



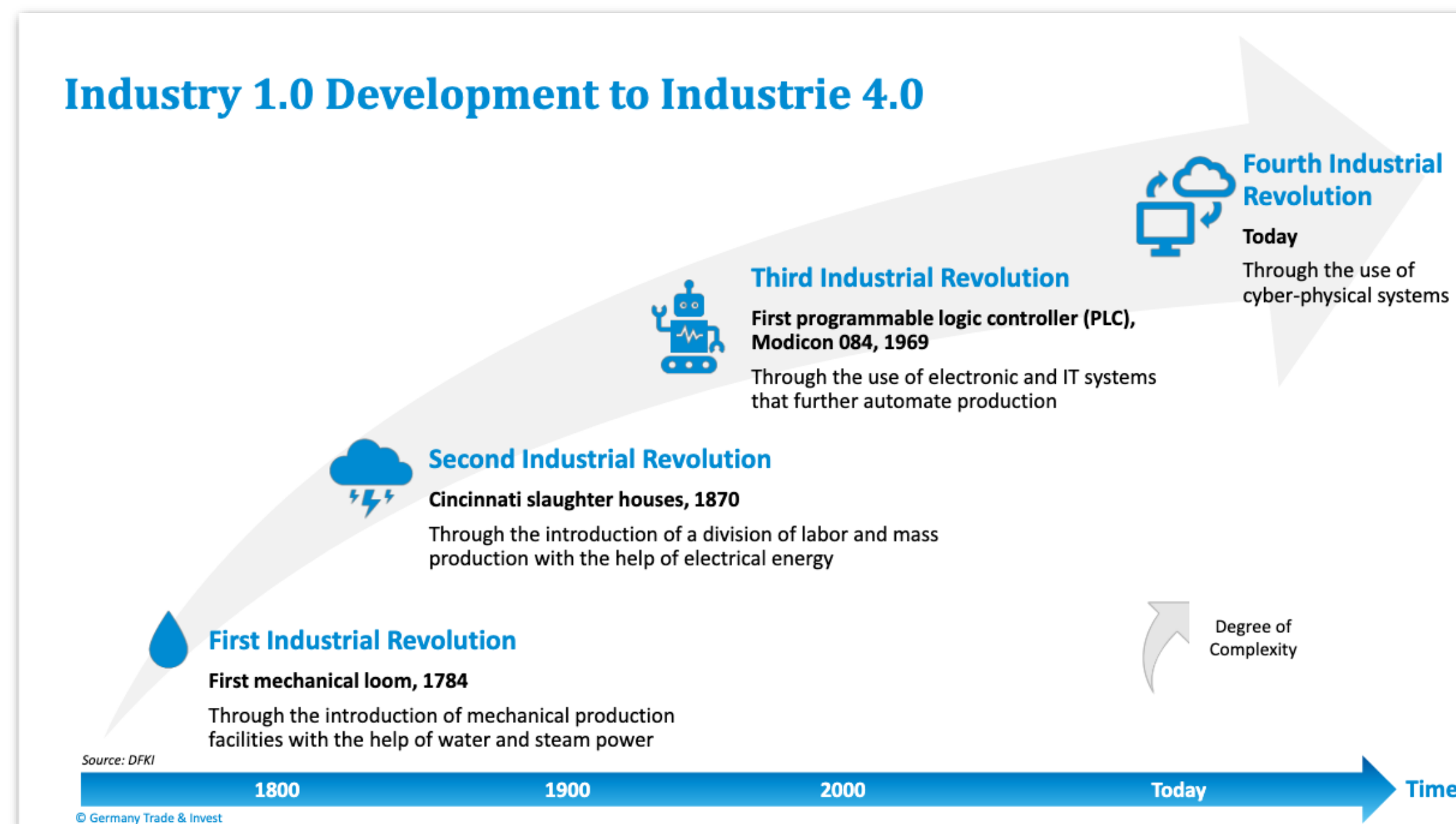
# Interoperability

INDUSTRIE 4.0 AND SMART  
MANUFACTURING

ISO 8000 and ISO 18101



# Industrie 4.0 - What is it?



- Industrie 4.0 (I4.0 or I4) started as a German government initiative in 2011. It is often described as a sub-set of the Fourth Industrial Revolution;
- Industrie 4.0 refers to the intelligent networking of machines and processes for industry with the help of information and communication technology;
- Industrie 4.0 is about automation and data exchange for the Industrial Internet of Things (IIOT) enabling smart factories and process plants.



# Terms and definitions

## interoperability

capability of two or more entities to exchange items in accordance with a set of rules and mechanisms implemented by an interface in each entity, in order to perform their specified tasks

Note 1 to entry: Examples of entities include devices, equipment, machines, people, processes, applications, computer firmware and application software units, data exchange **systems** (3.2) and enterprises.

Note 2 to entry: Examples of items include **services** (3.7), information, material in standards, design documents and drawings, improvement projects, energy reduction programs, control activities, **asset** (3.5) description and ideas.

Note 3 to entry: In this context, entities provide items to, and accept items from, other entities, and they use the items exchanged in this way to enable them to operate effectively together.

[SOURCE: ISO 18435-1:2009, 3.12, modified — The word “respective” has been replaced with “specified”, Notes 1 and 2 to entry have been modified and Note 3 to entry has been added.]

ISO/TS 18101-1:2019(en), 3.1 🔍

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

# Terms and definitions

## Industrial Internet of Things

### IIOT

global infrastructure for the information society, enabling advanced **services** (3.7) by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies

Note 1 to entry: The Industrial Internet of Things (IIOT) is used to identify the industrial specializations of the Internet of Things (IOT).

[SOURCE: ISO/IEC 38505-1:2017, 3.6, modified — The original Notes to entry have been removed and a new Note 1 to entry has been added.]

ISO/TS 18101-1:2019(en), 3.24 🔍

### digital twin

**digital asset** (3.10) on which **services** (3.7) can be performed that provide value to an organization

Note 1 to entry: The descriptions comprising the digital twin can include properties of the described asset, **IIOT** (3.24) collected data, simulated or real behaviour patterns, processes that use it, software that operates on it, and other types of information.

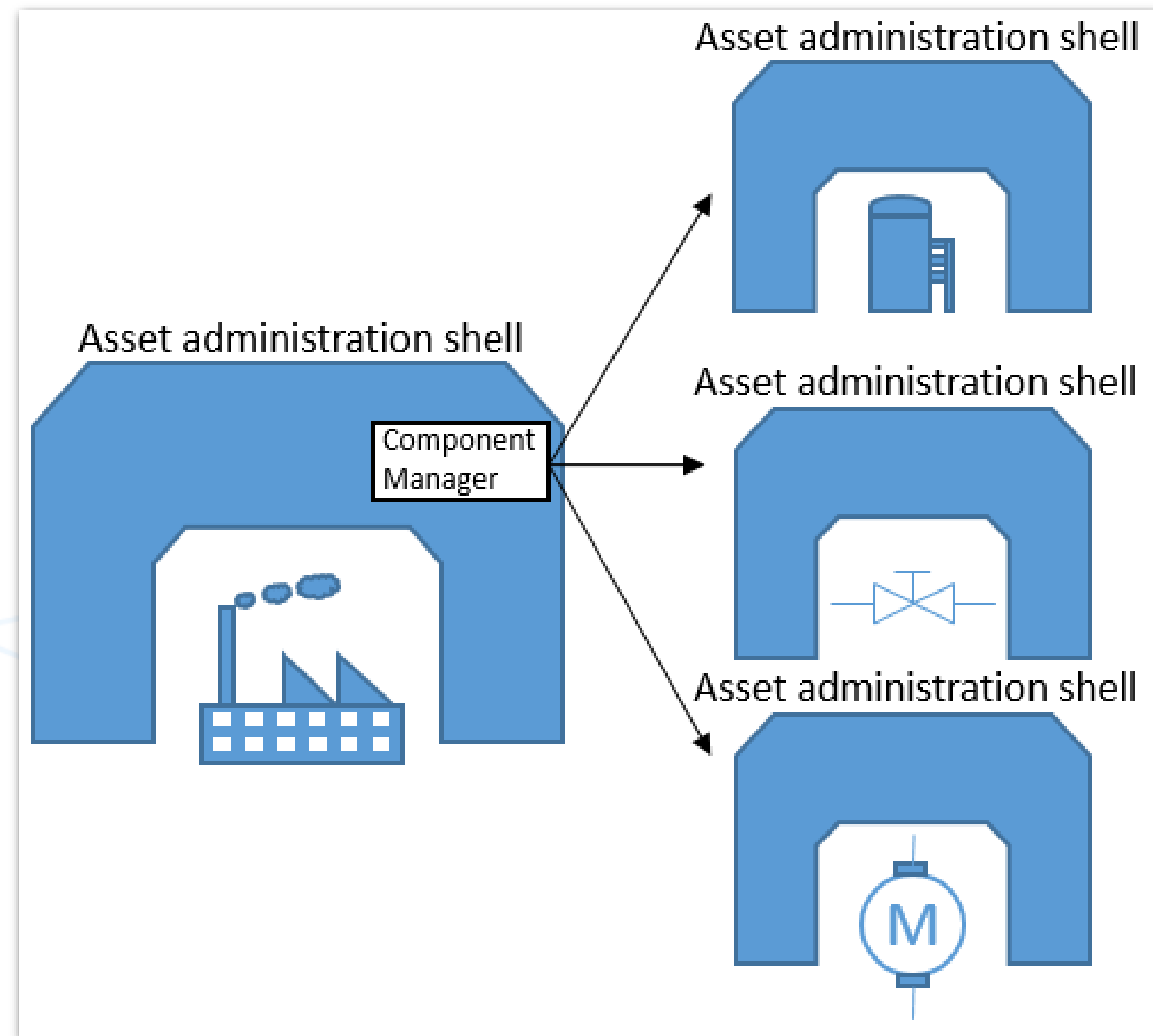
Note 2 to entry: The services can include simulation, analytics such as diagnostics or prognostics, recording of provenance and service history.

EXAMPLE: A digital model of an aircraft that allows crew training in a simulator; a stream of vibration readings that allows analysis of bearing wear; maintenance records that enable certification checks or total operation time computation.

ISO/TS 18101-1:2019(en), 3.9 🔍



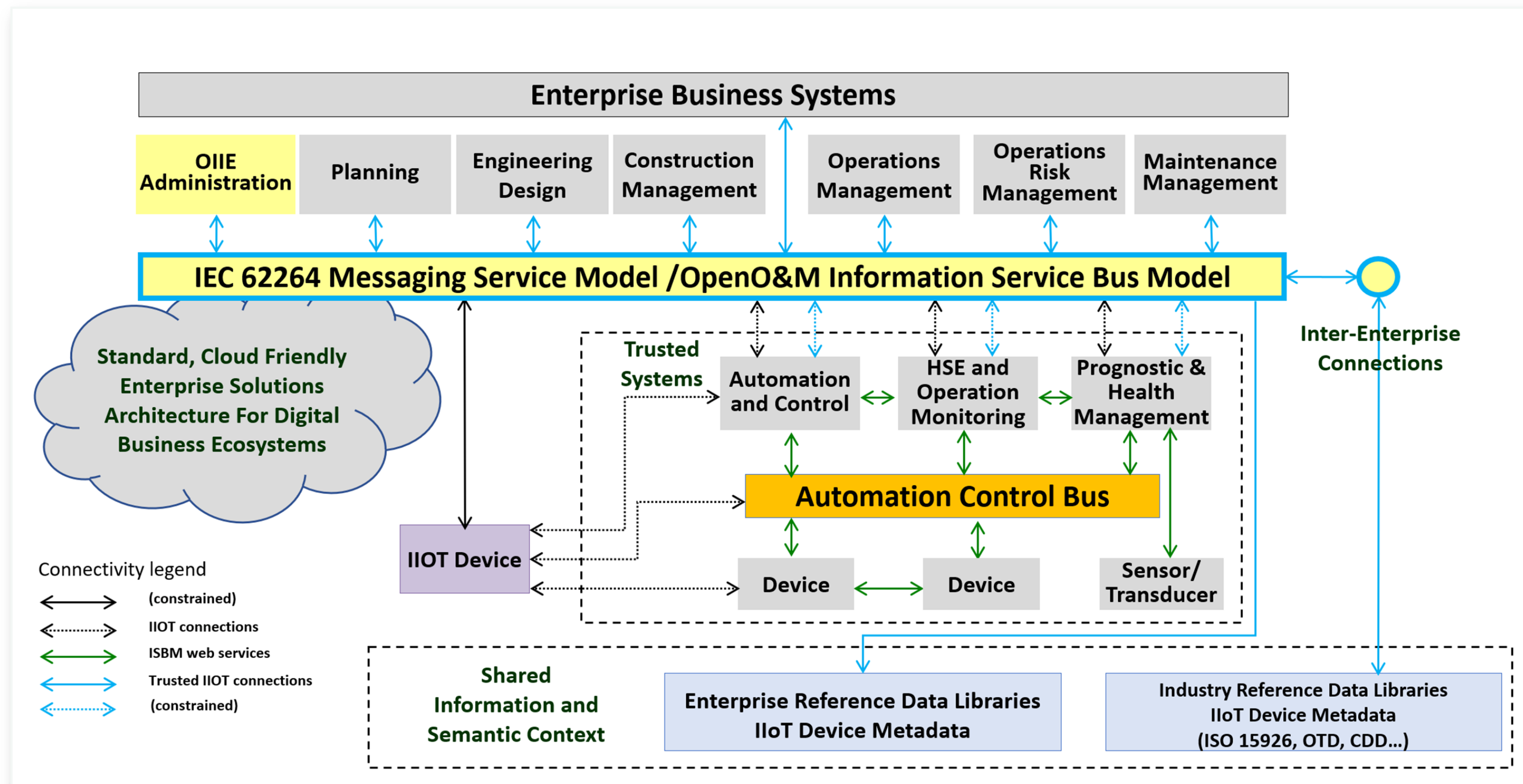
# Terms and definitions



- An asset administration shell (AAS) is a digital representation of an asset which maintains all the relevant information needed for its functionality as well as the functionality of all associated assets. It contains information which makes an asset easily administrable and identifiable

Source: SAP

# Interoperability according to ISO/TS 18101-1:2019



- capability of two or more entities to exchange items in accordance with a set of rules implemented by an interface in each entity, in order to perform their specified tasks

Figure and definition source: ISO/TS 18101-1:2019 – asset intensive industry interoperability



# Inter-enterprise system connectivity architecture enabling Industrie 4.0

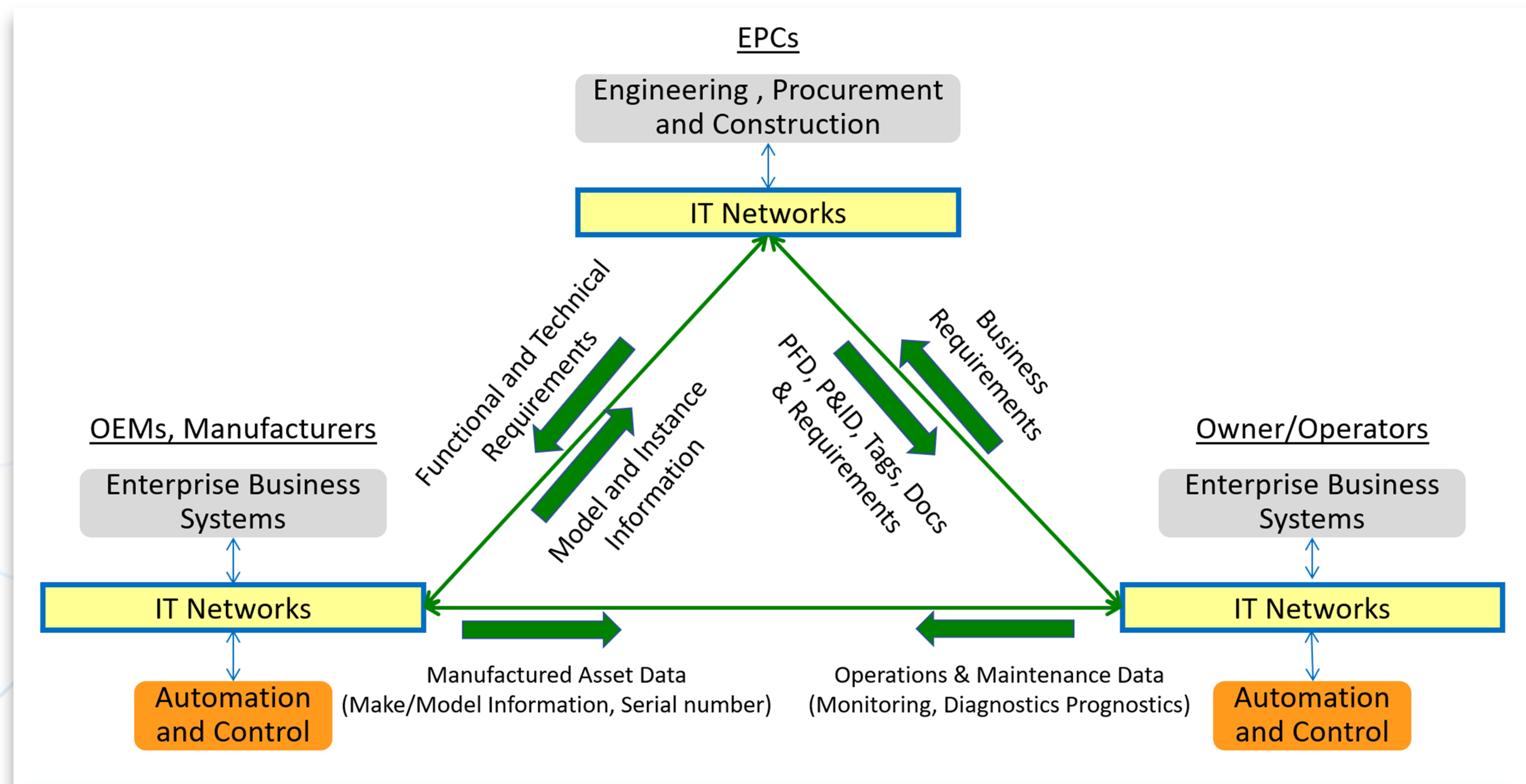
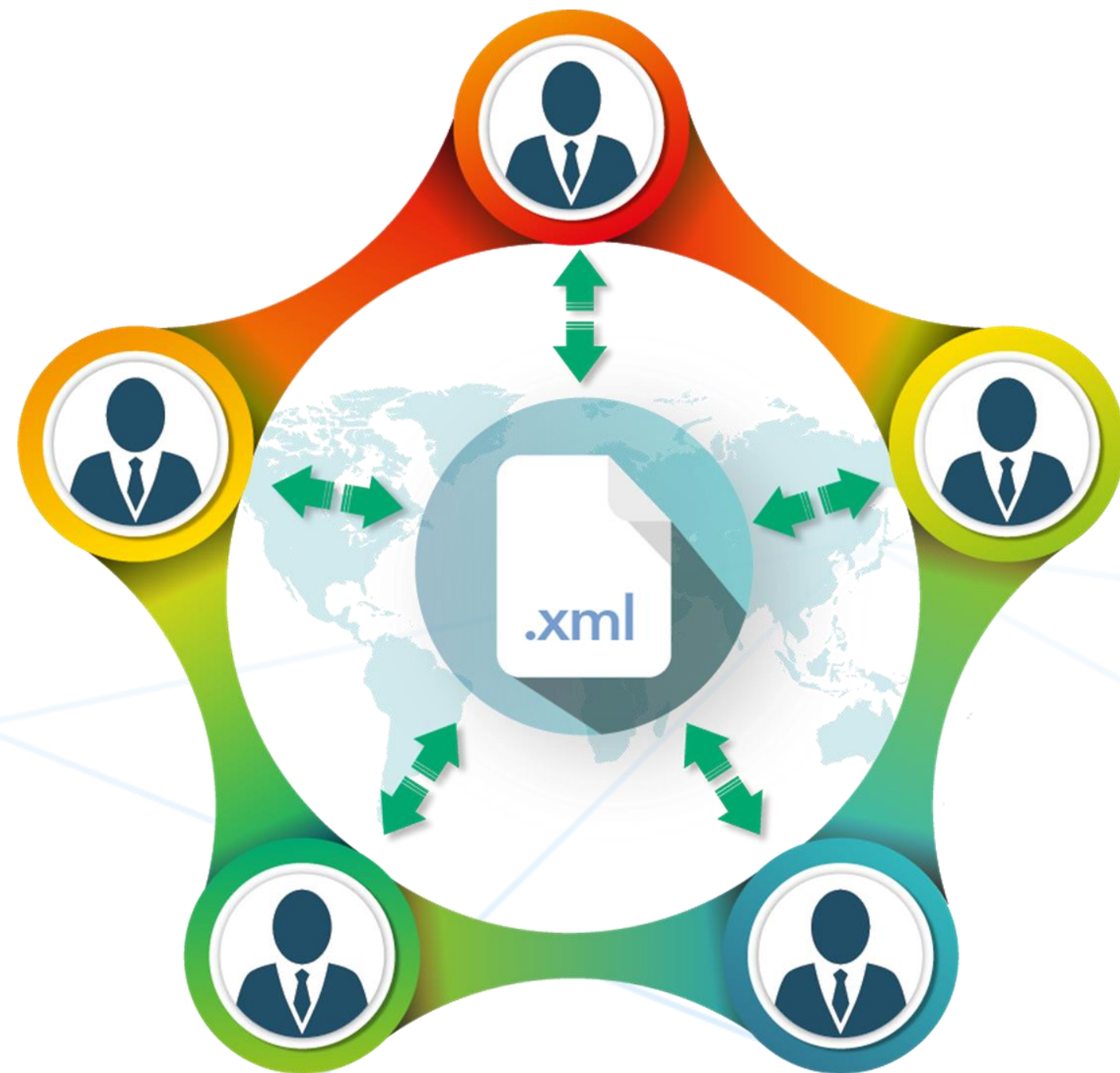


Figure source: ISO/TS 18101-1:2019 – asset intensive industry interoperability

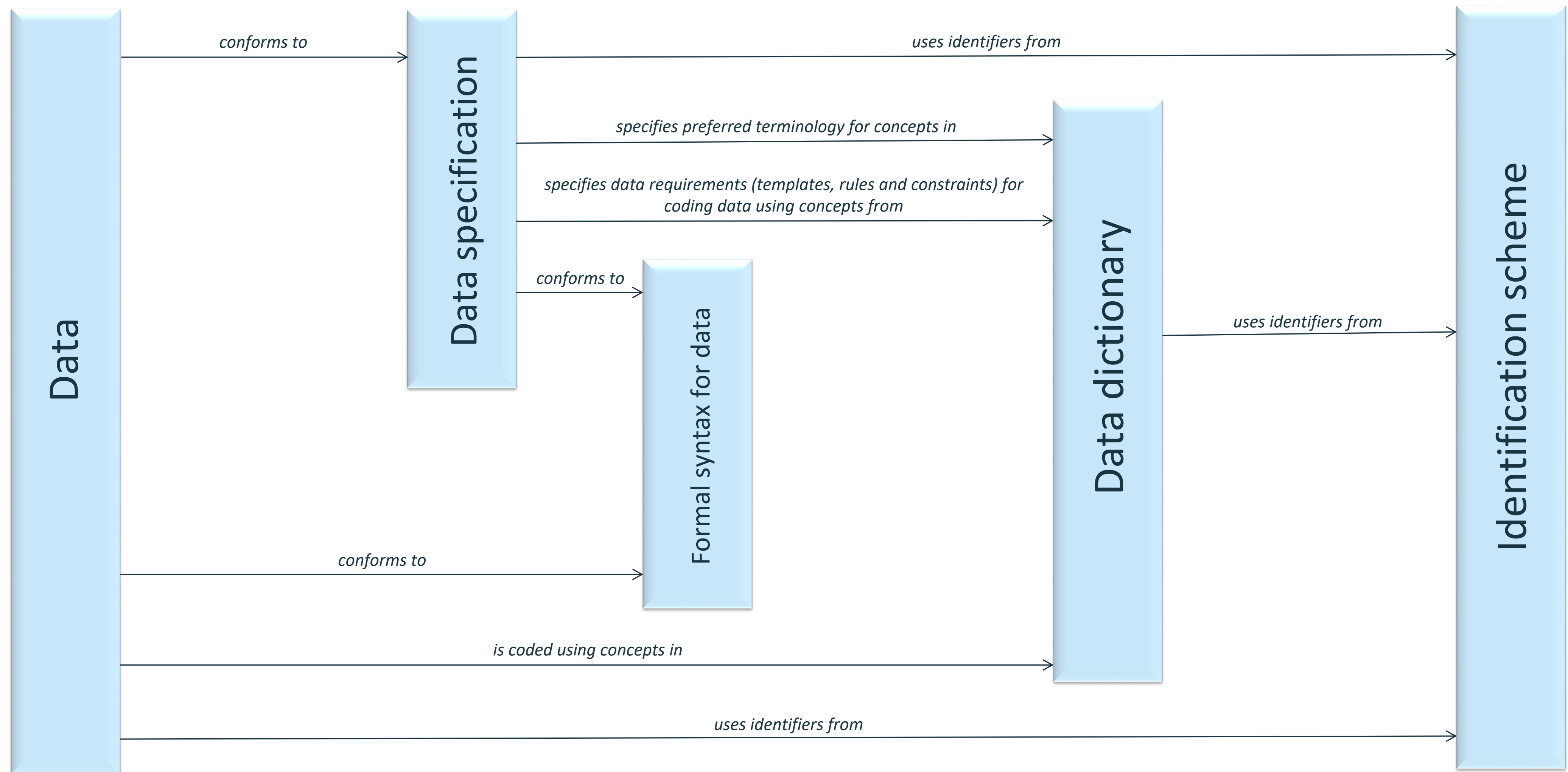
# Machine-readable data or digital data?

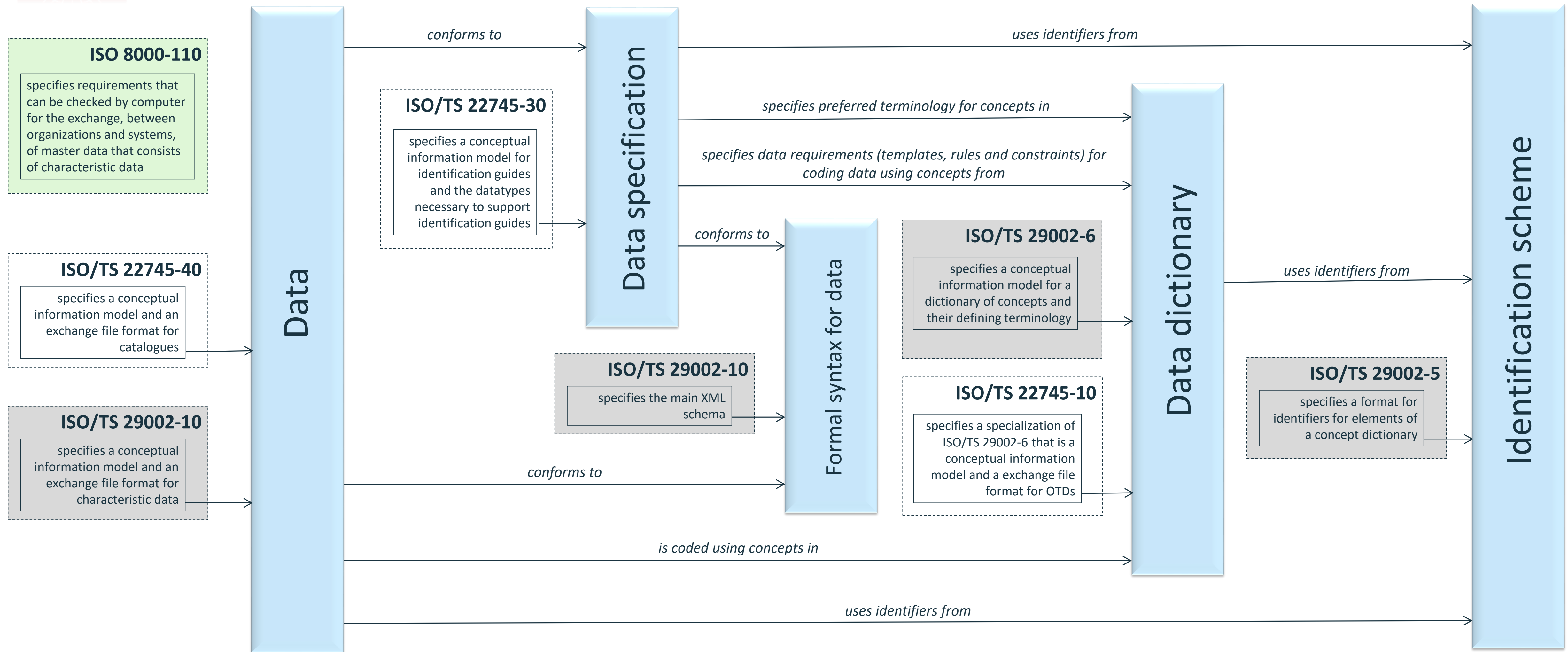


- Machine-readable data, is data in a data format that can be automatically read and processed by a computer, such as JSON, or XML;
- Machine-readable data must be structured data;
- Digital material may not be machine-readable. A PDF document containing tables of data is digital and human readable, but not machine-readable because a computer would struggle to access the tabular information

<http://opendatahandbook.org/glossary/en/>









# How standards work together



- the data dictionary is an effective way of compiling the different classes and properties from multiple sources, such as an ISO 13584 parts library, or an ISO 15926 reference data library, or the IEC 61360 common data dictionary (IEC-CDD);
- the identification scheme is ISO/TS 29002-5 is used by the IEC-CDD, the ECCMA Open Technical Dictionary (eOTD), the ecl@ss classification schema, IEC 62832 Industrie 4.0 (I4.0) components, including the asset administration shell, and also by KOIOS Master Data in their KOIOS Specification Library (KSL).



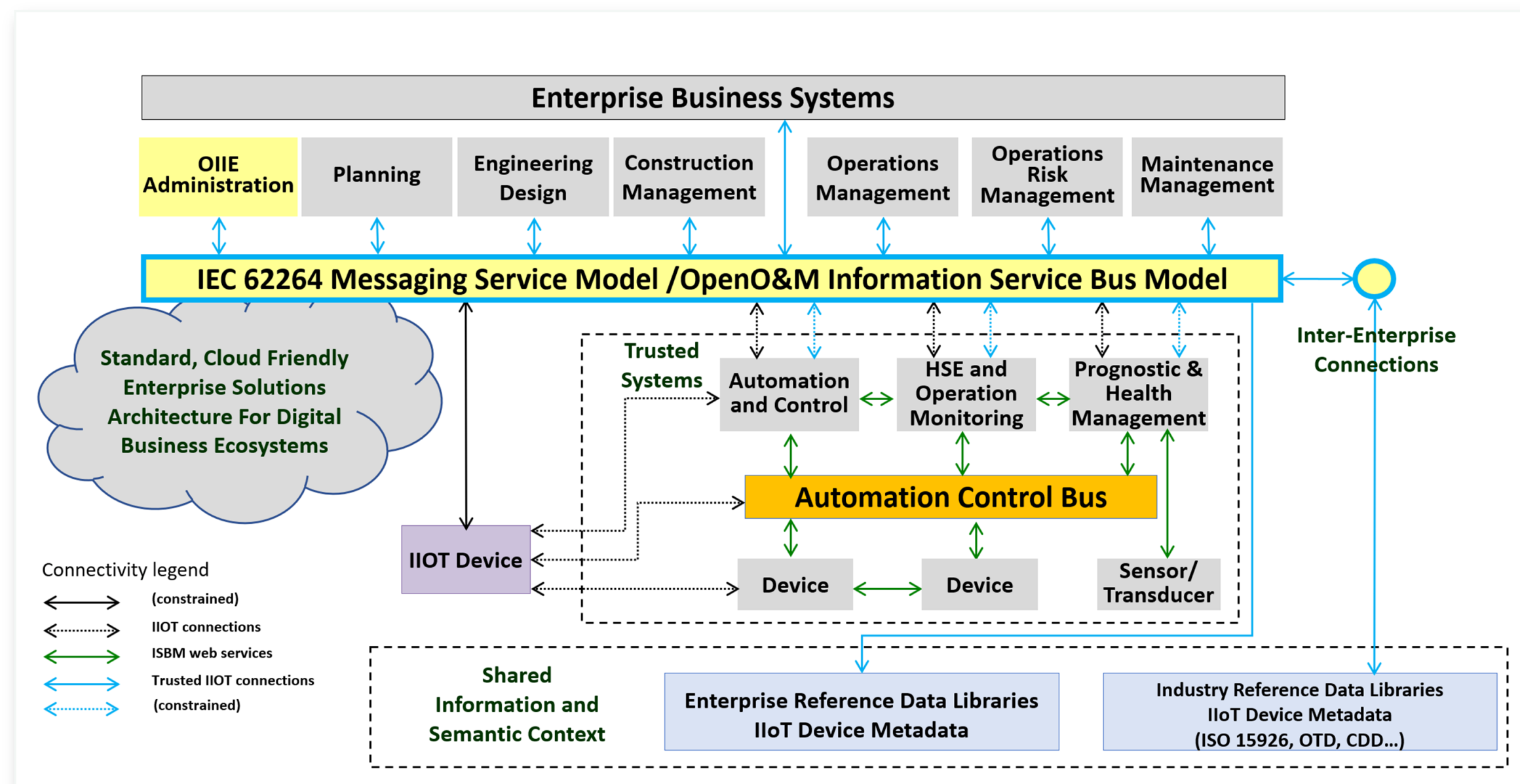
# How standards work together



- ISO/TS 8000-1 is one of three normative references in ISO/TS 18101-1, and will drive data quality and characteristic data exchange in asset intensive industries;
- ISO TC 184/WG 6 uses the MIMOSA OIIE OGI Pilot in the development of ISO 18101, the asset intensive industry interoperability standard;
- The technical reports generated by the OIIE OGI Pilot team are turned into formal ISO TRs which are then used to shape the subsequent parts of ISO 18101 if that is deemed appropriate.



# How standards work together



- MIMOSA standards support key requirements for critical infrastructure management. For example, MIMOSA standards and specifications enable a Digital Twin to be defined and maintained on a supplier-neutral basis, while also using that Digital Twin to provide context for Big Data (IIOT and other sensor-related data) and analytics.

# Summary: ISO 8000 compliant, quality master data is



**International  
Organization for  
Standardization**

- Derived from entries in an data dictionary;
- Structured data;
- Machine readable;
- Exchangeable without loss of meaning;
- Portable between systems;
- Optimal for Industrie 4.0 and smart manufacturing.





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DELIVERING INTERNATIONAL  
STANDARDS