INTERNATIONAL
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Industry 4.0 and European Initiatives

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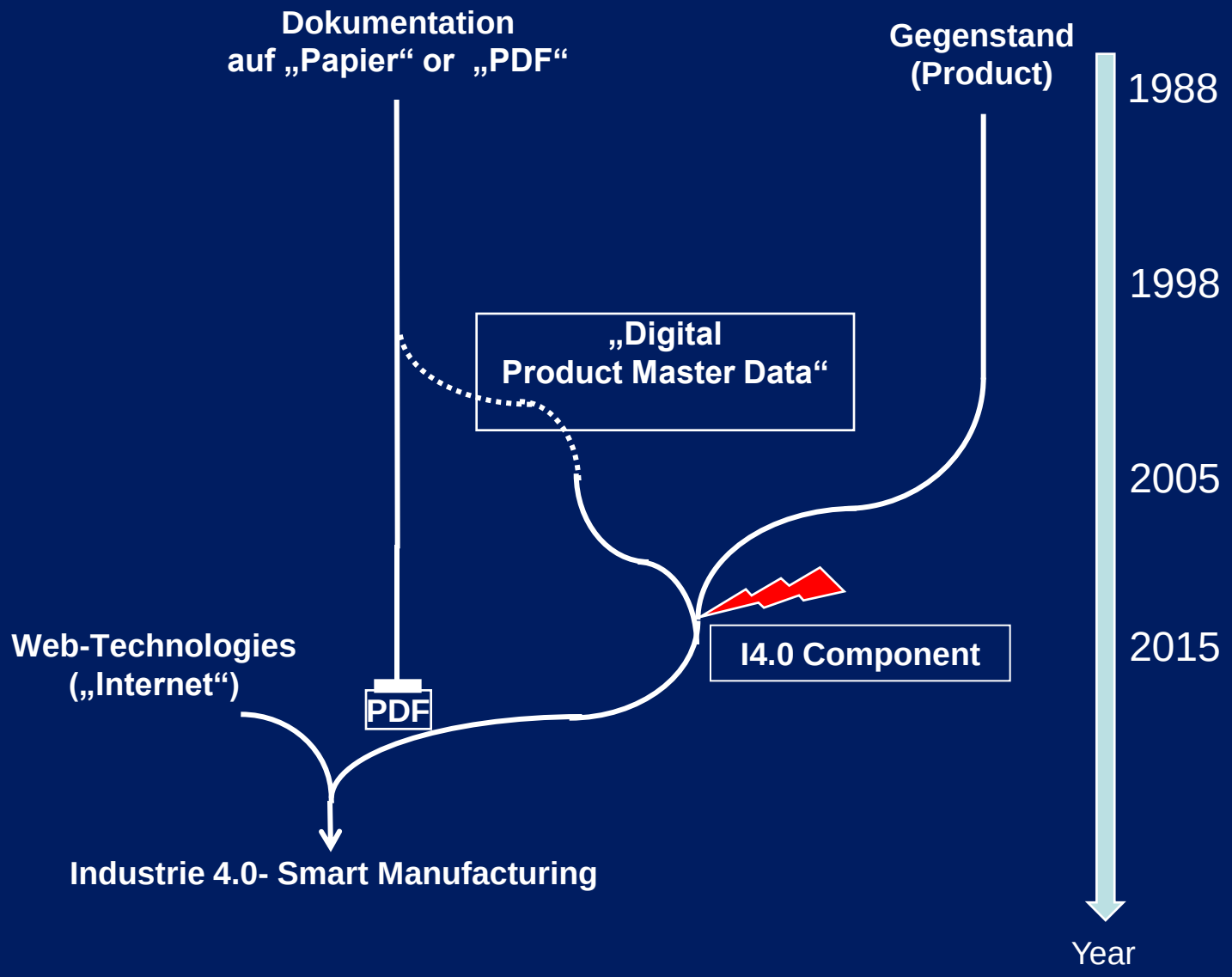
Industry 4.0 – Smart Manufacturing

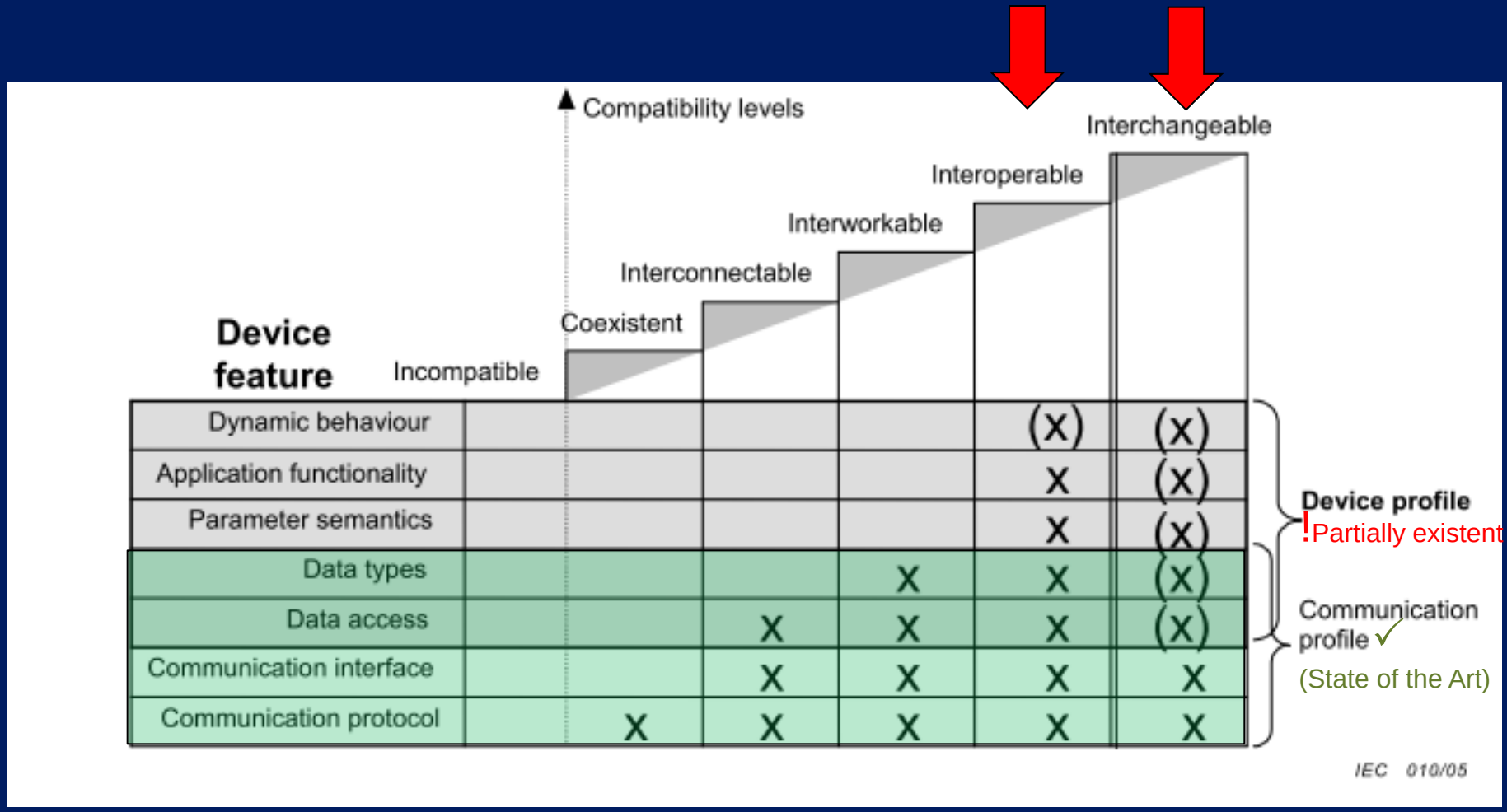
Things will collaborate with each other

- Interoperability/Interchangeability
- Cooperation
- Collaboration

The thing and its virtual description come together.

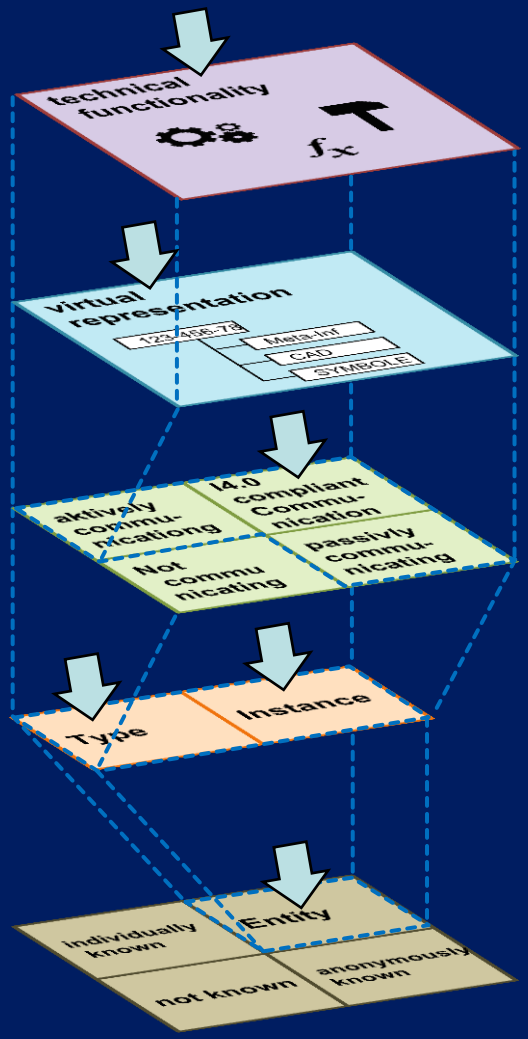


Compatibility Levels according to IEC TR 62390



Note: (X) indicates that according to this property interchangebility may be given or not

From the Thing to the I4.0 Component



Functions

Virtual representation (data)

Specification according to business logic and automation functions

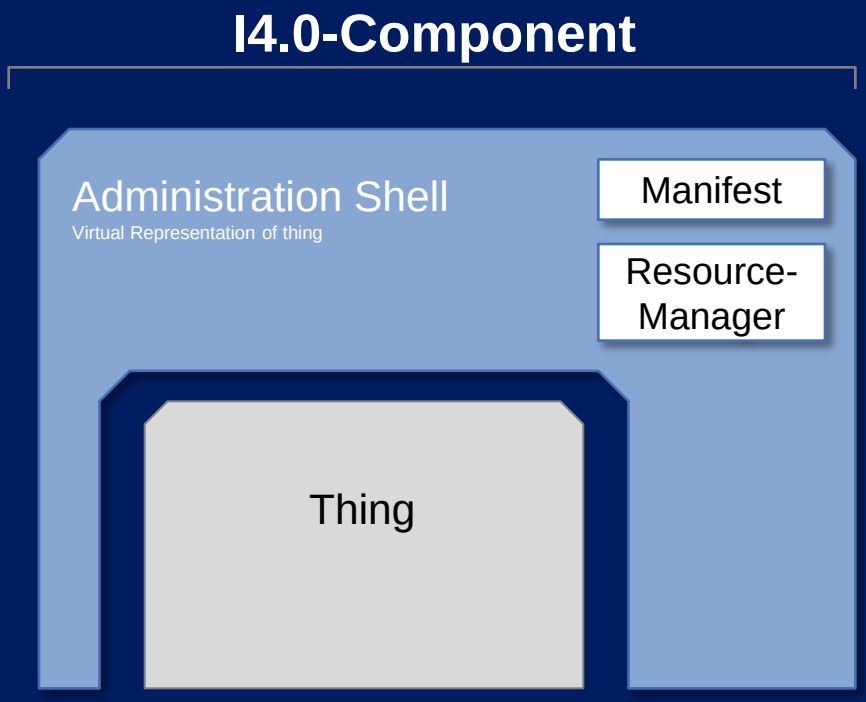
Communication skills

Type/ Instance

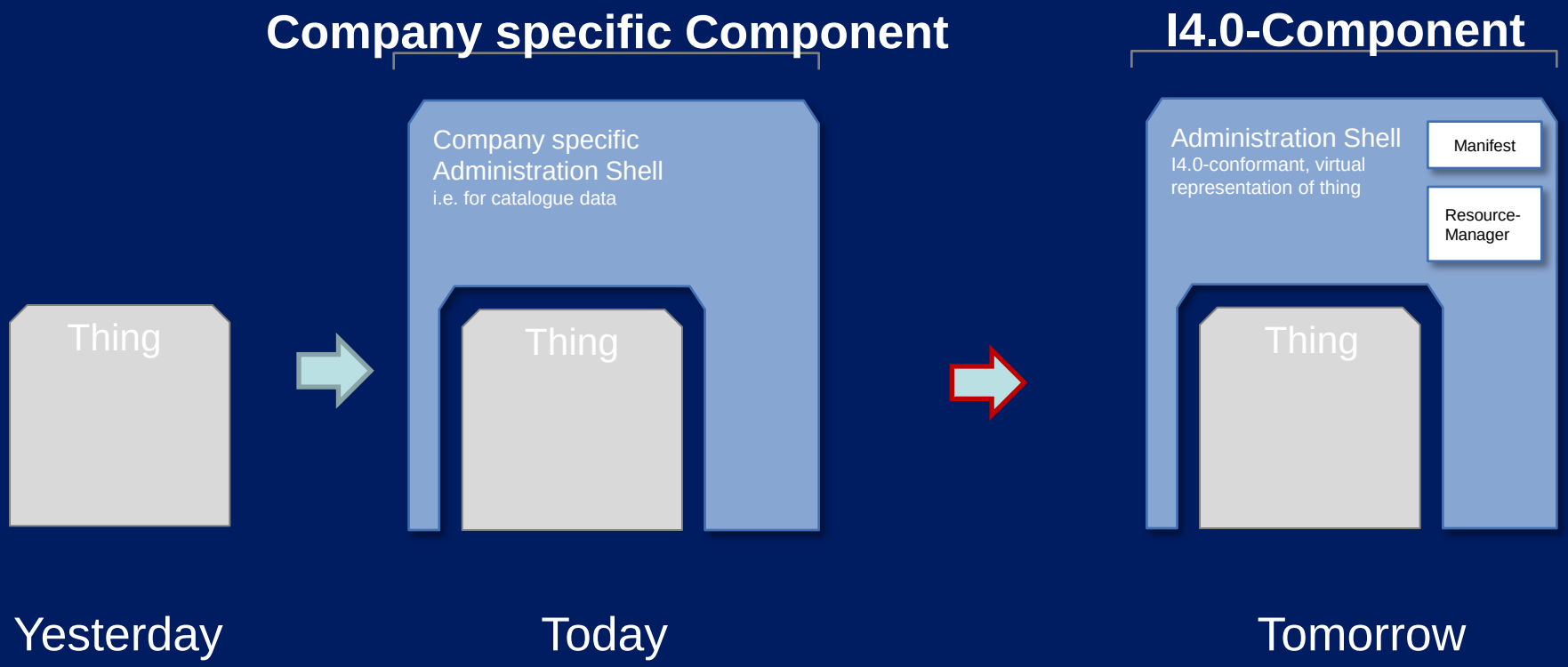
Methodology to describe abstract concept

Thing/ Entity

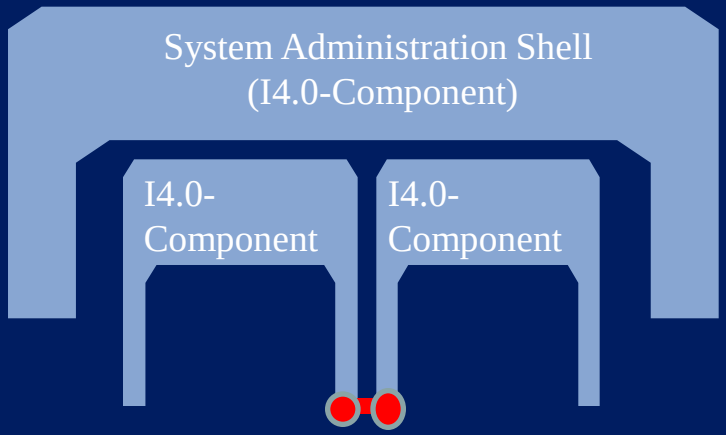
Each relevant thing has ist own administration shell: The I4.0 Component



Migration path from a simple „thing“ to I4.0 Component: The „thing“ is always the same



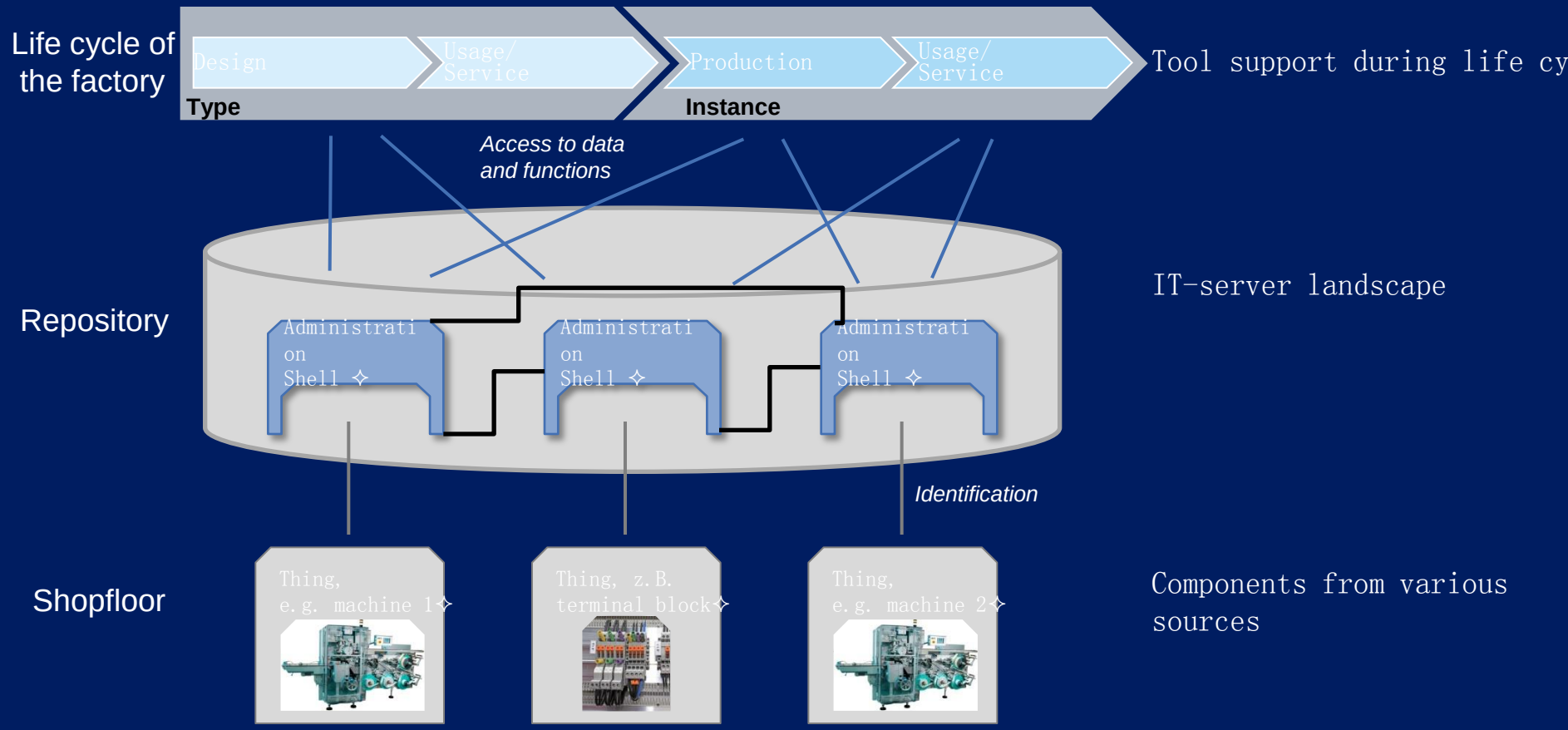
At least 2 connected Administration Shelles represent an new thing (I4.0-System) with ist own Administration Shell



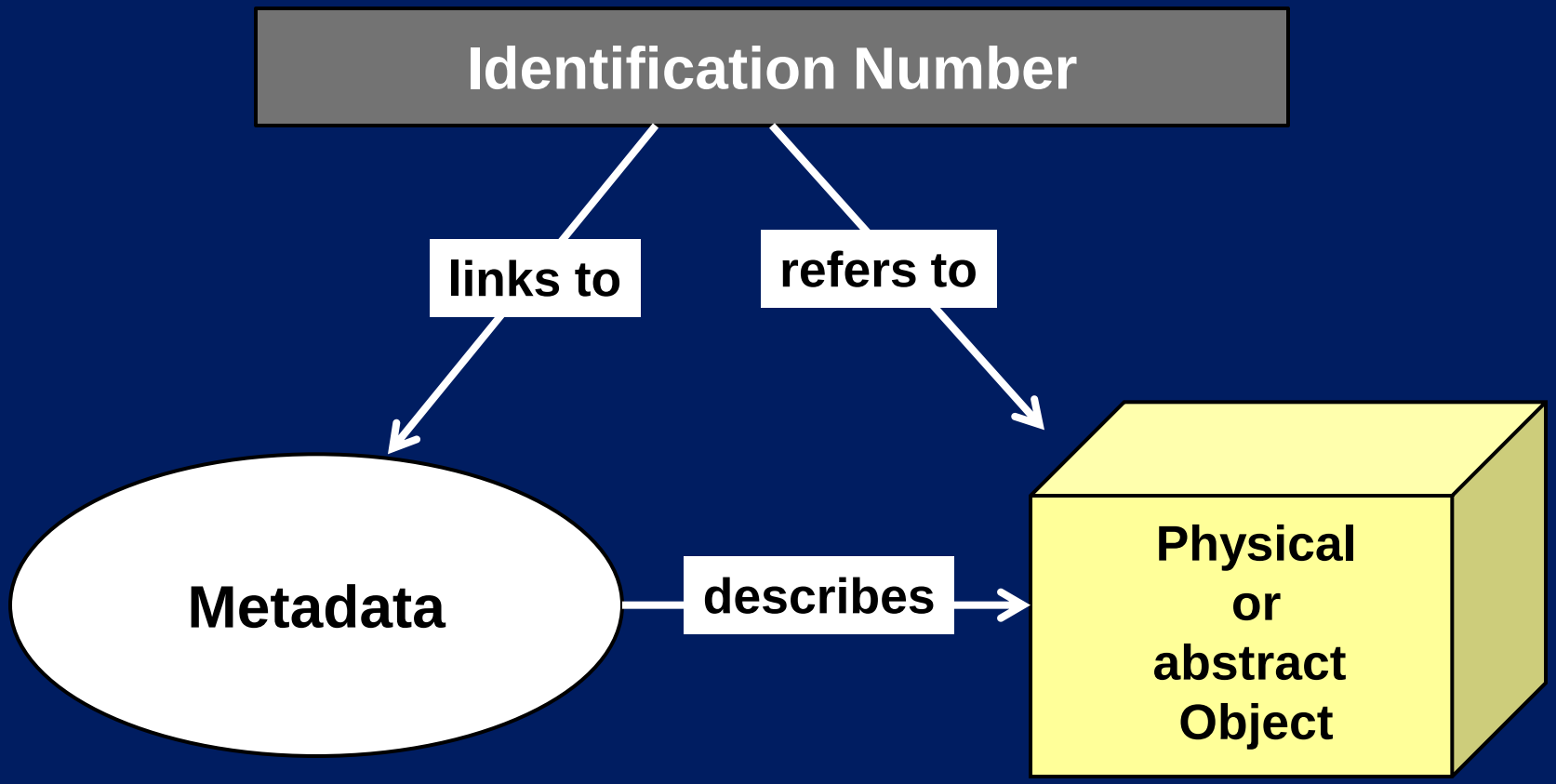
Basics of an „Industrie 4.0 Thing“

- A thing may be an idea, a software, an archive, a service or any physical thing (may not be physically existent)
- Each thing has a lifecycle
- Each information has a carrier
- A thing in the virtual world is represented by information of its administration shell
- A thing may have more than one administration shells according zu Industrie 4.0 for different purposes
- Things can by virtually combined in a Repository by their administration shells
- A combination of things will create a new thing with new properties and a new administration shell.
- A thing is characterized in a process by time, location and state.
- An Industrie 4.0 vocabulary allows the description of properties of a thing.
- The Industrie 4.0 vocabulary consists of a collection of terms, called properties, including a specific grammar

Things can by virtually combined in a Repository by their administration shells



DF Asset of IEC 62832 CD2 and I4.0 Component are based on Cyber Physical Object („Thing“) according to IEC 62507



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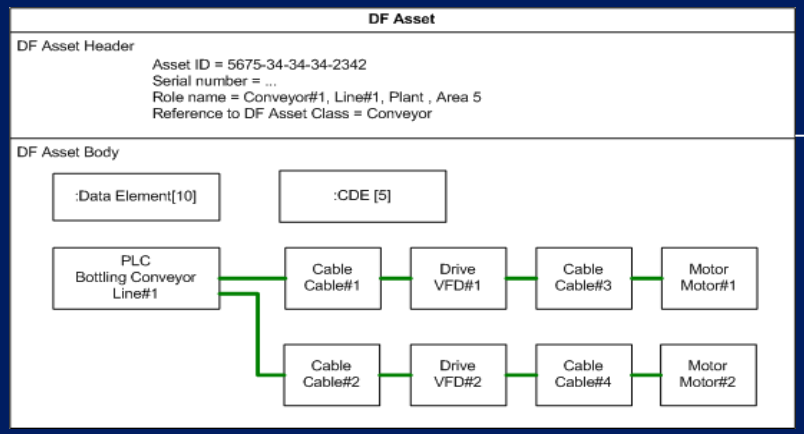
I4.0 Component is derived from DF Asset of IEC 62832 CD2



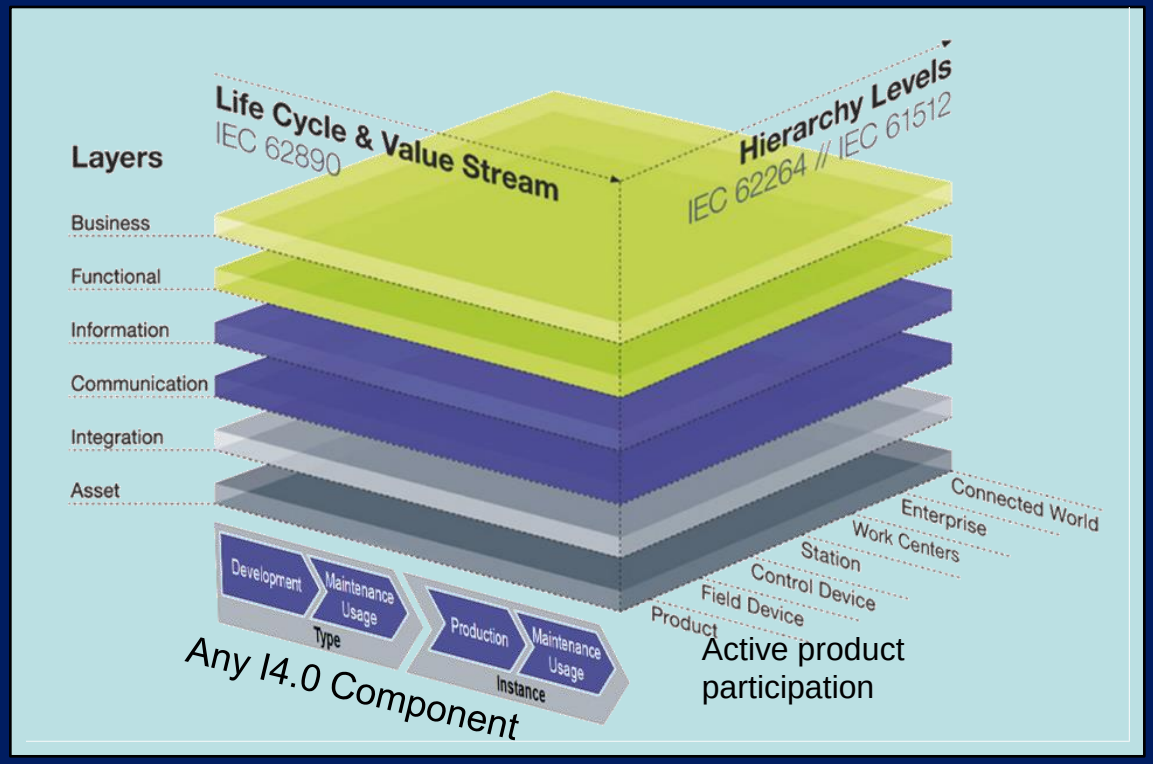
DF Asset of IEC 62832 CD2

Header

Body

Administration Shell
Industrie 4.0

The Reference Architecture Model Industrie 4.0 (RAMI4.0)



The Reference Architecture Model Industrie 4.0 (RAMI4.0) allows at the same time the correlation of:

- Workflow
- Workflow aspects („Layers“)
- Hierarchy

Type and Instance alternate depending on phase of the lifecycle. The part can actively (Product) participate in the processes

Supplier part

→ Part type in selection

Planning Development | Design | Virtual Commis-sioning | Commis-sioning | Production | Usage& Optimization

→ Ordered parts (instances)

Planning with possible part types

Delivery of specific parts

Machine

→ Planned type of machine

Planning Development | Design | Virtual Commis-sioning | Commis-sioning | Production | Maintenance& Optimization

→ Ordered machines of a type (instances)

Planning/ Ordering of a machine

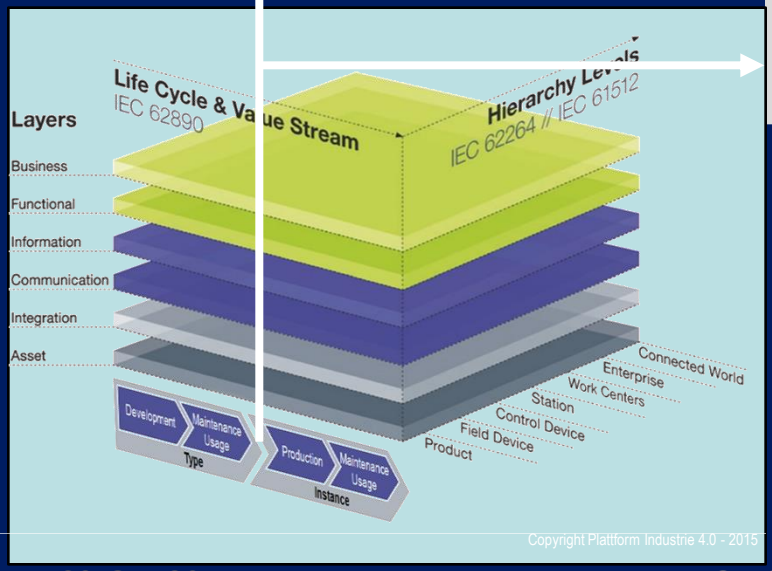
Delivery of specific machine

Factory

→ Factory concept (type)

(Invest-) Planning | Engineering | Virtual Commis-sioning | Commis-sioning | Production | Maintenance& Optimization

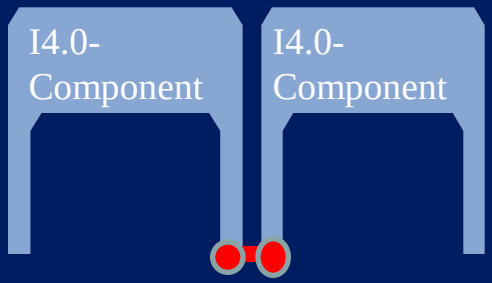
→ Specific factory (instance)



RAMI4.0 can be used for i.e.:

- Supplier Part
- Machine
- Factory

Connected things should have equivalent quality



Condition Monitoring is an important part of Quality

TC 65

Security

Functional Safety

Quality

•levels

Build-in Quality

- Safety
- Reliability

Condition Monitoring

- Availability
- Reliability (ahG2)

TC65: The System Committee for Smart Manufacturing

- **IEC 62832 and IEC TR62794 Digital Factory**
- **IEC 62890 Life Cycle Management**
- **IEC 62264 Manufacturinge Execution System**
- **IEC 61512 Batch Control**

- **IEC 62541 OPC UA**
- **IEC 62443 Security in Automation**
- **IEC 62714 Automation ML based on IEC 62424**
- **IEC 62424 CAEX-Exchange Format**
- IEC **65E/482/NP** Uniform Representation of Condition Monitoring Functions

- **IEC 61804 Electronic Device Description Language EDDL**
- **IEC 62453 Field Device Tool FDT**
- **IEC 62769 Field Device Integration FDI**
- **IEC 61987 Product Data for sensors and actuators**

- **IEC 61508 Functional Safety basic standard**
- **IEC 61511 Functional Safety in Process Control**

- **Wired Communications**
  - **IEC 61158 Fieldbus types**
  - **IEC 61784 Fieldbus profiles**
  - **IEC 62026-2 (AS-Interface, AS-I)**
  - **ISO/IEC 14543-3 (Konnex, KNX)**

- **Wireless Communications**
- **IEC 62591 Ed 1.0 published 2010-04-27 WirelessHART**
- **IEC 62601 WIA-PA**

- **Thank you very much**