

# Protocols for semantic interoperability in distributed environments

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**Abstract**—The domain of information and communication technology faces a challenge of integrating increasingly massive amounts of data. Despite significant progress in development of data management and exchange solutions (e.g., the FAIR principles for open data), information is often poorly managed, badly structured, and lacks context, complicating data integration. There's a need for improved or new modes of storage, sharing, recovery, modification of data. This project proposes a solution by way of data interoperability across different information systems and technological platforms. This doesn't imply compatibility of different information systems on a hardware-software level, but intersystem data representation and interpretation with the help of common standards and protocols. Such an approach has to be based on distributed data architectures designed with semantic models that facilitate information exchange. Semantic interoperability implies that data that is being exchanged is interpreted consistently by all parties. This research aims to develop new methods of ensuring semantic interoperability through standardization, formalization, and ontologies as primary data interchangeability enablers. The primary objectives are: to identify methods of designing new distributed data architectures that ensure semantic interoperability; to develop a methodology for implementing protocols that guarantee semantic interoperability in distributed systems; to create new models of interaction of heterogeneous network entities, and a protocol that supports effortless data interchangeability; to develop new methods of validation and verification of the developed protocol. The expected results consist of producing new formal and empirical methods of ensuring semantic interoperability in distributed information and communication systems. These methods would contain: a metalanguage for modeling interoperable data, and a protocol for semantic interoperability in distributed systems.

**Index Terms**—data serialization, ontologies, FAIR principles, knowledge graphs, Semantic Web.