Federated Semantic Data Management for Business Intelligence and Healthcare: Two Case Studies

Juan F. Sequeda[1] and Wayne Heideman[1]

[1] Capsenta Inc., Austin, Texas, USA
`{juan,wayne}@capsenta.com`

Abstract. We present two case studies, in the area of Business Intelligence and Healthcare, where Federated Semantic Data Management solutions has been successfully used and deployed, to address the needs of generating financial business reports and identifying patients in need of a cardio medical device. In both case studies, the semantic approach decreased time and cost compared to traditional data integration approaches.

Keywords: Business Intelligence, Healthcare, Ontology Based Data Access, R2RML, Ontology, Mapping

1 Introduction

Consider the following real-world examples. (1) Executives of a large e-commerce company need to know how many orders were placed in a given month and the corresponding net sales. Depending on whom they ask they get different answers. The IT department managing the website records an order when a customer has checked out. The fulfillment department records an order when it has shipped. Yet the accounting department records an order when the funds charged against the credit card are actually transferred to the company's bank account, regardless of the shipping status. Unaware of the source of the problem, the executives are vexed by inconsistencies across their business reports. (2) Cardiologist and nurses at a hospital are trying to identify patients in need of a Left Ventricular Assist Devices (LVAD), a mechanical device that helps a failing heart pump blood. However, the data needed to identify patients is located in different systems. Additionally, the only time when doctors and nurses are able to screen for patient matches is after their day shift. That is why on average only 10% of patients who are in need of an LVAD are identified.

In this presentation, we share our experiences of deploying Semantic Web technologies to address these two use cases. The architecture we follow is that of Ontology Based Data Access (ODBA): OWL ontologies [1] (aka Enterprise Knowledge Graphs for non semantic web users), serve as a uniform conceptual federated model describing the domain of interest, independent of where and how the data is stored; R2RML mappings [2] connect the source databases with the ontology. SPARQL queries [3] in terms of the ontology can be evaluated in a federated manner over the heterogeneous source databases.

A challenge we face of deploying a Semantic Web architecture from scratch is the engineering of the ontology and mappings. In this presentation we will discuss our pay-as-you-go methodology that address this challenge and enables agility [4].

2 Case Study 1: Business Intelligence

For the first case study, we will present how a large e-commerce company, after multiple failed Enterprise Data Warehouse efforts, was able to make sense of their inscrutable order-management system and Oracle E-Business Suite by using federated semantic data management technologies. Initially, the knowledge of what data was needed to generate business reports was coming from a couple of business analyst and IT developers. This approach did not scale. Executives did not always trust the data because the process to generate the business intelligence reports was not well understood. Today, this organization has reduced time and cost to generate new and trusted business intelligence reports because a much larger group of business analysts are empowered by the semantic data.

3 Case Study 2: Healthcare

In the second case study, we will present a patient stratification case study from the Ohio State University Wexner Medical Center. Traditional Enterprise Data Warehouse solutions did not satisfy the need due to cost. Additionally, moving data into a centralized warehouse was not an option due to data privacy. By using federated semantic data management technologies, the medical center was able to identify 30% more patients in need of a life-saving Left Ventricular Assist Devices (LVAD).

4 Conclusion

Attendees of this presentation will takeaway the following: understand the business problems from these two use cases, the limits of traditional data integration approaches, the benefits of a federated semantic data management solution and the challenges that were addressed to successfully deploy the semantic solution.

References

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