

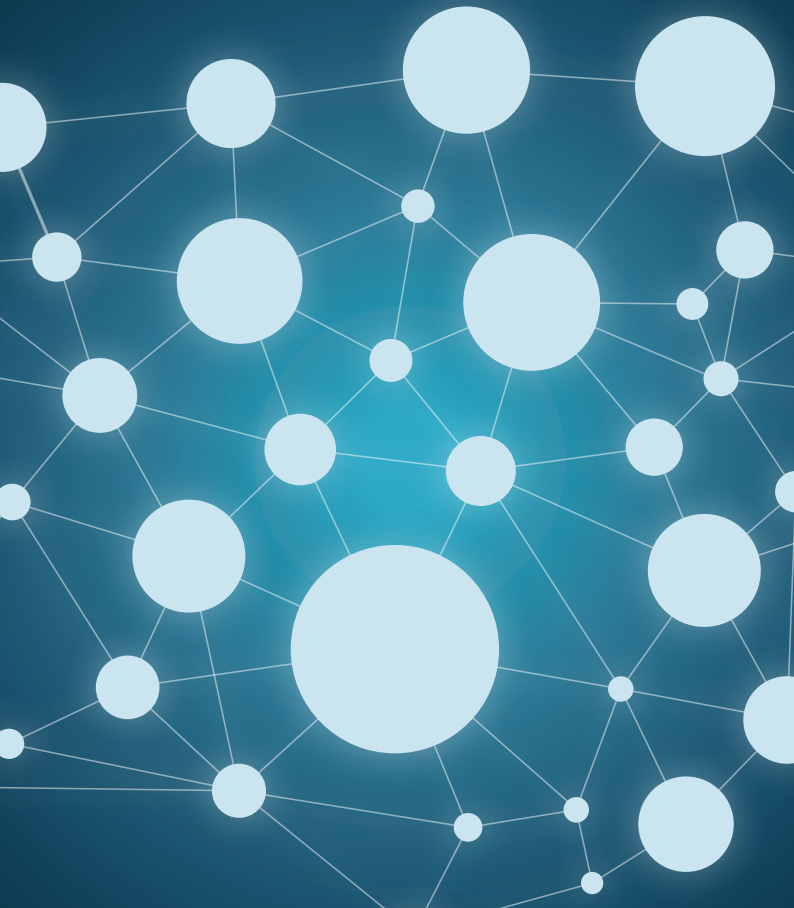


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ANALYSIS AND INFORMATION SYSTEMS IAIS

ENTERPRISE KNOWLEDGE GRAPHS



KNOWLEDGE GRAPHS INTERLINK DATA SILOS AND PROVIDE AN INTELLIGENCE LAYER FOR DATA LAKES

Efficient Enterprise Data Management reduces costs, increases performance levels and generates additional value for customers and enterprises. However, an obstacle for increasing efficiency in this regard is the disconnected nature of heterogeneous data sources and the exponentially increasing data volumes. As a result, enterprises require information management solutions that facilitate the integration and interlinking of heterogeneous data and thus deliver profitable insights and generate Big Data value, conferring long-term competitive advantage.

The Linked Data paradigm provides a semantic coherence layer to existing enterprise systems and data lakes through the introduction of an integrated set of vocabularies, based on which different types of data can be semantically described and to a large extent automatically interlinked, even when retained at source. The realisation of such a Semantic Data Lake for a specific company results in an »Enterprise Knowledge Graph (EKG)«, which can also comprise linked open data, thus extending the scope of the business application areas.

ENTERPRISE KNOWLEDGE GRAPHS TO THE RESCUE!

»Enterprise Knowledge Graphs (EKGs)« are realisations of Linked Enterprise Data, creating valuable business insights by bringing together semantic technologies and enterprise data infrastructures. EKGs go beyond data integration and also enable the next generation Artificial Intelligence applications. The semantics underlying EKGs provide machines with a unique advantage of understanding the meaning of large data volumes, allowing for instant linking, reasoning and automation.

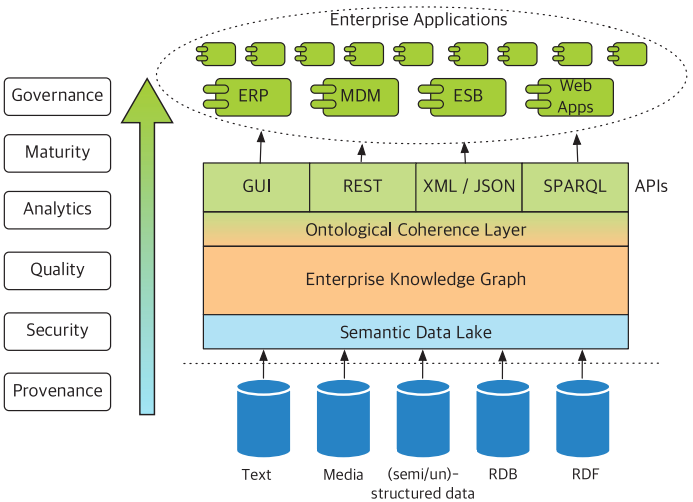
EKGs consist of a semantic network of concepts, properties, instances and relationships representing and referencing foundational and domain knowledge within or across different enterprises. They use a knowledge representation formalism (typically RDF, RDF-Schema, OWL) to holistically represent multi-domain enterprise knowledge including:

- **instance data** (ground truth) from open (e.g. DBpedia, WikiData) and private data sources (e.g. supply chain data, product models),
- **derived** and aggregated data,
- **schema data** (vocabularies, ontologies, taxonomies) categorizing entities,
- **meta-data** (e.g. provenance, versioning, documentation licensing),
- **links** between internal and external data,
- **mappings** to data stored in other systems and databases.

The »Enterprise Information Systems EIS« department at Fraunhofer IAIS investigates formal conceptual frameworks for designing, maintaining and exploiting such graphs:

- developing strategies for the semi-automatic construction of such graphs
- combining proprietary enterprise data and relevant open data repositories
- methods for retaining semantic coherence across the entire graph
- Improving query performance as well as governance and access control
- developing methods for the operation of EKG-driven enterprise information systems
- establishing data value chains across organisational boundaries
- integrating big data processing pipelines for analysis and generating insights

EKGs are positioned on top of Semantic Data Lakes, which consume raw data in various structured and unstructured formats and allow for on-the-fly data integration. The ontological coherence layer on top of the EKG consists of a set of ontologies covering different aspects of the contents, and provides unified means to interact and communicate with the EKG. The integrated data is then transformed into knowledge and exposed via the API layer to various enterprise information systems and applications.



Enterprise Knowledge Graph Architecture

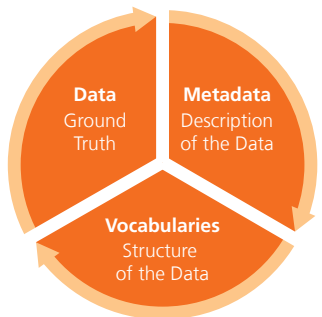
The operation and maintenance of an EKG-driven system is supported by a number of features such as provenance tracking, governance, security, etc. As an enterprise-level solution, EKGs must comply with corporate policies and standards governing its contents and evolution. We address this need with features such as provenance control, governance and security measures. These features are orthogonal to the knowledge acquisition and representation pipelines, and distinguish an »Enterprise Knowledge Graph« from other Knowledge Graphs.

Business value is generated via

- connecting and integrating data silos within and across enterprises
- generating novel insights through integrating company data with external open data
- facilitating queries across the entire graph and comprising data from various sources
- generating vocabulary-based views for different business perspectives or granularity levels
- integrating big data processing pipelines in order to provide valuable product insights

What we offer

- Vocabularies and Information Models for Enterprise Knowledge Graphs
- Customised Integration Strategies
- Semantification of Data Lakes
- Governance, Operation and Maintenance Guidelines
- EKG-ready Big Data Platform



Related Projects

■ BigDataEurope

Empowering Communities with Big Data Technologies
(H2020 CSA project)

www.big-data-europe.eu

■ Smart Data Innovation Lab

Accelerating innovation cycles using smart data approaches
(Supports multiple projects)

www.sdil.de

■ Industrial Data Space

Sovereignty over data and services (Industry project)

www.industrialdataspace.org

Publications

■ Mikhail Galkin, Sören Auer, Hak Lae Kim, Simon Scerri:

»Integration Strategies for Enterprise Knowledge Graphs«.

Tenth IEEE International Conference on Semantic Computing, ICSC 2016, Laguna Hills, CA, USA, February 4-6, 2016. IEEE Computer Society 2016, ISBN 978-1-5090-0662-5.

■ Niklas Petersen, Christoph Lange, Sören Auer, Marvin Fromm-

hold, Sebastian Tramp: »Towards Federated, Semantics-Based Supply Chain Analytics«. 19th International Conference on

Business Information Systems BIS 2016, Lecture Notes in

Business Information Processing 55, Springer 2016,

ISBN 978-3-319-39425-1.

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Enterprise Information Systems



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