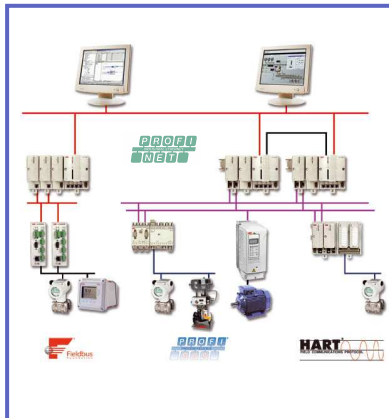


ABB Corporate Research

Integrating Automation

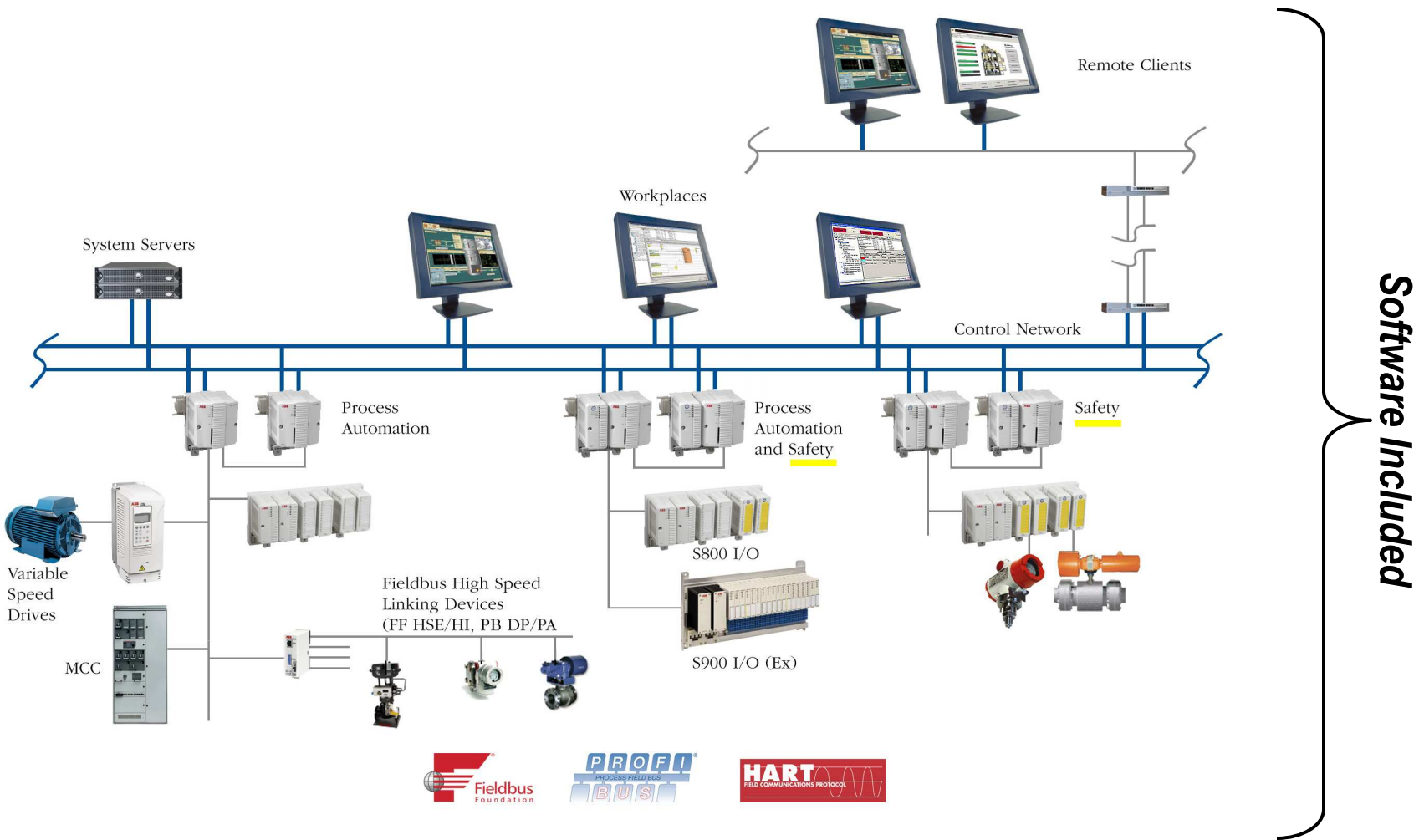
Dr. Ulrich Topp
Dr. Dirk John



What are we talking about?

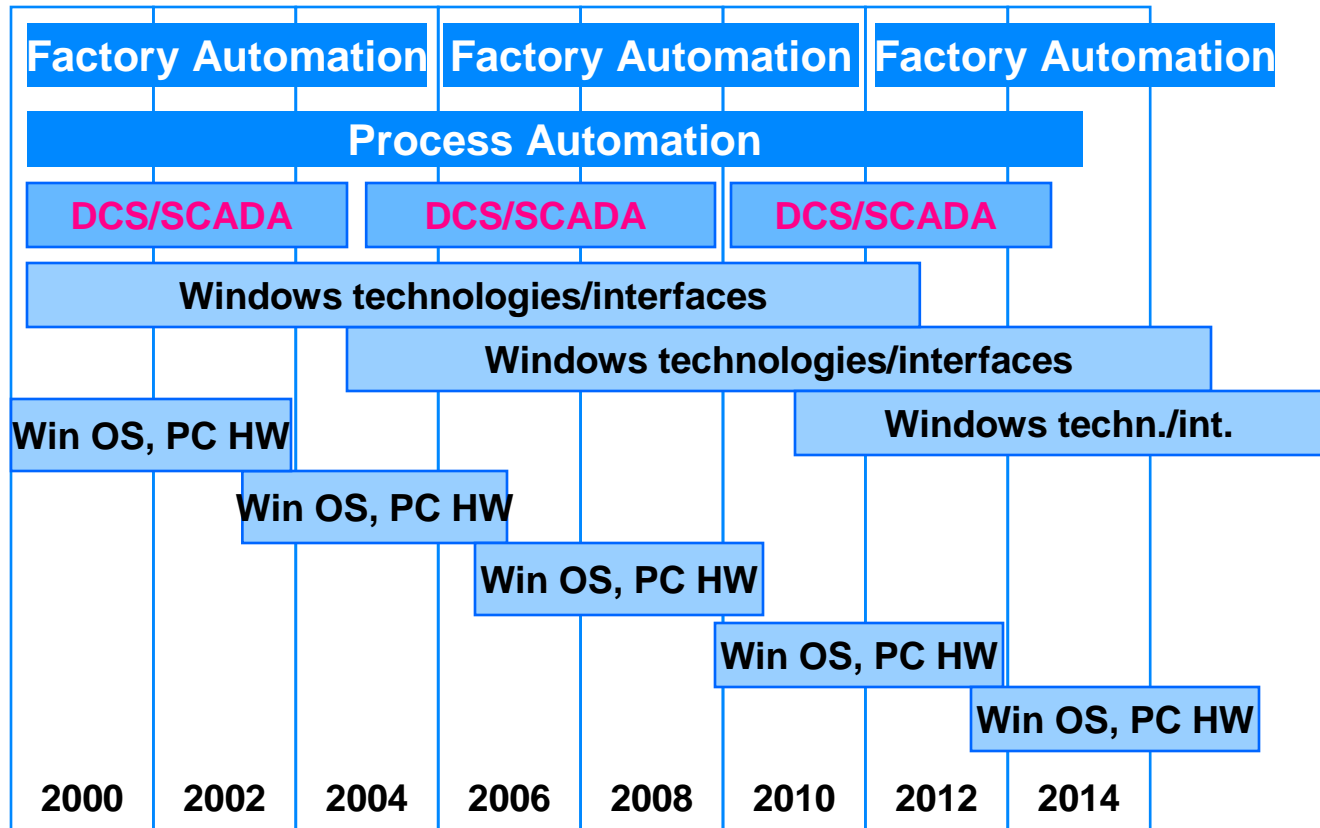
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Automation levels

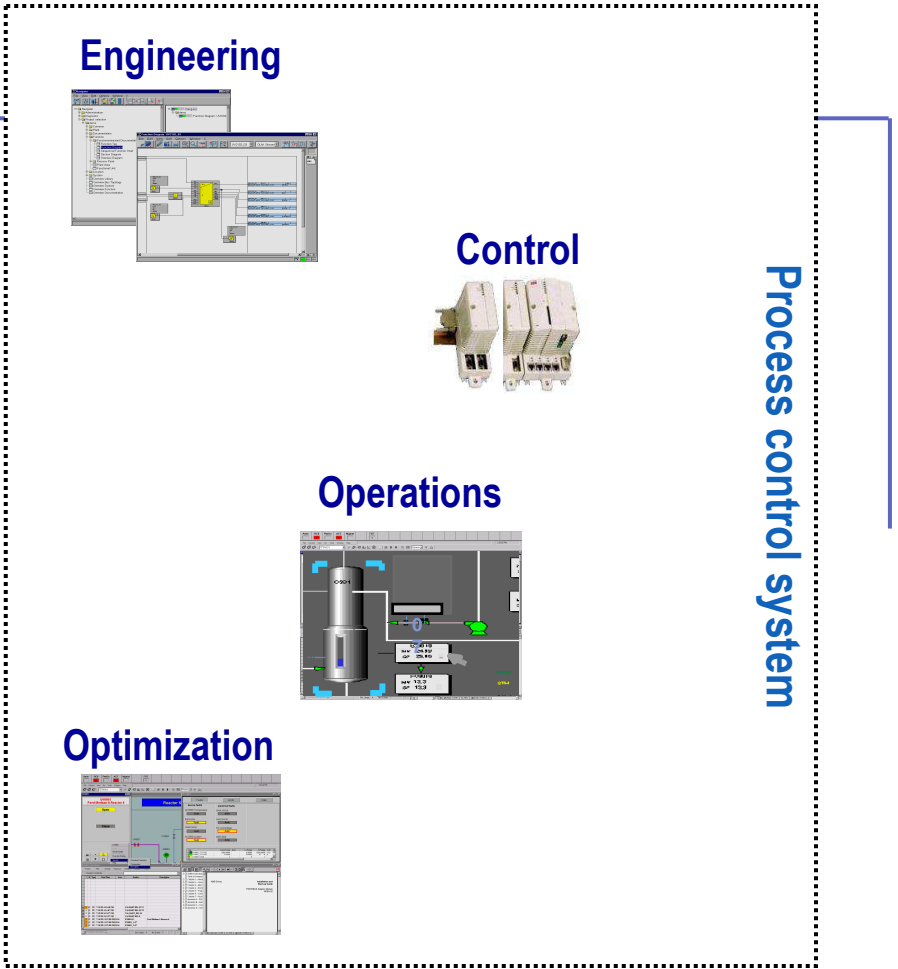
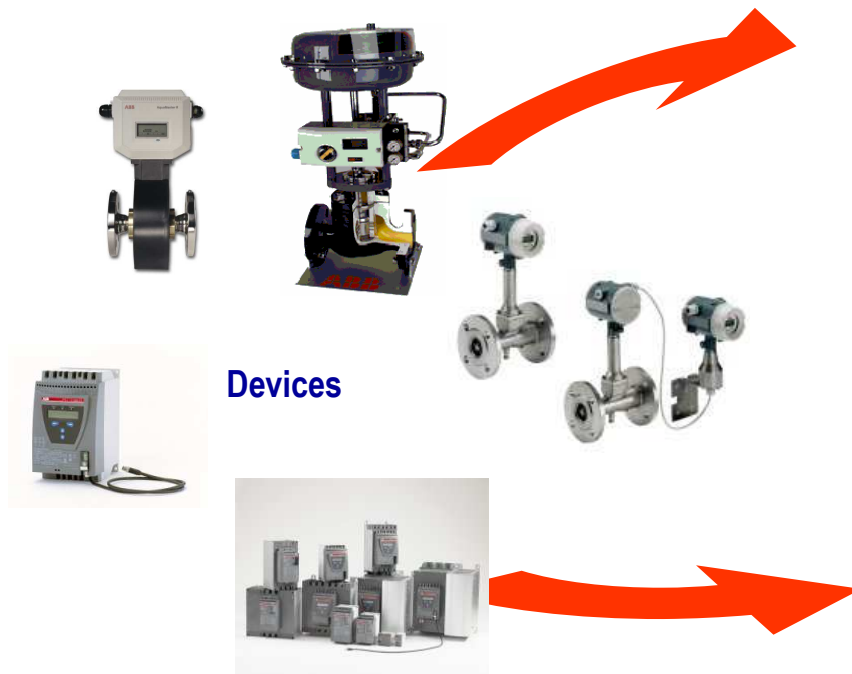


Long-Term Viability of Device Integration

- 5 to 10 ys
- 10 to 15+ ys
- 4 to 5+ ys
- 10+ ys
- 3 to 4 ys



Integration



Integration is synonymous with making the **information** and **functions** of devices (entities) available and accessible for various tasks in the **life cycle** of a system, e.g.

- During the engineering process for configuration and parameter assignment
- During plant operation, e.g. for monitoring alarms and asset management

Device

The scope is based on definitions in ISO 15745:

- ***Device***

- entity that performs control, actuating and/or sensing functions and interfaces to other such entities within an automation system

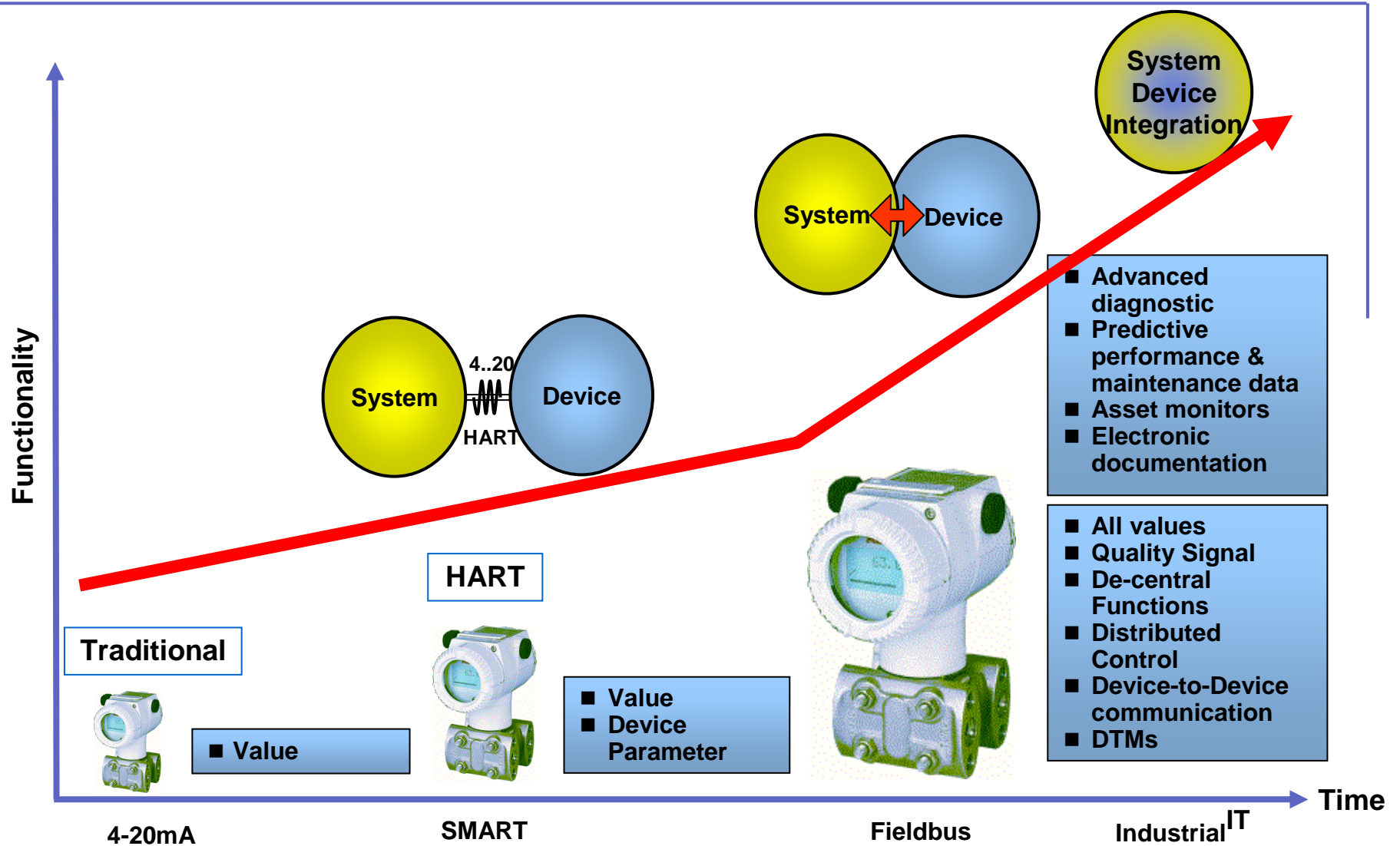
- ***Device profile***

- representation of certain integration aspects of a device

- ***Device integration model***

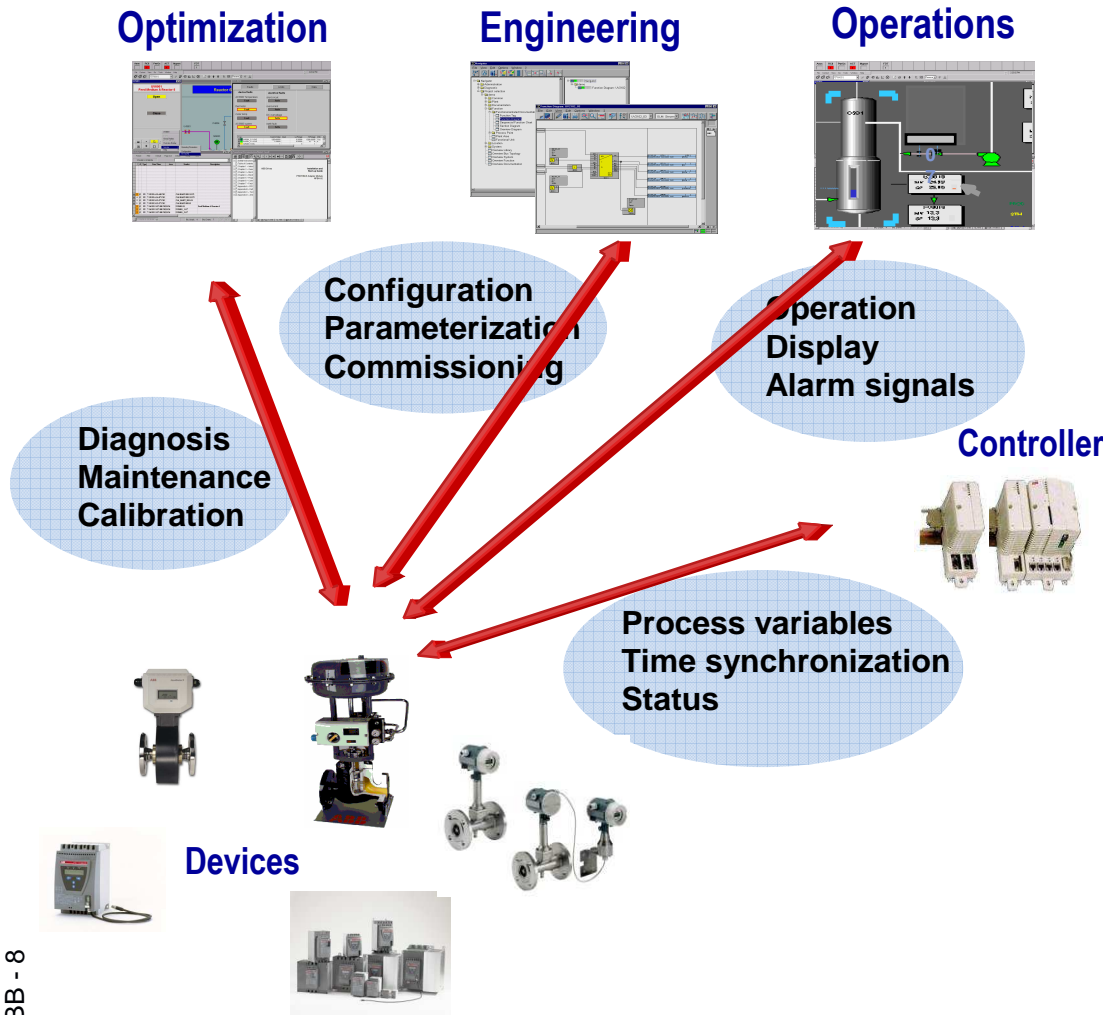
- The device integration model describes the properties of the device that are necessary to support the application
- requirements defined in the process integration model and the information exchange integration model e.g.:
 - function(s) performed by the device;
 - input and output data exchanged with the device;
 - configuration parameters and runtime variables stored by the device.

Device Integration - Evolution



Expectations on Device Integration Technology

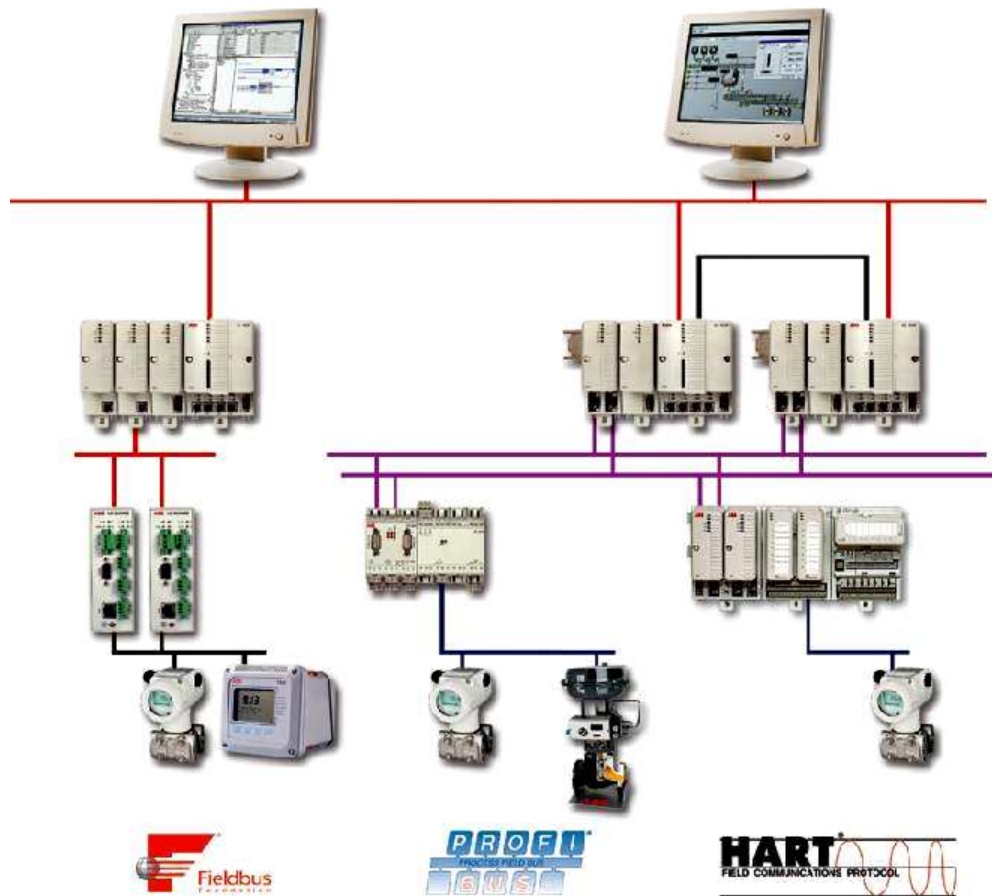
- Seamlessly integrated into control system
- Access to device internal data
- Openness for all device manufacturers
- Easy to use



What are we talking about?

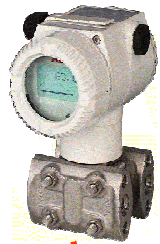
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Example: ABB System 800xA



- System integration makes external tools obsolete
- Fieldbus topology planning
- Fieldbus application configuration
- Field device parameterization and diagnostics
- Device Asset Optimization
- Easy navigation through plant explorer and context sensitive menus
- All field device aspects are only one mouse click away

Device Type Object with its Aspects



Real Object

Each device type object includes aspects for

- Instrumentation, Object Type Group
 - Actuators & Positioners, Object Type Group
 - Positioners & Converters, Object Type Group
 - Electro-Pneumatic Positioners, Object Type Group
 - Analytical Products, Object Type Group
 - pH/Redox, ORP Products, Object Type Group
 - Measurement Products, Object Type Group
 - Flow Measurement Products, Object Type Group
 - Coriolis Mass Flowmeters, Object Type Group
 - Electromagnetic Flowmeters, Object Type Group
 - Vortex & Swirl Flowmeters, Object Type Group
 - Pressure Measurement Products, Object Type Group
 - Absolute Pressure Transmitters, Object Type Group
 - 264AS, Object Type Group
 - 264NS, Object Type Group
 - 264VF, Object Type Group
 - 264VS, Object Type Group
 - 264VS_HART, Object Type**
 - Differential Pressure Transmitters, Object Type Group
 - Gauge Pressure Transmitters, Object Type Group
 - Transmitters, Remote Seals, Direct Mount, Object Type
 - Temperature Measurement Products, Object Type Group
 - Head mounted Temperature Transmitters, Object Type
 - TH02, Object Type Group

Aspects of '2600T_264xx'	Modified
Alarm List	10/10/2003 8:29:..
Asset Reporter	12/05/2003 11:1..
Asset Viewer	12/05/2003 11:1..
Control Structure	12/05/2003 11:1..
Copy of Copy of Name	12/05/2003 1:52:..
Device Management	12/05/2003 11:1..
DMS Asset Monitor	12/05/2003 11:1..
Event List	10/10/2003 8:29:..
Fault Report Submitter	12/05/2003 11:1..
Fieldbus Management	12/05/2003 11:1..
HART ABB 2600T-264 Asset Monitor	12/05/2003 11:1..
Maximo Equipment ID	12/05/2003 11:1..
Product Documentation	12/05/2003 1:57:..
Property Management	12/05/2003 11:1..
View Active Work Orders	12/05/2003 11:1..
View Equipment Status	12/05/2003 11:1..
View Prev Maint Schedule	12/05/2003 11:1..
View Spare Parts	12/05/2003 11:1..
View Work Order History	12/05/2003 11:1..

2600T_264xx:Product Documentatio

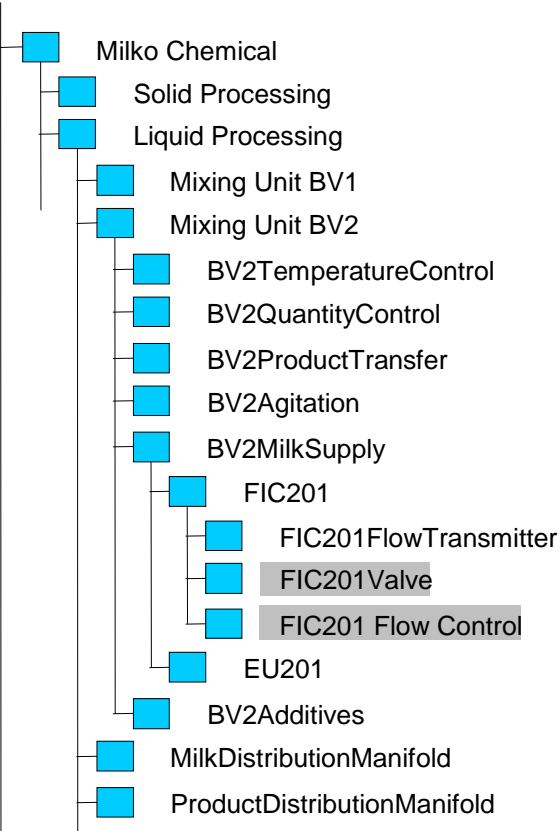
Aspects of '264VS_HART'	Modified	Descr..
Application Manual	10/15/2003 10:55...	Instru...
Aspect Category Definition	10/15/2003 8:06...	The b...
Certificate Industrial IT	10/15/2003 10:56...	Test r...
Declarations ATEX FP	10/15/2003 10:56...	Decla..
Declarations ATEX IS	10/15/2003 10:56...	Decla..
Declarations FM FP	10/15/2003 10:56...	Decla..
Declarations FM IS	10/15/2003 10:56...	Decla..
Declarations of Conformity	10/15/2003 8:06...	Decla..
Installation Manual	10/15/2003 10:55...	Install..
Maintenance and Service Manual	10/15/2003 10:55...	Instru...

Object Type, delivered by Device Integration Center with Device Library

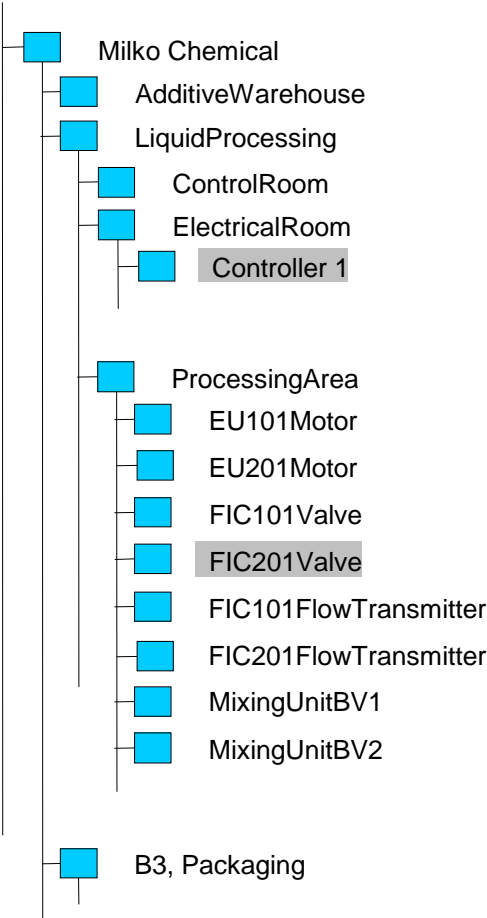


Represented in different Object Structures

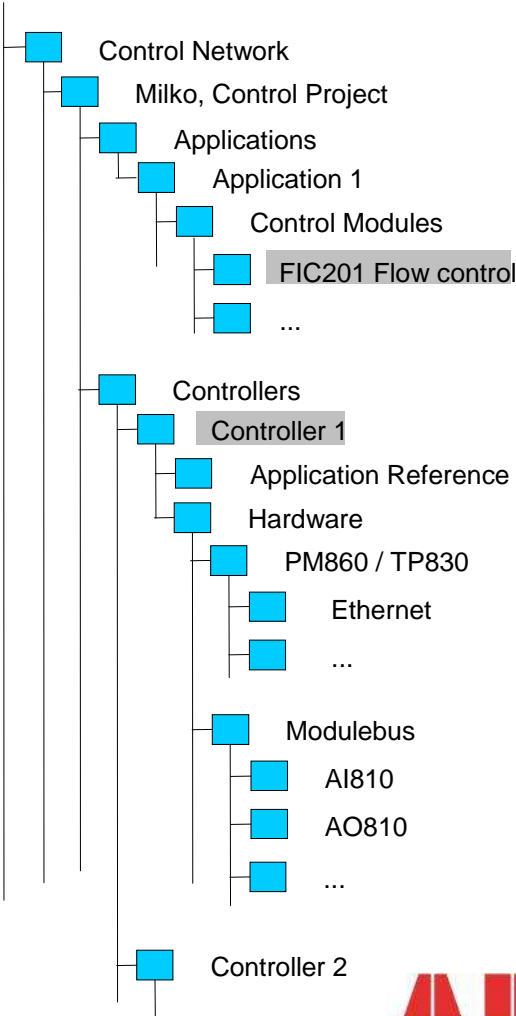
Functional Structure



Asset Structure



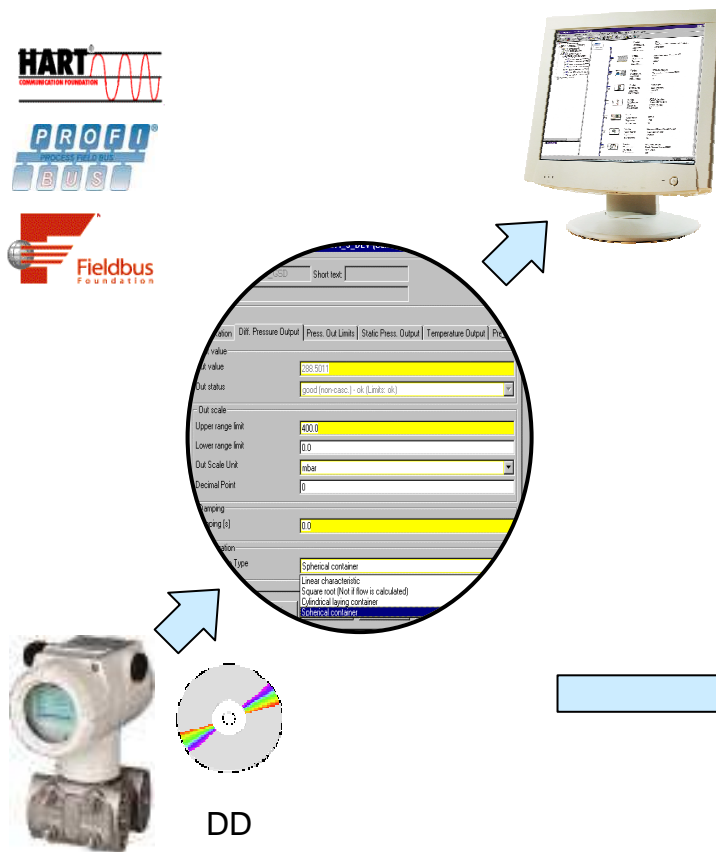
Control Structure



Device Driver Integration

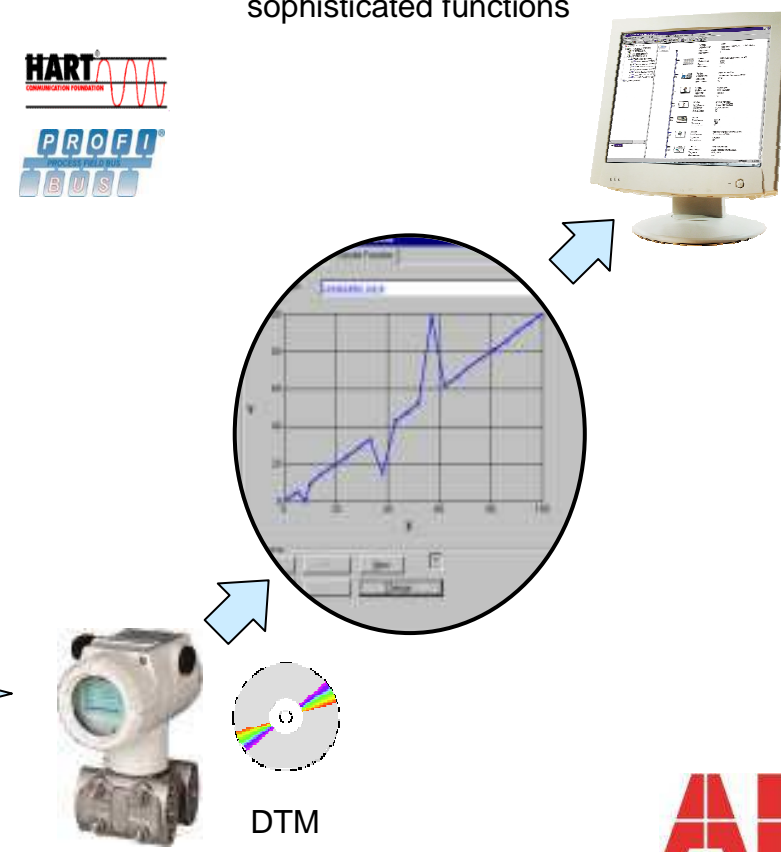
Device Description (DD)

All Instruments have a DD file for all communication protocols. These files provide a basic textual interface for device configuration in ABB and 3rd party systems



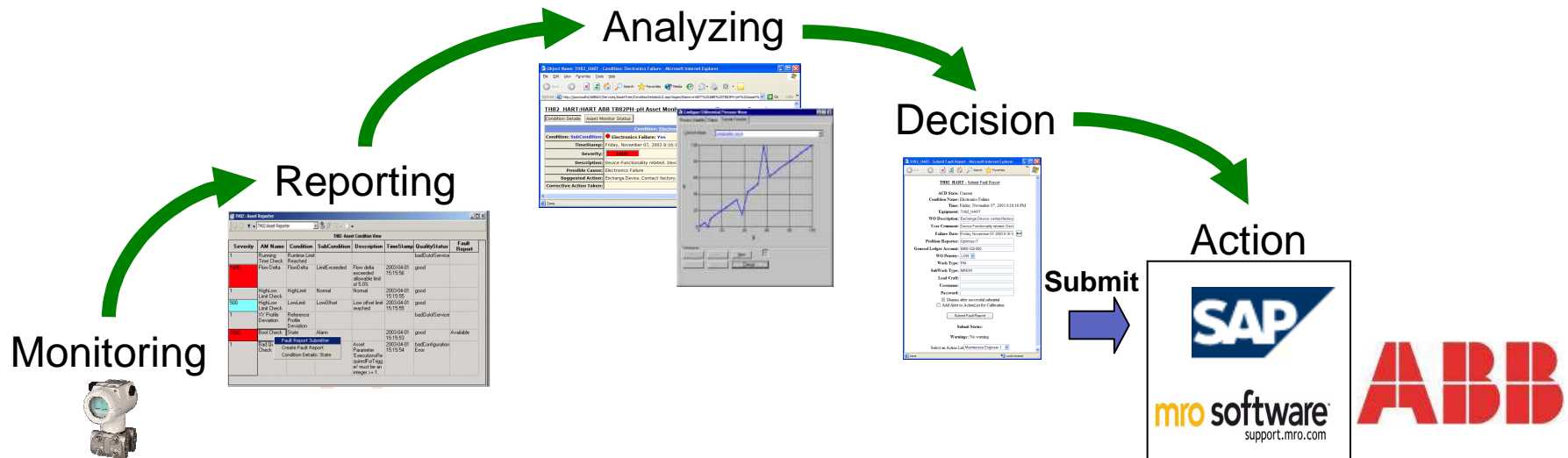
Device Type Manager (DTM)

For all HART & Profibus devices, ABB devices provide a DTM configuration tool. This DTM is an open standard supported by ABB and many 3rd party systems. The DTM allows an advanced, graphical, 'user friendly' interface and incorporation of high sophisticated functions



Ease of Use

- Optimized maintenance workflow reduces time to action
 - Continuous Condition Monitoring
 - Fault Condition Reporting
 - Alarming
 - Visualization
 - Access to detailed diagnostic
 - Fault Report Submitting into CMMS
 - Work order information in 800xA



Summary Integrating Automation

- Integrated information
 - featuring a single access to all plant information and an integrating system architecture.
- Efficient engineering
 - through one-time data entry, automated object creation and easy re-use of existing solutions.
- Highly scalable
 - therefore being the optimum solution in all situations, from the smallest to the largest applications and devices.
- Open communications
 - thanks to standard systems, commodity components and common fieldbus technologies.
- Unrivalled scope
 - providing a vast range of interoperable products and systems

Device Integration based on open but often competing Standards

- IEC 61158 parts
 - Foundation Fieldbus
 - PROFIBUS
- IEC 61804-2
 - (Electronic) Device Description (Language)
 - Dialects of this are actually used by the different protocols
- HART
- Field Device Tool Interface
 - Device Driver concept independent of fieldbus protocol
 - Specifying software interfaces and behavior of device drives as well as hosting tool environment
- OLE for Process Control
- ...



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NAMUR Recommendation NE105

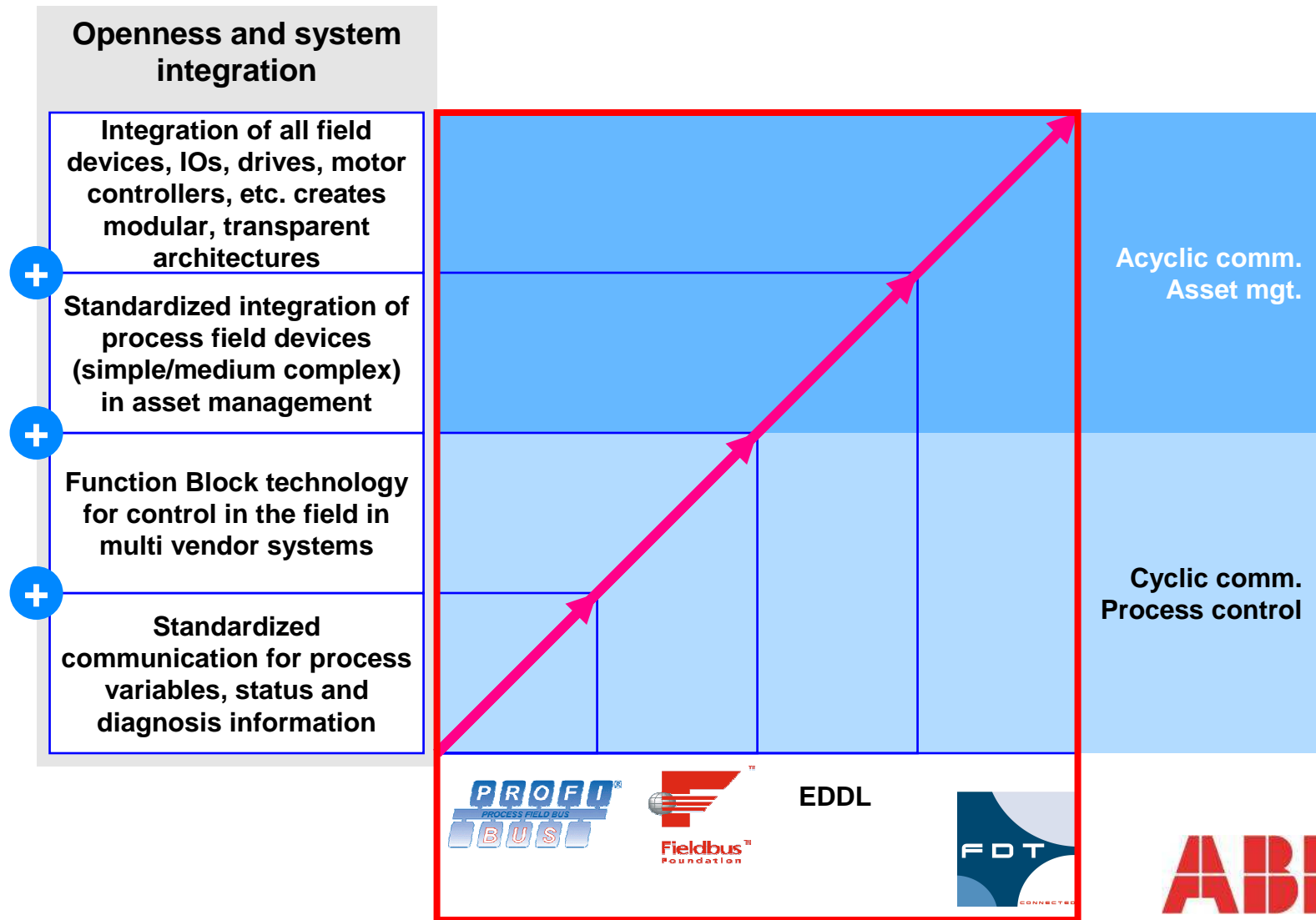
Specifications for Integrating
Fieldbus Devices in
Engineering Tools for Field
Devices

- NAMUR-AK 2.6 „Fieldbus“

NAMUR Recommendation NE105 - Content

- Long-Term Viability of Device Integration
 - Investment Safety
 - Version Conflicts
- User Interface Specifications & Style Guide
 - Integration of Devices (Installation & Removal) in Configuration Tools
 - User Guidance
 - Display of Devices
 - Standard Profiles
- Functional Specifications for Device
 - Connections and Interfaces for Device Data Processing
 - Device Descriptions
 - Licensing of Device Descriptions
 - Cross-Platform Compatibility
 - Full Support of Device Functionality
 - Standardized Data Filing
- Certification

Full support of device functionality

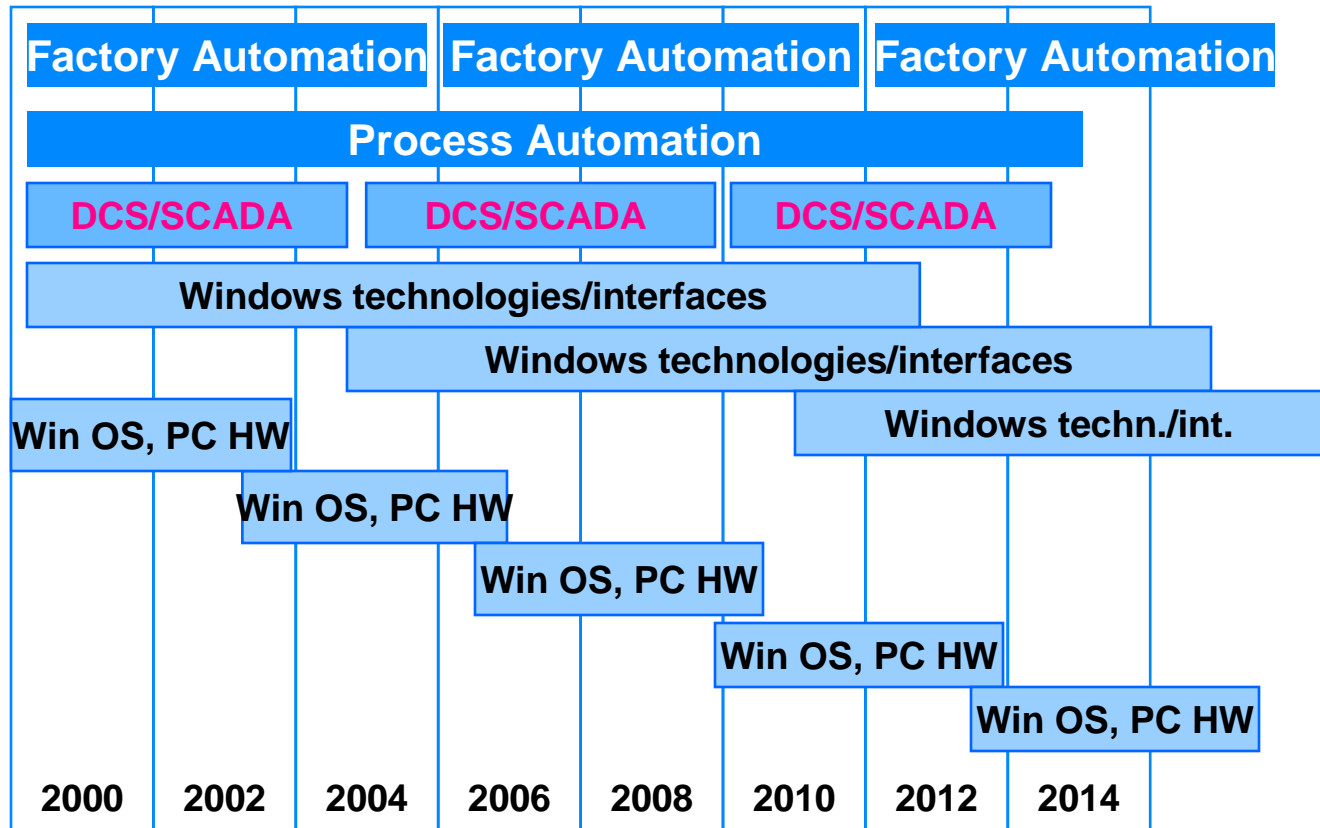


NAMUR Recommendation NE105 - Content

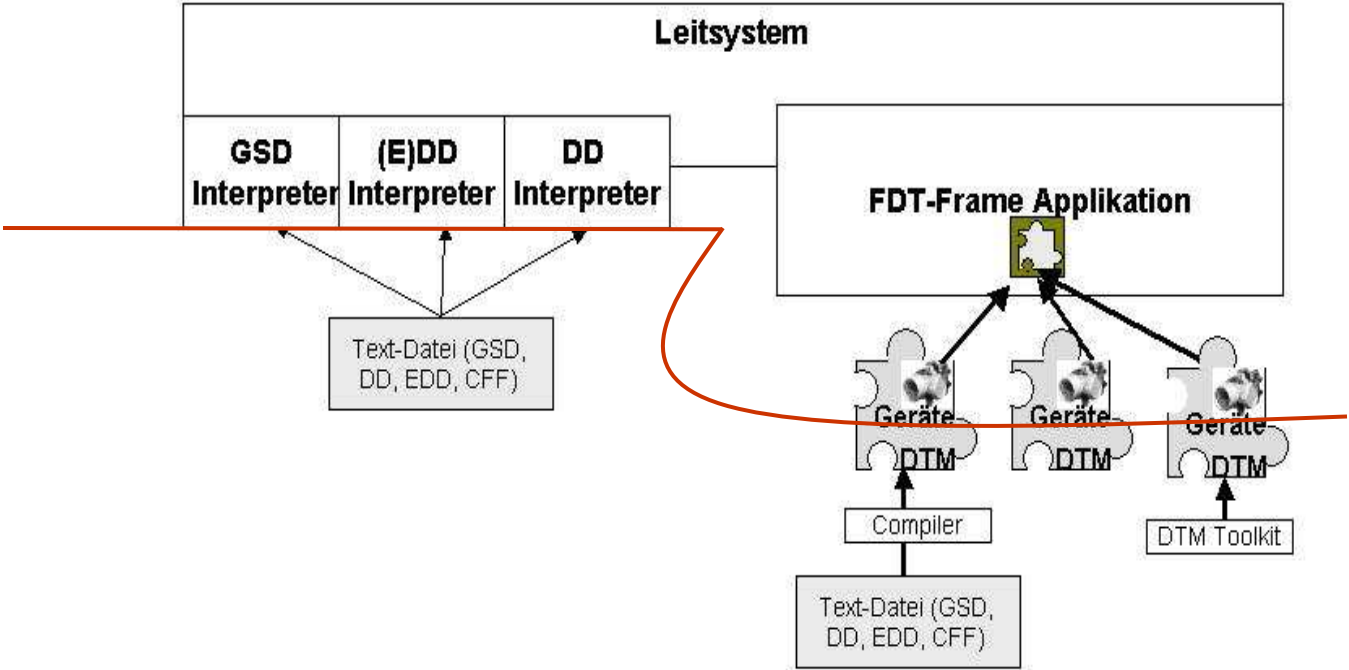
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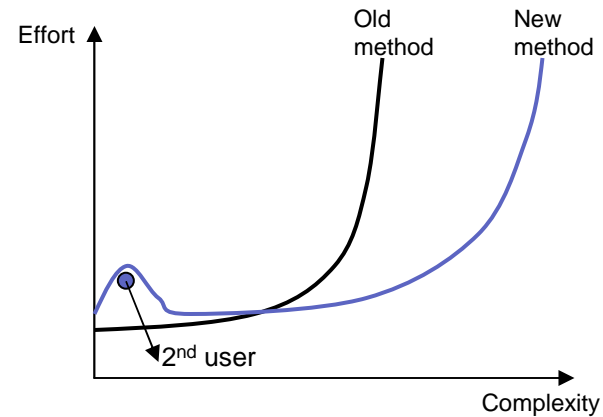


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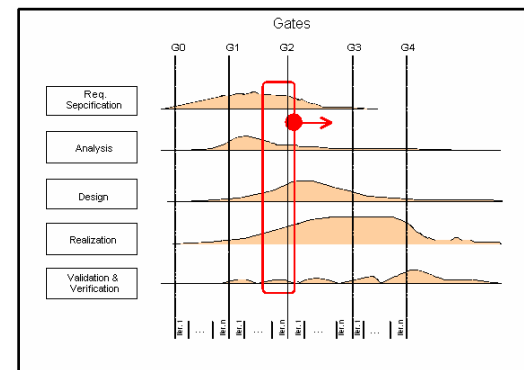
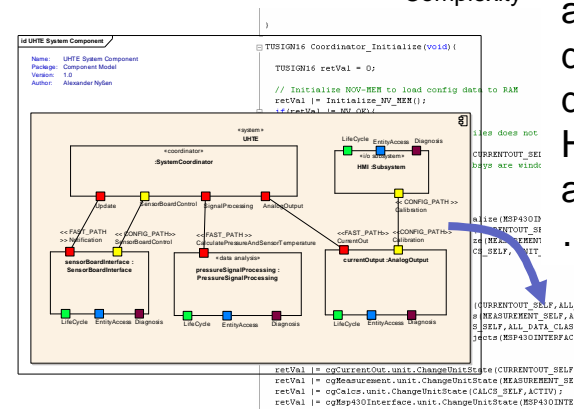
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Manage SW complexity

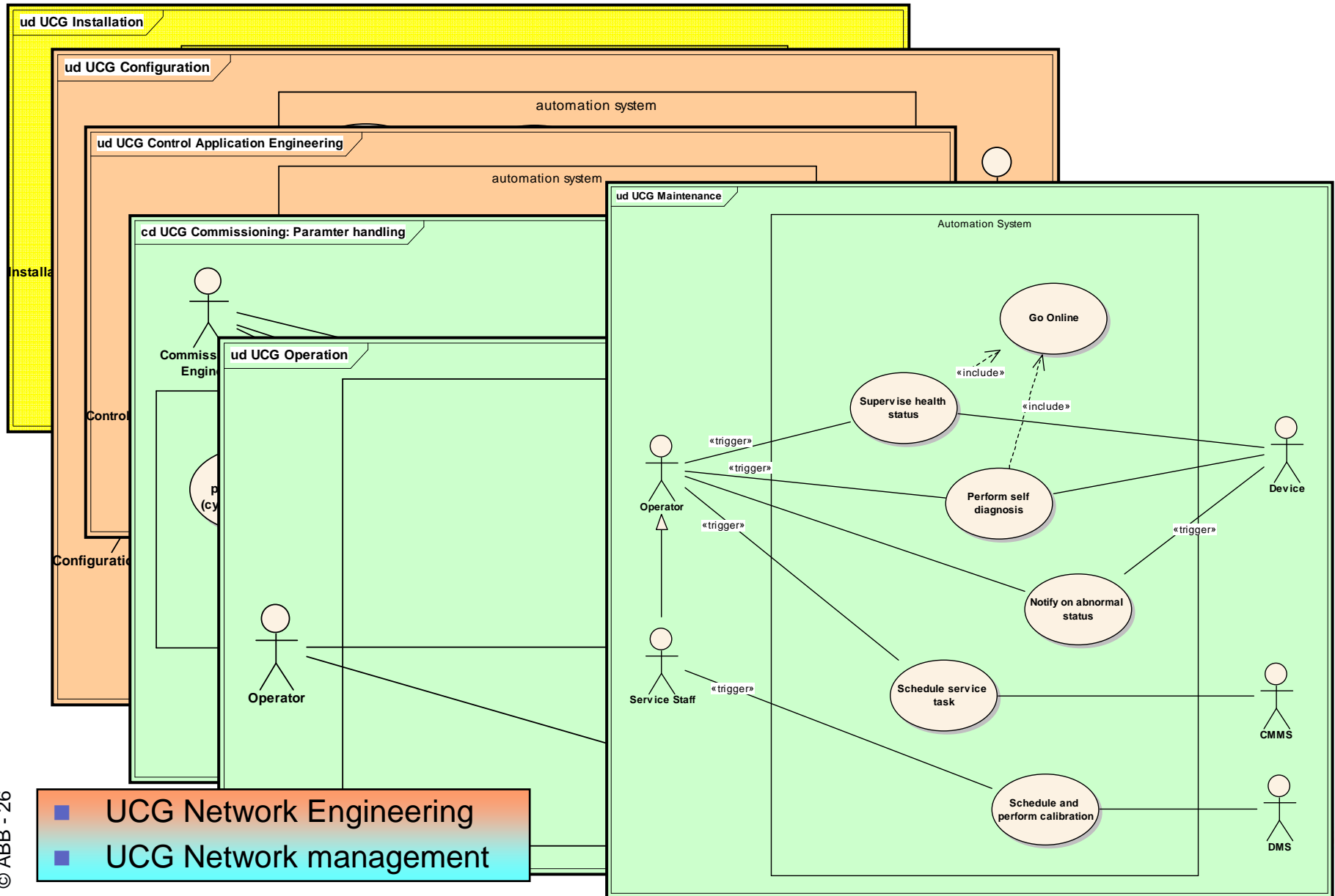
- Methodology
 - UML
 - Developers handbook
- Process
 - Common process with templates, checklists
 - Tools
- Reuse
 - Enabled by component based development
 - Common repository to share work results
 - Common Framework
 - Common Components



From System Design down to source code and other required assets like device descriptions, HMI, asset monitors ...

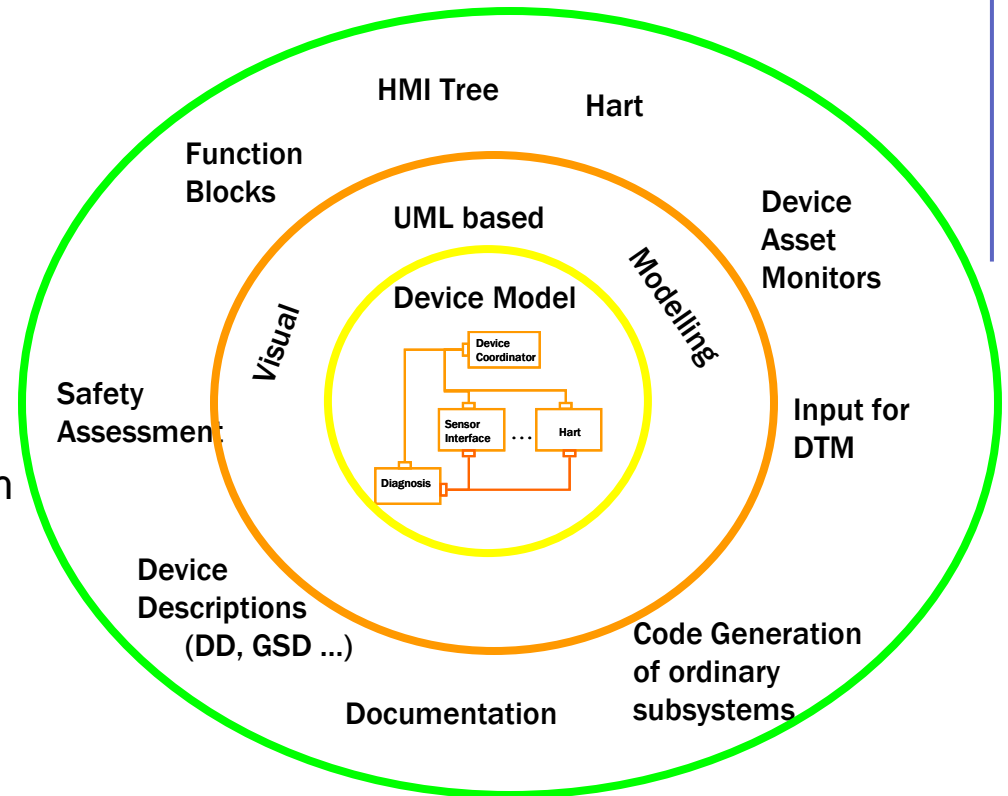


Use case groups related to field devices



Device Development – a comprehensive view

- Idea: Device Model, which describes and delivers
 - Software oriented aspects of a device such as sub-systems, entities, state machines ...
 - Aspects required for system integration (Device as system component).
 - Version Management for all aspects of the device and all related to the device in the system
 - ➡ Generate artefacts relevant for device construction (code, state machines, Hart layer 7 ...)
 - ➡ Generate artefacts relevant for system integration (DDs, Asset Monitors, Function Blocks ...)



- Device Model
- Core Environment
- Assistants



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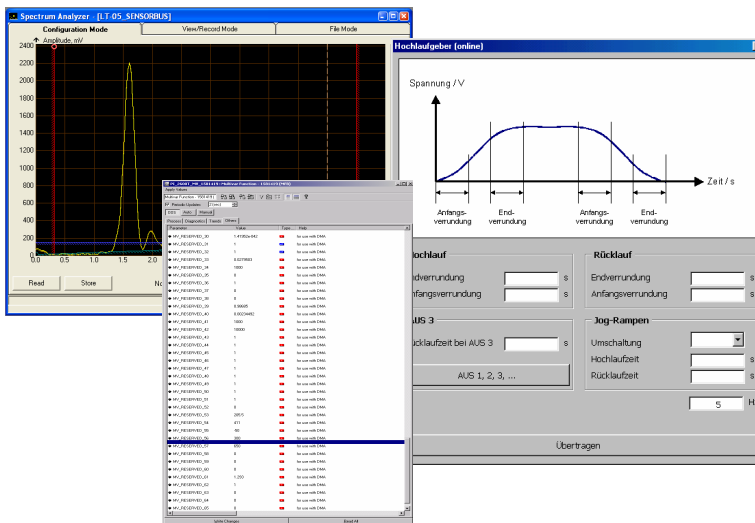
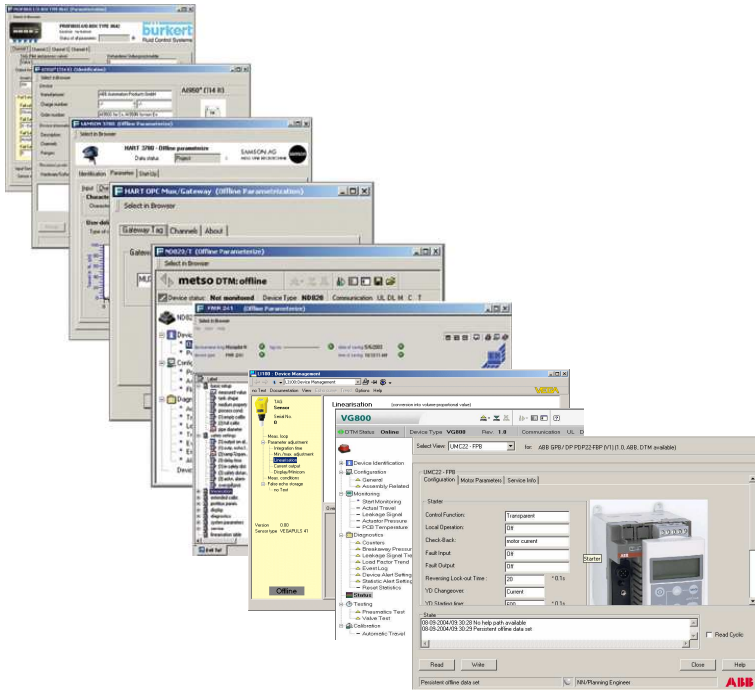
AIBB

Enhanced DDs (eDD)

- User Interface
 - Show Pictures
 - Generate Data-driven Plots
 - Trending and bar-graphs of live device data
 - Tabbed Dialogs and Windows
(Supports full screen PC GUI's)
- Other Enhancements
 - Simplified development of Methods
 - Improved error handling/status (INFO, WARNING, ERROR)
 - Default values for simulation and offline configuration

Styleguide - Spezifische und generische DTMs

- Eine wachsende Anzahl an spezifischen DTMs ist neben aus DDs generierten DTMs verfügbar
 → In Zukunft gemäß des FDT Styleguide



- Das User Interface der EDDs wird bisher weitestgehend vom Host System bestimmt

