBar IOP	
16-Oct-12 10:16:15	TT202_T1	PV = 13 inH2O IOP	
16-Oct-12 10:16:15	TT202_T2	PV = 23.7 psig IOP	
16-Oct-12 10:16:15	TT202_T3	PV = 23.6 DEGC IOP	
16-Oct-12 10:16:15	TT202_T4	PV = 23.6 DEGC IOP	
16-Oct-12 10:16:15	TT202_T5	PV = 24 inH2O IOP	
16-Oct-12 10:16:15	TT202_T6	PV = 23.7 psig IOP	
16-Oct-12 10:16:15	TT202_T7	PV = 23.6 DEGC IOP	
16-Oct-12 10:16:15	TT202_T8	PV = 23.7 DEGC IOP	
16-Oct-12 10:16:21	F0002_AI1	PV = 0.0 M3/H CNF	
16-Oct-12 10:16:46	FT101DP	PV = -0 mBar IOP Recover	
16-Oct-12 10:16:46	FT101SP	PV = 1.0 mBar IOP Recover	
16-Oct-12 10:16:46	TT202_T1	PV = 13 inH2O IOP Recover	
16-Oct-12 10:16:46	TT202_T2	PV = 23.7 psig IOP Recover	

## Complexity of Field devices

Today devices with more than 1000 parameters are normal !

Configuration over device display is not possible !

- Operation Interfaces

- Different Software Tools
- On Site Push Buttons, different menus structure

Application specific settings are necessary, e.g.:

- Actuator, Valve specific tuning
- Adjustment of Process conditions
- Classification of Diagnostics

Tomorrow's device communication should present a stable base for modern maintenance strategies, device diagnostics, Asset Management without higher effort and with long term investment safety!



# Differences in device integration

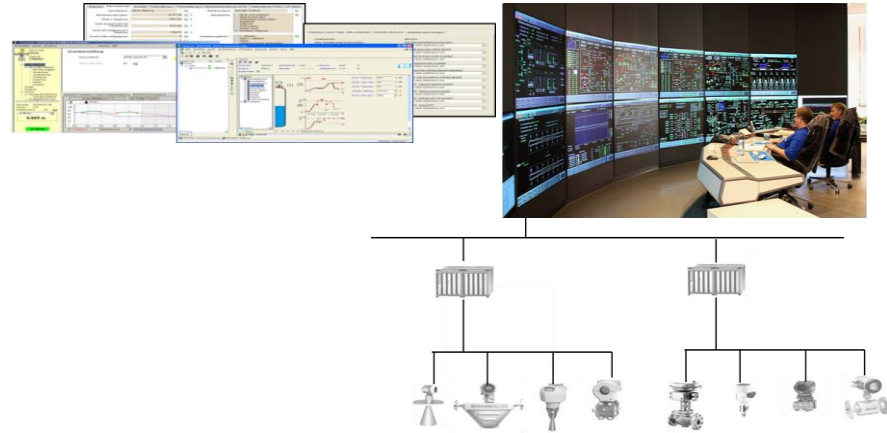
## Point to Point connection e.g. HART



Problems on a single place,  
e.g. with a notebook

Device integration is the problem !

## Central device management fieldbus



Problems with the complete system!

## Benefit: Flexible Device configuration

Configuration on the display



Which display?

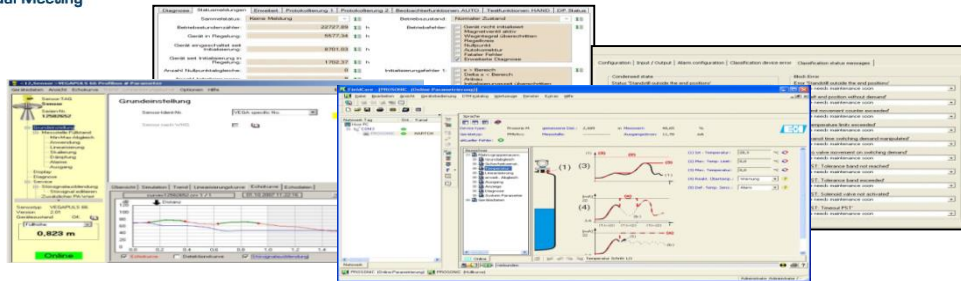
Configuration on the device!



No secure workplace!

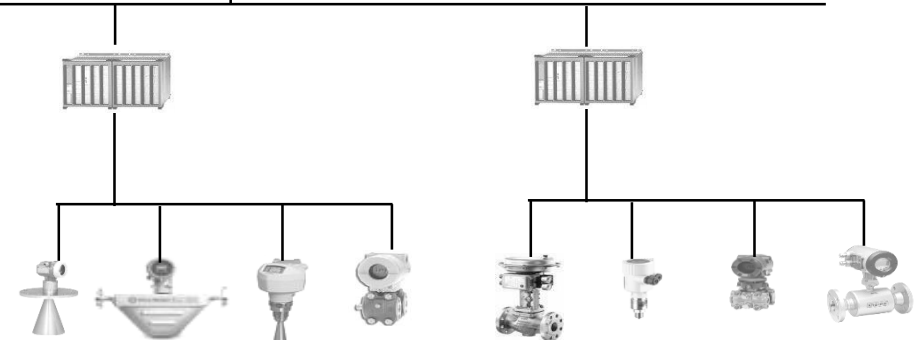
Do it in the control room!

# Benefit: Central Device Management



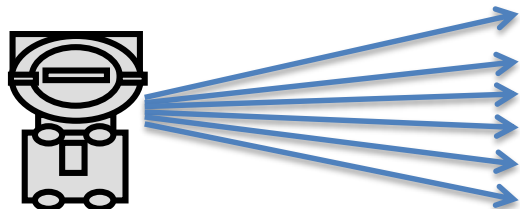
- The complete functionality of the devices can be used centrally
- Minimization of the up to now required ways to the field devices in the plant

Effective maintenance strategies are possible!



# Device integration

## Situation today



One device several options

- Fieldbus Foundation Device Description (DD)
- 375/475 Field Communicator
- DTM / PACT ware
- ABB Fieldbus Builder
- Emerson AMS / DeltaV
- Yokogawa PRM – Device Viewer

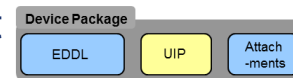


Tomorrow...

One single device  
integration such  
as. . .



- Clearly minimized effort to use and care of the device integration
- One device integration for all devices of process industry, independent of communication and manufacturer



# Software Cycles of Intelligent Devices

Start UP



**HW: 1.2**

**SW: 1.2**

Bug fix



**HW: 1.2**

**SW: 1.4**

New Language  
added



**HW: 1.2**

**SW: 1.6**

Point-Indicator  
added



**HW: 1.2**

**SW: 1.8**

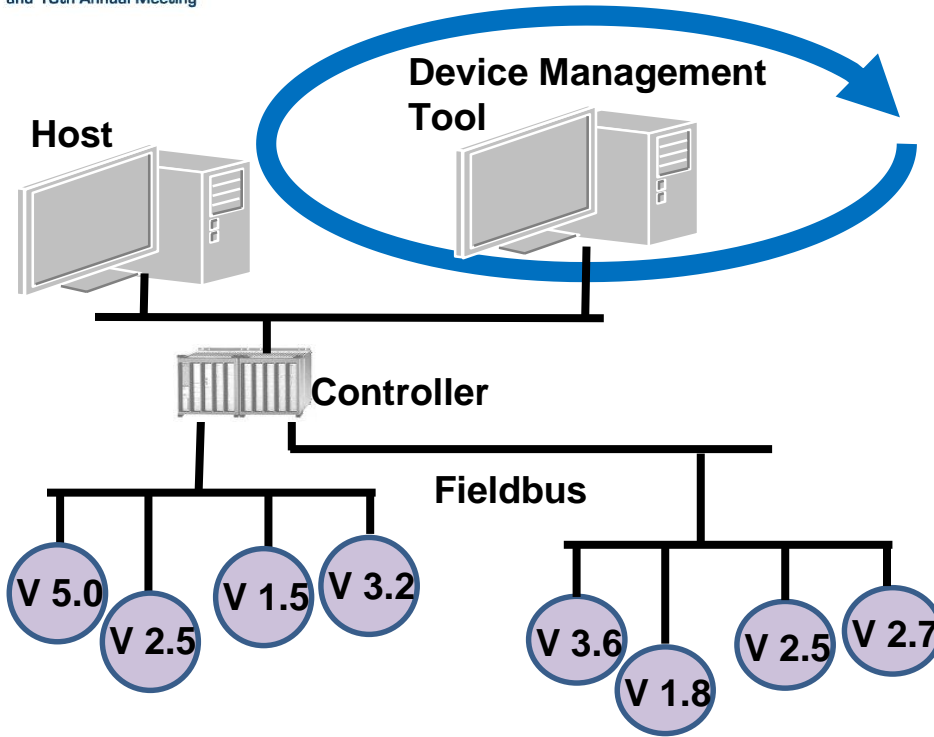
„Functionality“ of field devices changes, that courses also a change of the device description

New installation of device descriptions is necessary

Search for the suitable device description

Download in the DCS → Production stop

## Increasing versions during the plant lifetime



Change of host system versions  
Change of device management tool versions  
Devices with different revisions/SW

- Start up and change of devices must be possible independent of the device revision/SW
- Definition of Standard-Parameters for devices that ensure the start up and the work of devices (NE131)



## Needs of information



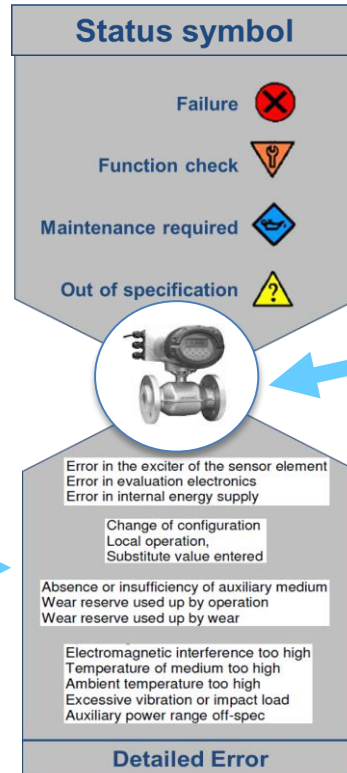
Operator

Automatically  
transfer



Maintenance

active access  
(manual)



Open  
Interface

### Asset management system

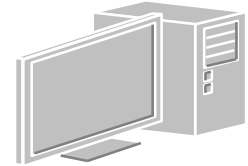
- historical Data
- Plant Health Status
- ERP connection



**Not possible today !**

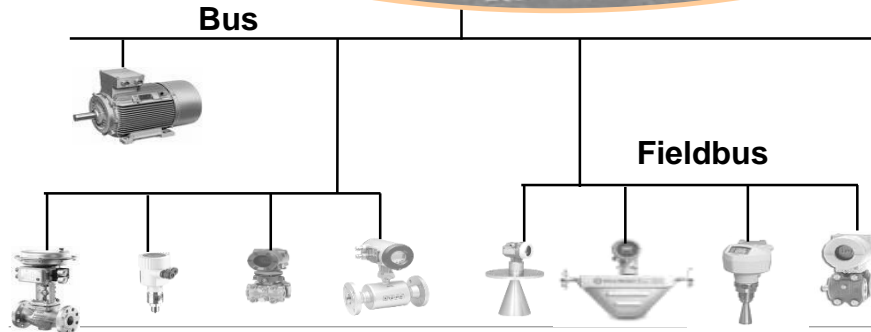
# Device information today

**Asset management ,Vendor B**

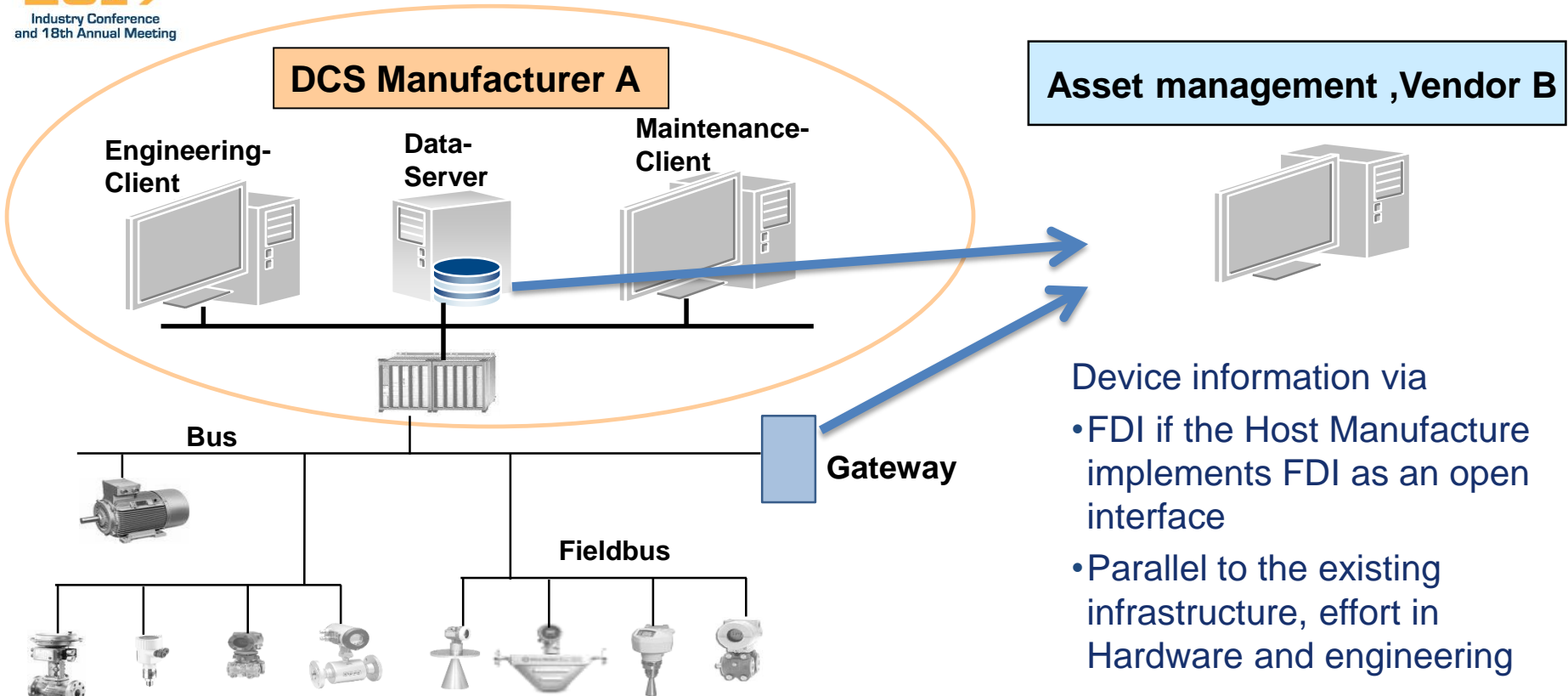


**Bus**

**Fieldbus**

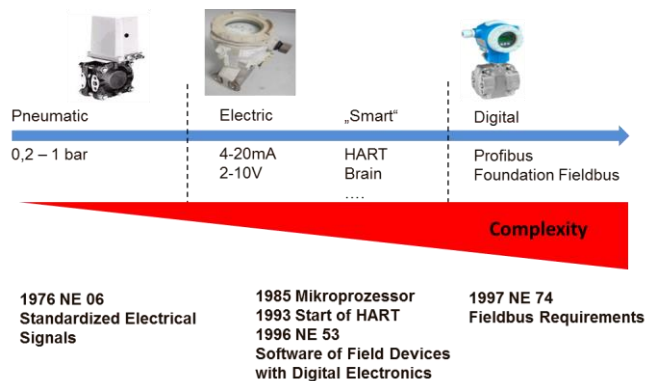


## Device information tomorrow



# ***Industrial Ethernet . . .***

## ***Next Generation Technology for Process Field Devices***



Digital

Ethernet

**Complexity**

**Position Paper  
Ethernet communication  
system for the process  
industry**


## Ethernet in the field

### Future challenges

- Rising amount of data
- Higher data rates
- Information and must be available everywhere

The handling of field devices must become much easier !

- Device integration
- Interchangeability
- Data access

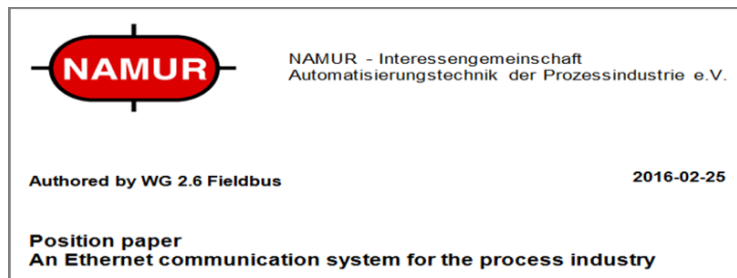
	<p>Anforderungen an einen Feldbus</p> <p>Fieldbus Requirements</p>	<p><b>NE 74</b></p>
--	--	---------------------

Bound to other fieldbus systems,  
focusing on the process industry

Expectations on a fieldbus system

- Economic benefits, better diagnostic
- Environmental conditions, hazardous areas, EMC
- Topology
- Safety equipment
- Interchangeability

## NAMUR Investigation

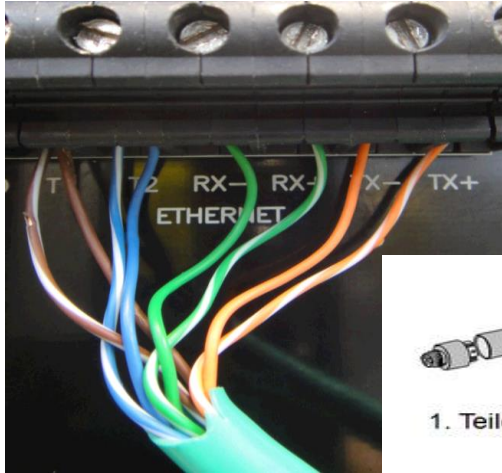


Existing requirements persist, even for Ethernet

- modular concept
- Topology and cable lengths
- Data rates
- Ex-protection
- Safety equipment
- Integration of installed field bus systems

<http://www.namur.net/index.php?id=123&L=1>

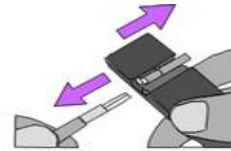
# Example interconnection technology



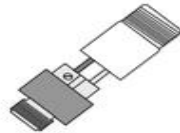
1. Teile auslegen



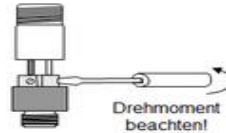
2. Kabel durchführen



3. Kabel abisolieren

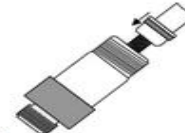


4. Drähte einführen

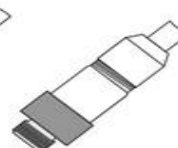


5. Leiter festschrauben

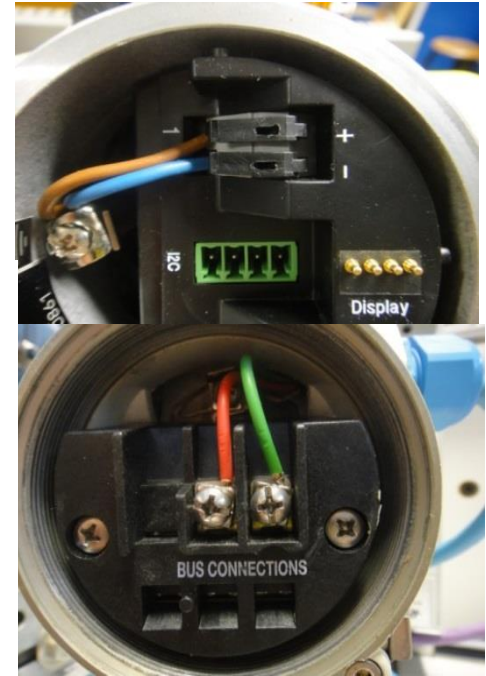
Drehmoment  
beachten!



6. Schirm einklemmen

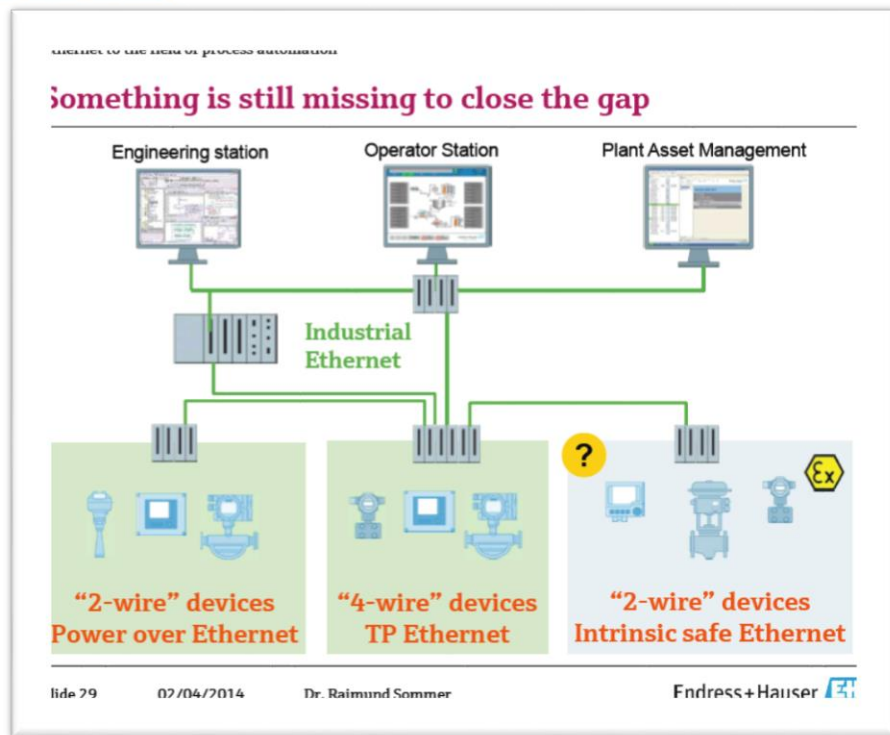


7. Gehäuse schließen



Connection today

# Next Generation Physical Layer for Ethernet

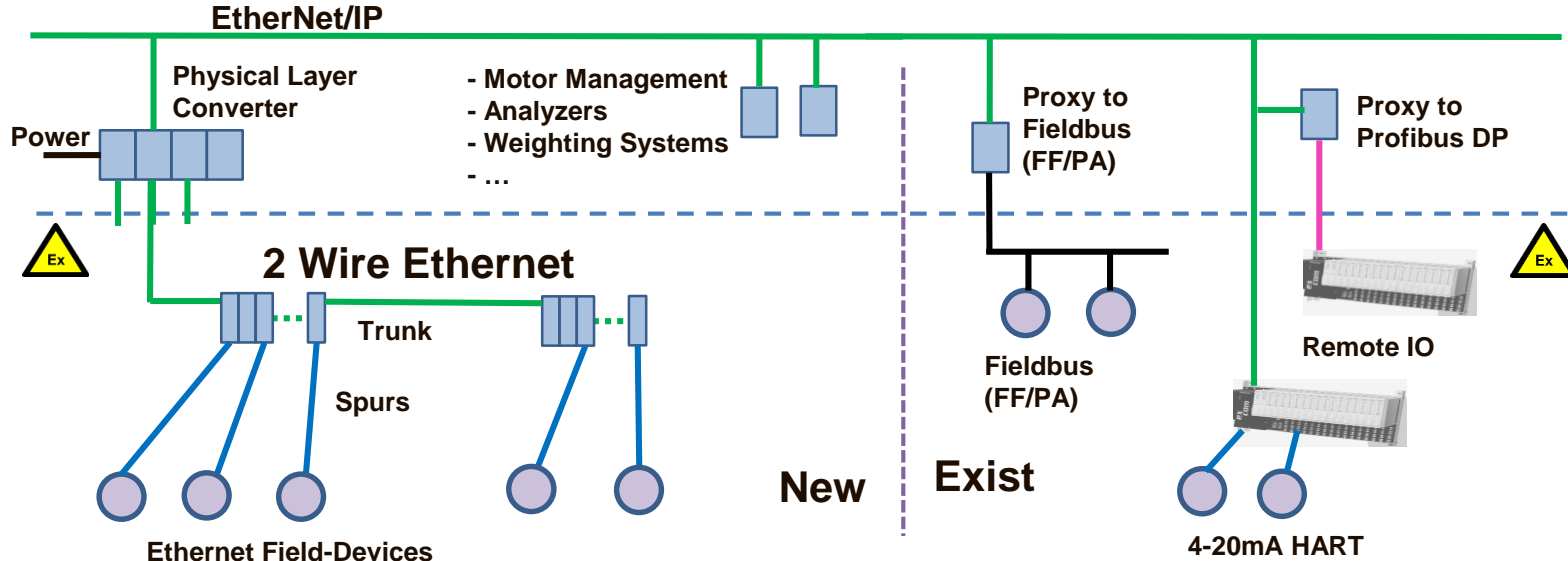


- Single twisted pair for signal and power transmission
- Installation in hazardous areas Zone0 / Class1
- Support of intrinsically safe wiring concept
- Connection technology via terminals
- Sufficient cable length

# Ethernet for Process industry

2 wire field devices with EtherNet/IP interface

One protocol for all devices in the plant



# Ethernet as an enabler

## Multi Protocol Devices

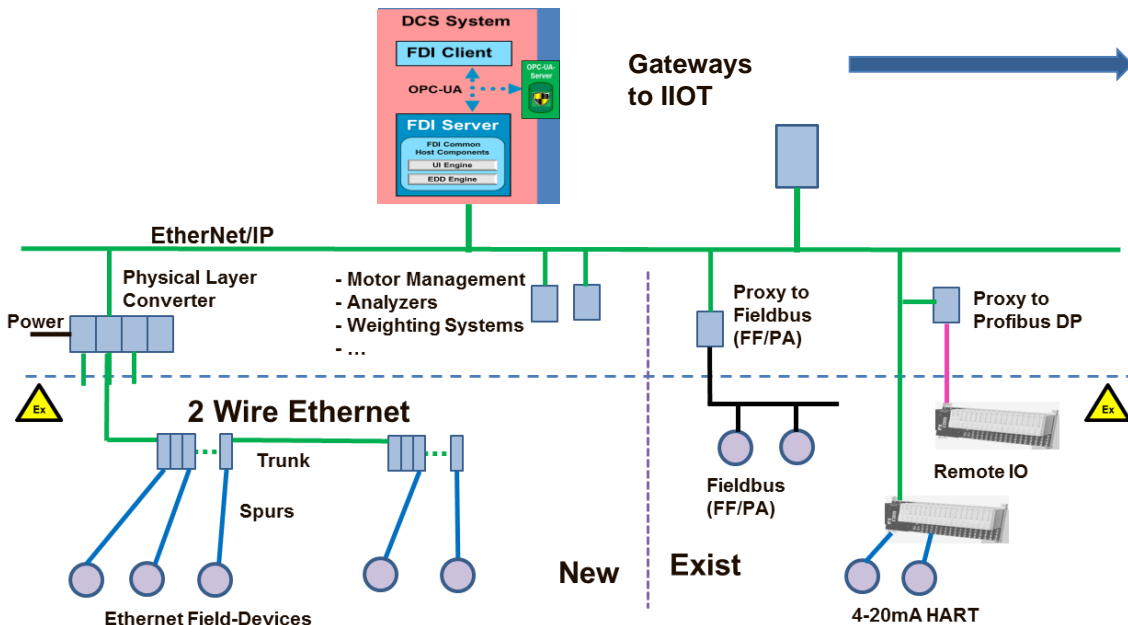
- Process Control
- Diagnostic / Monitoring

– Faster data transfer

– Device integration on board

## IIOT Use cases

- Asset management
- Machinery Health
- Mobile Maintenance
- Data Analyses



# Namur Approach (Namur Open Architecture)

Enhancement of existing approaches as a baseline for the efficient and flexible utilization of Industry 4.0 with the process industry

- Additive to existing structures
- Open for new approaches within Industry 4.0
- Simple integration of fast changing IT components from field level up to enterprise level
- Significant improvements of cost per sensor due to open and integrative approaches
- No risk of availability and safety of installed base

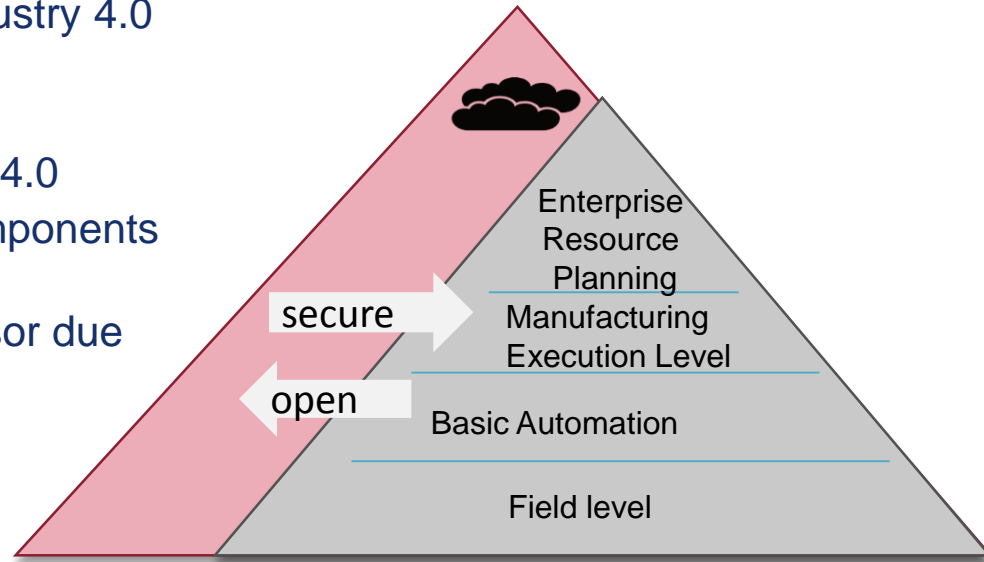


Abb. Aus Präsentation Tauchnitz/Klettner, NAMUR HS 2016

# Namur Approach (Namur Open Architecture)

Enhancement of existing approaches as a baseline for the efficient and flexible utilization of Industry 4.0 with the process industry

- Additive to existing structures
- Open for new approaches within Industry 4.0
- Simple integration of fast changing IT components from field level up to enterprise level
- Significant improvements of cost per sensor due to open and integrative approaches
- No risk of availability and safety of installed base

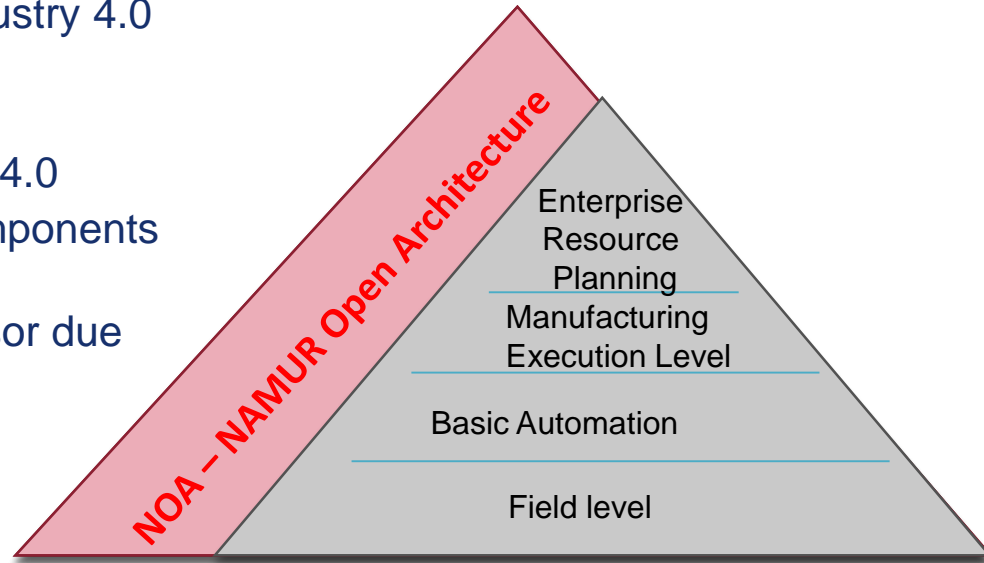


Abb. Aus Präsentation Tauchnitz/Klettner, NAMUR HS 2016

## Monitoring and Optimization Independent from Process Control

Monitoring and Optimization (M+O)

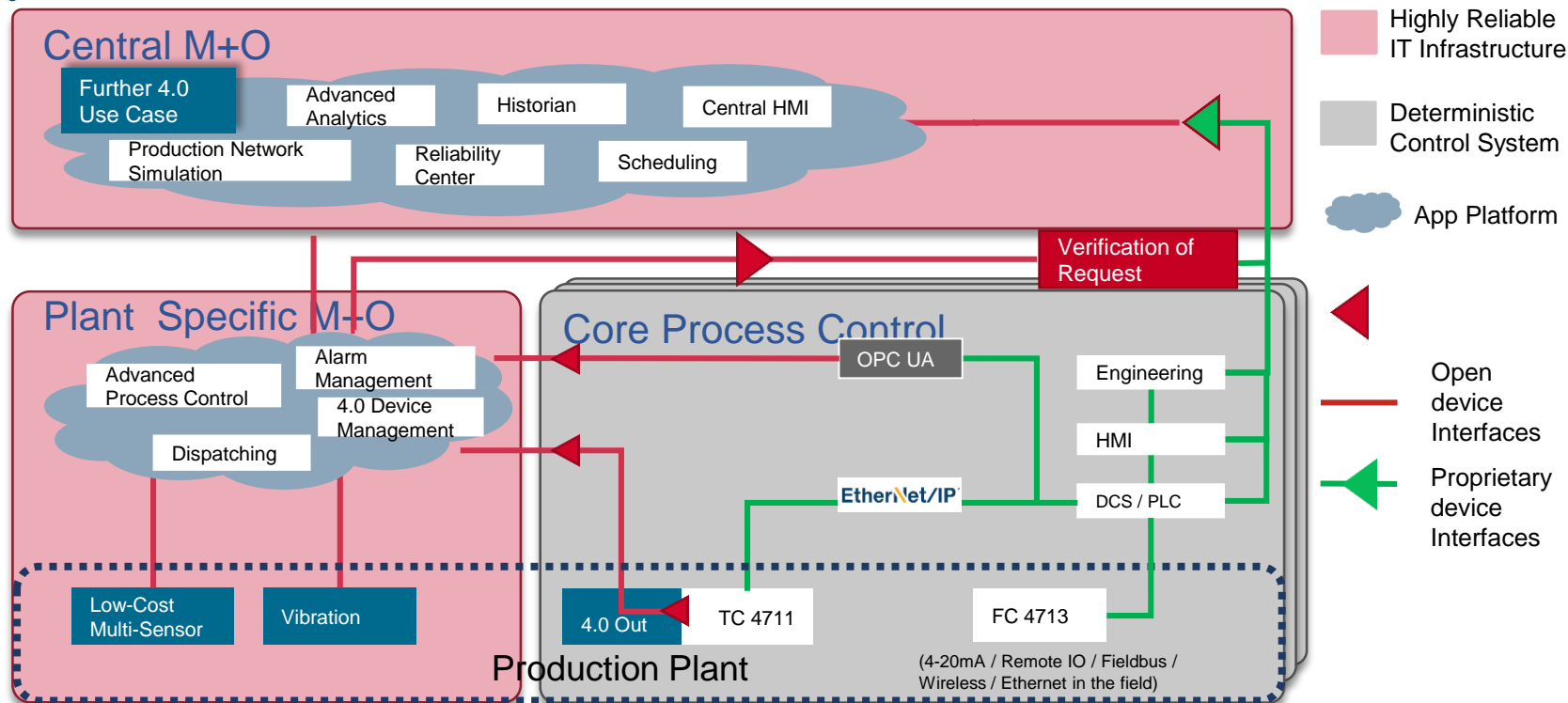


Abb. Aus Präsentation Tauchnitz/Klettner, NAMUR HS 2016

# EtherNet/IP for Process Industry

## Devices, easy to handle!



Digital

Ethernet



Position Paper  
Ethernet communication  
system for the process industry

## One Single Device integration

# EtherNet/IP™

## Next Gen Physical Layer



## A Solid Cornerstone for Process Industry

## Diagnosis + ASM



Asset management system

- historical Data
- Plant Health Status
- ERP connection





**THANK YOU**