



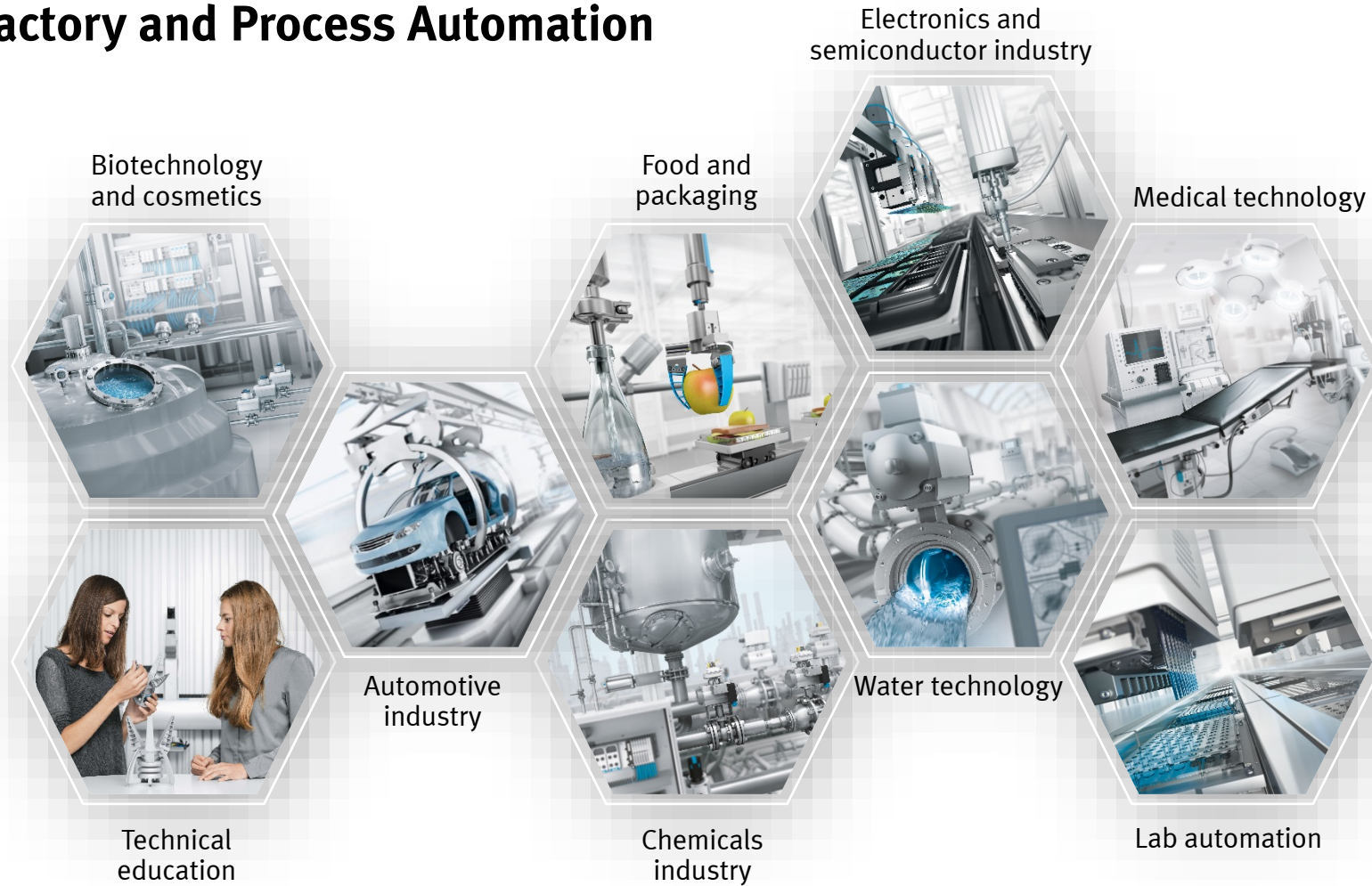
AssetAdministrationShell meets AutomationML

**AASX Package Explorer
with AutomationML Import**



PlugFest 2019, Hamburg
September 25th
Jürgen Herr

Festo – Partner of Factory and Process Automation



Festo Product Range

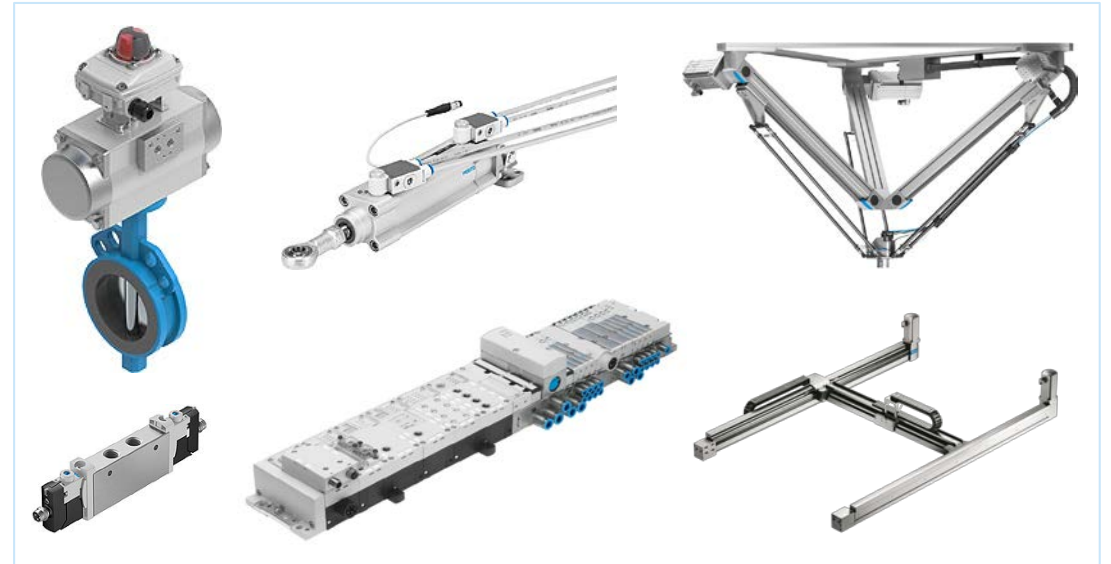
- > 34.000 products with millions of variants
- Simple connectors up to complex electrical and pneumatic systems



Electrical and pneumatic connectors, sensors, etc.

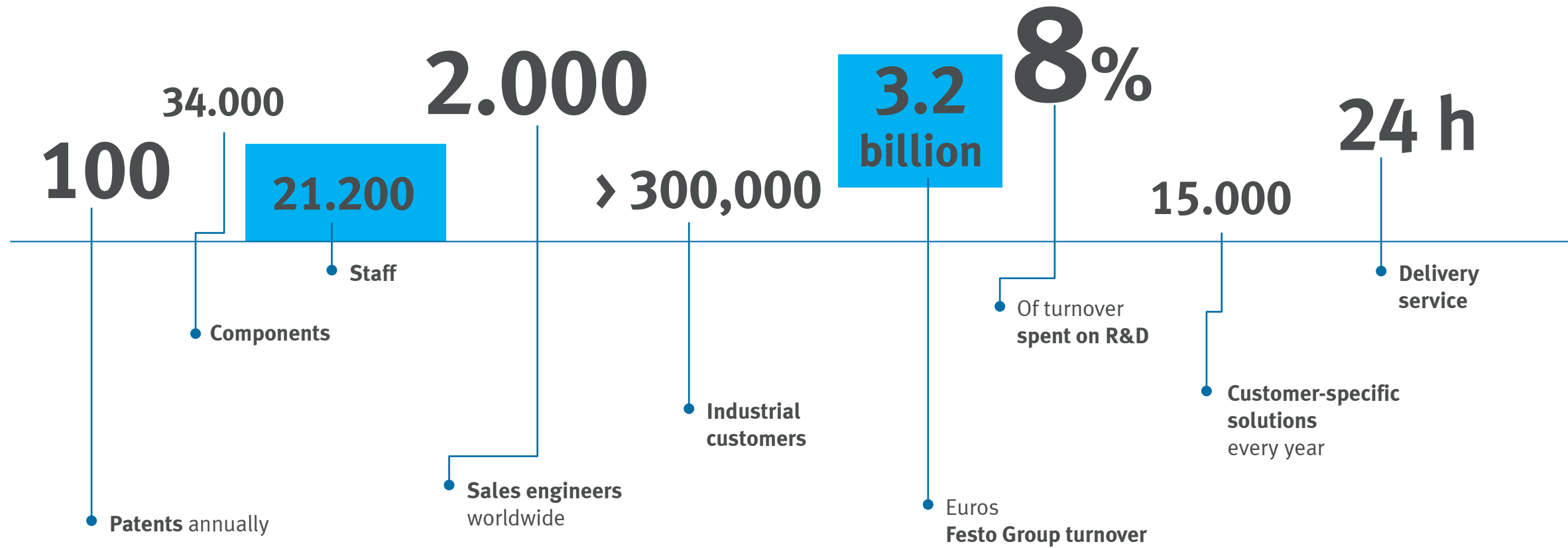


Drives and compressed air preparation, etc..



Valves, valve terminals, handling systems, ready-to-install solutions, etc.

Festo in Figures

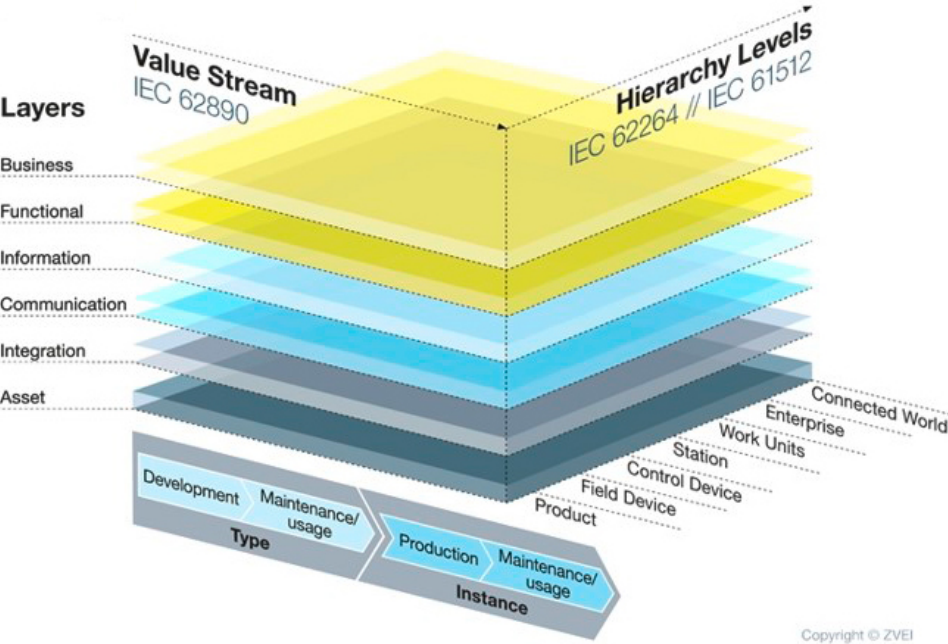
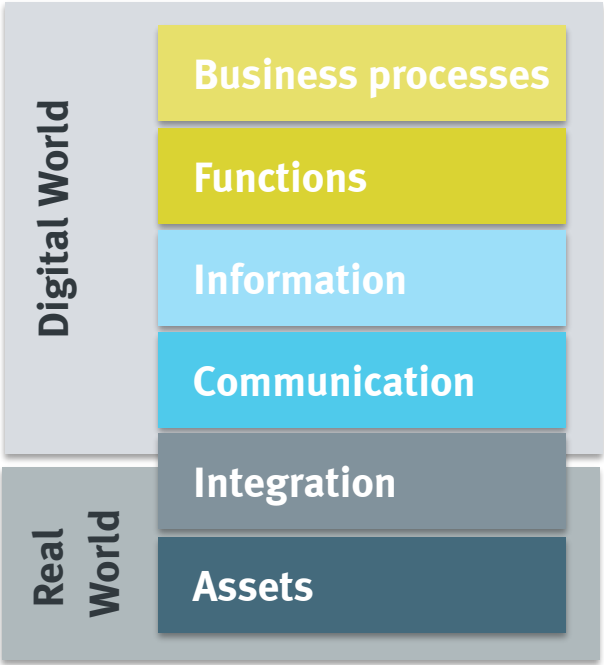




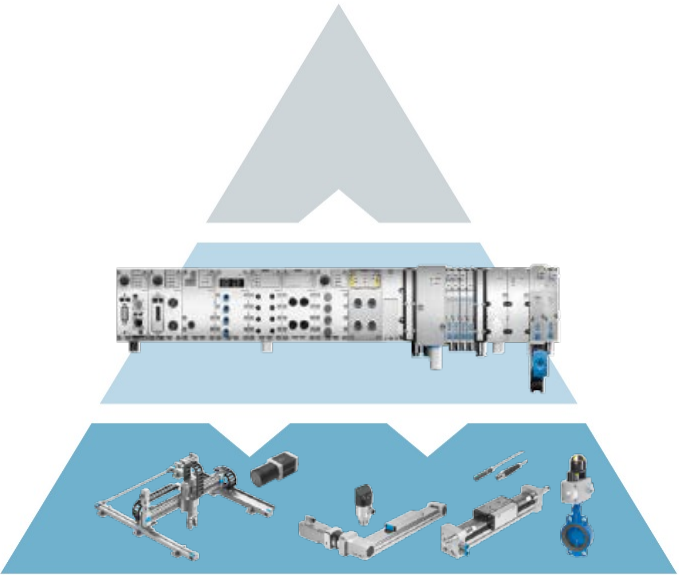
Administration Shell is a „Digital Twin“ for
Engineering, Commissioning, Operate, Diagnostics

RAMI 4.0 is a 3D Combination of the most important Aspects of Industry 4.0

Architecture



Use of the products

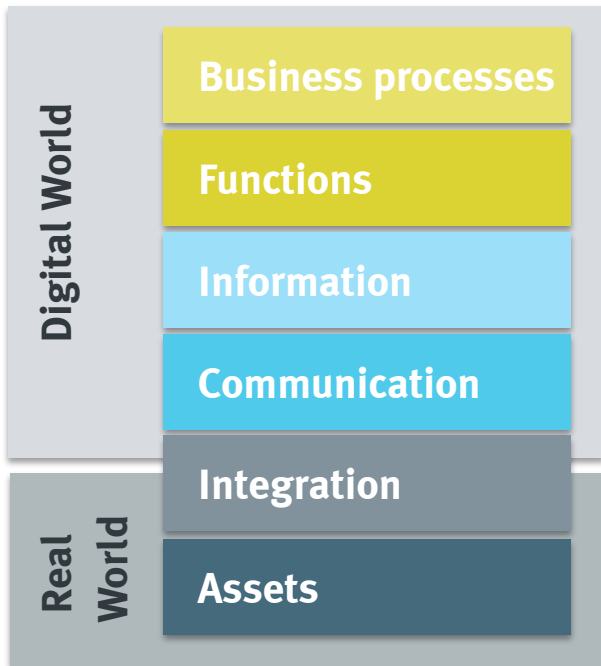


Production of the products

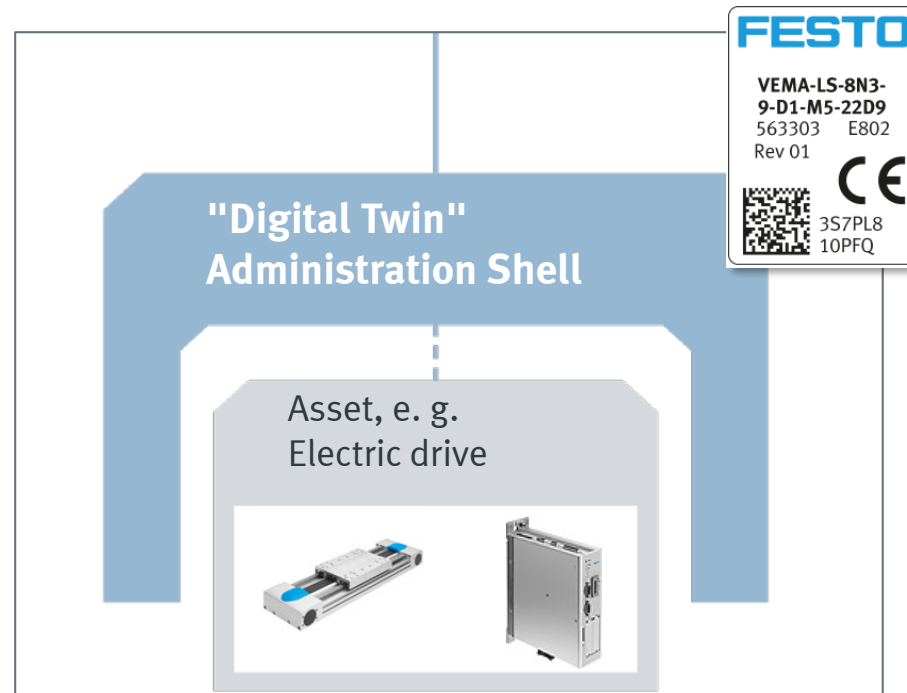
Cooperation along the entire value chain

RAMI 4.0 – an Orientation Framework for Digitisation

RAMI4.0 Architecture



I4.0 Communication



I4.0 communication creates a connection

The administration shell forms the virtual part of the component

The asset forms the real-world part of the component (physical / non-physical)

Each asset needs its own digital representation to be integrated into Industrie 4.0

The Administration Shell of the electrical axis...

...is also suitable for pneumatic drives!



- ...**knows the features & skills** of the electrical axis and makes it useable.
- ...**knows where to find the information** about the axis and provides it.
- ...has a precise **standardized syntax & semantics**.
- ...can be **realized in different ways**:
 - ▶ as a simple static data source („HTML file“), e.g. for a screw
 - ▶ on a field device
 - ▶ on a gateway, that operates several devices.
 - ▶ as a networked IT solution with distributed information sources ("cloud solution")



Data within the Administration Shell



Data for the "Digital Twin"

Identification, suitable for practical applications

M-CAD, in >50 file formats

EPLAN, precisely configured for each module of the component

Manuals, Manuals, exactly only what you need to know

Certificates, that are relevant for your customers

Simulation modules, for performance and virtual commissioning

Function blocks, for fast commissioning

Tools & Plugins, suitable for the modules of the component

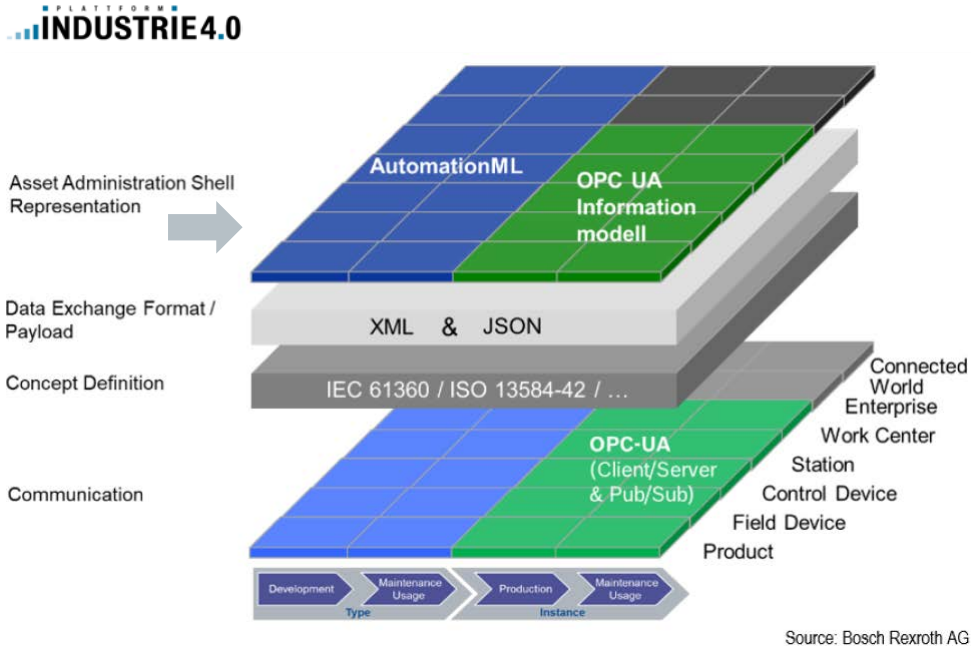
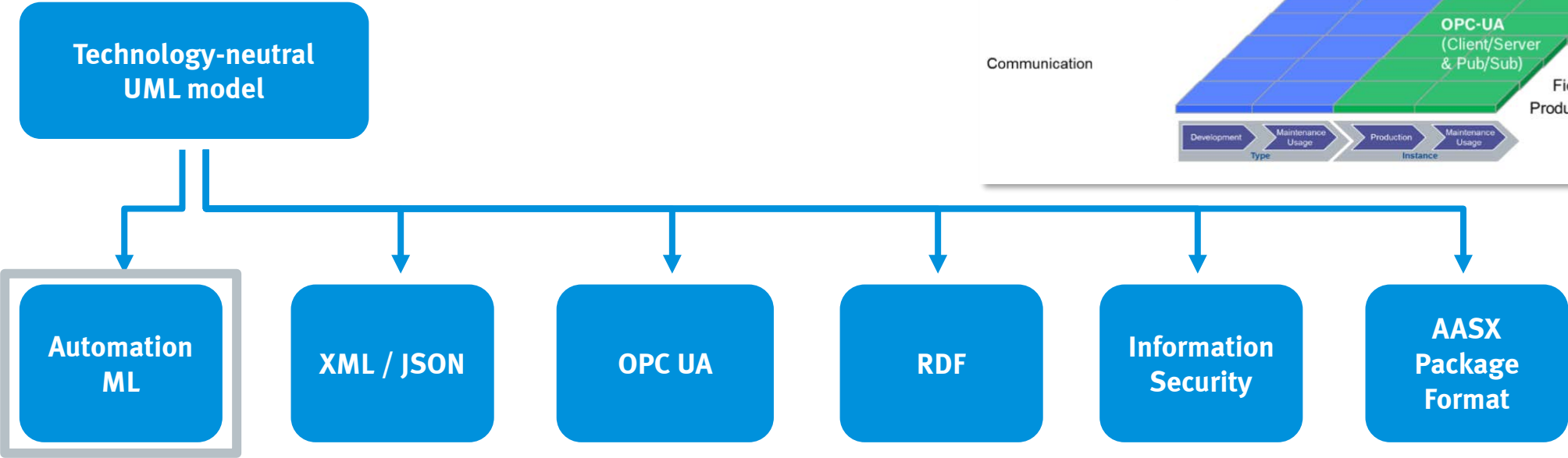
Dashboards, for diagnostics, condition monitoring and operational data in the cloud

AI functions for the component designed, for optimization in operation



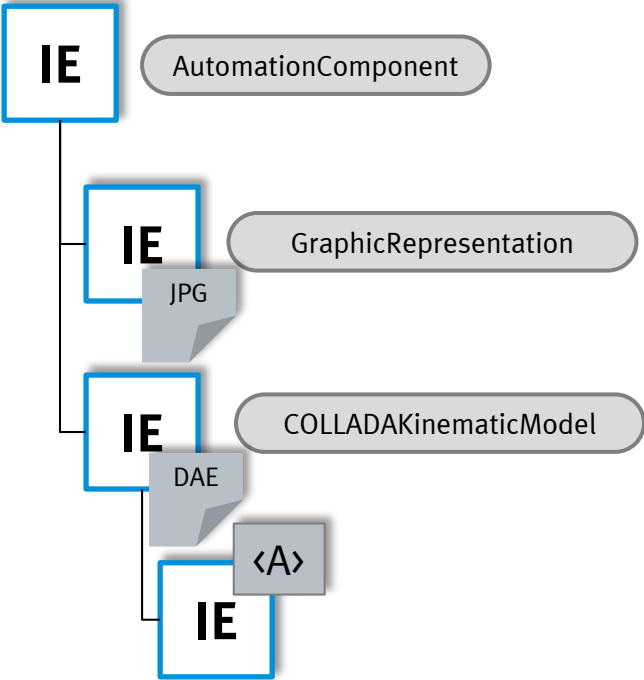
= consistent development of value-added services

Central Approach of the current Specification



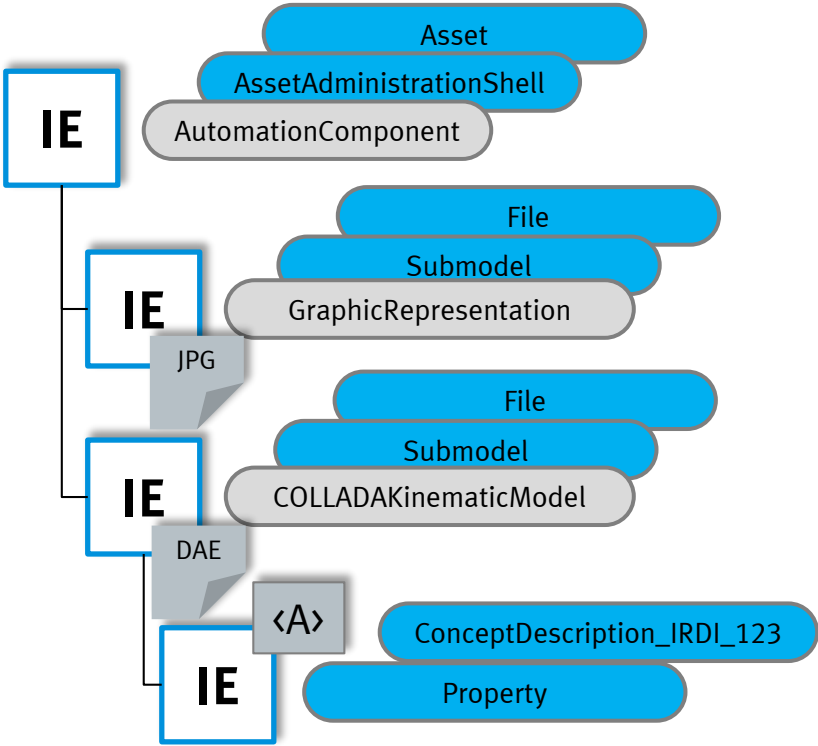
The AAS is structurally integrated in AutomationML

AutomationML Component



AutomationML Role

AutomationML Component with AssetAdministrationShell



AAS Role

Live Demo – Administration Shell via AASX Package Explorer



AASX Package Explorer - Festo_4830902_DPDm-6-15-PA_compact_cylinder_013.aasx


File Workspace Help

Submodel

Submodel element

Submodel element

http://pk.festo.com/LX7GYCYJKR



Switching to D:\Projekte_2\01_VWS_Verwaltungsschale\Beispiele_aasx\by_JHR\Festo_4830902_DPDm-6-15-PA_compact_cylinder_013.aasx ..

"Package" D:\Projekte_2\01_VWS_Verwaltungsschale\Beispiele_aasx\by_JHR\Festo_4830902_DPDm-6-15-PA_compact_cylinder_013.aasx

- Env "Environment"
 - Env "AdministrationShells"
 - AAS "DPDM" V1.0 [URI, http://smart.festo.com/id/instance/aas/5140_0142_3091_4340] of [URI, http://smart.festo.com/id/instance/aas/5140_0142_3091_4340]
 - Sub "Identification" [URI, http://smart.festo.com/id/instance/5312_1142_3091_4614]
 - Sub "DocuVDI2770" [URI, http://smart.festo.com/id/instance/0542_1142_3091_8974]
 - Sub "Datasheet" [URI, http://smart.festo.com/id/instance/3002_1142_3091_3839]
 - Prop "Size" = 6 [mm]
 - Prop "Stroke" = 15 [mm]
 - Prop "OperatingPressure" = 1,8 ... 8 [bar]
 - Prop "Weight" = 20,7 [g]
 - Prop "PneuConnection" = M5
 - Prop "AssemblyPosition" = any
 - Prop "AmbientTemperature" = -10 ... 80 °C [Celsius]
 - Prop "ModeOfOperation" = double-acting
 - Prop "Cushioning" = P
 - Sub "SpareParts" [URI, http://smart.festo.com/id/instance/7343_0272_3091_4440]
 - Sub "MCAD" [URI, http://smart.festo.com/id/instance/8460_0142_3091_7451]
 - Sub "ECAD" [URI, http://smart.festo.com/id/instance/1392_0142_3091_0152]
 - Sub "AML" [URI, http://smart.festo.com/id/instance/7043_6172_3091_5867]
 - Env "Assets"
 - Asset "LX7GYCYJKR" [URI, http://pk.festo.com/LX7GYCYJKR]
 - Env "ConceptDescriptions"
 - CD [IRDI] 0173-1#02-BAA001#006 Manufacturer
 - CD [IRDI] 0173-1#02-BAD847#003 ManProdCode
 - CD [IRDI] 0173-1#02-AAQ211#003 DS_AssemblyPosition
 - CD [IRDI] 0173-1#02-BAE507#002 DS_AmbTemp
 - CD [IRDI] 0173-1#02-BAE507#003 DS_ConstSize

Element **Content**

SubmodelReference

submodelRef: ☒ local

Editing of entities

SubmodelRef:

SubmodelElement:

Copy from existing SubmodelElement:

ConceptDescriptions from eCI@ss:

Submodel & -elements:

Submodel

Referable members:

idShort:

category:

The use of an description is recommended to allow the consumer of an Submodel to understand the nature of it.

description:

HasDataSpecification:

Identifiable members:

idType:

id:

Check if providing administrative information on version/ revision would be useful. This allows for better version management.

administration:

Check if you want to add a semantic reference. The semanticId may be either a reference to a submodel with kind=Type (within the same or another Administration Shell) or it can be an external reference to an external standard defining the semantics of the submodel. (for example an PDF if a standard).

Live Demo – AASX File to AutomationML Explorer



AutomationML Editor 5.1.2

File Edit View Tools PlugIns Settings Help

D:_Projekte_2\01_VWS_Verwaltungsschale\test_aasx.aml

Click here to change → CAEX 2

InstanceHierarchy

- AssetAdministrationShellInstanceHierarchy
 - DPDM (Role: AssetAdministrationShell)
 - LX7GYCVYJKR (Role: Asset)
 - Identification (Role: Submodel)
 - DocuVDI2770 (Role: Submodel)
 - Datasheet (Role: Submodel)
 - Size (Role: Property)
 - Stroke (Role: Property)
 - OperatingPressure (Role: Property)
 - Weight (Role: Property)
 - PneuConnection (Role: Property)
 - AssemblyPosition (Role: Property)
 - AmbientTemperature (Role: Property)
 - ModeOfOperation (Role: Property)
 - Cushioning (Role: Property)
 - SpareParts (Role: Submodel)

SystemUnitClassLib

- AssetAdministrationShellSystemUnitClassLib

RoleClassLib

- ManProdCode_IRDI_0173-1_02-BAD847_003 (Class: ConceptDescription)
- DS_AssemblyPosition_IRDI_0173-1_02-AAQ211_003 (Class: ConceptDescription)
- DS_AmbTemp_IRDI_0173-1_02-BAE507_002 (Class: ConceptDescription)
- DS_ConstSize_IRDI_0173-1_02-AAP898_003 (Class: ConceptDescription)
- DS_Cushioning_IRDI_0173-1_02-BAE235_003 (Class: ConceptDescription)
- DS_Stroke_IRDI_0173-1_02-AAD002_001 (Class: ConceptDescription)
- DS_ModeOfOperation_IRDI_0173-1_02-BAB278_004 (Class: ConceptDescription)
- DS_NetWeight_IRDI_0173-1_02-BAD875_006 (Class: ConceptDescription)
- DS_OpPressure_IRDI_0173-1_02-AAB836_006 (Class: ConceptDescription)
- DS_PneuConnection_IRDI_0173-1_02-AAK168_004 (Class: ConceptDescription)
- DocumentationItem_IRDI_0173-1_02-AAD001_001 (Class: ConceptDescription)
- DocTitle_IRDI_0173-1_02-AAD004_007 (Class: ConceptDescription)
- DocLang_IRDI_0173-1_02-AAD000_002 (Class: ConceptDescription)
- DocVersion_IRDI_0173-1_02-AAD005_006 (Class: ConceptDescription)
- FileName_IRDI_0173-1_02-AAD005_005 (Class: ConceptDescription)
- File_IRDI_0173-1_02-AAD005_008 (Class: ConceptDescription)

InterfaceClassLib

- AssetAdministrationShellInterfaceClassLib
 - FileDataReference
 - BlobDataReference
 - DataReference
 - Referable
 - Reference

Attributes: Stroke

- idShort
- category
- kind
- semanticId
- value

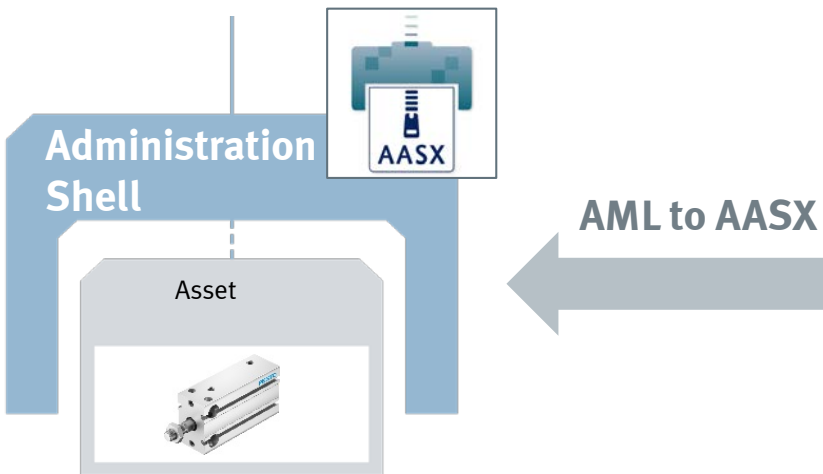
Attribute detail: value

Value	
Value	15
Default Value	
Data Type	xs:integer
Unit	
Constraint	Constraint collection
Relations	
Semantic	Semantic collection

Header Attributes Relations

Zoom 100.00 %

Live Demo – AML File to AASX Package Explorer



AutomationML Editor 5.1.2

File Edit View Tools PlugIns Settings Help

D:_Projekte_2\01_VWS_Verwaltungsschale\test_aasx.aml

Click here to change → CAEX 2

InstanceHierarchy

- AssetAdministrationShellInstanceHierarchy
 - DPDM (Role: AssetAdministrationShell)
 - LX7GYCVYJKR (Role: Asset)
 - Identification (Role: Submodel)
 - DocuVDI2770 (Role: Submodel)
 - Datasheet (Role: Submodel)
 - Size (Role: Property)
 - Stroke (Role: Property)
 - OperatingPressure (Role: Property)
 - Weight (Role: Property)
 - PneuConnection (Role: Property)
 - AssemblyPosition (Role: Property)
 - AmbientTemperature (Role: Property)
 - ModeOfOperation (Role: Property)
 - Cushioning (Role: Property)
 - SpareParts (Role: Submodel)

SystemUnitClassLib

- AssetAdministrationShellSystemUnitClassLib

RoleClassLib

- ManProdCode_IRDI_0173-1_02-BAD847_003 (Class: ConceptDescription)
- DS_AssemblyPosition_IRDI_0173-1_02-AAQ211_003 (Class: ConceptDescription)
- DS_AmbTemp_IRDI_0173-1_02-BAE507_002 (Class: ConceptDescription)
- DS_ConstSize_IRDI_0173-1_02-AAP898_003 (Class: ConceptDescription)
- DS_Cushioning_IRDI_0173-1_02-BAE235_003 (Class: ConceptDescription)
- DS_Stroke_IRDI_0173-1_02-AAD002_001 (Class: ConceptDescription)
- DS_ModeOfOperation_IRDI_0173-1_02-BAB278_004 (Class: ConceptDescription)
- DS_NetWeight_IRDI_0173-1_02-BAD875_006 (Class: ConceptDescription)
- DS_OpPressure_IRDI_0173-1_02-AAB836_006 (Class: ConceptDescription)
- DS_PneuConnection_IRDI_0173-1_02-AAK168_004 (Class: ConceptDescription)
- DocumentationItem_IRDI_0173-1_02-AAD001_001 (Class: ConceptDescription)
- DocTitle_IRDI_0173-1_02-AAD004_007 (Class: ConceptDescription)
- DocLang_IRDI_0173-1_02-AAD000_002 (Class: ConceptDescription)
- DocVersion_IRDI_0173-1_02-AAD005_006 (Class: ConceptDescription)
- FileName_IRDI_0173-1_02-AAD005_005 (Class: ConceptDescription)
- File_IRDI_0173-1_02-AAD005_008 (Class: ConceptDescription)

InterfaceClassLib

- AssetAdministrationShellInterfaceClassLib
 - FileDataReference
 - BlobDataReference
 - DataReference
 - Referable
 - Reference

Attributes: Stroke

- idShort
- category
- kind
- semanticId
- value

Attribute detail: value

Value	
Value	15
Default Value	
Data Type	xs:integer
Unit	
Constraint	Constraint collection
Relations	
Semantic	Semantic collection

Zoom 100.00 %

A robotic hand, specifically a Shadow Hand, is shown holding a large, glossy blue sphere. The hand is white and black, with visible joints and sensors. The sphere is the central focus, and the text is overlaid on it. The background is a plain, light gray.

Thank you!
Questions,
Discussion

Appendix...

Industrie 4.0 - the german platform of all stakeholders

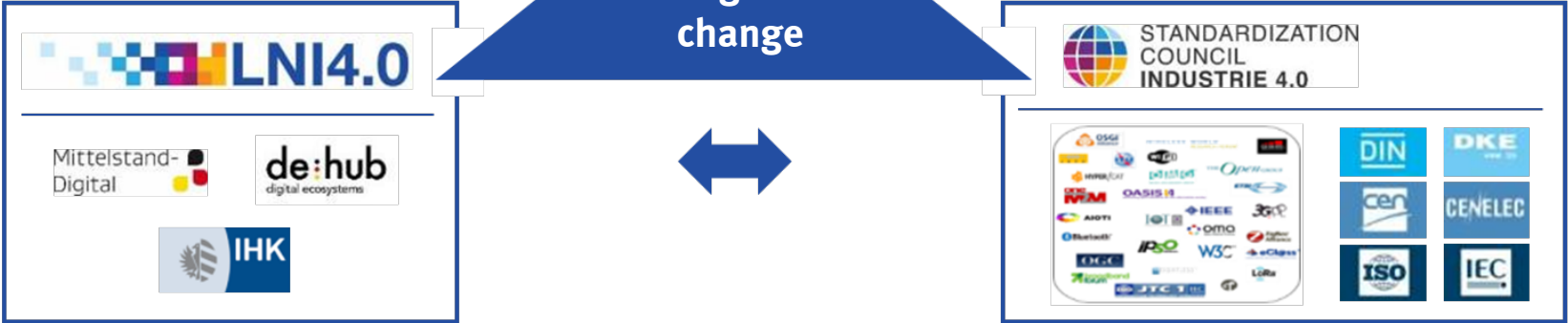
Community of experts



Reference architectures,
standardisations , Research, IT-
platforms and data economy

PLATTFORM
INDUSTRIE4.0

Safety of networked systems,
legal frame, technical educations



The Administration Shell represents the entire life cycle of Products, Devices, Machines and Plants

