eCl@ss®
CLASSIFICATION AND PRODUCT DESCRIPTION

TOWARD SMART MANUFACTURING WITH DATA AND SEMANTICS

An eCl@ss white paper

Contents

Semantics in smart manufacturing – with the eCl@ss standard

We are all witnesses to the digital transformation of the economy and industry. For an engineer, combining and integrating technologies to create products, systems and solutions is a part of everyday life. The natural and technical sciences provide the basis for these activities. Until recently, concepts such as "ontology" and "semantics" tended to be located in the humanities. Yet now, they too are a part of the ever-changing world of engineering. The world of digital transformation. We're shaping it.

The most dynamic field within this world is known as smart manufacturing or Industry 4.0. Within this rapidly growing sector, it's clear that no description of properties can be created, and thus also no "digital twin," without a quality-assured semantic repository. And without a unified underlying ontology, no communication with universally recognized significance can take place, which undermines cross-domain functionality. There can be no smart-manufacturing administration shell without an associated semantic system, and no universal smart-manufacturing components without an associated ontology. So much for the theory.

Engineers want to create realities. To do this, they need a real ontology and a similarly real semantic repository. The eCl@ss standard offers both. In particular, it provides a well-stocked arsenal of industrial semantics. For this reason, it has already established itself as a de facto standard in business-to-business (B2B) applications (e.g., procurement, logistics, part and product data, catalogue management, trade, etc.).

Because it is open to comprehensive property descriptions, the eCl@ss standard is an ideal starting point on the way to producing digital twins. This is the path we have traveled. A path sometimes rendered difficult by obstacles and steep climbs. This document is intended to illustrate how eCl@ss can support companies and other entities on their own paths to the smart-manufacturing future.

Munich, 18 February 2018, signed Markus Reigl
eCl@ss Chairman

This document describes eCl@ss' views on digitalization, and details the measures and projects with which the association is currently reacting to the associated challenges. The document also describes the basics of smart manufacturing and highlights the contributions that eCl@ss can make, both today and in the future, to digitalization and machine-to-machine communication.

The eCl@ss association

The eCl@ss association was collectively founded in 2000 by Siemens, BASF, AUDI/VW, e.on, SAP, Bayer, Degussa, Wacker, infraserv chemfidence and Solvay. The goal of the association is to simplify cross-sectoral electronic data exchange through the classification of standardized product descriptions. Today, around 140 national and international companies from virtually all sectors, as well as numerous organizations and public institutions, have joined the association.

After 18 years of continuous development, eCl@ss has established itself in numerous sectors, and constitutes the basis for digital data exchange between business partners. eCl@ss' key unique selling point is the ability to uniquely describe any product or service in a language-neutral, machine-readable and sector-independent way. With more than 40,000 product classes and more than 18,000 properties, eCl@ss covers a majority of traded goods and services within each sector, and is continuing its steady growth. Currently, eCl@ss is used in about 3,500 companies both nationally and internationally.

The Digitalization Expert Group (DEG)

For several years, industrial-sector digitalization has become an increasingly strong focus for eCl@ss, both with the rise of smart manufacturing processes, and in global terms with the internet of things (IoT). In the spring of 2017, the eCl@ss board founded an expert group, the Digitalization Expert Group (DEG), in order to provide a platform for all digitalization-related issues, and to thus have the ability to engage with these issues in a structured and dedicated manner.

The DEG is recruited from among a small group of experienced experts in the field who are delegated by their companies to address the topic of eCl@ss as well as issues having to do with smart manufacturing and/or IoT.

The DEG's work under the general heading of *digitalization* includes:

- Collecting and distributing information both inside and outside the eCl@ss organization
- Coordinating all eCl@ss activities in the area of *digitalization*
- Monitoring, managing and supporting projects
- Screening and initiating research work and projects
- Cooperating with other committees and associations
- Compiling requirements
- Providing advice to the eCl@ss board
- Preparing documents relating to decisions

The smart-manufacturing vision

At the center of the smart-manufacturing landscape are integrated production facilities with self-describing machines and products that can actively guide their own production processes. Products, machines, facilities and even tools are networked with each other at the application level through product-data-sensitive interfaces. This allows value chains to be vertically and horizontally integrated both within a single company and externally.

However, people, as the vital creative factor, still play the most significant role in this process. Within the smart-manufacturing context, humans are integrated into or supported by information systems even more so than in the past. Thanks to the fourth industrial revolution, a world is emerging in which at any given time, people and machines alike have access to the precise information needed to make optimal decisions – whether this relates to the products being manufactured or to the associated manufacturing processes.

Cooperation between objects

In the smart-manufacturing context, partners within the value chain are not simply integrated with each other; they also cooperate with each other. This requires an unhindered information flow, without media discontinuities, as a prerequisite for a consistent data-driven and data-informed production world.

In the smart-manufacturing context, objects "know" their capabilities, and can thus independently decide whether they want to cooperate with other objects. This enables the emergence of the internet of things and services, not only in the smart-manufacturing context, but also in other "smart" applications such as smart homes, smart buildings, smart grids, etc. Items in a given location are "smart" only if they and their characteristics are described in such a way that these descriptions can be transferred and used in the form of properties in the administration shells of smart-manufacturing components. eCl@ss, with its product data transferred into the information world, is ideal for the description of objects, products, equipment and services. Today, eCl@ss provides an ontology of properties in 16 commonly used languages, at least in part.

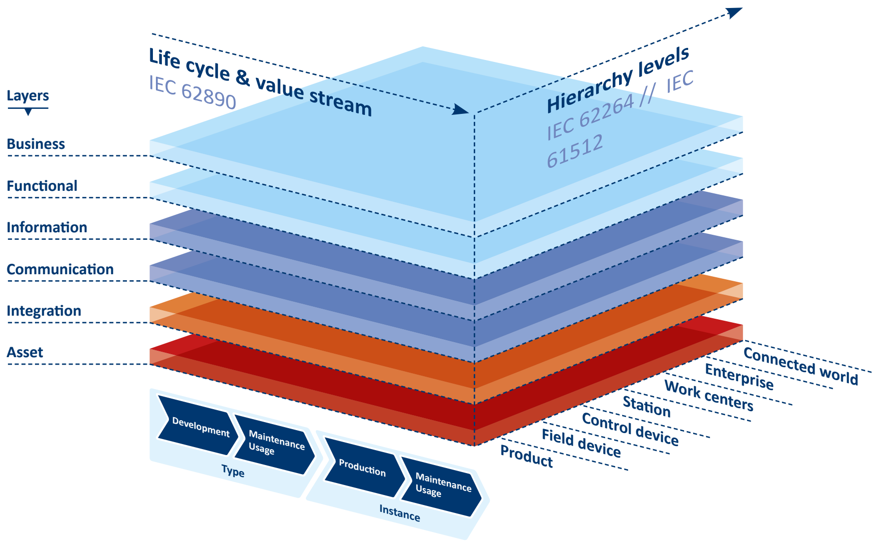
eCl@ss properties, with quality-tested information based on an informatics knowledge architecture and a precise system-wide semantic system, offer an ideal foundation for smooth cooperation between smart-manufacturing components.

Thanks to the fourth industrial revolution, a world is emerging in which at any given time, people (and machines) have access to all the information necessary to make optimal decisions – whether this relates to a product or the manufacturing process.

The Industry 4.0 Reference Architecture Model (RAMI4.0)

An asset can be a tradable good such as a tangible object, but can also be a piece of software or a service. With the help of RAMI4.0, every asset can be described using uniform criteria relating to three axes: the architecture axis, the process axis and the hierarchy axis.

Smart manufacturing, as an aspect of the internet of things, places the "object" – called an "asset" in the Industry 4.0 Reference Architecture Model – at the center of its method of describing physical-world objects in the information world.



Industry 4.0 Reference Architecture Model; Source: [1]

The architecture axis serves as the detailed description of the asset itself. Six layers represent the asset in the physical world on the one hand (asset layer), while addressing the information world with machine-readable descriptions of the asset's characteristics on the other.

Descriptive elements in the smart manufacturing information world include:

- **Integration layer** as a transition layer from the asset layer to the information-world layers. For example, changing physical-world values may be captured by sensors in the RAMI4.0 integration layer, translated into an electrical quantity with subsequent transformation into the appropriate digital format, and then transmitted to the higher layers for further processing.

- **Communication layer** for the description of the functional information to be exchanged with other assets. This layer specifies the Industry 4.0-compliant communication on the basis of the ISO/OSI-7 layer models.

- **Information layer** for the description of the asset's functionally relevant information and data. The information layer was deliberately separated from the functional layer in order to facilitate the evaluation and assessment of the separated data (big data).

- **Functional layer** with the asset-specific technical functionality. This contains information on asset functionality related to a specific purpose.

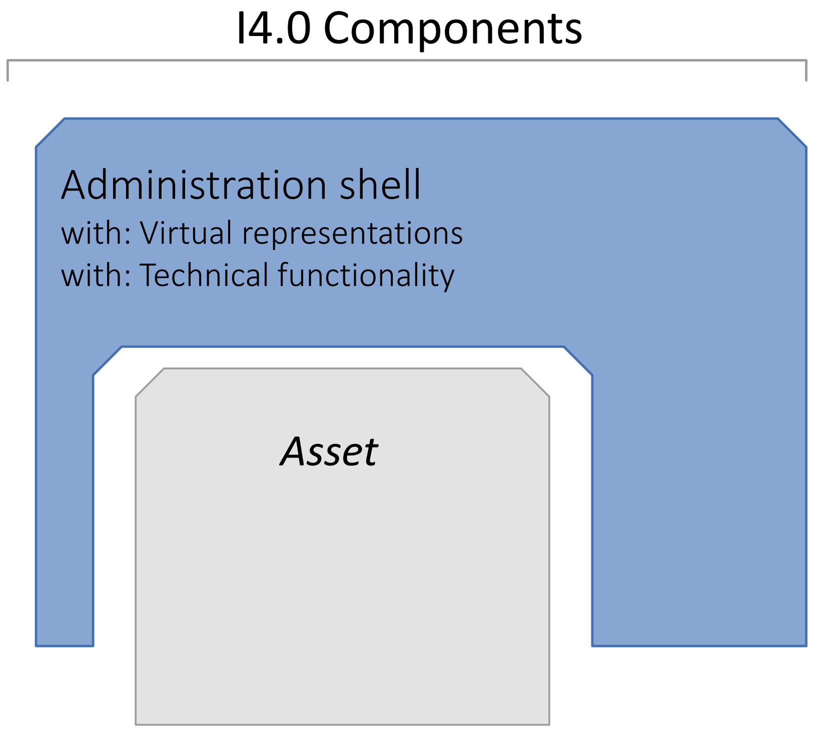
- **Business layer** with the information relevant to the asset's use and role in business transactions, such as regulations and legislative rules, detailed contract information, discounts, prices, etc.

Because every asset features a time stamp for its creation and disposal, the process axis describes the asset's life cycle, primarily characterized by its state (type or instance) and its location at a given time.

The hierarchy axis reflects the fact that an asset is always associated with someone or something. Drawing on the ISO/IEC 62264 standard, it describes the extended hierarchy known from the production-control world, here expanded upward to include the "connected world" level. The hierarchy contained in the ISO/IEC 62264 and ISO/IEC 61512 standards, previously limited to a single company, is accordingly extended in the Industry 4.0 concept to encompass a network of companies.

The downward-reaching extensions are based on the fact that the field-device hierarchy level accomplishes the technical translation of physical quantities into the information world using sensors, actuators, and so on. This is particularly significant for the integration layer (transition from the physical world into the information world, and vice versa). The lowest or product level represents the individual item in the production process. In accordance with the Industry 4.0 concept, this is an autonomous entity, and is thus in a position to intervene actively in its own manufacturing process.

With the addition of the Industry 4.0-compliant administration shell to a physical asset, the Industry 4.0 component is created as the representation of the asset in the information world. The asset information, logically structured on the basis of RAMI4.0 principles, is made available to other Industry 4.0 components by the Industry 4.0 component's administration shell, allowing them to cooperate with one another. The administration shell is divided into a header and a body.



Schematic representation of an Industry 4.0 component with asset and administration shell; Source: [1]

The semantic gap: A key challenge for smart manufacturing

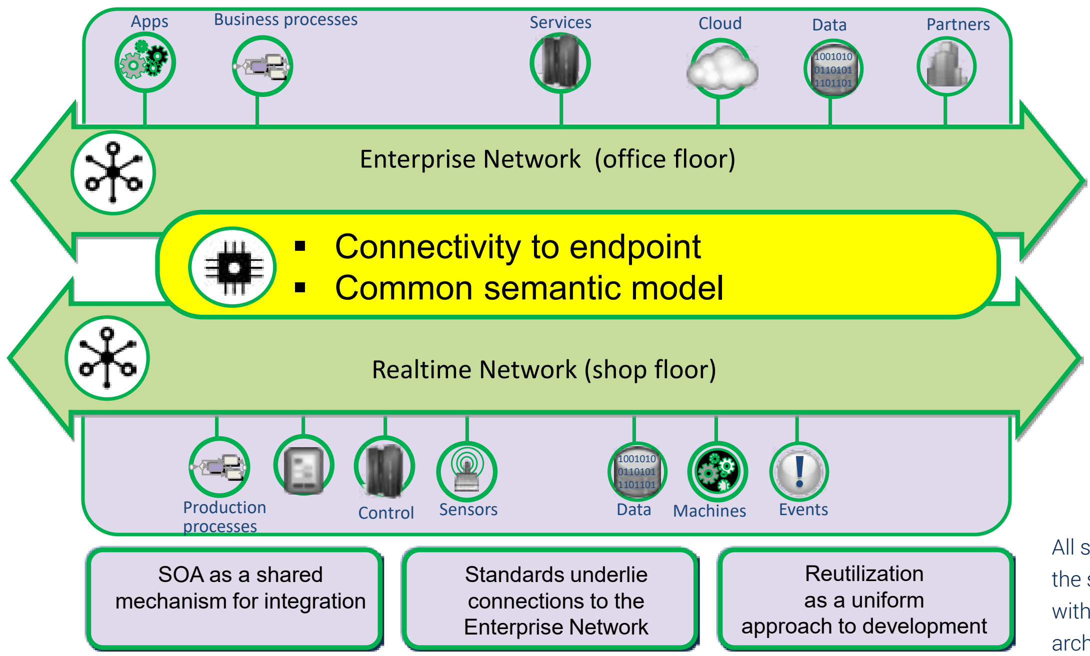
With its quality-tested classes and properties, eCl@ss can provide the most important part of such a dictionary. Thus, it is ideally suited to be the semantic system for smart manufacturing. This is true both for the back office and the shop floor of a smart-manufacturing company!

Smart manufacturing offers new opportunities for companies and business models. However, if all these worlds are to be connected, standards for implementing an unambiguous, application-wide semantic system are necessary.

This requires that the smart-manufacturing components involved exchange machine-readable concepts – that is, properties – during the course of the entire life cycle, thus facilitating automated, harmonized cooperation between machines. Much like a spoken language's nouns, such properties constitute a dictionary describing the components and processes involved in a smart-manufacturing installation. The set of properties listed in this dictionary represent a large portion of the (uniform) semantic system of a smart-manufacturing or Industry 4.0 installation.

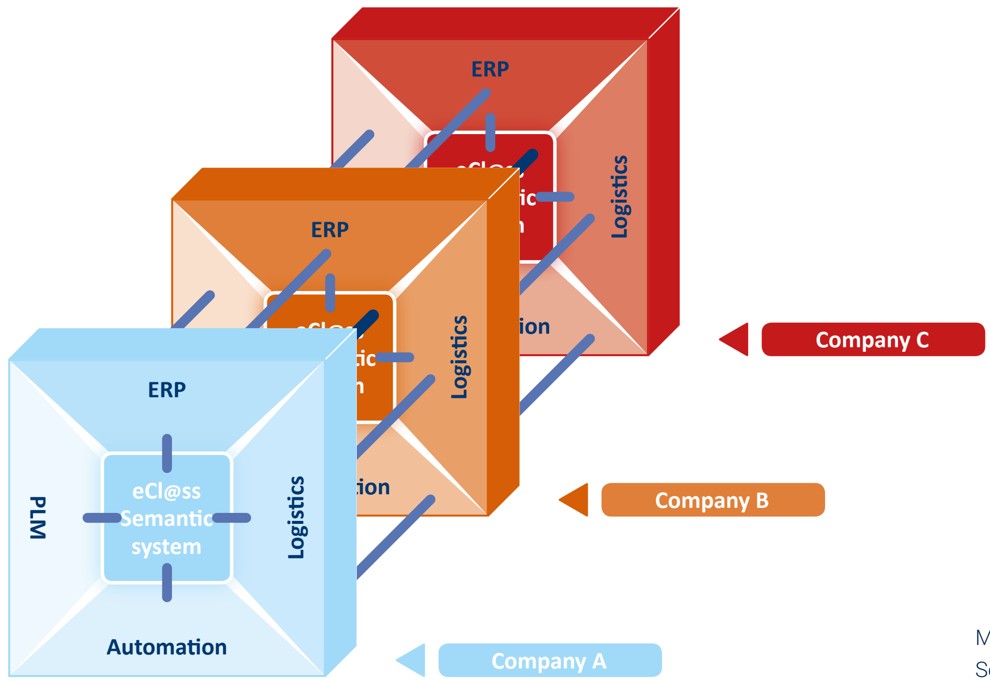
In practice, companies today generally lack a consistent and coherent mechanism for exchanging information between the back office and the shop floor. While various protocols for communications between assets can be translated relatively easily from one into another, there is as yet no universal facility for communication between components at the application level. This is in part due to the insufficiently detailed description of components using clear concepts, and thus also to the lack of derived properties usable within the information world.

SOA implementation by semantically linking the back office and shop floor



All smart-manufacturing components from the shop floor and back office cooperate with one another; SOA = service-oriented architecture; Source: [1]

A digital production plant's intelligent manufacturing network can become a reality only with standardized information-exchange formats. These must enable a secure, reliable and error-free flow of data across the various systems (ERP, PLM, MES, logistics, production automation, etc.), and should be used on a cross-firm and cross-sectoral basis.

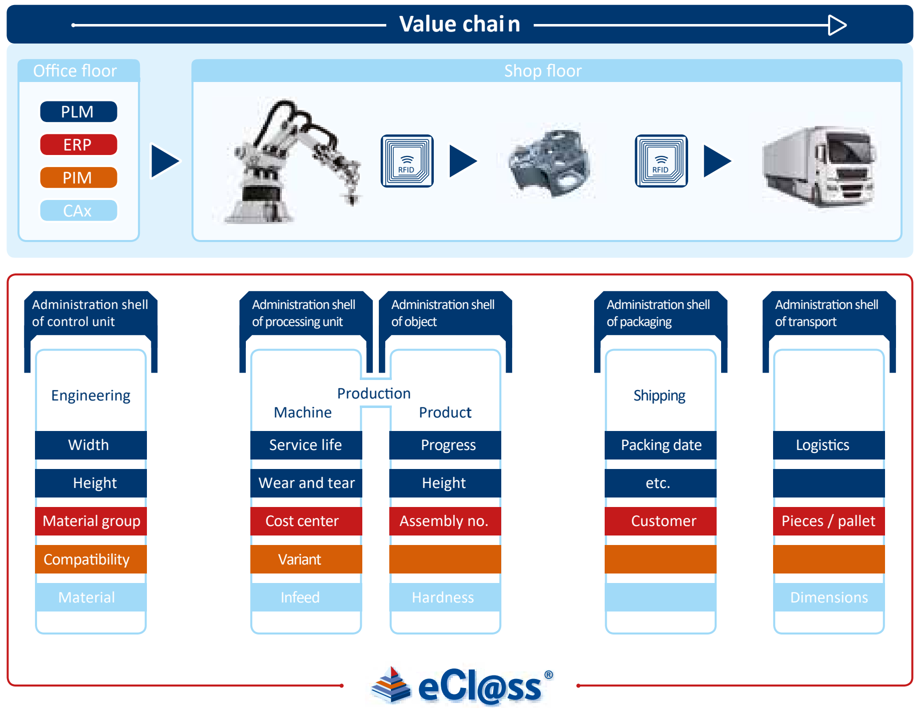


Multilateral data exchange with eCl@ss; Source: eCl@ss

One important aspect of the smart-manufacturing production process is ensuring that the piece being worked on is itself a carrier of information, and helps to (co-)determine its own manufacturing steps.

In order to attain this goal, smart-manufacturing production facilities strive to reach the highest degree of automation possible.

The necessary control parameters are directly supplied by the back office's ERP system (target values). Comparing these with the shop floor's live data (actual values) enables a real-time comparison between targets and actual outcomes, with the subsequent responses producing a self-controlling system.

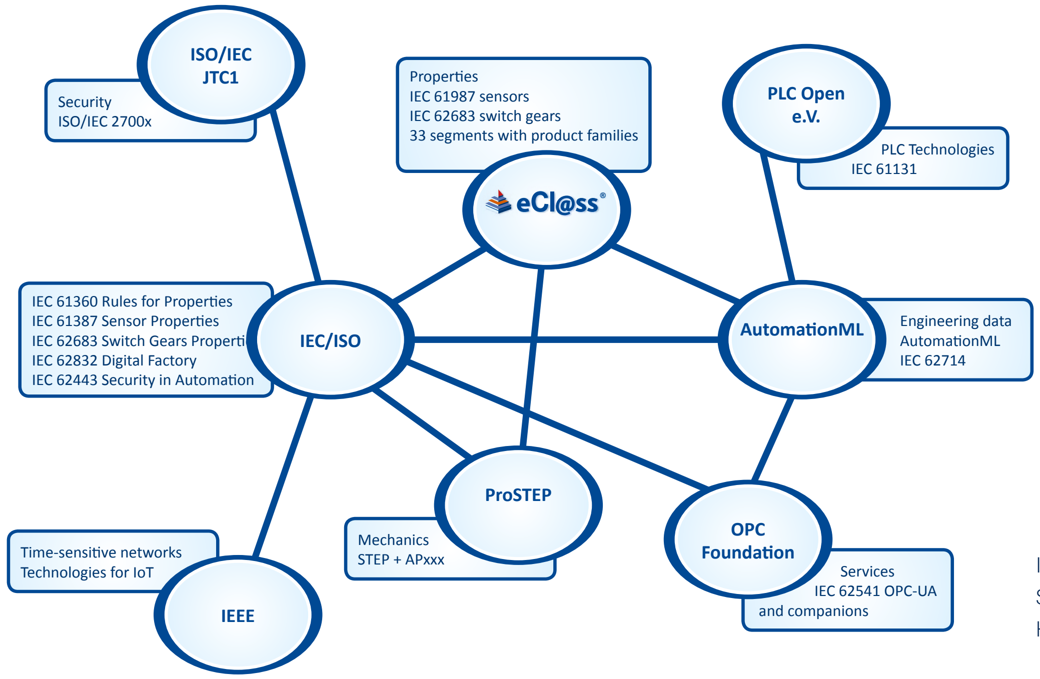


Properties of the value chain;
Source: eCl@ss

In a globally networked production process, manufacturing information must be exchanged not only within a company, but also between its various locations, and even with other firms. If a product is taken to another production location, the infrastructure there must be able to continue production efficiently and subject it to similar system controls. The basis for this is the information that accompanies the product (for example, on an RFID chip).

No common semantic system, no cooperation between objects

As previously mentioned, cooperation between assets is a key aspect of the smart-manufacturing environment. To this end, assets must exchange information with one another, and thus also "understand" each other. This requires a common smart manufacturing-compliant semantic system.



Institutions with semantic-system projects;
Source: Dr. Michael Hoffmeister / Roland Heidel

The requirements for such a semantic system are diverse. As the figure shows, there are already a number of relevant standards or projects with content relating to this area.

The lines drawn in the figure indicate the relationships between the various standards and projects.

Harmonized interfaces

Because property values are always exchanged as data at interfaces, a system-wide smart-manufacturing interface harmonization can be achieved through the use of common property descriptions. This is a side-effect of the widespread use of standardized properties. Thus, in combination with the results of other projects, eCl@ss is the ideal foundation for the semantic system necessary in smart-manufacturing environments. The direct reference to standards also means that these results are internationally relevant.

eCl@ss is closing the semantic gap

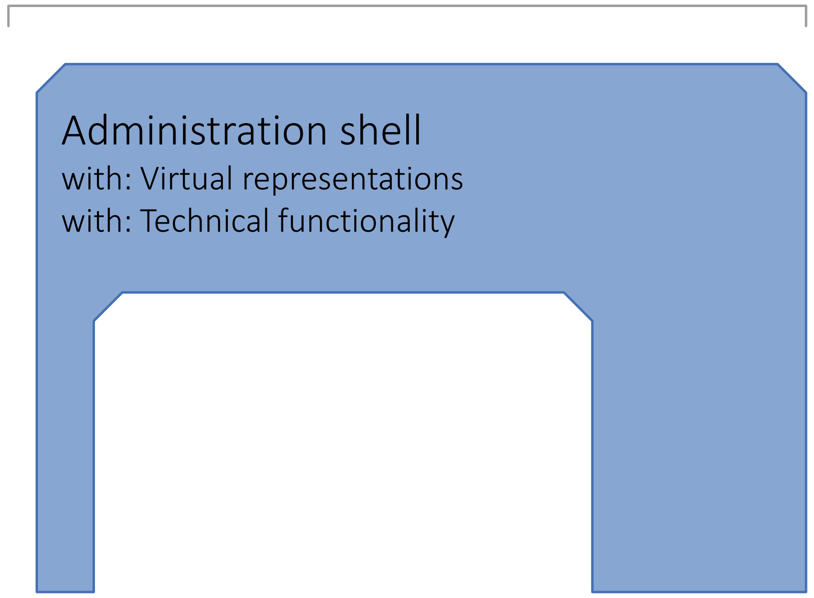
With its open, consistently ISO/IEC-compliant data model, the eCl@ss standard allows for the unambiguous description of characteristics and their manifestations.
This enables individual smart-manufacturing components to be connected to other smart-manufacturing component systems.

A necessary foundation for any fully automated smart-manufacturing facility that is self-controlling in real time is a consistently error-free machine-interpretable semantic system that is integrated into existing systems (ERP, PLM, MES, etc.). Thanks to its ISO-compliant (ISO 22274), continuous and consensual development process, eCl@ss can provide a property-based semantic system of this kind – effectively a quality-tested knowledge architecture.

With its consensually specified semantic system of concepts and their representation in the information world in the form of properties, eCl@ss is thus the predestined supplier of smart-manufacturing properties for the virtual representation of smart-manufacturing assets.

eCl@ss solution scenario for the administration shell

The figure illustrates the concept of the administration shell as the digital reflection of an asset in the information world. All smart-manufacturing components on the shop floor and in the back office cooperate with one another by means of the information in the administration shell, using the Industry 4.0-compliant set of eCl@ss properties.



Schematic representation of an administration shell, following Industry 4.0 guidelines; Source: [1]

To this end, assets at both levels of the production facility appear as Industry 4.0 components with an Industry 4.0-compliant communications system. The body section of the virtual representation generated in the administration shell contains an asset's individual properties. Information regarding installation, activation, use, repairs and so on is saved in the administration shell's header section, so that the header constitutes a kind of log book for the asset.

This can be explained more clearly using a specific asset as an example. A motor, say, has a number of specific properties. These are stored in the body of the asset's administrative shell; for example, the properties "height" (02-AAC850), "width" (02-AAJ172) and "length" (02-AAG779) are saved as constant values. The shell also includes technical characteristics such as the maximum engine speed, power and power consumption. These are all stored unchanged in the administration-shell body over the entire lifetime of the motor. In addition, the administration shell's header contains information about what has happened to the motor during its active service.

The eCl@ss standard is well-suited for the description of all these properties. Missing properties can either be specified in existing working groups, or a new group can be formed. The eCl@ss properties can also be found in the IEC's Common Data Dictionary (CDD).

Exchanging information across boundaries, without friction or error

The most important requirement of any smart-manufacturing facility is the smooth and error-free exchange of all information in the administration shell that is relevant to other assets. For this to be possible, an open meta-language with clear semantics is needed. Clear concepts are an essential part of any such meta-language. In the smart-manufacturing context, these concepts must be available in an informatics format – that is, as properties – for use in the information world. eCl@ss already provides both of these today.

eCl@ss Advanced as a data model for the administration shell

eCl@ss has always been provided in an ISO/IEC-compliant data structure. Major enhancements to the data model were incorporated through the integration of the PROLIST standards in 2012, as well as with the addition of the CAx elements. In the first step, an application class (AC) was added to the four-tiered class structure. Acting as a container, this holds all relevant structural elements such as blocks or aspects. The standard has been simplified with the implementation of extended data types (level type and axis type), and physical-technical relationships deriving from various properties have been combined into a single data type.

The "cardinality" multiplication element, which is vital in the engineering context, as well as the possibility of variant calls to special blocks with the help of "polymorphism," are taken into account from the beginning in the advanced data model.

These elements have been a part of the eCl@ss XML Format since 2010, allowing for automated processing of the eCl@ss standard. This export format is based on the ISO-standardized XML format for product-data exchange, following ISO 13584-32:2010 (ontoML). It provides a consistent and comparable data structure for the exchange of information between smart-manufacturing components.

Key points of eCl@ss Advanced

Basic functionalities	Data types
Hierarchic class structure	Integer (count)
IRDI (unique identifier)	Real (count)
Keywords and synonyms	Integer (measure)
Multidimensional property lists	Real (measure)
Value lists/suggestion lists	String (translatable)
Aspects/property blocks	Boolean
Dependent properties	Time/timestamp
Format specification for integer/real (optional)	Currency
Alternative units (SI/imperial)	Level type (min./max. values)
DIN-compliant units	Axis type (3D coordinates)
Dynamic functionalities	**Partially automated updates**
Polymorphism	Transaction update files (TUF)
Cardinality	Release update file (RUF)

Key points of the eCl@ss Advanced data model

Structural elements of the Advanced Representation

Block
A collection of various class-related properties that are themselves related is called a block. A structure of this kind is extremely helpful when using classes for the comprehensive description of devices. To create a block, a reference property must be created in the Advanced Representation.

Aspect
An aspect is a special variant of a block that can be found in the uppermost level of a class. In terms of content, it describes the non-product-specific properties of a class from certain points of view. The "manufacturer" aspect includes properties such as manufacturer name, manufacturer's article number, model description, and so on. These attributes depend directly on the manufacturer, and are not subject to any project-specific restrictions. Thus, this aspect can be used universally with every other class in order to compile and store manufacturer data.

Expanded functionalities

Cardinality

Cardinality defines the property that allows dynamic multiplication of a block within the scope of the property values to be managed. In the example of a car, cardinality could be used in the description of the doors. The doors are described using the attributes of "color," "door type," and "electrical window-opener." These attributes are combined in a "door properties" block, and can be called up arbitrarily often using the reference property "number of doors."

Polymorphism

In many cases, the content needed by a block inside a class is not predetermined. Polymorphism thus offers the ability to decide dynamically, as values are assigned to properties, what specific content the block requires. From a data-technology point of view, the decision of which block out of a set of blocks is to be used is made only at this point. In the aforementioned car example, polymorphism can be used in the description of the various types of doors.

This characteristic of multiple ("poly") substitutability ("morphism") is also used to describe the various details within a product structure, thus keeping the number of total properties manageable and free of redundancies.

eCl@ss is evolving along with digitalization

One consequence of the challenges of digitalization is that the eCl@ss standard is subject to ongoing substantive development. In response to the pressures of digital transformation, the eCl@ss association is developing a so-called Fast Track, offering a new path for swifter, more flexible expansion of the standard. The role of data as an economic good is also taking on growing importance. And because of the constant emergence of new business models, the association is reconsidering its licensing model.

Fast Track – The fast lane for eCl@ss content

Traditionally, new versions of the eCl@ss standard have appeared once a year in the form of so-called releases. This cycle has proved useful in conventional use cases such as materials logistics and procurement.

However, digitalization has made it necessary to develop a much swifter way of introducing content into the ecl@ss repository and making it available. The eCl@ss association's Center for Research and Development (CRD) group is currently tackling precisely these demands of digitalization. As part of its "Accelerated eCl@ss" project, the group is developing the so-called Fast Track, which will serve as a fast lane for the specification and rapid delivery of eCl@ss content.

The goal of the project is to provide an extension to the current eCl@ss content-development process, making it possible to introduce and retrieve new content through a web service. In order to ensure the unity of the content overall, the focus here is on synchronizing the new and the older, proven process. Therefore, if structural elements are introduced through the Fast Track during the course of the year, these will also be integrated later into the annual release process.

The Fast Track is thus an important building block enabling eCl@ss to meet the demands of digitalization by introducing and distributing content during the course of a year. This flexibility will help the organization make an important contribution to the smart-manufacturing landscape.

With smart manufacturing, data is itself a product

Smart manufacturing enables production with a batch size of one. The production process is already highly individualized, so that products can be tailored precisely to customers. The increasingly autonomous machines within smart-manufacturing value chains accordingly process data as well as physical materials. Data such as product information and production parameters has thus established itself among the most important production materials.

The fact that production materials are typically transported between companies along the supply chain suggests that production-material data will also be handled similarly in the future. It is thus short-sighted to reduce data simply to its role as an information-technology component. Rather, data is a tradable commodity. The first platforms and marketplaces for trading data are already being established.

Data must therefore be able to be described as a product or good. The eCl@ss standard, which has already established itself for goods and services of all kinds, will therefore be expanded to include classes and properties appropriate for the description of data products. Properties such as syntax, coding, vocabulary, volume, date of last modification, and price are clear possibilities. They describe characteristics of the data in itself. They allow data offerings to be compared, thus enabling trade in data.

However, the question of the form in which such data products are to be accessed or transferred must also be answered. This can again be understood as a component of the data product, and can be depicted in eCl@ss using properties such as protocols, identification or access rights. These mechanisms create conditions under which machines in smart-manufacturing architectures can act as data consumers autonomously acquiring the data necessary for their operations from data suppliers (e.g., relevant marketplaces). This expansion of the eCl@ss standard will enable the data supplier to have a consistent product-information management system, as is customary today for goods and services.

Extension of the licensing model

Because digitalization makes new demands on the eCl@ss content and the way it is made available, it is also little wonder that new demands on the eCl@ss licensing model are also emerging.

For smart-manufacturing components and their administration shells to be used efficiently, attributes and values must be able to be obtained quickly and individually. The future eCl@ss licensing model must be adapted to this state of affairs; that is, in addition to the licenses that exist today (membership or download), it should also be possible to purchase individual content elements (at the International Registration Data Identifier (IRDI) level).

eCl@ss has recognized this circumstance, and is actively working on an extension of the licensing model. The goal of this extension is to allow eCl@ss content to be acquired quickly and easily, in a way adapted to a specific use case, so that the acquisition can also be carried out independently by machines during the course of their operations.

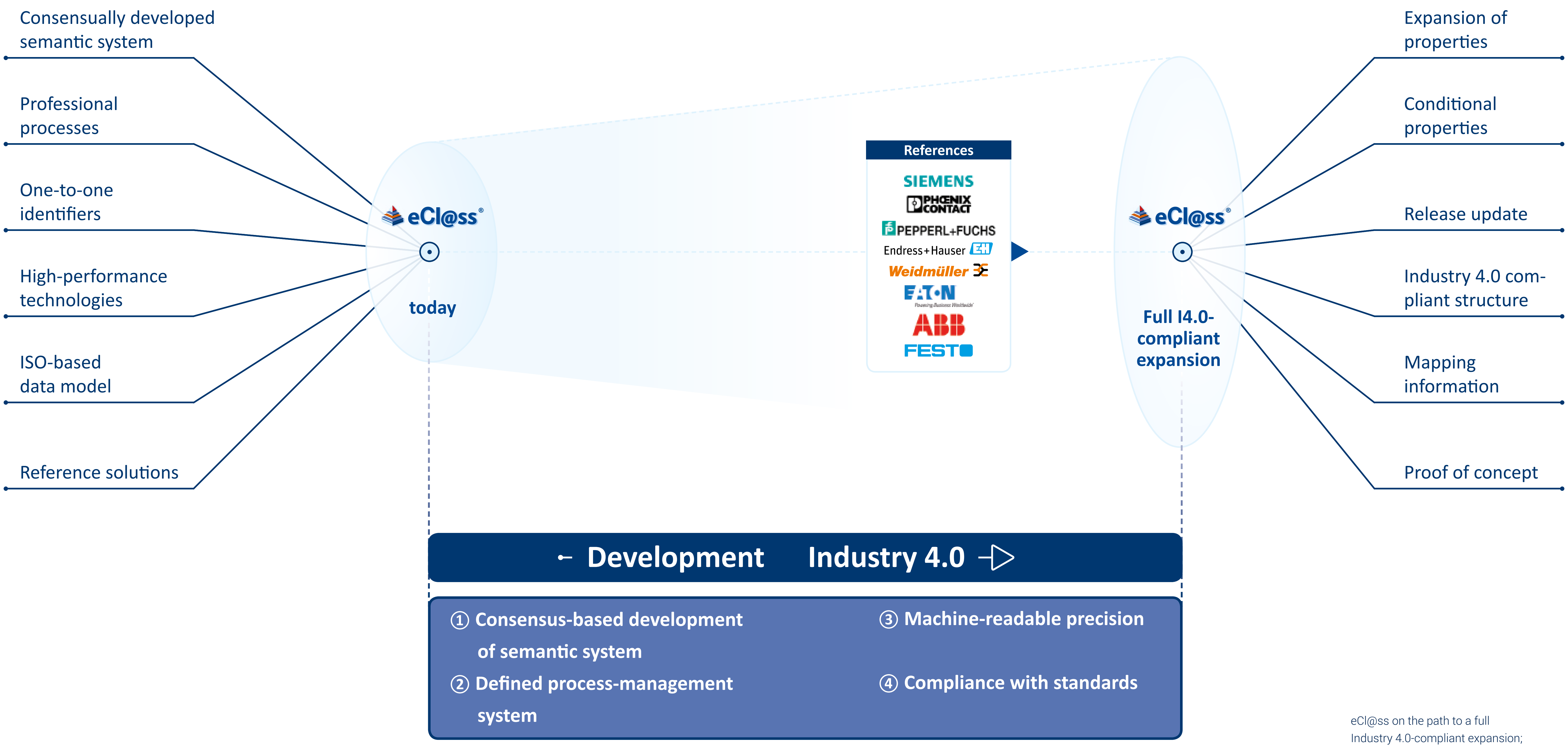
Summary

eCl@ss possesses a high level of expertise in the standards-compliant and consensual development of a product-data standard that already meets the central requirements for a smart-manufacturing semantic system.

An important ongoing task is the implementation of joint projects that demonstrate eCl@ss' great potential as a semantics-system solution for the smart-manufacturing sector, and which will serve as "proof of concept" use cases for future reference implementations.

Appendix: The eCl@ss Industry 4.0 road map

eCl@ss is a powerful, widely adopted standard that is already used in many B2B applications. The foundation for a full Industry 4.0-compliant expansion has been laid and documented with reference applications.



eCl@ss on the path to a full Industry 4.0-compliant expansion; Source: eCl@ss

On the road to a common "language for smart manufacturing"

eCl@ss today	Industry 4.0 activity areas
1 Consensus-based semantic system	
More than 40,000 product classes, more than 18,000 properties for the description of entities (including physical objects), easily accessed and affordable, even without membership.	Expansion of the standard to include additional classes and properties reflecting Industry 4.0/smart properties with variable parameters; specification of methods for application-specific purposes.
Defined structure for the classification and one-to-one description of objects on the basis of international standard ISO 13584-42/IEC 61360.	Participation in the further development of the specification and use of classes and properties. Introduction of the results in ISO and IEC for the extension of the ISO 13584-42 and IEC 61360 twinning standards.
Implemented and proven applications in procurement and product-information management systems. Increasingly also in maintenance applications and engineering processes.	Description and implementation of additional solutions increasingly oriented toward the smart-manufacturing context (up to the point of the full expansion).
Detailed ability to describe even complex products and product variants (assets) on the basis of structured properties at the device-class level.	Definition and integration of Industry 4.0-specific description requirements, such as the depiction of conditional properties.
Cross-consortia cooperation with content providers such as AutomationML, the OPC Foundation, PLCopen and ProSTEP, including VDMA, ZVEI and VDI/GMA.	Intensification of existing cooperative activities and collaboration with additional content providers.
2 Defined process-management system	
Proven, sustainable and tool-supported design process for the eCl@ss standard, drawing on cross-sector teams of experts. Clearly defined, transparent and standards-based workflow for the introduction of new properties (ISO 22274).	Further development of the open content-development platform. Cooperation with specific expert groups with smart-manufacturing expertise.

eCl@ss today	Industry 4.0 activity areas
Release process: System-supported with update files using automatic version-update mechanisms.	Expansion of largely automatic mechanisms for ensuring that new Industry 4.0 requirements are compatible with previous releases.
Support provided by tools from 11 service providers.	Expansion of the tool chain.
High level of acceptance thanks to existing consensus across many companies and sectors.	Gaining further acceptance by acquiring additional stakeholders in key smart-manufacturing sectors.
Expert groups including representatives from industry, SMEs, the commercial sector and relevant organizations. Free membership in expert groups; no eCl@ss membership status required.	Expansion of the expert groups to cover content relevant to Industry 4.0/smart-manufacturing topics.
3 Machine-readable precision	
Delivery of unique eCl@ss-IRDIs (ISO/IEC-compliant) for all eCl@ss elements (classes, properties, values, blocks, etc.).	Use of additional IRDIs for new entities.
Detailed ability to describe even complex products and product variants on the basis of structured properties at the device-class level.	Comprehensive cooperation with other large consortia such as AutomationML, OPC Foundation, VDI/GMA, PLCopen und ProSTEP.
4 Compliance with standards	
The structural model used by eCl@ss for the description and management of classes, properties, objects and so on is based on the ISO 13584-42/ IEC 61360 standard.	Expansion of the structural model to facilitate the implementation of Industry 4.0-compliant administration shells.
eCl@ss IRDIs are defined according to ISO/IEC 11179-6, ISO 29002 and ISO 6532. The eCl@ss release process is based on ISO 22274.	Where appropriate, this will also include participation in the adaptation and expansion of the standards referenced here.

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