Combining Distributed Knowledge Graphs for Agent-Based Decision Support

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1 Introduction

Microservices Architecture is a common approach to decomposing monolithic systems into smaller parts (services) that can be deployed and scaled independently. Adopting a Microservices based approach can weaken relationships within the applications data model due to the division of the monoliths data model into discrete sub-models that are each associated with a specific service.

Typically, relationships between entities hosted across different services are maintained by the use of primary keys, but this is not a good solution as the client must know the URL of the relevant API of the service to access information about the related entity.

REST offers a solution to this in terms of the embedding of hypermedia links and forms within resource (entity) representations which can be used to re-establish the diminished foreign key relationships. When semantic (RDF) representations are applied, the result is an emergent distributed knowledge graph that can provide an implicit structure that can be used by clients to explore the underlying application and extract knowledge required to achieved assigned tasks. In our mind, these tasks are performed by Hypermedia Agents who are designed to consume and reason about resources that are exposed on the web.

To illustrate this, we have explored the adoption of this approach to support the creation of decision support services for crop farmers, with a particular focus on winter wheat. A distributed knowledge graph is used to integrate and link multiple heterogeneous data sources to provide a single knowledge graph that combines all the information related to a given field/farm. A set of decision support agents are then implemented that are able to execute decisions by extracting the relevant input data from the knowledge graph. The results are then either automatically integrated into the knowledge graph or presented as recommendations to the farmer.