

# DIMA

Decentral Intelligence for Modular Applications

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16 maart 2017 ••• Hart van Holland Nijkerk

# Industrial Ethernet

# Awards

The first global concept for the automation of  
modular production plants

2015: 1. Place of AICHE Award Process Industry (Germany DECHEMA)

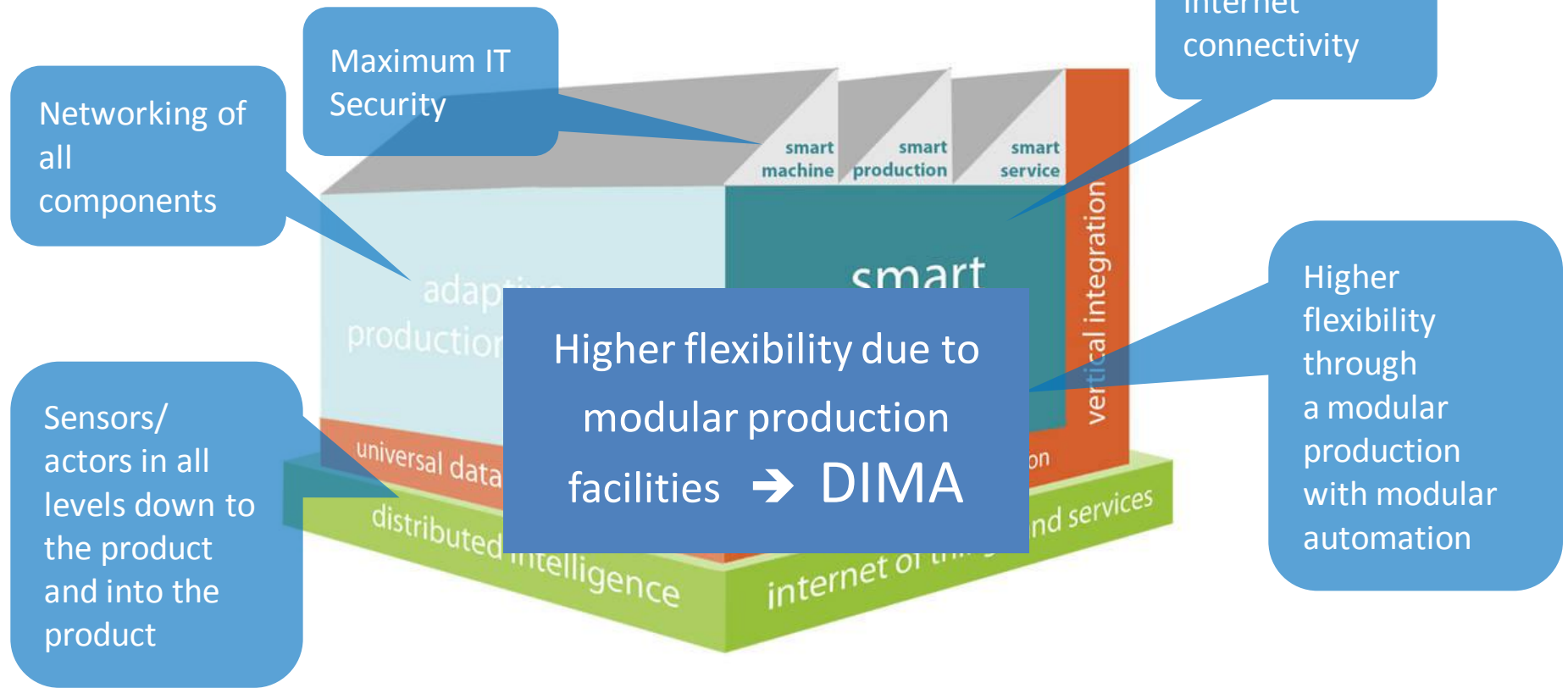
2015: 2. Place in the competition for the best Webinar (Germany Vogel Verlag)

2016: 2. Place in the competition for the best White Paper (Germany Vogel Verlag)

2016: 1. Place Food & Beverage Award Industry 4.0 (UK)

2016: 1. Place in the category most innovative Product for Industry 4.0 (Germany ZVEI, VDE)

# Requirements of Industry 4.0

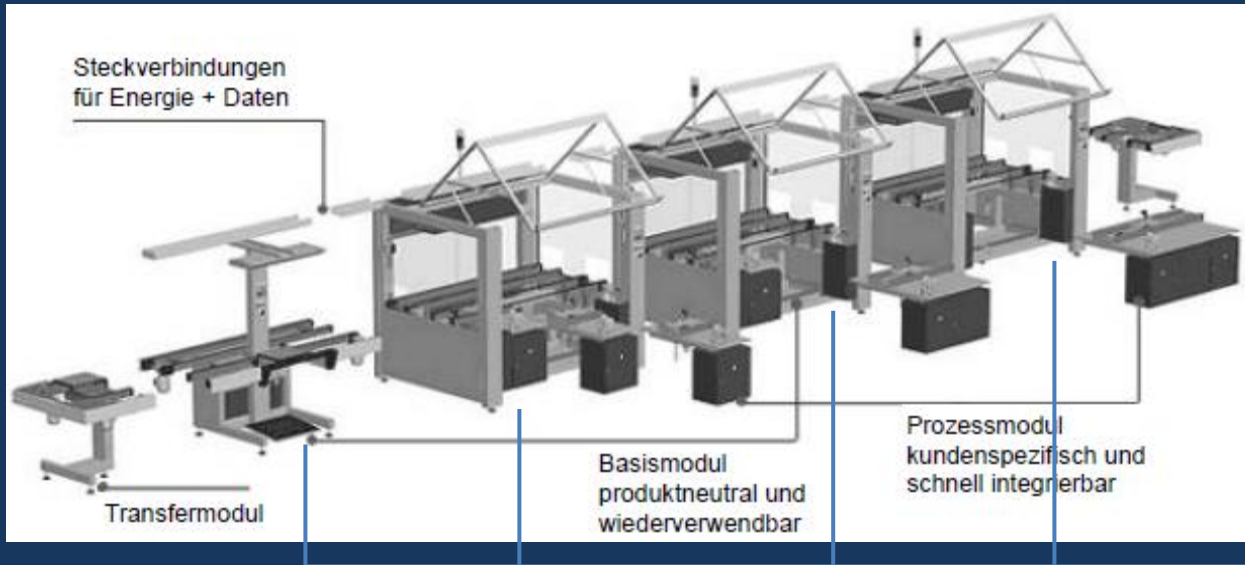


# Typical Factory Production Plant

Versatile production plants

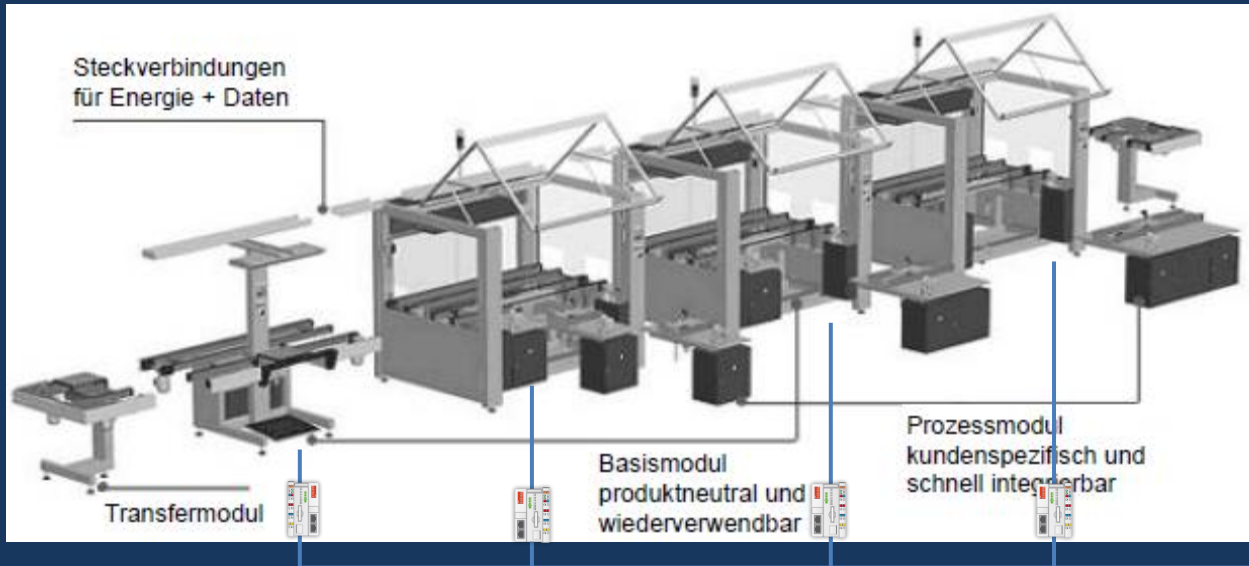
... are constructed modularly...

... the automation not.

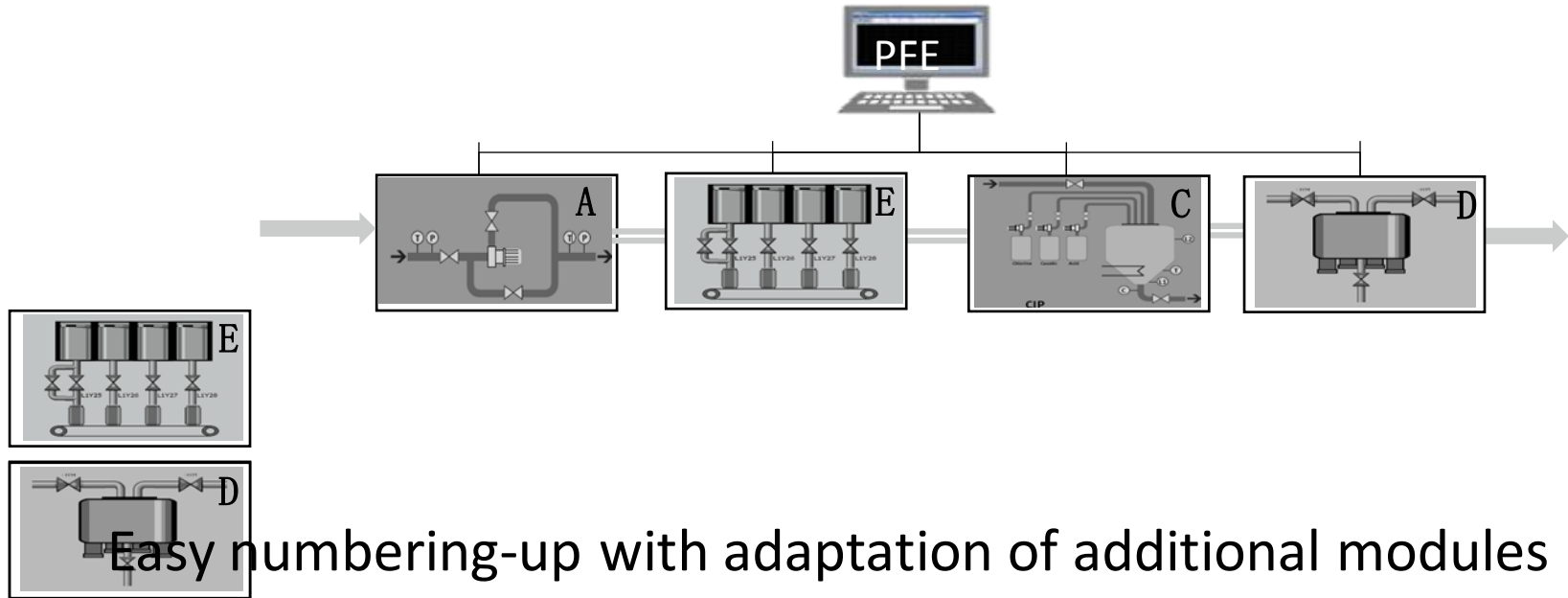


# DIMA offers efficient adaption

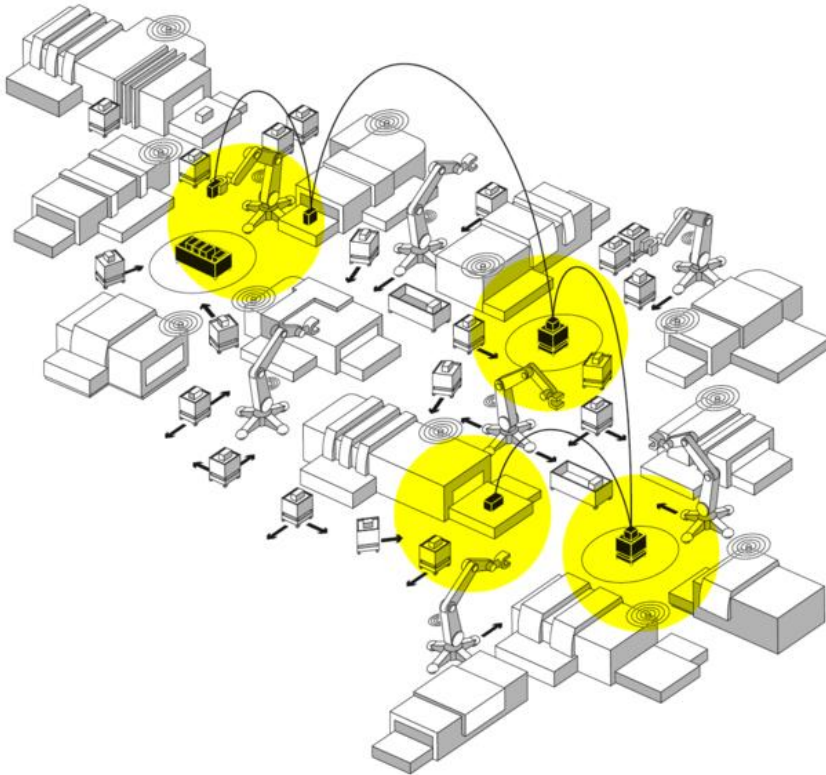
Versatile production plants should consist of modules with *seperate, decentralised automation*. This is essential for an efficient and fast changing production plant.



# Numbering-Up as opposed to Scale-Up



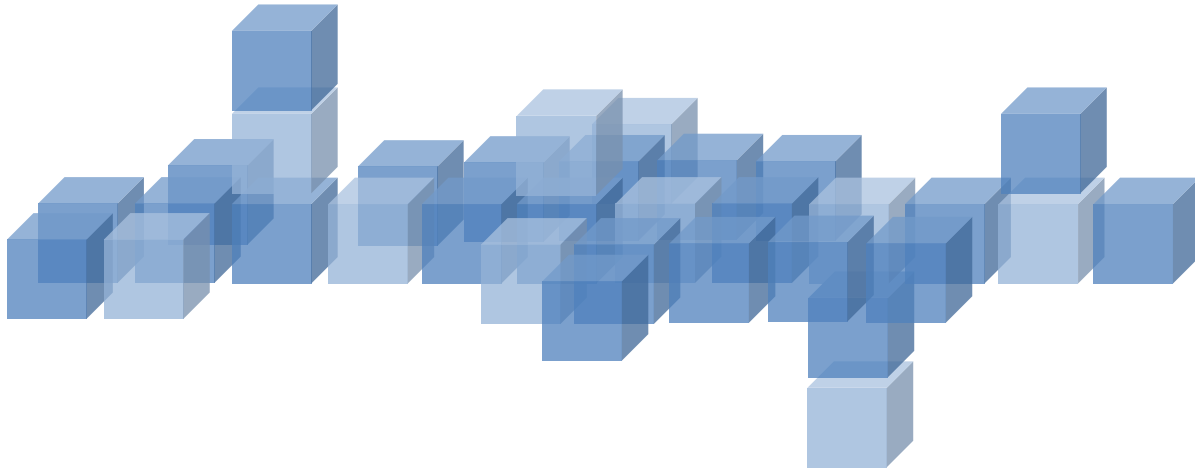
# Basic requirements for modular plants



- Each production module needs ....
  - his own automation intelligence
  - an open manufacturer independent interface to the control level
  - his digital twin in the control level
  - a quick adaption to the control level

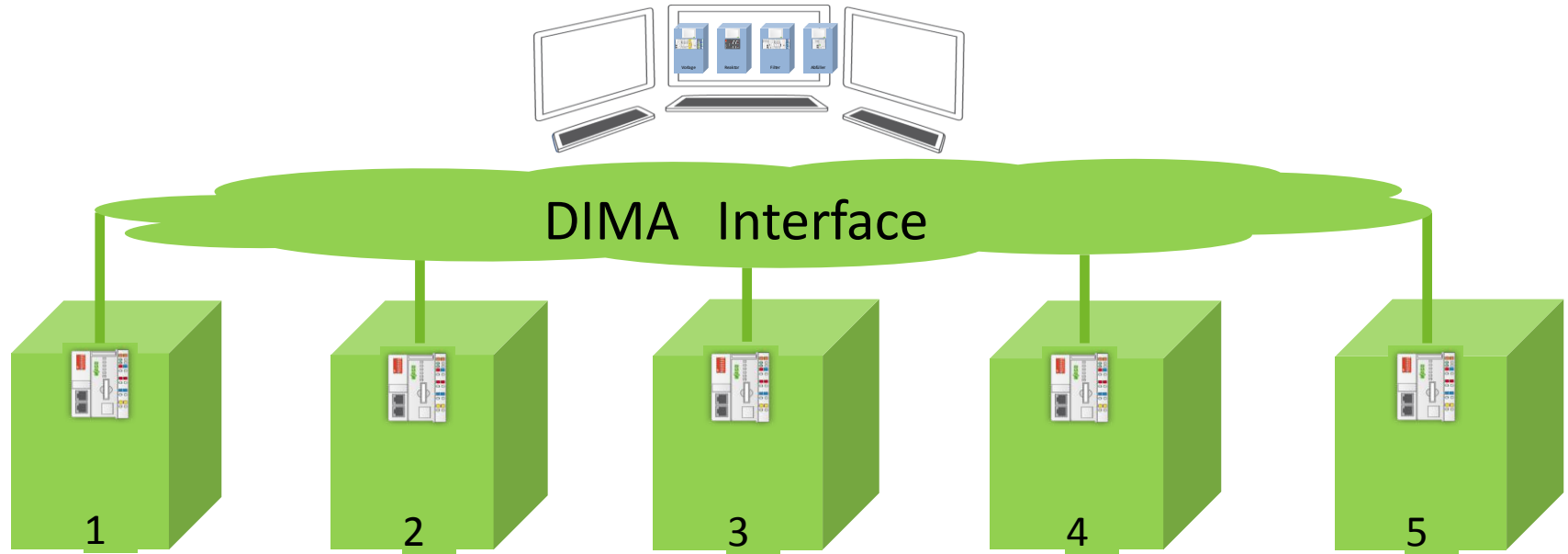


# DIMA





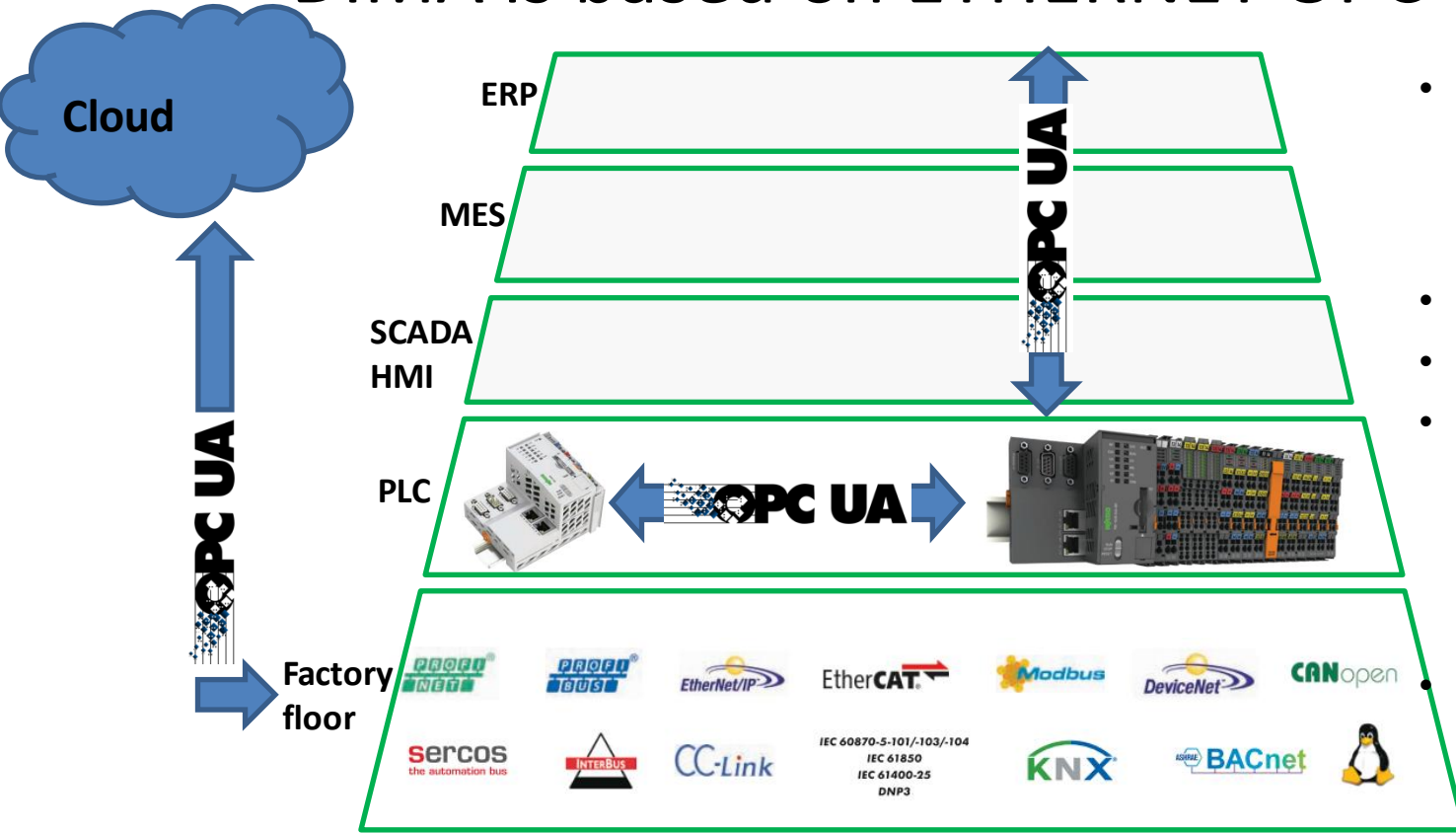
# Open DIMA Interface



## Services Oriented Architecture

opens the dynamic coupling of modules with little engineering

# DIMA is based on ETHERNET OPC UA



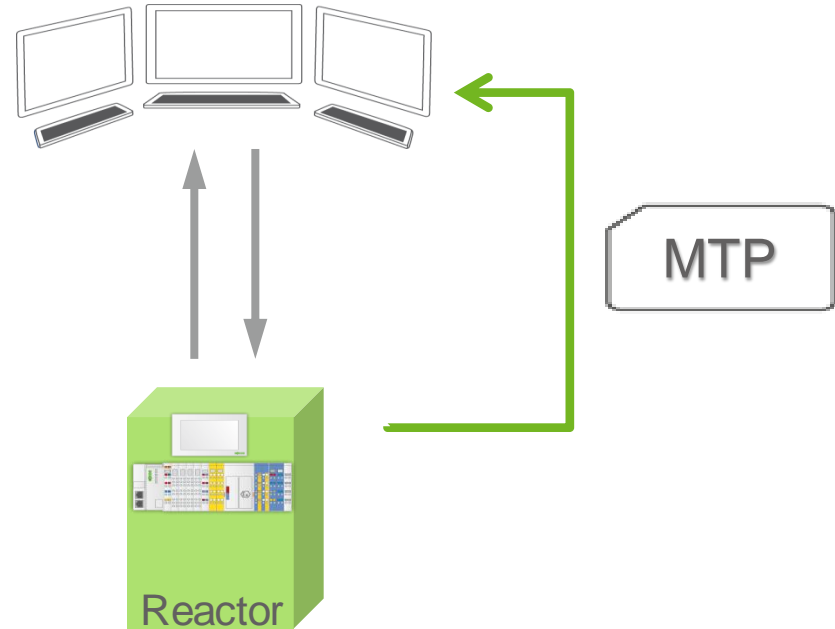
- OPC UA will be the upcoming standard for factory and process automation
- Based on TCP/IP
- Controller independent
- Consistent communication between different levels like Control, HMI, MES, Cloud, etc.
- Communication standard for Industry 4.0

# Process Control Level needs to know the Module Functions

Compulsory skill descriptions of a module:

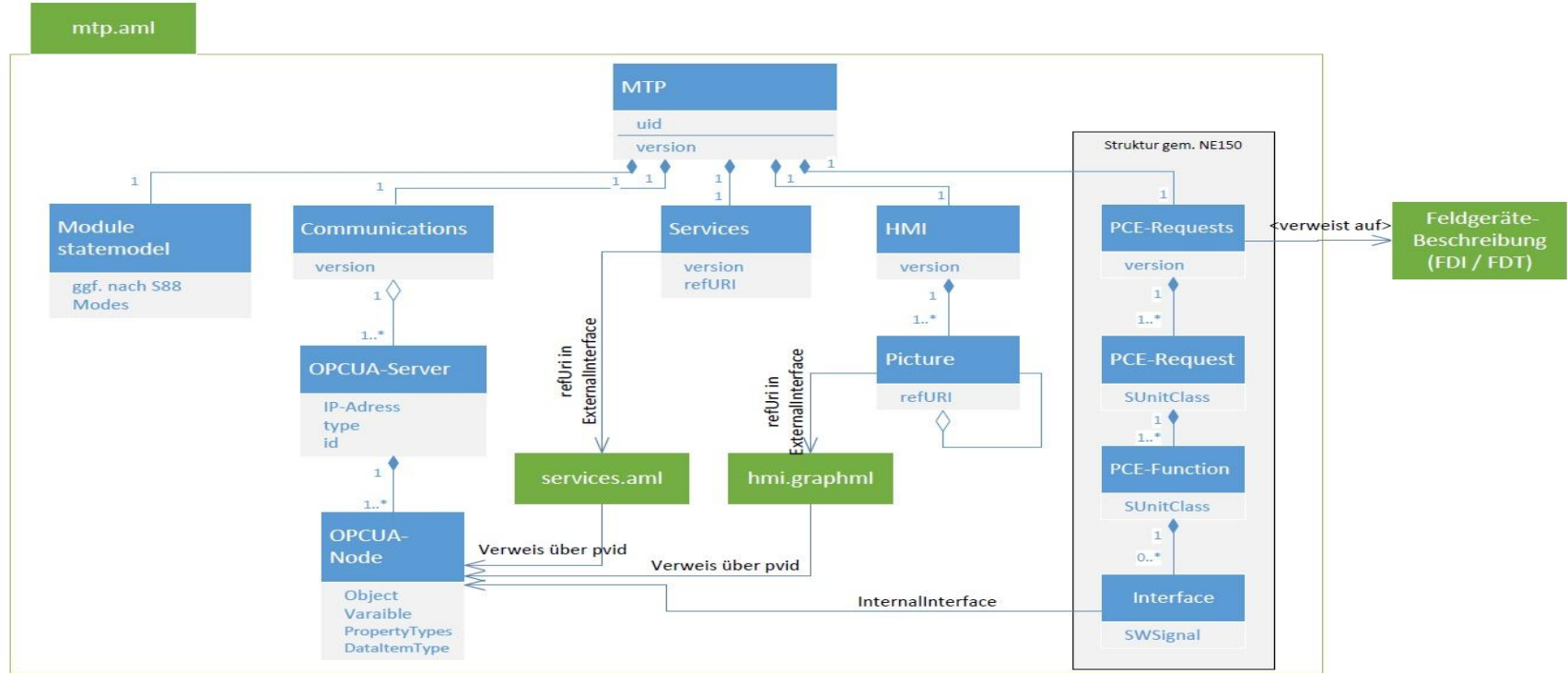
- Description of the service which the module offers
- information for visualizing the HMI of a module
- enabling the communication between PCL and modules
- providing a module documentation
- device information to parameterize

Process Control Layer



# Digital Description of the Module – MTP

## (Module Type Package)



# Engineering: Module Programming

The screenshot shows the WAGO 750 software interface for module programming. The main window displays a rack of modules, including a power supply and several digital input modules. The left sidebar shows the device structure, and the right sidebar shows the product catalog. The bottom section displays the K-BUS I/O Mapping for the selected module.

**K-BUS I/O Mapping - 4\_AL0\_10V\_5\_E**

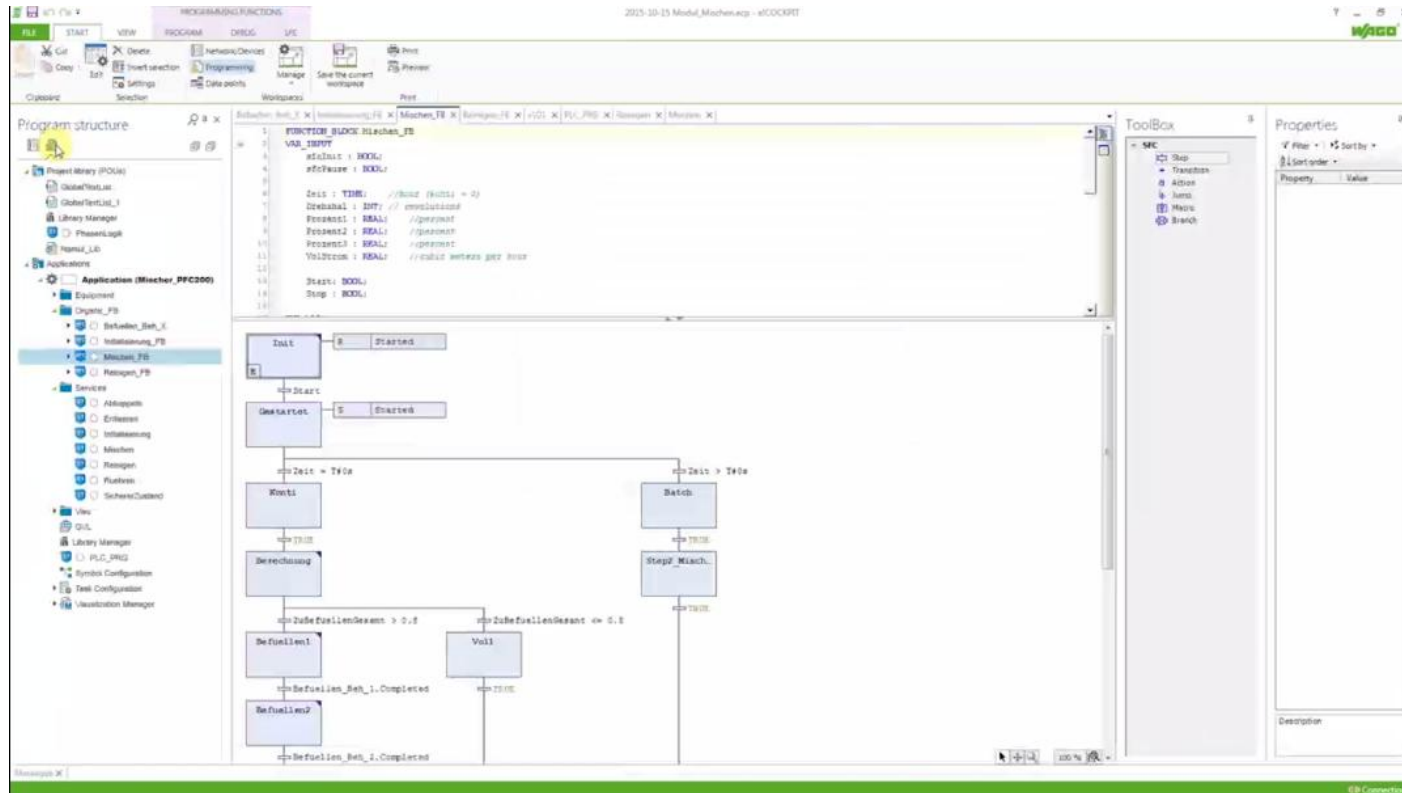
Variable	Mapping	Channel	Address	Type	Unit	Description
var101		IN 1	%DI15	WORD		Input word 1
		IN 2	%DI16	WORD		Input word 2
		IN 3	%DI17	WORD		Input word 3
		IN 4	%DI18	WORD		Input word 4

Buttons at the bottom: Create new variable, Map to existing variable, Reset mapping, Always update variables, Use parent device setting.

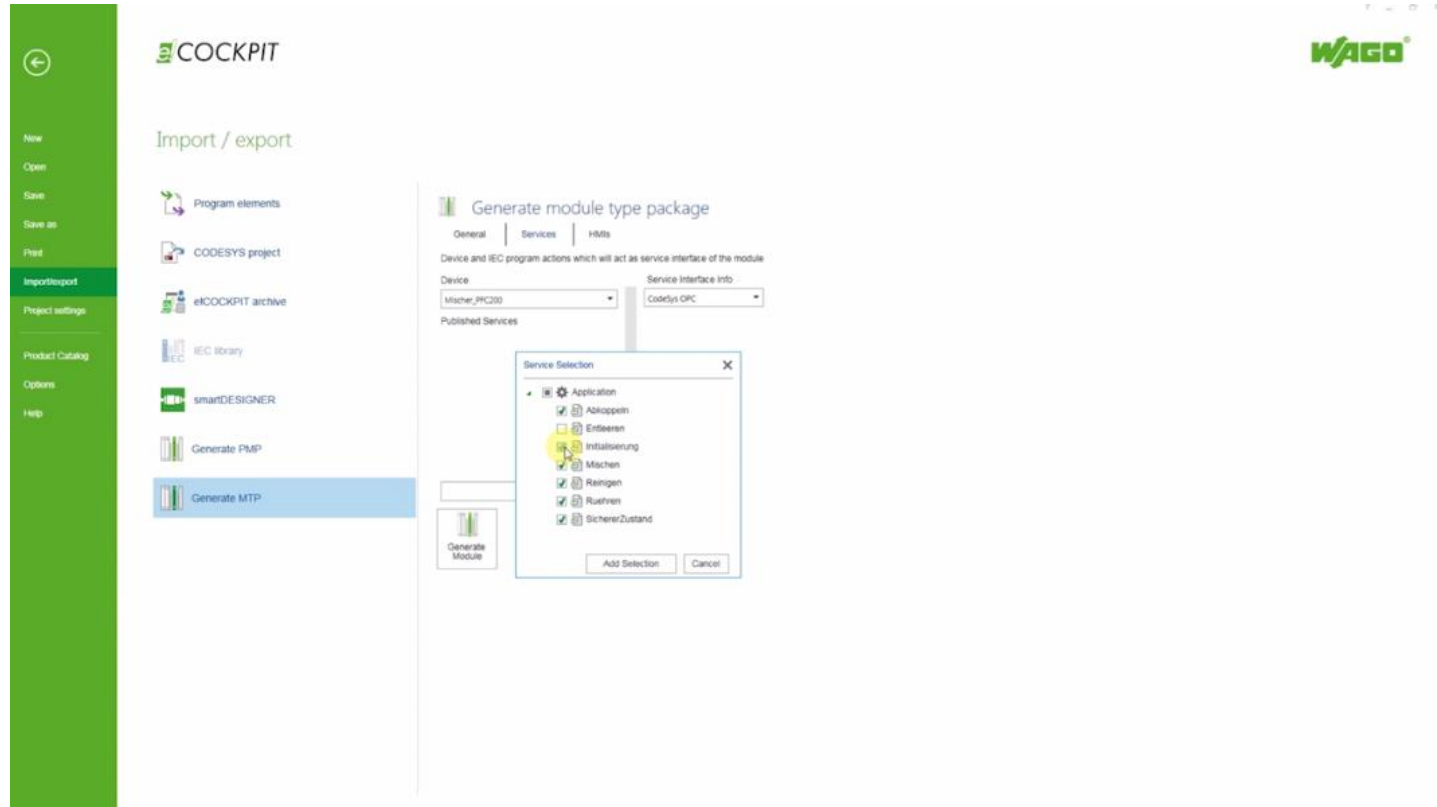
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# Engineering: Definition of Module Services



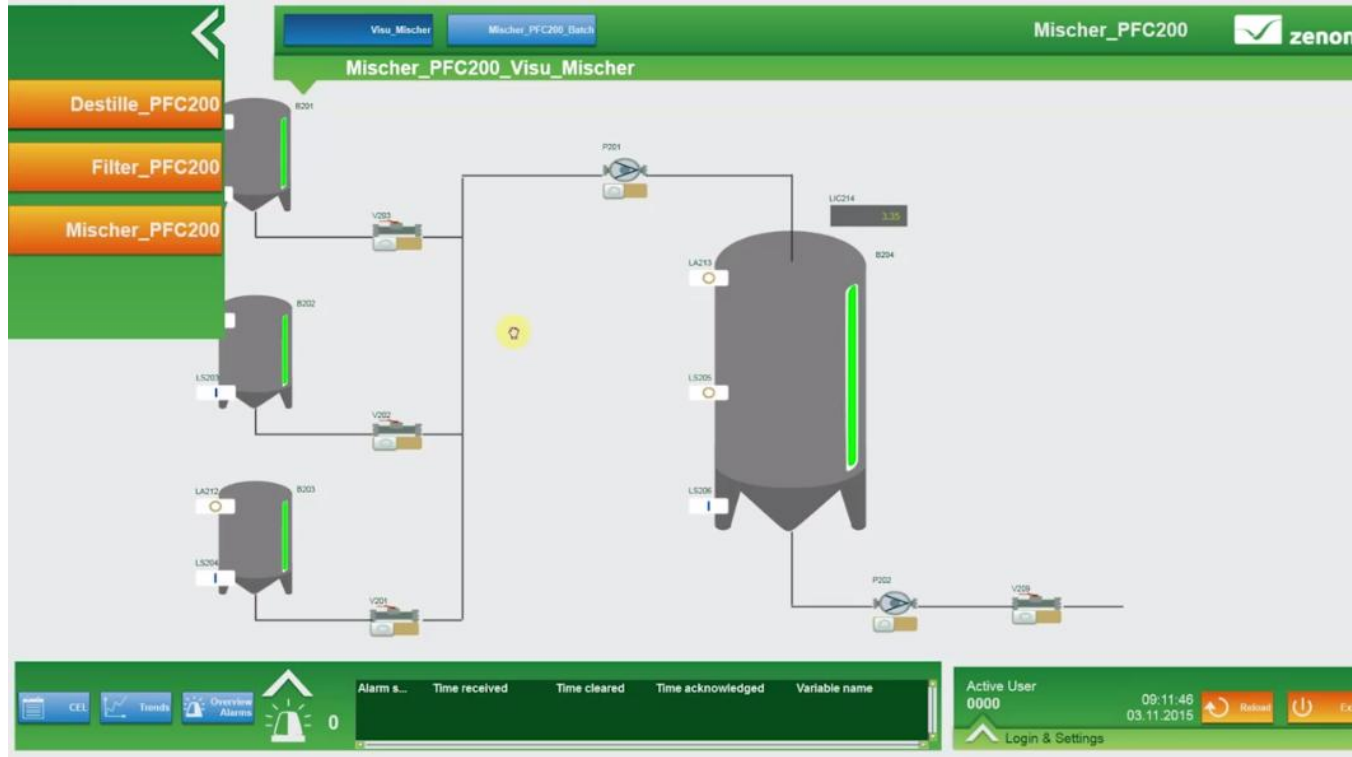
# Engineering: Generation of MTP



The screenshot displays the COCKPIT software interface. On the left, a green sidebar contains a navigation menu with options: New, Open, Save, Save as, Print, Import/export (highlighted), Project settings, Product Catalog, Options, and Help. The 'Import/export' menu is open, showing a list of actions: Program elements, CODESYS project, eCOCKPIT archive, IEC library, smartDESIGNER, Generate PMP, and Generate MTP (highlighted in blue). The main window shows the 'Generate module type package' dialog box. This dialog has tabs for 'General', 'Services', and 'HMTs'. The 'General' tab is active, showing 'Device' as 'Mischer\_PC200' and 'Service interface info' as 'Codesys OPC'. Below this, a 'Published Services' section is visible. A 'Service Selection' sub-dialog box is open, displaying a list of services with checkboxes: Application (checked), Abkoppeln (checked), Entleeren (checked), Initialisierung (checked), Mischen (checked), Reinigen (checked), Rühren (checked), and SichererZustand (checked). The 'Add Selection' button is highlighted.

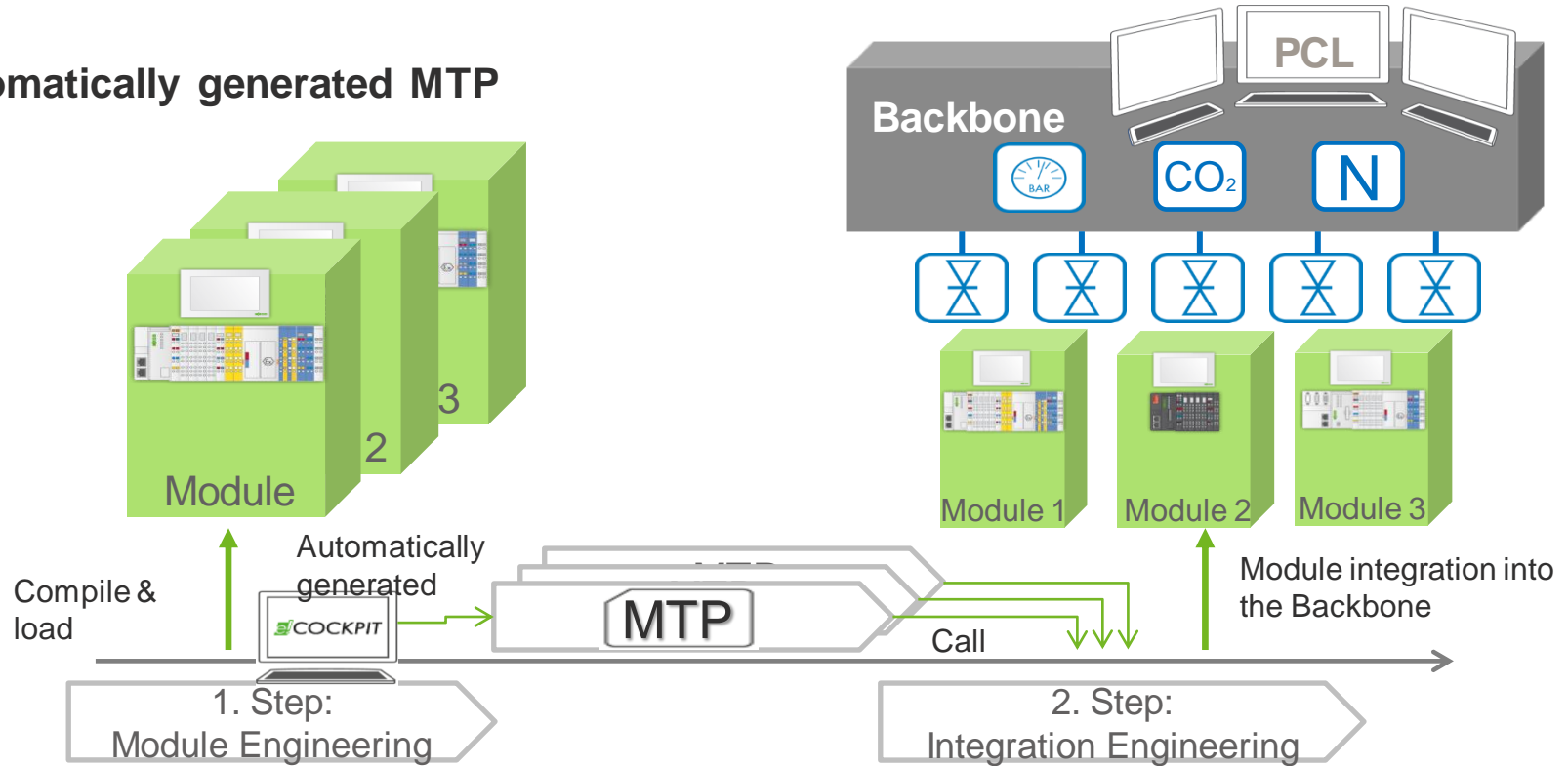


# Automatic Generation of HMI



# Engineering Workflow

## Automatically generated MTP



# Benefits

- Little engineering for adaptation of modular production plants
- Open interface between module and control level
- Automatic generation of visualization for HMI
- Know-How protection for module manufacturer



# Standardization Group

PLS Manufacturer	Sensor / Actuator Manufacturer	User	Decentralised Automation	Universities
ABB Emerson HIMA Safety Honeywell Rockwell Automation Schneider Electric Siemens Yokogawa	Endress + Hauser Festo Krohne Samson	BASF Bayer Bilfinger Boehringer Ingelheim Clariant Evonik Invite Merck Novartis Sanofi Spiratec	Pepperl + Fuchs Phoenix Contact Stahl Wago	Helmut-Schmidt- University Hamburg RWTH Aachen Technical University Dresden

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# High Efficiency

November 2016:

## DIMA in action at the SPS-IPC-Drives exhibition

- Fully automated generation of the MTP out of the WAGO e!Cockpit software
- MTP modelled in AutomationML
- Communication with OPC/UA
- MTP read in DCS zenon from Copa-Data
- Plug and produce of modules right after reading the MTP
- Orchestration and parameterization of the module services in the batch-tool



➤ **Changing one module  
(physically and logically) in  
less than 2:30 min!**



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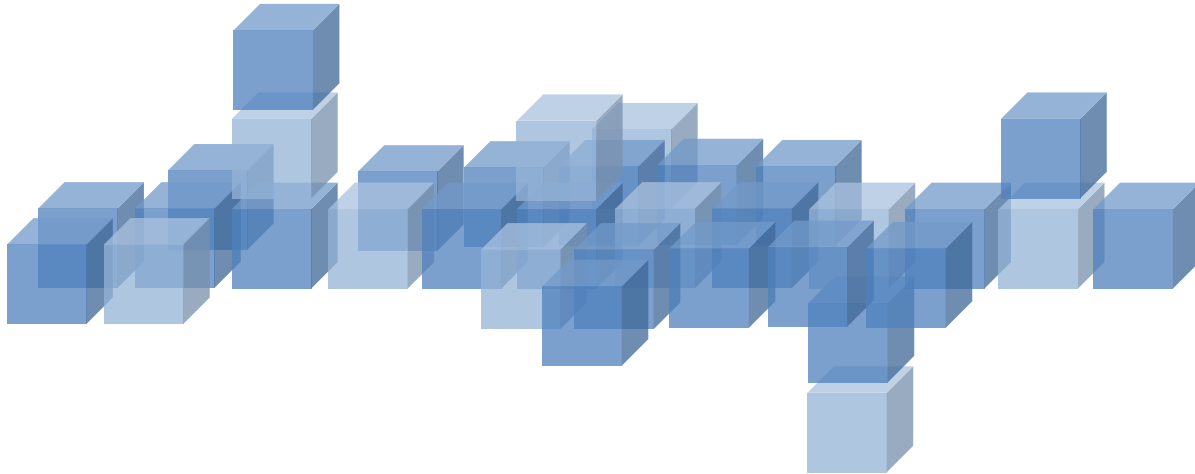


# Summary

- MTP will be the world wide first standard for digital description of production modules
- MTP standardization will be finished in 2017 with more than 30 companies and suggested as IEC international standard
- Communication model of MTP is based on ETHERNET OPC UA
- First implementation of MTP-interfaces in DCSs and Engineering-tools, e.g. ABB, Siemens, Yokogawa, Copa-Data „Zeton“
- With DIMA Method including the MTP Specification a „Plug-and-Produce“ for production plants moves closer
- WAGO is ready to realize first projects based on DIMA concept

# DIMA

The first global concept for the automation of modular production plants



First partner of DIMA in 2017: Statoil, BASF, EVONIK, Linde, Klüber, ZF

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