Chapter I

Meta-Model Based Information Mediation

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ABSTRACT

Information mediation is one of the major approaches to solve interoperability problems related to heterogeneous information integration. This paper first discusses the concept of information mediation and typical mediation architecture. Two major mediation research projects, TSIMMIS and MIX, and their limitations, are discussed. Meta-model, a way for exchanging metadata, is then introduced for the purpose of improving information mediation. Finally, a meta-model based mediation approach is proposed.

INTRODUCTION

Information mediation is a research area that deals with integrating information from different, usually heterogeneous, information sources, including regular databases, XML source, record files, email systems, etc. The software that handles or masks data heterogeneity from end users is called a mediator.
In the information mediation research community, there are several research projects that have been completed (Molina, 1997; Baru, 1999a). Two of the most important ones are TSIMMIS (by Stanford University) and MIX (by University of California at San Diego). Although both of them use typical mediation architecture, different data models and query languages are used to solve mediation problems.

Exchanging meta-data based on meta-model (meta-meta-data) is always considered a major interoperability solution. Currently this approach is strongly backed up by the emergence of eXtensible Markup Language (XML), which is considered a breakthrough solution for interoperability. For example, Common Warehouse Meta-model (CWM) (OMG, 2001; Poole, 2002) is the first meta-model standard established by the Object Management Group (OMG) to enable the exchange of meta-data, mainly in data warehouse domain using XML. Although still being improved, this standard becomes our major motivation for creating new meta-model driven information mediation architecture.

INFORMATION INTEROPERABILITY AND MEDIATION

A common problem that the distributed information system faces is the need to integrate heterogeneous information sources, including regular databases, file systems, web database, email system, etc. Business decision makers need to access multiple information sources to gather enough information; but this is usually hindered by information heterogeneity, which includes data model difference, data format inconsistency, data semantic difference, naming inconsistency, etc. Unlike Intranet, data models of distributed information sources are usually unknown (Saelee, 2001). This brings even more interoperability difficulty. The solution to solve heterogeneous data access problems is called information interoperability, including middleware-based interoperability and mediation-based interoperability.

Middleware-based interoperability is similar to other business service interoperability. The basic idea is to encapsulate data access functions into methods and publish them using implementation independent Interface Definition Language (IDL). This type of interoperability is at the service level because users only invoke data access methods rather than query data itself. Many commercial products (CORBA products, Microsoft DCOM, etc.) could be used to support this approach.

Mediation-based interoperability provides users with (probably converted) data view and query language for querying heterogeneous information sources. This type of interoperability is considered at the data level, in contrast to the service level.
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