

Bridging Heterogeneity: Research and Practice of Database Middleware Technology

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1 Introduction

At Daimler-Benz, the total corporate data resource is made up of multi-vendor database (DB) servers, legacy and current data, and relational and non-relational data sources. Unfortunately, such autonomous data sources have no ability to relate data from these heterogeneous data sources within the organization.

2 MENTAS

The project MENTAS (*Motor Development Assistant*) aims at realizing an interconnected, engineer-oriented development environment for a faster conception and comparative analysis of motors. In order to reach this goal, an integrated access to multi-vendor DBs is provided. In our exhibition we demonstrate how the interconnection of heterogeneous DBs in MENTAS works. After having analyzed the data models of each such DBs, we have brought the heterogeneous schemas into a global, virtual one, which contains just the data relevant for MENTAS. Finally, we apply a commercially available DB middleware solution to bridge the diverse ontologies and hence to cope with these heterogeneous schemas. Furthermore, we have designed a very friendly GUI in Java by means of which users are guided in the process of formulating SQL queries. We show how this interface allows users to issue SQL statements against any DBs incorporated in the federation, to navigate through heterogeneous DBs, and most importantly, to join and compare data in the DB federation. All of that as though all data reside in a

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single local DB when, in fact, most of the data are distributed over heterogeneous remote data sources.

3 AIDA

Unlike most DB middleware products nowadays, AIDA (*Architecture for the Integration of Data and Applications*) supports the coupling of DBs embodying different data models and schema structures to represent the same or overlapping application domain. AIDA's kernel is based on a generic translation approach employing a mapping language which supports data integration as well as migration. The mapping language, BRIITY (*Bridging Heterogeneity*), allows the application developer to integrate heterogeneous DB schemas in a homogeneous view. In particular, our mapping language is powerful and flexible with respect to solving mapping conflicts such as renaming, multi-source correspondences, (un-)nesting of attributes, etc. We have chosen an algebraic query translation approach which drives the mapping component. Hence, queries and mapping specifications are transformed to algebra graphs which are then assembled, optimized, and sent to the source DBs. Finally, either the result data are provided to the applications to support data integration, or the result set is stored in an (exchange-) file to support data migration.

4 Summary

We show a demo of the AIDA approach to bridge DB heterogeneity. Furthermore, we show how MENTAS can work well on top of AIDA, too. Finally, we deliberate on commercially available middleware solutions as well as on the AIDA approach and show which the best is, in which particular situation, and under which conditions. We point out the fulfilled expectations of the DB middleware products at the same time we discuss where they could have done better and what should be considered in next releases of such products.