Dataspaces Enhancing Decision Support Systems in Clouds

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ABSTRACT

Business Organizations increasingly rely on publicly accessible communication infrastructures such as the Internet and Cloud computing, in order to manage their internal processes and offer their services to financial actors, businesses and ordinary people worldwide. However, little attention has been paid to embracing Software-as-a-Service (SaaS) philosophy for supporting business analysts in evaluating effectiveness and relevance of business information or finding patterns to direct them on more sources of data. This paper proposes a flexible architectural framework for modelling application services useful in supporting business decision processes. This architecture goes beyond the static schemas offered by data warehouse systems as it supports including data gathered from heterogeneous sources and added-value services offered in Internet or provided by Cloud infrastructures. Central to this architecture is the concept of dataspace as a reference model for structuring information relevant to a particular organization, regardless of its format and location. A case study of a real world implementation is presented dealing with supporting decisions in the real estate domain.

Keywords: Cloud Computing, Dataspaces, Decision Support Systems, Real Estate, Service Oriented Architectures

INTRODUCTION

In today’s increasingly global and competitive business environment with fast-moving marketplace, advanced data management solutions help organization in linking together their processes and data to provide a common view of their business. The potential rewards of effective data managing are many, including real-time insight into data quality, quickly and easily, constant control of data as business grows, changes and evolves, more sharply targeted marketing campaigns etc. Business organizations increasingly rely on Information and Communication Technology (ICT) systems and networks, which may also consist of publicly accessible communication mediums such as the Internet and Cloud infrastructures, in order to manage
their internal processes and offer their services to financial actors, businesses and ordinary people worldwide. The above organizations have exploited these infrastructural changes in order to deliver innovative and high quality services, and increase their revenues, thus preserving efficiency and cost-effectiveness. The benefits have been enormous for both public institutions and private organizations.

The proper use of ICT services can support business analysts in extracting appropriate data from external databases, analysing the data and then linking results directly to other applications or tools such as the maps offered by Google Earth and similar Internet services. This results in the acquisition of value-added information which is becoming more and more the principle for organizing the business, rather than considering the hierarchical perspective offered by static and local decision support tools.

Such dynamic decisional environments are becoming increasingly common in small and medium enterprises and a lot of similar business realities. For example, real estate practitioners streamline their decisions by collecting property data and improving the accuracy and consistency of commercial property analysis. These practitioners must decide faster and do more with potentially less budget and resources. At the same time, they must be incredibly efficient and more precise with every decision, while complying with regulatory requirements. Their work relies on social, economic and environmental information ad specific data such as local market, location and the local economy general trend.

When similar circumstances arise in business environments, supporting decisions requires action based on information coming from many different parts of business – including external partners and markets. While ICT services are starting to emerge, data warehousing and current proprietary solutions are often expensive, cover only isolated aspects of business and lack support for sharing information between services and between users.

However, little effort has been done in the area of integrating technologies derived from Service Oriented Computing (SOC) and Cloud computing in a working Decision Support System (DSS) enabled by high quality, interoperable services.

Leveraging on Software-as-a-Service (SaaS) philosophy (Mell & Grance, 2011), this paper focuses on providing mechanisms for: (1) abstract the complexity of integrating data in heterogeneous computing environments and (2) provide a decisional support with a high level of flexibility to the user needs. The level of flexibility is intrinsically linked to the way in which these mechanisms are able to integrate information, regardless of its format and location, and make complementary the different aspects of decision processes.

Specifically, we investigate how application services can become innovative components of these emerging decisional supports in order to automatically offer functionalities that are not longer locked to a static infrastructure, as it happens in data warehousing systems or enterprise databases, but refer to computational resources made available through a computer network. We try to explore the features of a reference model for designing a flexible decisional environment by identifying its critical aspects, the limits of its applicability and its scope.

The main contribute of this paper focuses on proposing a flexible service oriented architecture for a Decision Support System which gathers data from heterogeneous networked sources, interfaces business tools and added-values services offered by different providers, including Internet providers and Cloud infrastructures.

Central to this architecture is the concept of dataspace (Franklin, Halevy, & Maier, 2005; Halevy, Franklin, & Maier, 2006) as a reference model for structuring information relevant to a particular organization, regardless of its format and location. The elements of a dataspace are a set of participants (i.e., individual data sources) and a set of relationships in which
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