

## MODULE TYPE PACKAGE (MTP)

The Way to the Modular System



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# AGENDA

1. OVERVIEW AND MOTIVATION
2. WORKFLOW
  - MODULE ENGINEERING
  - SYSTEM ENGINEERING
3. COMMUNICATION
4. BENEFITS OF MODULAR ENGINEERING WITH MTP
5. MODULE ENGINEERING IN DETAIL
6. ANNEX



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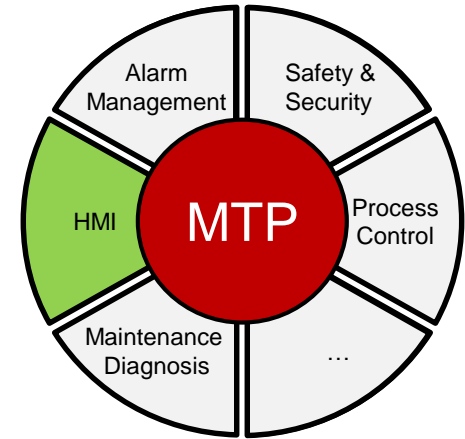
# OVERVIEW

## Distributed Intelligence for Modular Systems

- Increasing demands for modular systems in process and production engineering:
  - Fluctuating volumes and increasing individual product requirements require an efficient production in low volumes
- This results in technical requirements:
  - Rapid construction of new systems by reutilization of finished modules
  - Simple adaptation of existing systems to changed conditions
  - Standardization for the simultaneous use of products from different manufacturers
- Also issue in other industries, e. g. Marine:
  - Simple and fast commissioning by integration of existing modules

### Benefit of MTP:

- Simple integration of plant modules into the supervisory level
- Dynamic adaption without great engineering effort
- Standardized Look-and-Feel, even with modules of different manufacturers



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# STARTING POSITION

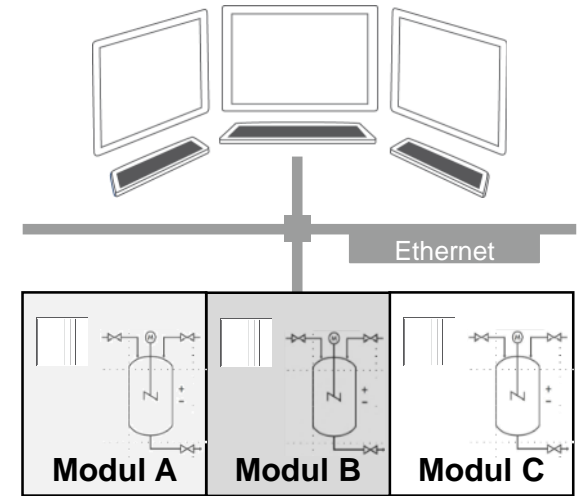
## Plant Engineering as of Today

Modular production systems

... are modular,

... but not the automation!

- Flexible production systems consist of modules with separated decentralized automation.
- To integrate a module at least the following is needed:
  - A parameter list for the data points
  - A graphic system diagram
    - E. g. schematic diagram of material flow in the form of an P&ID diagram (process engineering)
  - The description of the module functionality
- When changing a module it is necessary to
  - connect the data points of the module with the variables of the process control level
  - create a new visualization in the leading control system



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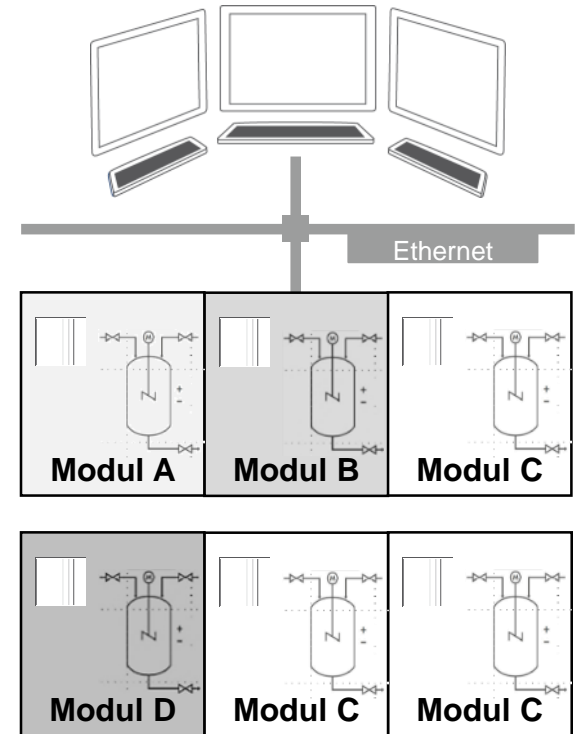
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# REQUIREMENTS

## Flexibility by simple Module Integration/exchange

- Rapid construction of new systems by reutilization of existing modules
  - Standardization of interfaces and a simple data exchange needed, „Plug & Produce“
- Simple adaptation of existing systems to changed operating conditions
  - E.g. **product change** requires other modules
  - E.g. **maintenance/repair** require module exchange
  - E.g. **capacity change** requires more or less modules of the same type



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# SOLUTION IDEA

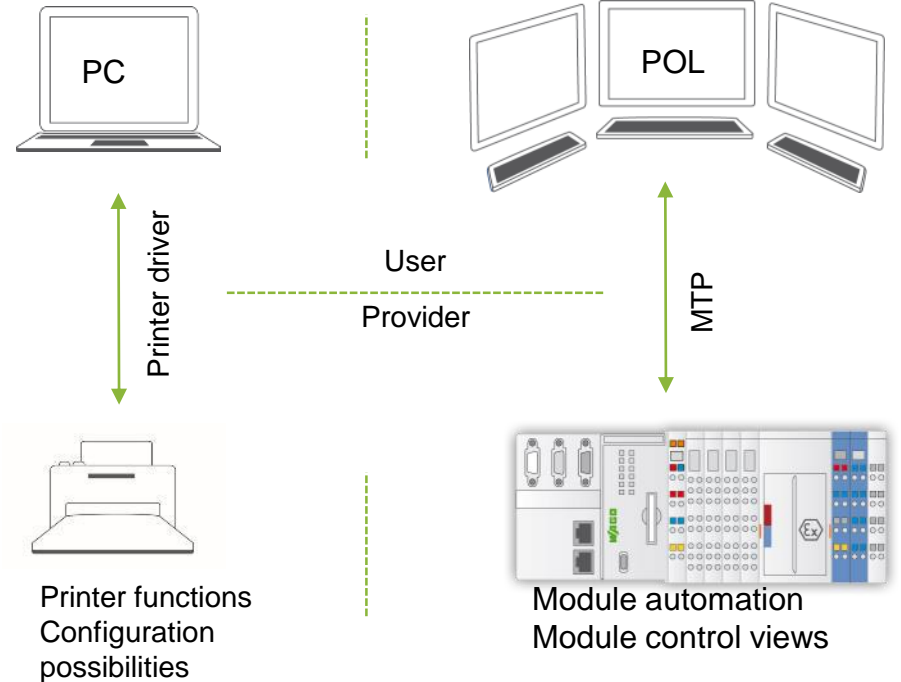
## Standardized Module Integration

The MTP concept in industry can be compared best with a printer in the private sector:

- The printer manufacturer delivers a printer driver.
- The driver contains the necessary detailed knowledge about the printer and can integrate it with all its services in any Windows PC.
- Transferred to a production environment, the module corresponds to the printer, the MTP to the printer driver and the PC to the visualization-/control system (Process Orchestration Layer POL).

Practical solution:

- Common standard VDI/VDE/NAMUR 2658
- Defines how to describe system modules and
- How to integrate them in a standardized way into the process control of the complete system.



Fulfils the increasing requirements regarding digitalization according to Industry 4.0

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# WORKFLOW

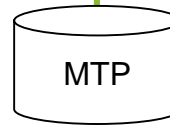
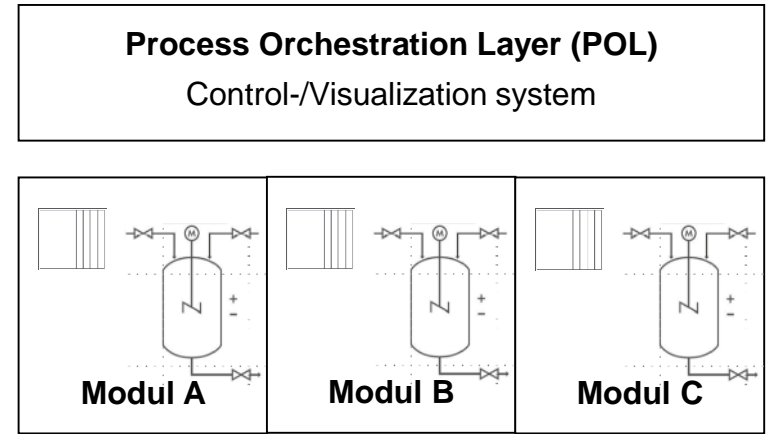
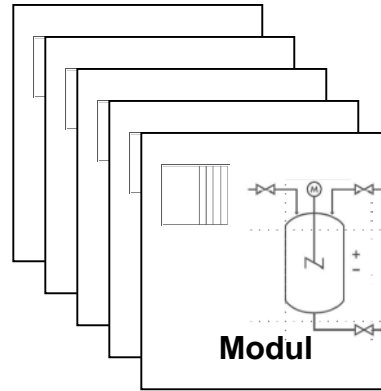
## Engineering in two Steps

### Module Engineering (project independent)

- Definition of information technology interfaces (Process Control Points)
- Create control logic
- Create control views

### Plant Engineering (project-related)

- Integration of modules into the control-/visualization system (Process Orchestration Layer - POL)
- Parametrization of modules
- Network engineering
- Coordination and procedure control of modules among each other (orchestration)

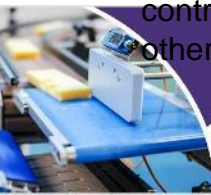


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# MODULE ENGINEERING

## Creation of reusable Plant Modules

- Creation of module automation by using a library with pre-prepared functions (subject to licensing).
  - Use of e!COCKPIT
- besides the pure logic the library also contains the control views.
- Determine which information and services the module provides to the outside.
- After finishing the module creation the description may be exported as a MTP.
  - The MTP contains the module description in a standardized format (Automation Markup Language, IEC 62714).
  - For this purpose the Add-on e!COCKPIT MTP is needed (subject to licensing).

## RESULT: PROJECT INDEPENDENT REUSABLE PLANT MODULE



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# SYSTEM ENGINEERING

## Use of previously created Modules

- Import of module descriptions in the tool for system engineering (Process Orchestration Layer)
  - Process control engineering, control system, SCADA system, visualization system, and so on
- Instantiation, configuration and wiring of modules
- Coordination and procedure control of modules among each other (orchestration)

Process flows and output adjustments can be easily adapted by adding or removing modules without having to intervene in the modules themselves

## RESULT: FLEXIBLE PROJECT SPECIFIC SOLUTION WITH SMALL ENGINEERING AMOUNT



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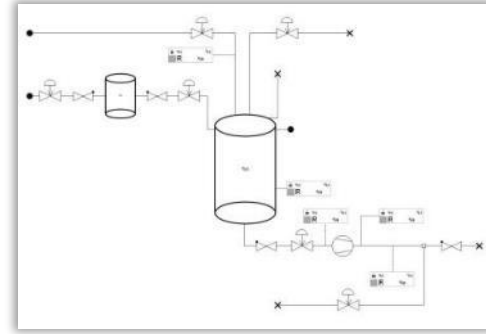
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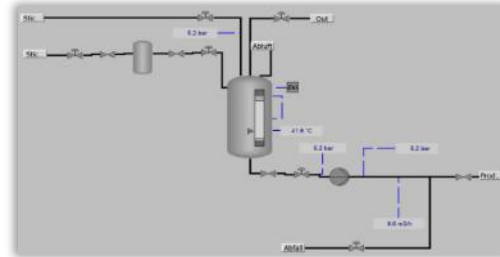
# DESCRIPTION INSTEAD OF PROGRAMMING

## Interpretation of the Information of the MTP

- The MTP contains the following description information for visualization:
  - Role
  - Position
  - Size
  - Variables
- The description information is interpreted by the respective system and shown in the respective style:
  - Visualization of the module elements
  - Display of the variables lists / process control points and – if applicable – manual control options
- Standardized Look-and-Feel guaranteed, even with modules of different manufacturers



control view of a module created in e!COCKPIT



Generated control view in the POL tool  
(reference: VDI 2658-2)



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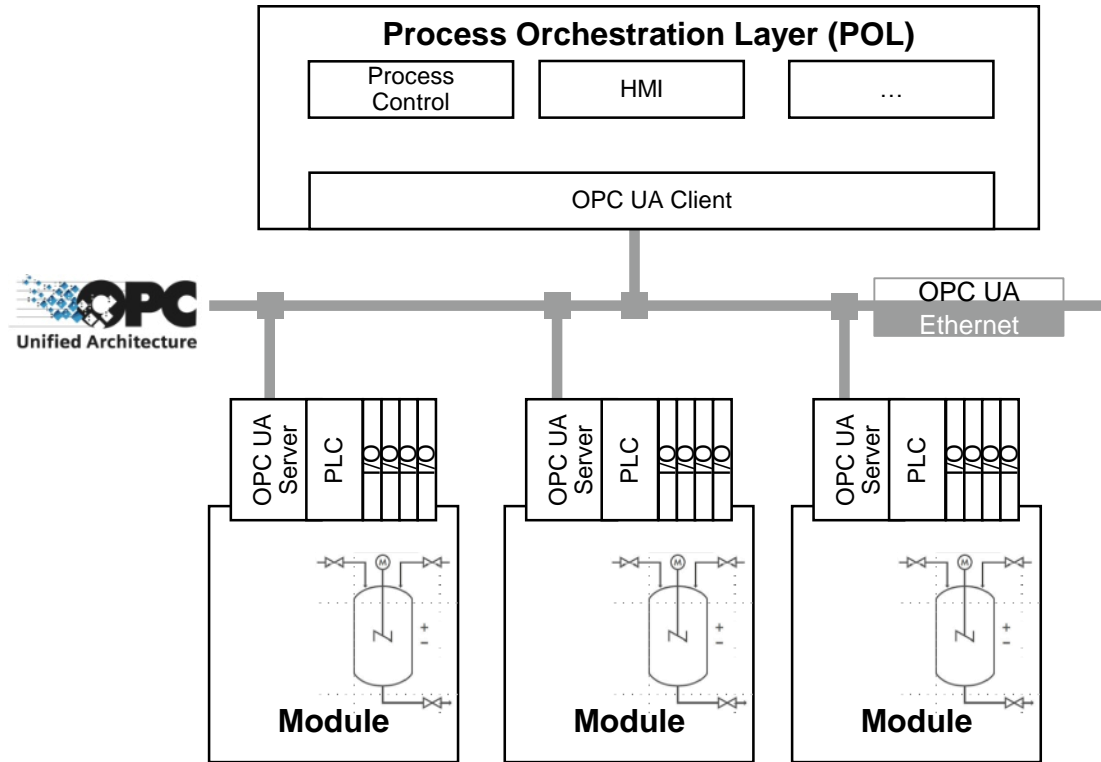
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# COMMUNICATION

## OPC UA

- Platform independent, service orientated communication standard, based on Ethernet
- Industry and manufacturer independent
- Set in many areas as a standard
- OPC server provides data and services
  - Semantic description included
- OPC client in the form of a control/ visualization system can access several OPC servers simultaneously



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# COMPARISON ENGINEERING STRATEGY

## Comparison of standardized modular Engineering with classical Engineering

### CLASSICAL ENGINEERING

- Individual construction with extensive integration in central structures
- PRO:
  - Design by / for end customer
    - High efficiency, since it is precisely tailored to the requirement
- CONTRA:
  - High engineering effort
  - Late implementation date
  - Long term projects

### MODULARE AUTOMATION WITH MTP

- Application of prefabricated modules
- PRO:
  - Engineering effort reduced by
    - Better time scheduling of engineering efforts
    - Easy reusability
    - Simple plant engineering by standardized module descriptions (MTP)
  - Earlier commissioning date
  - Shortened project terms
- CONTRA:
  - Higher engineering effort for the module creation in advance
  - Same modules for different end user
    - Maybe less efficiency than with individual solution



# ADVANTAGES

Advantages from the perspective of different users

- **Module Manufacturer**
  - Reusable modules
  - Information encapsulation, know-how protection
  - Possibility to export specific parts only
    - > new business models
- **System Integrator**
  - faster integration than before
  - also for the future: more and more data is needed, so the automatic information supply is particularly worthwhile.
  - Free choice of module manufacturer, since identical integration mechanisms
- **Plant Operator**
  - simple module exchange (product change, maintenance, capacity change)
  - Same look and feel, even with different module manufacturers



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# PARTNER

## Broad Basis of Supporters in different Areas

- Manufacturers of:
  - SCADA-/MES-/Process control systems
  - Control systems
  - I/O systems
  - Sensors/Actuators
- Module plant manufacturers
- Plant operators
- Universities
- Associations



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# MODULE ENGINEERING IN DETAIL

Creation of Module Automation



- Step by step approach as screenshot



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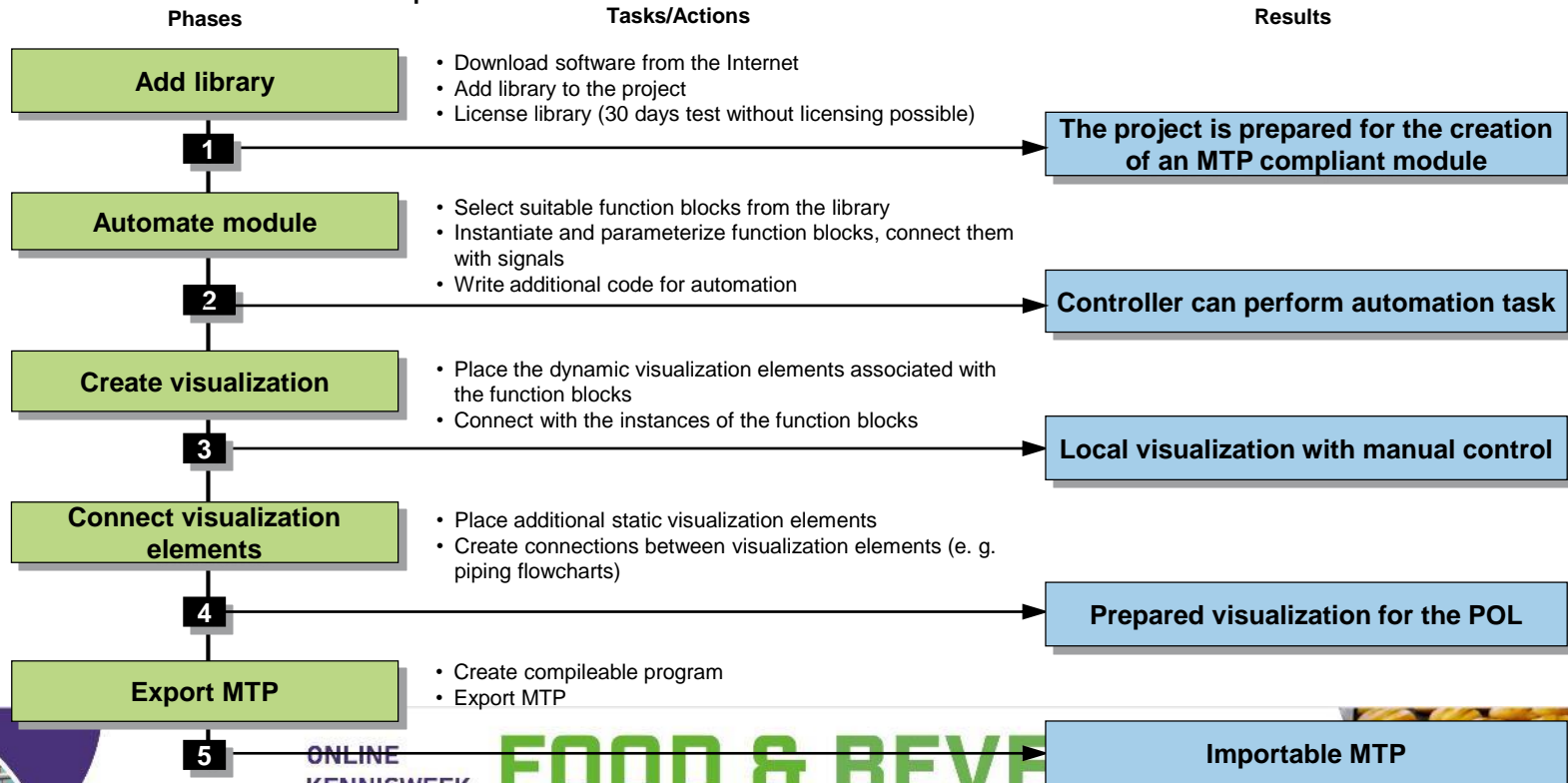


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# MODULE ENGINEERING IN DETAIL

## Overview of the individual steps



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# MODULE ENGINEERING IN DETAIL

Creation of Module Automation



- Demonstration create MTP file



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**WAGO**

The logo consists of the word "WAGO" in a bold, green, sans-serif font. A green double-headed arrow is superimposed over the letter "A", pointing both upwards and downwards.