The Semantic Web in Corporate Applications

The Semantic Web in Corporate Applications

The Asset Administration Shell (AAS for short) is the implementation of the digital twin for the Industry 4.0 platform.

In future, automation technology suppliers will also provide standards-compliant administration shells for their products. However, this requires a wide variety of information sources that are already available, or are yet to be created, to be integrated with the manufacturer. Using an Enterprise Knowledge Graph based on Semantic Web technology offers an opportunity to get a grip on the associated complexity.

The requirements on the administration shell are undergoing continuous further development. But it is becoming increasingly clear that the diversity and complexity of aspects of an administration shell are difficult to represent with a classic relational data model when it comes to variance and dynamics, especially considering the long-term maintenance costs for such data models that arise as the model requirements change again and again.

Semantic Web technology promises suppliers a possible escape from the dilemma this entails. We are all familiar with the World Wide Web; the Semantic Web was designed to expand it, making it easier to exchange data among computers and machines around the world and to use this data. What is crucial in this approach is to describe not only content, but also semantics, i.e., the meaning of the data – hence the term "Semantic Web."

The goal is to integrate many different information models defined by separate institutions, companies and individuals into a global knowledge graph based on the Semantic Web, linking various sources of information together and making them accessible.

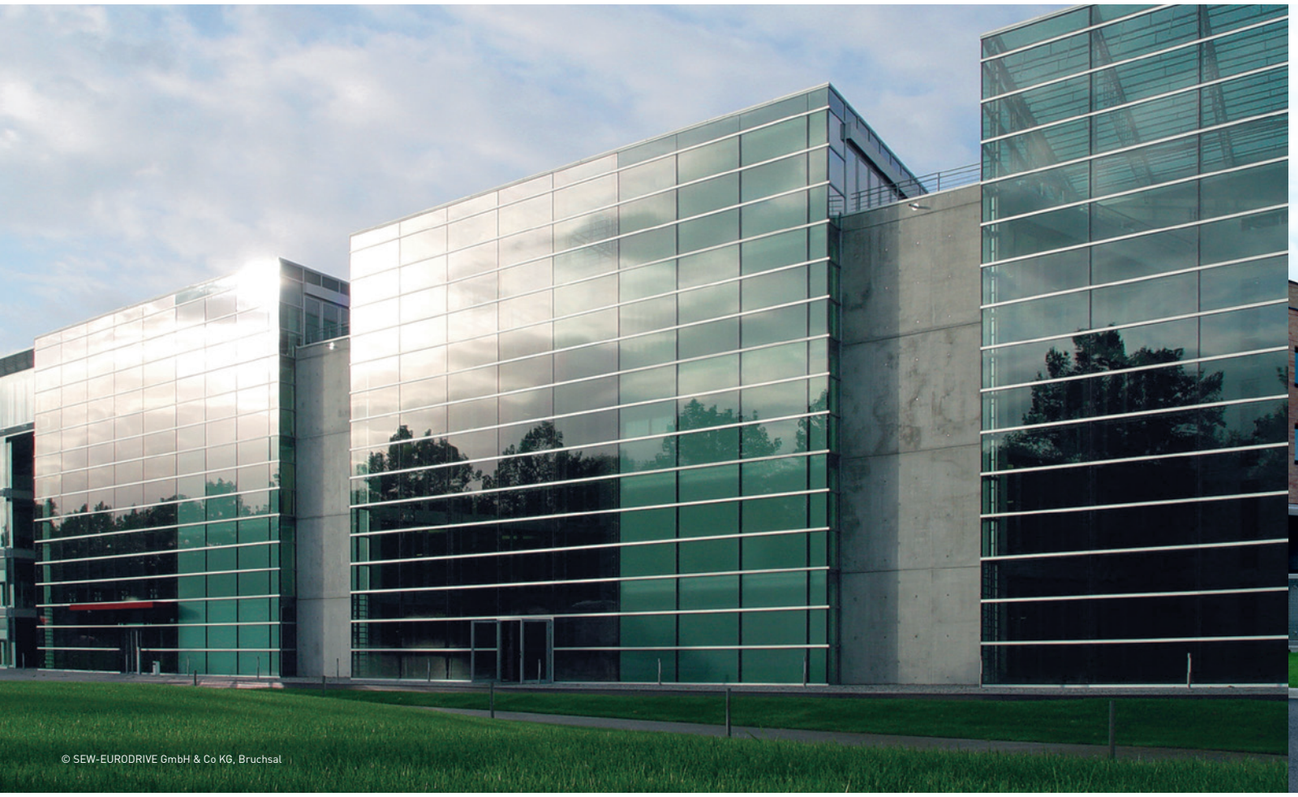
Although often derided as "too academic," this global knowledge graph is now a reality. In parallel with conventional website content indexing, large search engines like Google Search and Bing already support and exploit these technologies to a large extent. Since this has a positive influence on websites' rankings, many commercial sites are also enriched with such additional semantic information.

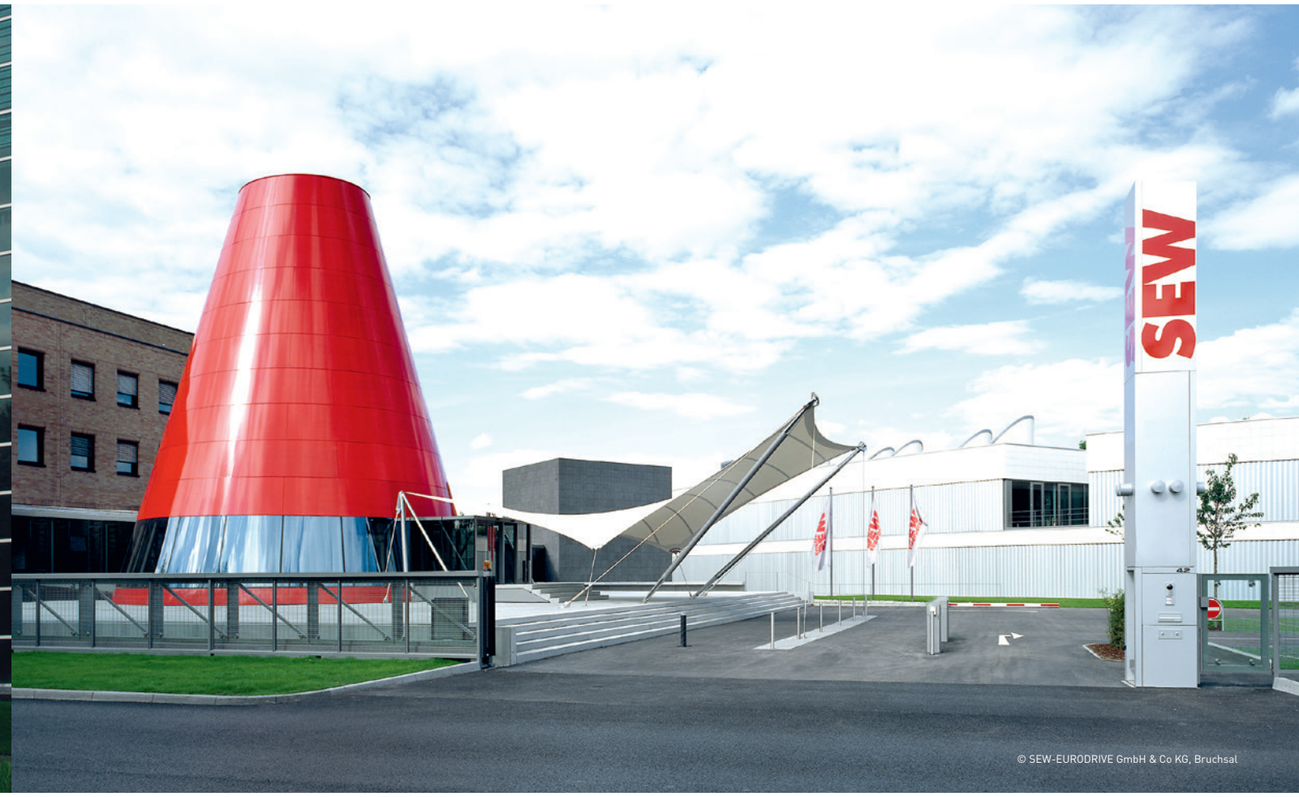
Standardized query and description languages like GraphQL, RDF, RDFS, OWL, SPARQL and SHACL form the technological foundation of this Semantic Web on the basis of infrastructure components like RDF Triple Stores and Graph DBs.

The Semantic Web has little to do with the kind of pattern-recognition AI based on deep learning or machine learning that is so popular today. However, the Semantic Web and pattern-recognition AI are complementary and can be combined effectively. So-called inference engines can derive insights from the combination of existing knowledge through logical closure. This also allows a wide variety of domains of knowledge to be linked together later on.

What needs to be done now is to take advantage of these strengths of the Semantic Web to better integrate the often very heterogeneous and dynamic data sources that exist within a company. Doing so yields a so-called Enterprise Knowledge Graph, which feeds on various types of available information and links them together semantically.

Such an Enterprise Knowledge Graph can also be used to represent every aspect of every one of a company's products throughout their entire lifecycle. The project described here follows precisely this approach.





A Product Data Structuring Platform for SEW-EURODRIVE

SEW-EURODRIVE GmbH & Co KG is a leading global supplier of drive technology. In addition to its core product – electric motors – the company, which is headquartered in Bruchsal (Baden, Germany) and active worldwide, offers drive motors, gearboxes, motors, components for decentralized installation, electronically controlled drives, mechanical adjustment drive motors and drive solutions with a high level of engineering, complemented by their selection of additional services. SEW-EURODRIVE is taking a very consistent and strategic approach to the challenges arising from Industry 4.0. Providing a central product data structuring platform plays an important role in this strategy. This platform is being developed further at SEW-EURODRIVE in cooperation with M&M Software.

It combines product data from various internal data sources covering specific use cases within the product lifecycle and makes it available in a knowledge graph. This integration process is timely, automated and repeatable at any time, helping keep future maintenance costs as low as possible.

It creates a harmonized knowledge base that supports uniform querying, allowing a wide variety of services to build on it in the future for both internal use by SEW and customer use.

One important requirement is support for Industry 4.0 administration shells in the form of dynamic Web services. The AAS schemas are used in knowledge graph modeling for defining the central ontology, in order to allow a uniform, standardized information model to be used for all queries of the knowledge graph. These queries then no longer require knowledge of the corresponding data sources and their data models.

Benefits for the End Customer

With this highly innovative product data structuring platform, SEW-EURODRIVE aims to achieve the following benefits for itself and its customers:

- Permanently increasing efficiency in all SEW-EURODRIVE software projects by streamlining and minimizing non-value-adding tasks: data formatting, data structuring, data mapping, data scaling, integration of new data sources and the associated coordination cycles
- Obtaining valuable insights and innovative perspectives on the lifecycle and use of SEW-EURODRIVE products
- Creating a foundation for efficient, automated, cost-optimized, scalable customer business by providing the necessary data in a standardized format in the form of a transparent, easily consumable service
- Achieving broadly effective risk minimization in software projects through early consideration of basic IT requirements right from the system design stage, for instance in relation to scalability, data governance, security and modifiability

OVERVIEW	
Sector(s):	automation technology, electrical automation
Customer:	SEW-EURODRIVE

Technologies Used

- Semantic Web
- RDF (Resource Description Framework)
- Turtle
- SPARQL
- OWL
- SHACL
- GraphQL
- Enterprise Knowledge Graph
- Asset Administration Shell (AAS)
- Eclipse BaSyx
- Data Fabric Pattern

This is us.

M&M Software is an international software and digitalization partner.

We accompany companies in the digital transformation of their organizations, products and business models. We identify potential, generate ideas, derive strategies and develop tailor-made software solutions for the digital world.

The results of our trusting and cooperative collaboration are digital products or systems that are successful on the market and that we accompany throughout their entire life cycle.

We consult and implement at eye level and in close coordination with our customers. In this way, we create new business opportunities and secure competitive advantages. Our global teams work closely with partners in research, academia, and industry.

We turn visions for a digital world into reality.

M&M Software offers more than 35 years of experience and state-of-the-art technical know-how. Our almost 300 highly motivated employees at four locations across the globe are the main success factor of our projects. Together we drive the digital future.

www.mm-software.com

M&M Software GmbH

Industriestr. 5
78112 St. Georgen

Zentrale +49 (0)7724/9415-0

info@mm-software.com
www.mm-software.com

Part of the WAGO Group